OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO. PROC-SERVICES/CB/EXPL-4394-A/2019

3D SEISMIC DATA ACQUISITION SERVICES FOR NARA CANAL-3D PROJECT

Note:

Bid bond of **USD 420,000/- (US Dollar Four Hundred Twenty Thousand Only)** to be submitted with the technical bid.

The master set of tender documents (services) uploaded on OGDCL website (www.ogdcl.com) is the integral part of this TOR.

Annexure-A

TERMS OF REFERENCE (TOR)

3D SEISMIC DATA ACQUISITION SERVICES

FOR

NARA CANAL-3D PROJECT

Oil & Gas Development Company Ltd.

INVITATION TO BID FOR 3D SEISMIC REFLECTION SURVEY OF NARA CANAL SINDH - PAKISTAN

GUIDELINES FOR THE BIDDERS

1. Oil and Gas Development Company Limited (Hereinafter referred to as "the Company") intends to carry out seismic reflection survey in Exploration Lease Area under petroleum concession agreement over onshore in Nara Canal and invites bidders to submit their firm proposals for conducting 3D Seismic Reflection Survey as per Schedules of TOR on turnkey basis using Dynamite & vibroseis as source of energy.
2. Data acquisition will be for a work program as defined in Schedule– A. The bidder must have experience in acquiring seismic data in such type of area and must provide detail of projects conducted.
3. Area information including environmental characteristics is important to understand before recording data.
   "The bidder is required to conduct a detailed reconnaissance of the area physically prior to submission of the bid and submit reconnaissance report with the technical bid proposal without which the bid will be declared as non-responsive and will be rejected."
4. Bidder must ensure in the reconnaissance report; ***"that complete seismic lines be recorded to delineate the subsurface structure especially the lines crossing the Nara Canal."***
5. The seismic acquisition program shall be carried out in proper manner as per international Oil and Gas industry environmental and safety standards and in accordance with good geophysical practices. The parameters mentioned in Schedule–B for guidelines only and final parameters will be decided after experimentation in the field.
6. For the purpose of carrying out the seismic survey, the contractor shall provide and maintain a basic operating unit consisting of personnel, equipment supplies and services adequate to carry out the survey on continuous basis.
7. The basic operating unit shall be required to be mobilized immediately after award of contract and to commence survey work forthwith.
8. The basic operating unit shall be required to carry out the work on a continuous basis till accomplishment of the program.
9. The contractor shall be required to comply with and conduct all operations in accordance with all applicable laws and Governmental orders, rules and regulations of Pakistan and of the Political Sub-Division, in which work is to be performed including, but, not limited to income tax laws and regulations, workmen's compensation laws, employer's liability laws, insurance laws, wage and working hours laws, safety rules and any regulations pertaining to the conduct of seismic operations in Pakistan.
10. Bidder/Contractor shall arrange for/provide and bear full costs of the following:

10.1 Basic operating unit, personnel's salaries/wages, bonuses, allowances, other benefits prescribed by law, entities, facilities, accommodation, messing, social insurance, medical services, leaves, traveling and transportation, etc.

10.2 All necessary land entry permits and fees and any other permits required by local authorities.

10.3 All import licenses, custom duties, sales tax and surcharges, if any/ bonds for the entry and exit of all contractor's equipment and supplies, port dues, octroi, handling expenses and agency fees, contract registration fees and all other levies fees, taxes or charges assessed against contractor.

10.4 All income taxes levied in connection with the contract on contractor's income and on the income of contractor's basic operating unit personnel whether in contractor's home country or in Pakistan.

10.5 Arrange / manage maintenance and repair of all the equipment that is part of basic operating unit.

10.6 All the necessary fuel and lubricants requirements of the crew.

10.7 Magnetic tapes used by field recorders, monitor paper, chemicals, films and photographic paper, survey supplies such as beacons, cement and flagging including materials for survey pegs.

10.8 Office/Warehouse rent, utilities, services and supplies, etc.

10.9 Technical and logistic support and supervision.

10.10 Furnishing of boarding and lodging in the field for max of four company representatives.

10.11 Transportation facilities (one A/C fitted 4x4 vehicle) should be permanently reserved for company representative deputed in the field and should be provided by the contractor. The same should be planned and included in the bid.

10.12 Delivery of all recorded data on 3592/LTO2/LTO3/LTO4 cartridges with seal & secured three copies (SEG-D) to OGDCL Head Office, Islamabad.

10.13 All replacement costs of basic operating unit, personnel deemed unqualified by OGDCL and of any unserviceable equipment which is part of basic operating unit.

10.14 Settlement of all claims for land damages resulting from survey, which are caused by negligence on the part of contractor's basic operating unit personnel, or, by source/explosives.

10.15 Primary survey control and material for permanent markers as required by OGDCL.

10.16 Explosives, detonating cord, detonators and firing line including their transport to the area of operations, handling and storage including licenses for explosives, radios, transport and equipment, work permits, residence, visas and fees.

10.17 Telephone/ Tele fax contact from field to OGDCL Head Office and as well

as mobile telephone facility to OGDCL representative in the field for the communication with OGDCL Head Office. The same will be provided by the contractor.

10.18 Health, Safety & Environment: - OGDCL expects that these issues will be handled with adequate care and the OGDCL has to be thoroughly satisfied prior to award of the contract.

10.19 Carry out and document an Environmental Health and Safety audit of facilities, and operational procedures to OGP standards.

10.20 Carry out and document a Technical audit of all recording equipment and systems including ground equipment and recording instruments.

10.21 Include on site camp medical facilities including a qualified on site paramedic and or nationally certified Medical doctor.

10.22 Implement and document an Emergency Response Plan to have arrangements in place to initiate a medical evacuation of an injured or person requiring medical treatment beyond the scope of the onsite paramedics and seismic base camp facilities.

11. You're Technical and Financial Quote should be for Seismic Data Acquisition using Dynamite & vibroseis as source of energy and should also include up hole /refraction survey for static correction control including line clearance, security, Land permitting / Crop Compensation, geodetic computations and on-site seismic data processing etc.

12.1 List of personnel (Expatriate and local staff/ labor proposed to be included in basic operating unit along with their qualification/ experience).

12.2 Detailed list of equipment including recorder, ground electronics, drilling units, survey, communication, bulldozers, workshop, camp and office etc. Also specify number of vehicles and their types to be employed for the operation and give details.

12.3 Likely date of mobilization and commencement of work.

12.4 Approximate duration for completion of the survey. And complete schedule of work Program in tabulated form.

12.5 Work experience in Pakistan as well as in the area of operations.

12.6 The contractor is advised at its own expense and security arrangements to conduct reconnaissance of the area for knowing the actual topographic and other field conditions of the area and submit reconnaissance report along with bid proposals.

13 Standard insurance coverage to be taken out and kept in full force and effect for the full duration of the contract to cover all of contractor's liabilities under the contract. Such insurance should be with insurance carriers and up to limits prescribed by law and satisfaction to the Company.

14 Contractor will be also responsible for transport, accommodation and food for the security agencies that will provide security Cover to the Contractor's Crew/Employees, Company Representative, and all Crew's equipment.

LIST OF SCHDULE

Schedule – A	INTRODUCTION AND SCOPE OF WORK
Schedule – B	TECHNICAL SPECIFICATION AND PARAMETERS
Schedule – C	PERSONNEL AND EQUIPMENT
Schedule – D	TEST AND QUALITY CONTROL STANDARDS
Schedule – E	RATES FOR THE 3D SEISMIC DATA ACQUISITION
Schedule – F	COMMUNICATION & REPORTS
Schedule – G	HEALTH, SAFETY AND ENVIRONMENT
Annexure- I	CHECK LIST
Annexure-II	TECHNICAL PROFORMA TO BE FILLED BY BIDDER

SCHEDULE - A

INTRODUCTION AND SCOPE OF WORK

1- SCOPE OF WORK

The NARA CANAL 3D Project is planned to acquire 3D seismic data of 600 Sq. kms operational area. The project area lies in three districts (Khairpur, Sanghar and Shaheed Benazeerabad) of Sindh Province, Pakistan. The main project area is located in jurisdiction of District Sanghar and Khairpur, whereas the north-west side falls in District Shaheed Benazeerabad (Nawabshah). The area in which 3D seismic acquisition is planned, lies within 2 EL. s of OGDCL namely Bitrisim EL and Khewari E.L.

A- GEOLOGICAL FRAMEWORK

The strata is regionally getting shallower southeastward with thinner sedimentary cover being progressively truncated. Therefore, the strata generally dips down from SE to NW. There is normal fault pattern with horst and grabon style. Generally, the faults run in NW-SE direction. Majority of the faults with such directions are sealing, either downthrown towards east or west.

B- SEISMIC OBJECTIVES

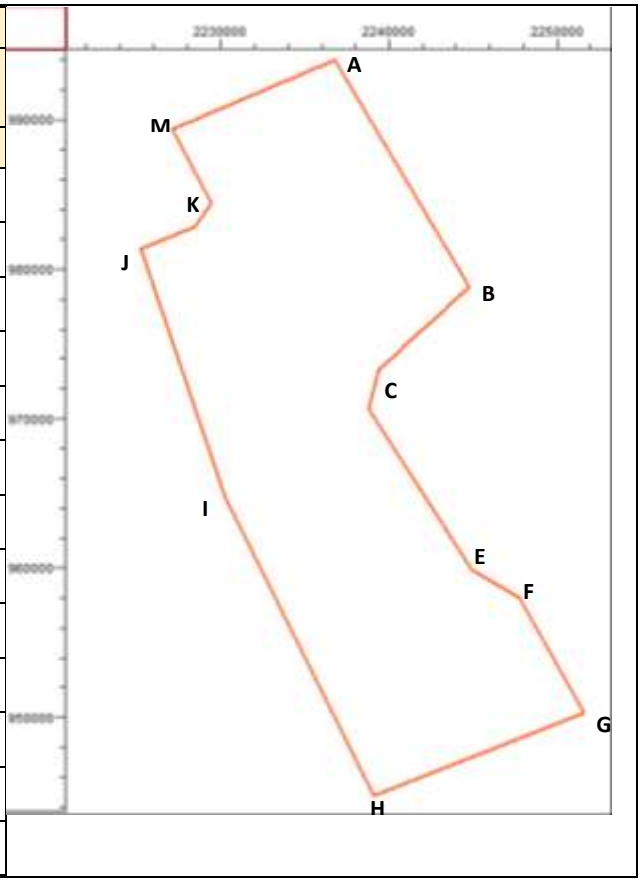
In the project area of The Lower Indus Basin, Cretaceous clastics are the major reservoirs. Cretaceous clastics mainly consists of Lower Goru and Sembar sandstones and are major oil/ gas producers in Lower Indus Basin. A number of wells have been drilled in this area. Since the major reservoirs lie in Lower Cretaceous clastics therefore our prime target is from 1500 M. Sec to 2650 M. Sec.

C- SEISMIC WORK PROGRAM

The Detailed 3D seismic work program is given below.

Operational Area: 600 sq. kms (about 80% dynamite & 20% vibroseis)
Source Line Orientation: 335 degree
Receiver Line Orientation: 65 degree
The completion period of the project is 10 (ten) months from the date of signing of contract.

Nara Canal-3D Operational Boundary Coordinates (GIIA)		
Point	X	Y
A	2236800.00	993998.00
B	2244788.00	978832.00
C	2239426.00	973275.00
D	2238834.00	970689.00
E	2244955.00	959910.00
F	2247815.00	957981.00
G	2251600.00	950284.00
H	2239086.00	944775.00
I	2230272.00	964737.00
J	2225231.00	981377.00
K	2228445.00	982873.00
L	2229424.00	984449.00
M	2227092.00	989349.00



Note:- Cable points (tail spread) will be laid out on eastern side of the project.

2- SCOUTING OF THE SURVEY AREA

The Company requires that the Contractor is fully aware of all local conditions in relation to seismic operations. Bidder should conduct a detailed scouting trip prior to submission of technical & financial Bid proposal of the Project area to address, amongst others, the following issues:

1. Sufficient base station locations for the survey system, as required.
2. Hazard Maps.
3. Operational Risk Assessment
4. Baseline Environmental assessment of the survey area
5. Evaluate effects and disturbance of the operation on the local habitats.
6. Road Maps and location of airstrips
7. Location of proposed base camp
8. Local logistics and infrastructure.
9. Local legal frame work, in particular for labor and safety regulations.
10. Licensing permits and tax requirements,
11. Explosive magazines requirements etc.
12. Equipment related to Nara Canal area.

3- GENERAL TERMS AND CONDITONS

Bidders will prepare their bid in two parts i.e. technical proposal (Part-I) and financial proposal (part-II) strictly in line with the instructions given in the TOR.

The contractor shall be required to comply with and conduct all operations in accordance with all applicable laws and Government orders, rules and regulations of Pakistan and of the Political Sub-Division in which work is to be performed including, but not limited to income tax laws and regulations, and working hours' laws, safety rules and any regulations pertaining to the conduct of seismic operations in Pakistan.

4- TECHNICAL PROPOSAL

4.1 The Technical Proposal of bidder should include the following documents/information, as the contractor shall have to meet the minimum technical eligibility criteria as per details provided in Schedule B, C & D.

4.2 List and detail CV of Technical personnel's, Expatriate and local proposed to be included in basic operating unit as per Schedule C.

4.3 Technical details and list of equipment and quantities as per Schedule C.

4.4 List of test and quality standards as detailed in Schedule D.

4.5 Complete/comprehensive schedule of work program.

4.6 Detailed reconnaissance report (Scouting Report of the Survey area).

4.7 Documented Experience in similar type of survey areas.

4.8 A copy of safety manual, HSE Organization and sample of accident /incident reporting forms.

4.9 EHS exceptions e.g. Emergency Response Plan, Medical arrangements, camp clinics, field magazine and security etc.

4.10 Copy of all crew operational procedures for land and in lake area.

4.11 The Checklist at Annexure-I must be provided in the Technical proposal.

4.12 Technical Performa to be filled by the bidder in Annexure –II.

Note: - Technical Evaluation criteria are mentioned in Annexure –III.

5- FINANCIAL PROPOSAL

Bidder should quote their charges in the financial bid strictly in accordance with the Schedule "E".

SCHEDULE - B

TECHNICAL SPECIFICATION AND PARAMETERS

1- INTRODUCTION

The Company requires that all seismic equipment supplied for the survey to be in new or nearly new condition in particular the spread cable and geophone strings. Geophone receiver elements should not be more than two years old.

All equipment proposed for the survey will be subject to audit for technical and safety before acceptance by the Company.

Specifications of all seismic, equipment and positioning equipment should also be provided with the Bid Proposal.

2- ACQUISITION PARAMETERS

Following are the tentative field parameters for 3D seismic data acquisition work to be tested in Nara Canal-3D Project.

3D Recording Land Geometry

Source Type	Dynamite / Vibroseis
Survey type	Orthogonal
Receiver Interval	50
Source Interval	50
Receiver Line Interval	300 m
Source Line Interval	300 m
Patch configuration	20L* 6S *144Ch/L
Total No. of Live Channels	2880
Total Fold	12 * 10 = 120
Aspect Ratio	0.83
Source Density	66.67
Inline Maximum Offset	3575 m
Largest Offset	4650.9 m
No. of Geophones / stations	24
Geophone array	Linear
Sample Rate	2 m sec
Record Length	6 Sec
Swath	Uniform, 06 shots/ salvo
In-line roll /X-line roll	01 line

Source Parameters for 3D surveys:

A) Deep hole drilling	
No. of holes	01
Hole Depth	18 m, 21 m, 24 m, 27 m, 30 m,
Charge size	01 kg, 02 kg, 03 kg, 04 kg, 05 kg
B) Vibroseis	
No. of vibrators	4 + 01 spare
Peak force	minimum 60,000 lbs
Sweep length	12,14,16 sec to be tested
Sweep frequency	6 - 96 Hz to be tested
No of sweeps	6,8,10 & 12

Final parameters will be selected after experimentation in the field.

SCHEDULE – C

1- PERSONNEL PERSONNEL AND FIELD EQUIPMENT

Following is the list of minimum personnel to be made a part of the agreement for seismic data acquisition, between the Company and Contractor for 3D seismic reflection data acquisition.

1	Party Chief	01
2	Data Acquisition Engineers (05 to 15 years' experience)	05
3	QC Geophysicists (05 to 15years experience)	02
4	On-site seismic data processor (05 to 15 years' experience)	02
5	HSE Advisor (one for base and one for fly camp)	02
6	Medical Doctor	02
7	Accounts / Admin Assistants	02
8	Surveyors	07
9	Radio Operator	02
10	Recording Field Assistant	04
11	Recording men	08
12	Drilling Technicians	04
13	Shooting Supervisor	03
14	Plant Attendant / Electrician	02
15	Mechanics	05
16	Drillers	08
17	Shooters and technician	05
18	Carpenter	01
19	Dozer Operators	As required
20	Any other as per requirement	

2- FIELD EQUIPMENT

Following is the basic field equipment which will be provided by the Contractor to perform the 3D seismic reflection data Project.

A.	**RECORDING EQUIPMENT** (Type / Make / Model) 24-bit latest telemetry system (Like 428, 508 XT & G3i) or better with details as under. 1. Recording / Instrument / Specification / maximum Number of active channels available/ channel capability with dynamite & vibroseis mode /online data quality control system. 2. Detail of Ground Electronics / cables with years of purchase Number of available Geophone strings / (SM-24/ SG-10 or equivalent / better), Technical Literature. 3. 12 Nos. of Geophone per string (Configuration, 06 series +06 series & both series in parallel. 4. Detail of auxiliary / test equipment for ground electronics and geophone groups. 5. Encoder / Decoder (Shooting Equipment) Equipped with GPS. 6. Detail of Transition zone equipment (hydrophone/marshy/submersible geophone / positioning sensors) Transition Zone Safety Equipment.
B.	**DYNAMITE SOURCE EQUIPMENT** 1. Vibrators fitted with latest control electronics VE 432/464, Vib Pro/Force II/III or equivalent or better (At least 05 Nos.) Peak force not less than 60000 lbs. equipped with DGPS System & its type. 2. Numbers, Type, Drilling Capacity (30m) of Rigs. 3. Portable Rigs/ Jack hammers / No. of units available. 4. Truck Mounted Rigs / No. of units available 5. Source equipment for Lake Area.
C.	**REFRACTION / UPHOLE LOGGING UNITS** 1. Up-hole Logging Unit: 24-bit Instrument with Specification, type of geophones & numbers, Rig with Capacity 100m. 2. LVL / Refraction Survey Unit, type of geophones & numbers, Instrument Specification / Spread Length / Channels LVL processing & Statics calculation software.
D.	**ON-SITE SEISMIC DATA PROCESSING UNIT AND 3D PLANNING AND DESIGNING SOFTWARE** Detail of 3D Processing Software & hardware.
E.	**GPS AND SURVEY EQUIPMENT** 1. Make /Model of GPS and related equipment 2. Version Number 3. Survey Computation Software
F.	Detail of vehicles and other machinery like dozers, tractors and Generators in the crew. Radio and Communication equipment & facilities.
G.	Radio and Communication equipment & facilities
H	Miscellaneous equipment etc.

SCHEDULE - D

TEST AND QUALITY CONTROL STANDARDS

A. FIELD PROCESSING SYSTEM

An on-site data processing system will be required for monitoring quality control of seismic data acquisition and a complete set of a state-of-the-art 3D basic and advanced seismic data processing software package.

MAIN FUNCTIONS OF THE SYSTEM WILL BE:

1. Daily quality control of the data.
2. Optimization of the processing parameters.
3. Data processing to the final/migrated stack level.
4. Instrument test analysis.

FOLLOWING BASIC PROCESSING FLOW WILL BE FOLLOWED:

1. De multiplexing
2. Building of geometry
3. Display field records
4. Editing of bad & noisy traces
5. Early mute application
6. Filter analysis & application
7. Trace balancing
8. De convolution analysis & application
9. Application of field static / Refraction static
10. Velocity analysis & application
11. Preliminary stack
12. Compute residual statics & application
13. 1st Velocity analysis
14. NMO and mute
15. DMO
16. 2nd Velocity Analysis
17. Final stack
18. Migration Stack

A report should be prepared after the completion of each line swath. This report should contain a summary of all kinds check done (geometry, coordinates, traces, records etc.), results and observation during processing and final / Migrated stack and processing flow chart.

A CD/DVD should be attached to the report with the following data.

- Updated SPS files.
- Interpreted up-hole result in Pdf or excel format
- Seismic section in SEGY format with XY coordinates in the headers.
- Seismic velocities (NMO, migration) in any standard format compatible with Geoframe/Petrel.
- Any other data related to on-site processing.

B. TEST AND QUALITY CONTROL

1. DAILY TESTS

According to instrument specifications and tolerances given by manufacture, the following tests should be recorded daily on tapes.

i. Noise and offset of all channel units lay to start production.
ii. Internal pulse test.
iii. External geophone pulse test.
iv. Short dynamite range determination.
v. Ambient noise (line noise). The test may be repeated whenever there is increase in noise.

2. MONTHLY TESTS

i. Noise and offset.
ii. Internal pulse test.
iii. Dynamic range determination.
iv. Cross feed test.
v. A-D Non Linear test.
vi. Geophone tap test.

3. PARITY AND SYNC ERROR

The system should be maintained in good mechanical and electromagnetic condition to ensure minimum parity and sync error within published specifications.

4. RECORDING SYSTEM POLARITY

SEG Standard, A positive signal at the amplifier input produce positive numbers recorded on magnetic tape and upward reflection of field monitor.

5. PAPER RECORD

Data traces and timing should be clearly visible with constant paper speed (within 1% error).

6. NOISE SPECIFICATION

Noise specification will be based on fixed gain monitors to maintain a signal to noise ratio of 1.5:1 or improved. A fixed gain monitor of spread noise recorded will be taken on field tape and will be displayed on paper monitor daily prior to start seismic recording and any time requested by company representative.

The spread noise will be recorded with normal recording filters and recording setting. A record with all the channels will be analyzed by the seismic QC system.

7. CABLE AND GEOPHONES

Contractor will continually check the faulty groups with proper geophone group tester & SMT instrument.

All the significant noise, dead traces and groups with low response will be repaired or removed from the line.

If the recording spread does not fulfill the operation specification as listed in the contract, the company representative has the authority to suspend the operation at any time.

8. RECEIVERS

The contractor will ensure the vertical plantation of geophones with good ground coupling. In case of wind noise the geophones should be completely buried in the ground to reduce the effect of wind on geophones where ground condition does not permit the burying the

geophones and spread noise is outside normal acceptable standards, the company representative must be informed the situation.

All the geophones will be planted at correct spacing to ensure the validity of recommended array.

To avoid effect of noise from pipelines, the change in lay out plan source and receiver may be required at places.

9. SEISMIC SOURCE

9.1 DYNAMITE

i- Charge in the shot holes will be loaded with poles to ensure its placing at recommended depth.

ii- Time break confirmation and up-hole time should be systematically recorded for each shot point.

iii- All the charges must be properly tamped with small graded crushed stone to avoid blowouts.

iv- Any charge that is loaded at shallower depth must be reported to Company Representative who will decide to take it as production shot point or to re-drill/ re-load.

v- Extra care must be taken while drilling source points, loading & shooting explosive close to the pipe lines& populated areas. Standard Operating Procedures will be adhered while handling explosive.

9.2 Shooting System

i- Shooting system should be equipped with GPS system.

ii- Timing test is performed by blasting of a detonator cap, which breaks a low voltage DC electric circuit winded around the cap. The following signals have to be recorded using the auxiliary and data traces of the equipment:

- The voltage of the DC circuit,
- Clock time break (TB) supplied by the encoder,
- Confirmation TB supplied by the decoder (shooting box)

iii- Up-hole time test

First breaks from the two single geophones planted close to each other are used for the test. The sources have to be located far enough from the geophones so that the difference in the direct arrival time to geophones is below one millisecond.

Data of one of the geophones have to be recorded on an auxiliary trace, while data from the other geophone on a data trace. Time break has to be recorded on both, an auxiliary and a data trace.

Up-hole time read out from the auxiliary and the data traces have to be corresponding within one millisecond. Up-hole time read out from the auxiliary traces and the shooting box has to correspond within 2 milliseconds.

iv- Prior to the commencement of the acquisition, Contractor shall perform both, timing and up-hole tests for each shooting box at the crew.

v- Additional tests have to be performed if

- Any part of the shooting system (shooting box or radio, cables) has been changed,
- The type of detonator caps changed

- The equipment newly joined the crew
- When the accuracy or stability of the system becomes doubtful.
- Up-hole or shallow refraction Equipment

The tests prescribed by the manufacturer have to be run first at start-up and later every time before the start of acquisition of a new up-hole or shallow refraction point. The time break has to be recorded and must correspond to the zero time of recording.

9.2 Vibroseis

Vibrators should be equipped with DGPS and latest model of vibrator control electronics for GPS positioning and navigation, real time quality control and data monitoring.

The following signals have to be recorded on the auxiliary and data traces of the seismic recorder (All traces polarities have to meet SEG standards).

i. Mass accelerator
ii. Base plate accelerator
iii. Ground force
iv. True reference sweep
v. Pilot sweep (pilot sweep generated by sweep encoder
vi) Sweep time break

All the polarities have to meet the SEG Standards. Polarity has to be checked in pulse mode when downward moving base plate (positive number on the tape and upward signal on camera display).

The ground force signal has to be used for phase-locking.

The phase shift between the reference sweep and the ground force signal has to be set to 180 degrees.

Periodic tests:

The periodic tests have to be accomplished to each vibrators

periodicity	Tests	description
Start-up	Hardwire Similarity	To be recorded on separate magnetic tape with separate file number.
At every two weeks	Hardwire similarity	To be Recorded on a production Tape & also on separate magnetic tape with separate file number.

* All hardwire Similarity Tests recorded on separate magnetic tape should also be provided at the end of the project

Additional wire line and radio similarity has to be performed when

- The vibrator newly joined the crew.
- The vibrator has been repaired
- The sweep has changed

The vibrator GPS test has to be logged and the results have to be handed over to Company Representative.

During production a continuous quality control will be performed through the real time vibrator QC system in the Recorder. Average and peak phase, distortion and force of each operating vibrator on every sweep will be recorded on diskette and delivered to company representative on daily basis.

Tolerances for vibrator performance, with the exception of the tapered zones.

Parameter	Tolerance
Avg. phase error	Less than two (2) degree
Peak phase error	Less than ten (10)degree
Avg. force	Not less than 80% of nominal drive level
Avg. distortion	Less than 25%
Start time difference	Less than 0.5 m sec between two vibrators
Tolerance for GPS Horizontal Vertical	 2 meters 2 meters

On normal areas, the actual position of any vibrator shall not differ from its theoretical position by 3 meters. In case of discrepancy the source point can be repeated or actual position is surveys depending on the Company representative advice.

10. RECORDING EQUIPMENT.

i- Recording equipment has to be tested as it is prescribed in the standard seismic equipment tests.

ii- The recording parameters;

- Are either set in geophysical data acquisition contract /agreement or
- Given by company representative in writing before the start of the project.

iii- During the recording the seismic data all events, which may be important from the point of view of any later check-up, processing or interpretation of recorded data, are recorded on automatic and/or manual log (observer log). The seismic crew is responsible for the completeness, exactness and unanimity of data logged.

iv- The observer log (s) have to contain at least the following Information:

i) Company	ii) Contractor	iii) Block, Country
iv) Recorder type & Serial No.		v)Parameter settings
vi) 3D line name/swath,	vii) Date	viii) recorder position
ix) Source type	x) Reel No.	xi) Record No.
xii) Source position	xiii) Up-hole time	xiv) Recording time
xv)Spread description	xvi) weather conditions	xvii) Remarks

v- The ambient noise has to be checked permanently during recording. Every reasonable effort shall be made to minimize the ambient noise. Company representative has to be informed on the increase of noise level.

vi- During the recording, the recording truck shall be offset from the receiver lines at least 150 meters. Any switch settings or modification in the recording electronics, blasting units or the related equipment including their driving software that can result in the change of the value or format or the control of the digital data recorded, can only be changed or done after company's approval or instruction.

vii- There shall be no bad traces on the spread at the beginning of the day. During the normal day of operations, a maximum of 1% of the traces may be bad (except for surface restrictions).

viii- Playback of records shall be produces at a scale agreed by company representative. Monitor record of every 10^{th} shot point will be provided to Company Representative. Each monitor must be annotated to show line number,

shot point number etc. and signature of the observer. However, if required by the Company QC / representative monitor record of any shot point will be provided to him.

ix- Auxiliary channels have to contain at least the following signals:

- Clock time break
- Dynamite Recording
- Up-hole from encoder

x- Dynamite shooting will be controlled by radio shooting system. The transmitted time break must be synchronized to recording within 0.250 mille-seconds.

Safety distances:

Minimum safety distance from any deep shot hole or vibrator position to the local main pipe lines (buries or surface fixed), water or oil wells, permanent buildings at normal conditions will be maintained.

However, an increased safety distance has to be kept to avoid excessive damages in case of increased charge, unstable structures, gas/oil/water pipelines of overriding importance, sensitive environments, etc.

11. MAGNETIC RECORDING TAPES:

The seismic data will be recorded on new magnetic Tapes/HD/ NAS/SAS of branded acceptable company.

Proper precautions would be observed in recording, sealing, storing and transportation of magnetic tapes.

Tapes will be labeled showing line number, file number, shot point numbers, calendar date, Prospect Area, Client's name and Contractor's name etc. Recorded tapes will be numbered in a serial order.

12. SEISMIC DATA RECORDING DELIVERABLES.

Contractor shall be responsible and bear the cost of surveying consumables for the 3D Seismic Data recording including field tapes and explosives, caps and firing line. The Contractor shall provide the field data on LTO2/LTO3/LTO4 cartridge tapes in SEG-D as following three sets:

i- Original field data set
ii- A second copy of field data set
iii- A third copy of field data set

13. MISFIRE AND SKIPPED SHOTS (Dynamite)

A misfire is any seismic record not correctly recorded. The following are examples of misfire**.**

- Loss of magnetic recording.
- Loss of time break.
- Time break is not synchronized to the system cycle delay time.
- Explosive in shot point does not detonate.
- Explosive partially detonate resulting unacceptable data quality.
- SP is unnecessarily recorded at offset not recommended by company representative.
- Dead/ noisy channels should not be more than 1%, however in extreme field conditions i.e. terrain of the area, populated area, the noisy/dead/skip channels may vary and company representative will decide accordingly.
- Company representative will also decide the re-shot schedule for misfire and skipped shots.

14. SURVEYING AND POSITIONING

All the survey equipment shall be calibrated and tested prior to the start of operations and later, during the operations according to the manufacturer's specification and good survey practice.

Contractor shall be responsible for the construction and installation of permanent markers.

Position, coordinates and access to the permanent markers should be logged and reported in the final operations report.

Based on the primary network points, Contractor will survey a secondary control network from which the seismic lines will be set out.

All the control points will be permanently marked and clearly described to allow recovery in the future.

Generally, Observations with less than five satellites are not allowed. Check shots will be made on 5% of the surveys stations, evenly distributed during the observation period.

All the necessary computations will be completed on site. Final coordinates and elevations will be produced in SPS format.

The final survey report will be a part of the final operation report and will include the following information.

- Co-ordinates and elevation of the receiver and source points of seismic lines including deviated points.
- List of key survey personnel.
- List of equipment used (types and versions)
- List and description of software used (types and versions)
- Description of processing method/Surveying parameter used (spheroid, projection, datum shift etc.)
- Listing of coordinates, elevations and description of permanent markers.
- Listing of coordinates and elevations of seismic lines crossing
- Listing of coordinates and elevations of control points
- Kmz files of each modeled and recorded data
- Listing of disk ID-s directories and file names
- Field notes
- Line description
- Factors influencing the accuracy and efficiency of survey
- Any problems encountered during the processing of survey data.
- Loop closure maps, if required, (bearing, coordinates and elevation) and operation maps in scale accepted by company.

NOTE: Any other data relevant to project, if required by client should be provided.

SCHEDULE - E

RATES FOR THE 3D SEISMIC DATA ACQUISITION

The bidder shall provide rates for the 3D seismic data Acquisition in NARA CANAL 3D Project for the performance of work according to the parameters proposed by the Company and included in Schedule – B of Term of Reference in the format given below. All the rates should be quoted on a production basis.

Financial evaluation will be carried out on lump sum basis. The quoted prices will be utilized for the financial evaluation purpose only, however payments will be made through cross cheque in 100% equivalent Pak Rupees at actual against verified invoices at the official exchange rate prevalent on the date of payment.

S.N		PAYMENT ITEMS	(US$)
1.		**MOBILIZATION** (Lump Sum) The Lump Sum shall include all cost related to entire project for mobilizing and transporting Contractor's Personnel, equipment, and supplies to the location where service will be performed.	
2.		**DEMOBILIZATION** No Charges will be paid for demobilization.	Nil
3.		**DAY RATES (12 hours per day)**	
	3.1	**Field Experimentation Rate** (12 hours per Day rate/hour rate) **(about 4 days)** a- Field experimentation for selection of acquisition parameters. b- Hourly rates shall be applicable for testing at company's request provided that this test program is not covered by turnkey rate.	
	3.2	**Standby Rate** (12 hours per Day rate/hour rate) **(Maximum 5 days)** Contractor shall be paid daily standby rate for each day when the Contractor's crew is ready and available to perform services, but is prevented from doing so due to.	
	a.	Force Majeure. No production due to weather or safety reasons. When the contractor is unable to move between the base camp / fly camp and the work site due to law and order situation, or if the movement of the contractor's personnel and equipment is prevented in the program area but not relating to land permitting. The standby Rate shall not be applicable prior to commencement of recording on the 3D seismic program. The Standby Rate shall not apply during any period of time when delay is caused by something for which Contractor is responsible.	
	b.	No standby will be applicable against Gazetted / Public Holidays when crew is not working.	

4. TURNKEY RATES FOR SEISMIC DATA ACQUISITION

Rates for 3D seismic data acquisition (per Sq. km) will be provided for 600 Sq.kms (dynamite & Vibroseis mode) and must be inclusive of Security cost & Land crop compensation otherwise, the bids will be declared non-responsive.

Note: Rates will be provided as per Schedule-B for dynamite & vibroseis (area about 80% dynamite & 20% vibroseis).

For financial evaluation purpose average rate of dynamite will be taken by multiplying with 480 sq.kms (80% of the area)

and the average rate of vibroseis will be taken by multiplying with 120 sq.kms (20% of the area)

A- Dynamite Source (Deep single hole)

Depth (m)	Charge (kg/hole)				
	1	2	3	4	5
18					
21					
24					
27					
30					

B- Vibroseis

Peak force 60,000 lbs minimum

No. of Vibrators: 04

Sweep frequency will be selected after experiment.

No. of sweeps	Sweep Length (sec)		
	12	14	16
6			
8			
10			
12			

Vibrators sweeps must not be missed. Coupling of the base plate (100%) should be firm with the ground. Shots with week energy due to poor coupling/ missed sweeps will be repeated.

No charges will be paid for misfire or skipped shots.

5. UPHOLE LOGGING UPTO 100 M DEPTH

Approximate 150 upholes for the project.

Up-hole depth will be determined after experimentation.

6. CABLE POINT CHARGES

Approximate 11000 cable points for the project.

Cable points (tail spread) will be laid out on eastern side of the project.

SCHEDULE – F

COMMUNICATIONS AND REPORTS

Following reports shall be supplied by the Contractor.

- Daily Progress Report and HSE reports
- Monthly progress reports and HSE Statistics
- Final seismic Operational report including field processing, Survey and HSE reports (4 Hard & 6 soft copies)

All reports shall preferably be in Microsoft Word/Excel format. LVL/ Up-hole data will be submitted in Microsoft Excel format on CD/DVD. All survey data will be submitted in both UKOOA and Excel formats on a CD's/DVD's. Any other data relevant to project, if required by client should be provided.

SCHEDULE – G

ENVIRONMENT PROTECTION SAFETY AND HEALTH

1. General HSE regulations to be observed:

1.1 CONTRACTOR in the conduct of its operations should adhere to, at a minimum, the safety regulations published in the Safety Manual of the International Association of Geophysical Contractors.

1.2 A safety meeting should be carried out in the Crew at least twice a month, or more often if deemed necessary, with all members of the crew in which hazards of the operation are analyzed and safety measures discussed. Special attention will be given to safe driving methods and proper handling of explosives.

1.3 Sufficient hygienic facilities shall be provided for all employees and shall be well maintained.

1.4 CONTRACTOR shall provide adequate supply of drinking water for all employees at campsites and in the area where crews are working.

1.5 One full time medical specialist and a Safety Officer with sufficient infrastructure shall be provided in the base camp and fly camps if any.

1.6 All vehicles will be equipped with seat belts for all passengers and driver, and first aid kits and fire extinguishers shall be provided.

1.7 Any accident in the crew which may result in personnel injuries and /orwork- days lost should be reported in writing to Company, explaining cause of accident and measures taken to prevent similar one in the future.

1.8 CNTRACTOR shall exercise all due diligence to conduct the work in a manner that will prevent pollution and shall comply with the applicable laws, rules and regulations. No trash, waste oil, fuel bilge water or other pollutants shall be purposely discharged or otherwise allowed to escape from Contractor's equipment, cars, trucks etc. and CONTRACTOR shall promptly clean up all and any discharge of such pollutants whether discharged purposely or accidentally as required by applicable law.

1.9 CONTRACTOR shall collect all non-permanent markers set at any phase of operation soon after the completion of the data acquisition on the area.

1.10 CONTRACTOR shall comply with, and shall cause its personnel and any other person (s) acting under the direction of Contractor, or acting for or on behalf of Contractor to so comply with all applicable laws, orders and rules & regulations pertaining to the safety, health and environment prevention standards under Pakistan law and with all standards / procedures formulated by Safety Health and Environment Division of the Operator's Company.

1.11 All operations are to be conducted in accordance with the International safety and environmental protection standards. Every effort should be made to prevent environmental damage during the course of the survey and to fulfill any conditions stipulated in the final Contract Agreement.

1.12 CONTRACTOR shall be liable for and shall save, defend indemnify and hold COMPANY harmless from and against any and all claims resulting from any such pollution.

2. CONTRACTOR shall comply with all the Company's HSE regulations that are available with its Environment Protection and Safety Department for reference and strict compliance on request.

ANNEXURE- I

<table>
<tr><td colspan="8">Check List
(The bidder must quote the rates item wise in their commercial offer)</td></tr>
<tr><td>Sr. No</td><td colspan="6">Item Description</td><td>Please tick item</td></tr>
<tr><td>1</td><td colspan="6">Mobilization cost</td><td></td></tr>
<tr><td>2</td><td colspan="6">Demobilization
No Charges will be paid for demobilization of crew.</td><td>Nil</td></tr>
<tr><td>3</td><td colspan="6">Experimentation
Day Rates / Hourly Rates (12 hours per day/ hour rate).</td><td></td></tr>
<tr><td>4</td><td colspan="6">Standby Rate
Day Rates / Hourly Rates (12 hours per day / hour rate)</td><td></td></tr>
<tr><td>5</td><td colspan="6">Turnkey Rates of 3D Seismic Data Acquisition as Dynamite & Vibroseis Mode inclusive of security charges & Land crop compensation charges.</td><td></td></tr>
<tr><td rowspan="7">A
Deep Single hole shot</td><td rowspan="2">meters</td><td colspan="5">Charge (kg/hole)</td><td rowspan="7"></td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>18</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>21</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>24</td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>30</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">B
Vibroseis</td><td rowspan="2">No of sweeps</td><td colspan="3">Sweep Length (sec)</td><td></td></tr>
<tr><td>12</td><td>14</td><td colspan="2">16</td><td></td></tr>
<tr><td>6</td><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td>8</td><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td>10</td><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td>12</td><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td>6</td><td colspan="6">UPHOLE LOGGING UPTO 100 M DEPTH PER METER</td><td></td></tr>
<tr><td>7</td><td colspan="6">CABLE POINT CHARGES PER POINT</td><td></td></tr>
</table>

Note: Checklist must be filled by the Bidders.

ANNEXURE -II

TECHNICAL PROFORMA TO BE FILLED BY THE BIDDER

Category No.	Description of Technical Information
1- **Company History & Profile**	No. of years Since establishment. Experience in similar project areas. No. of 3D Seismic surveys with details. 3D seismic coverage for last 3 years. No. of Seismic Crews.
2- **RECONNAISSANCE OF THE AREA**	Area information including environmental characteristics is important to understand before starting seismic acquisition work. Therefore, the bidder must conduct a detailed reconnaissance of the area physically prior to submission of the bid and submit reconnaissance report with the technical bid proposal.
3- **Specific technical information of equipment detailed for the job.**	**RECORDING EQUIPMENT** (Type / Make / Model) 24-bit latest telemetry system (like 428 XL/508XT/G3i) or better, with details as under: Maximum capability of recording system capable of dynamite/ Vibroseis operation and available ground electronics. Type of data storage and on-site real time quality control system. **Type of geophones (10 Hz) (**Make/ type and year**).** Total no. of geophone strings available with 12 geophones per string (SM- 24/SG-10 or equivalent). No. of marshy, submersible geophones / hydrophones & transition zone equipment (Geophones / Units / Cables etc.) available. **Detail of laboratory equipment** Type of geophone tester, Ground electronic tester and repair system etc.
	SHOOTING EQUIPMENT Total available number and detail of Encoder / Decoder / Shooting Equipment/ equipped with GPS.
	SOURCE EQUIPMENT (make/type / model). Total No. of truck mounted mud pump/ duel system rigs with drilling capacity. Total number of air compressor rigs/ dual system rigs with Drilling capacity and Portable rigs with drilling capacity 30m. Detail of source equipment to be used in Canal area. Vibrators (minimum 05 Nos), peak force not less than 60000lbs. equipped with DGPS.
	REFRACTION / UPHOLE LOGGING UNITS (Make/ type / Model) 24-bit recorder with at least 24 recording channels to record a spread of 220 to 260 m. No. of LVL geophones with (~5 Hz) Type of source with description to record refraction survey to determine LVL if other than dynamite. Details of rig to drill a hole up to 100 m depth to record up-hole logging survey. Up/hole / LVL processing and calculation static correction software.

	QC AND ONSITE PROCESSING FACILITIES (make/ type/ model). On-site 3D seismic data processing system (detail of hardware & Software).
	GPS/ SURVEY EQUIPMENT AND PROCESSING SOFTWARE (Make/type/ model). No of units available and detail of survey equipment with specifications equivalent or better than duel frequency GPS-1200 RTK/Trimble R-8 Detail of Survey Processing Software with specification equivalent or better to Leica Geo Office/TBC.
	MISCELLANEOUS EQUIPMENT (make/ type/ model) EARTH MOVING MACHINES No. of Dozers, tractors etc. RADIO EQUIPMENTS Total Nos. and detail of VHF radios for field operation. Total No. and details of walki talki set for field operation. Fax and satellite facility. VEHICLES (make/type/Model) No. of LT vehicles No of HT vehicles/Trucks (4*2 & 4*4) Cable Buggies & boats etc. CAMP KIT No. of electric generators). No. of living caravans with living capacity and accessories. Messing/dining facilities. Description of workshop, data acquisition lab, medical unit, water purification facility, security, POL and explosive storage and any detail the bidder want to give.
4- **Human Resource deputed for the job**	List of crew Professionals. Qualification & Experience of key personnel. All professionals/ technical staff should have the experience more than five years in their relevant field. Back-up & replacement options. List of additional staff to meet any replacement of professionals in the crew due to leave or on recommendations of representative of client on performance basis.
5- **Execution plan/Completion of Survey**	Availability of crew. Schedule of work, survey, line clearance, drilling, recording etc in the form of bar chart. Confirmation of date to commence operation.
6- **HSE POLICY**	Detail of HSE policy. Procedures to implement HSE Policy. Crew HSE plan and Operational Procedures. Detail of Accidents if any. Detail of emergency response plan, Medivac arrangements, camp clinics etc. Provision of a field magazine and security etc.

ANNEXURE -III

Technical Evaluation Criteria (Qualifying Marks 80 %)

Technical proposal of the bid shall be reviewed first to determine/check its responsiveness and conformity with the requirement of bid. The technical evaluation will be carried out on the basis of information supplied by the bidders in their technical proposals and the criteria spelled out at Annexure-A/ITB provided with this document. The bidders securing 80 % or more marks will qualify.

The detail breakup of the relevant information to be provided by the bidder and the comprehensive marking criteria are tabulated below. There are six (6) categories and the bidders are required to obtain at least qualifying marks 75 % in each category and 80 % or more overall. Technically responsive and financially lowest bidder will be considered for award of job. Further, any information related to seismic operation will be provided by bidder if required.

Cat. No.	Description of Technical Information	Qualifying Criteria	Max. Marks
1	**COMPANY HISTORY & PROFILE**		**18**
	No. of years since establishment	Less than 5 years: 0 marks 5-7 Years : 2 marks More than 7 years: 4 marks	4
	No. of 3D on-shore Seismic surveys. in last three years.	Less than 2 surveys: 0 marks 2 to 5 surveys: 2 marks 6 to 10 surveys: 4 marks More than 10 surveys : 6 marks	6
	3D on-shore seismic surveys coverage in last 3 years.	Less than 500 Sq.kms: 0 marks 501 to 2500 Sq.kms: 2 marks 2501 to 5000 Sq.kms: 4 marks More than 5000 Sq.kms: 6 marks	6
	No. of Seismic Crews.	One seismic crew : 1 mark 02 or more seismic crew: 2 marks	2
2	**RECONNAISSANCE OF THE AREA** (Physically conducted Reconnaissance)	Report not submitted: 0 marks Report submitted: 5 marks	**5**
3	**SPECIFIC TECHNICAL INFORMATION OF EQUIPMENT DETAILED FOR THE JOB.**		**48**
	RECORDING EQUIPMENT (make / type/ model) 24-bit latest telemetry system (like 428XL / 508XT/ G3i or better). Maxi. number of active channels available. **Available ground electronics**: Cables, geophone strings with 12 geophones per string (SM-24/SG-10 equivalent or better), No. of hydrophones, Marshy phones, & submersible geophones etc.		16

	Type of data storage and on-site real time QC system. Detail of auxiliary/ test equipment, Encoder/ Decoder (shooting equipment), Vibrator control system etc.	
	SOURCE EQUIPMENT (make / type/ model) Rigs Type/ Drilling Capacity, Portable Rigs. Air compressor rigs/Truck Mounted Mud Rigs/ duel system Rigs etc. (Minimum 30 Rigs). Detail of source equipment used in Nara Canal portion. No. of vibrators with peak force not less than 60,000 pounds, equipped with DGPS system.	16
	REFRACTION / UPHOLE LOGGING UNITS (make / type/ model) 24 Bit Up-hole Logging Unit Instrument with Specification, type of geophones & numbers, Rig with Capacity LVL / Refraction Survey Unit, type of geophones & Numbers, Instrument Specification / Spread Length/ Channels. Source type if other than dynamite. LVL processing & Statics calculation software.	4
	QC & ONSITE PROCESSING (detail with make / type/ model) Detail of hardware for on-site seismic data processing system. Detail of 3D Processing Software	4
	GPS/SURVEY EQUIPMENT AND PROCESSING SOFTWARE (detail with make / type/ model) Detail of survey equipment, Detail of GPS/ survey processing software	5
	MISCELLANEOUS EQUIPMENT EARTH MOVING MACHINERY Bulldozers with supporting vehicles & Boats etc. RADIO/ COMMUNICATION EUIPMENT. VHF Radio Equipment, Walki Talki, Internet, Fax, Satellite phone facility. CAMP KIT: Detail of all facilities & vehicles etc.	3
4	**HUMAN RESOURCE DEPUTED FOR THE JOB**	**12**
	Total no. of Professionals. Give detailed list	4
	Qualification & Experience of Key professionals. (Mini. 5 year experience)	4
	Back-up & replacement options	4
5	**EXECUTION OF SEISMIC SURVEY**	**12**
	Availability of crew in Pakistan	3
	Schedule of work, Confirmation of date to commence survey.	9
6	**HEALTH SAFTY ENVIRONMENT**	**5**
	Compliance to HSE policy	5
TOTAL MARKS (Qualifying Marks 80 %)		**100**