"Expression of Interest" (EOI) for Third Party Quality Control (QC) Services during Acquisition of 2D Seismic Data in un-appraised on land areas in Sedimentary Basin of India

A plan to conduct 2D seismic surveys within a timeframe of 5 years in "un-appraised" areas of all on-land sedimentary basins of India where no/scanty geo-scientific data is available is currently being executed. A total of 48243 LKM of 2D seismic Survey data in "To be Appraised Areas" of Indian Sedimentary Basins is to be acquired. For this purpose, two National Oil Companies, namely ONGC and OIL have been entrusted by MoP&NG, Govt. of India to carry out 2D seismic data Acquisition, Processing and Interpretation (API) of 48243 LKM in "un-appraised" areas of Indian Sedimentary Basins (onshore areas).

OIL has been assigned to carry out 2D seismic API of 7408 LKM identified in four sectors in North eastern part of India covering states of Assam, Arunachal Pradesh, Nagaland, Manipur, Tripura and Mizoram. ONGC has been assigned to carry out 2D seismic API of approx. 40835 LKM seismic data spread over 11 sectors in on-land part of 22 sedimentary basins of India viz; Cambay, Kutch, Saurashtra, Rajasthan, Pranhita-Godavari, Krishna-Godavari, Cuddapah, Bastar, Cauvery, Vindhyan, Narmada, South Rewa, Satpura-Damodar and Chattisgarh, Bengal, Mahanadi-NEC, Ganga, Deccan Synclise, Bhima-Kaladgi, Himalayan Foreland, Spiti-Zanskar, Karewa and Andaman-Nicobar basins. Sector-wise details of areas to ONGC and OIL are given in **Annexure-1, 2 and 3**.

The objective of this wide spaced 2D Seismic Survey for appraisal of unapprised areas of Indian Sedimentary Basins is mapping and studying of different geological sequences/horizons like Deep Tertiary, Deeper Paleozoic plays, Syn-rift Mesozoic plays, Sub-basalt, Gondwana sediments and Proterozoic sediments, fractured basement prospects, Strati-structural, sub-thrust prospects etc.

ONGC has commenced / to be commenced data acquisition work through service providers in 11 sectors. OIL has commenced / to be commenced data acquisition work in 6 sectors.

Directorate General of Hydrocarbons (DGH) seeks Expression of Interest ("EOI") and budgetary quote for the hiring of third party QC/QA services. Budgetary quoted should be per LKM (Line Kilometer) inclusive of all charges. The hiring of Third Party Quality Control (QC) services is to be awarded through Open Competitive Bidding ("OCB") process from globally reputed and experienced companies during and soon after acquisition of 2D Seismic Data in these un-appraised onshore areas spread over various sedimentary basins of India. QC / QA jobs are to be carried out on already acquired data and yet to be acquired data which is to be completed by March, 2019.

For the details and scope of work may please contact: Head of the Department (GDA) through email: **tempal.singh@dghindia.gov.in** .

GENERAL CONDITIONS

BIDDER's EXPERIENCE AND RESPONSIBILITY

1. Globally reputed and experienced companies who have expertise in providing Third Party QC services during 2D/3D onshore seismic data acquisition using Explosive and Vibroseis as sources worldwide to various E&P operators/ National OIL Companies (NOC).
2. Bidder shall have adequate trained and experienced (in similar terrain condition) technical personnel, resources and capability to deploy and use necessary tools (application Software & requisite Hardware) suitable to undertake Third Party QC Services during 2D onshore Seismic data acquisition using Explosive and Vibroseis as source efficiently and complete the same within scheduled timeframe.
3. The Bidder shall assign adequate number of qualified and trained QA/QC personnel for every Seismic Data Acquisition crew deployed in each campaign during the entire period of Data Acquisition under this contract. Bidder shall furnish tentative engagement schedule for their QA/QC personnel during the project execution.
4. The Bidder shall bear all the costs including transportation, boarding/lodging, incidental charges etc. for the deployment of its personnel and equipments.
5. Bidders shall arrange on their own for all necessary clearances pertaining to deployments and use of their QA/QC personnel and equipments (including HW and SW), if required, as applicable for India and in respective operational area.
6. Bidder's QA/QC personnel shall be conversant with various QA/QC measures as stipulated in Service Contract (as signed/to be signed between ONGC/OIL their service provider for hiring of services of 2D Seismic Data Acquisition) for implementation of Quality Control (QC)/Quality Assurance (QA).
7. The principal responsibility of bidder is to examine/scrutinize the acquired seismic data as per QA/QC measures adopted and implemented during execution of the seismic data acquisition as per "Scope of Work" **(Annexure-4)** defined in service contracts signed /to be signed (between ONGC/OIL & service providers) and issued by OIL and ONGC in their respective contracts and reported gaps/constraints, if any, in practice.
8. The bidder shall perform periodic/regular quality assurance through analysis and quality control of survey/navigation Data, raw data through to in-field processed data for ensuring precision in survey/positioning and quality of acquired raw data and processed data for QC purpose (processed at Field Process Unit).
9. The bidder should have the capability and diagnostic tools to (a) ascertain the quality of data based upon general quality expected in the area with the given parameters and industry standard practices and (b) isolate the quantum of data that falls outside the acceptable limit or contractual QC norms.
10. The bidder shall deploy at least one qualified and experienced personnel for each operating seismic crew as per **Annexure-5 & 6** to carry out QA/QC job to ensure / certify that the seismic data has been acquired in accordance with the quality norms specified in the respective contracts signed /to be signed between ONGC / OIL with their service providers / contractors. In addition, the Bidder shall deploy one domain expert on on-land seismic data acquisition technology having experience of 20 years for overall supervision of QC work of all crews in addition to one QC expert for each crew as defined in **Annexure-5&6** .
11. The bidder has to provide bio-data with documentary evidence in support of experience of all the key personnel to be engaged for performing the scope of work along with the techno-commercial bid.

12. The QA-QC professional will use his diligence and professional experience in the evaluation of acquired 2D seismic data under Scope of Work. QA-QC personnel shall make periodic/regular visits to seismic crew as deemed necessary in order to perform the job of QA/QC of 2D seismic data acquisition and field processing work to analyze data quality of the acquired 2D seismic data.
13. Upon award of the Contract, the bidder will discuss with DGH scheme of proposed QC of survey work to enable the bidder to plan for execution of jobs. The schedule of QC jobs will be finalized between DGH's representative and bidder's personnel prior to or on the arrival of equipment and crew at the base station/area of operation.
14. The Bidder shall carry out field Data analysis to have a periodic check on the raw field monitor data records, Brute stack & Data Quality outputs pertaining to Signal Characteristics, S/N Ratio, Spread, including impacts of logistics obstructions.
15. At the start of Seismic Survey or during the entire course of survey operation, the QA/QC Personnel should be readily available for the said job.
16. The Bidder personnel shall ensure confidentiality of the data acquired. Bidder shall undertake responsibility to keep all the information that he may come across during the seismic data acquisition and field processing confidential and should not disclose the same to any other than the authorized representative(s) of DGH at any point of time. No data in any form shall be taken out of India. The successful bidder shall sign the confidentiality agreement with DGH as per rules.
17. Immediately notify to DGH in case of any failure on the part of the signed contract(s) between ONGC/OIL and their service provider(s) to comply with its contractual obligations in respect of data quality norms as laid down in the signed/to be signed contract(s) between ONGC/OIL and their service provider(s).

Annexure– 1

BRIEF DESCRIPTION OF SURVEY AREAS & THE OBJECTIVES OF 2D SURVEYS

1. Cambay, Saurashtra

Cambay Basin: Cambay basin is a NNW-SSE trending narrow, elongated rift graben which extends from Surat in south to Sanchor in the north. It is a proven petroleum province from tertiary sediments. The proposed lines lie on both basin shoulders beyond eastern/ western margins.

The main objective of the survey is to explore Mesozoic sediments which lie below the Deccan trap of unknown & varying thickness (expected up to 1200 meters).

Saurashtra basin: Saurashtra basin**:** is located in the northern part of western continental margin of India which trends NNW-SSE. This basin lies north of Mumbai Offshore, south of Kutch basin and west of Cambay Basin. Mesozoic, Tertiary and Deccan Trap volcanic exposures are present at some places in the area.

The main objective of the survey is to map and study Tertiary and sub-basalt Mesozoic prospectivity in the onland area.

2. Rajasthan, Kutch

Rajasthan Basin: Rajasthan Basin forms the eastern flank of Indus geosyncline and comprises the sedimentary strata to the west and northwest of Aravallis up to Indo-Pak border. This pericratonic basin also forms a part of the great Thar Desert.

The main objectives of the survey are to map Tertiary, Paleozoic and Mesozoic plays in the Bikaner-Nagaur, Jaisalmer and Barmer-Sanchor sub-basins.

Kutch Basin: Kutch basin forms the north-western part of the western continental margin of India and is situated at NW of Gujarat state. The basin is expected to be filled up with approx. 1550 to 2500m Mesozoic and 550m Tertiary sediments in onland region and up to 4500m Tertiary sediments in offshore region (Well GKH-1). Some of the lines pass through Rann of Kutch and extend nearer to Indo-Pak border.

The main objectives of the survey are to map and study Tertiary and Mesozoic/sub-trappean sediments and to assess hydrocarbon prospectivity of the basin.

3. Pranhita- Godavari, Krishna- Godavari, Cudappah, Bastar, Cauvery

Pranhita- Godavari Basin: Pranhita-Godavari is a part of Gondwana basin, consist a series of NNW-SSE grabens and half-grabens. Three prominent fault patterns are identified viz. (i) NNW-SSE trending syn depositional faults (ii) NW-SE faults and (iii) the NE-SW transverse faults. Some of the proposed lines are passing through forests and scrub jungles.

The main objectives of the survey is to map sub-basalt Paleozoic-Mesozoic, Gondwana and Proterozoic sediments.

Krishna- Godavari Basin: Krishna Godavari Basin is a proven petroliferous basin of continental margin located on the east coast of India. Extensive deltaic plain is formed by two large East Coast Rivers viz. Krishna and Godavari.

The main objectives of the survey are to map deeper Tertiary and synrift Mesozoic sediments.

Cuddapah basin: Crescent shaped easterly concave,Cuddapah basin falls in the east central part of Dharwarcraton. The area has an irregular landscape with a number of hill ranges with intervening valleys and high lands.

The main objectives of the survey are to explore the Paleo-Proterozoic and Neo-Proterozoic sediments.

Bastar: Rectangular-shaped Bastarcraton is bounded by three prominent rift on three sides' viz. NW-SE trending Godavari and Mahanadi rifts, ENE-WSW trending Narmada-Son rift and NE-SW trending Eastern Ghats mobile belt.

The main objectives of the survey are to map sub-basalt Paleozoic-Mesozoic, Gondwana and Proterozoic sediments.

Cauvery: The Cauvery Basin is an intra-cratonic rift basin, divided into a number of sub-parallel horsts and grabens, trending in a general NE-SW direction formed due to initial rifting.

The main objectives of the survey is to map deeper Tertiary and syn-rift Mesozoic plays.

4. Andaman-Nicobar

Andaman-Nicobar: The Andaman-Nicobar basin forms a part of Island Arc System which extends from Myanmar in the north to Indonesia in the southeast.

The main objectives of the survey are to map Tertiary sediments and play types.

5. Bengal and Mahanadi-NEC

Bengal: Bengal basin is located between the eastern edge of the main Indian craton and Indo-Burmese orogeny to the south of Shillong Plateau. The formation of basin initiated during Middle-Upper Cretaceous time with differential subsidence.

The main objectives of the survey are to map deeper plays within Tertiary and Gondwana sediments.

Mahanadi: The Mahanadi Basin, a product of rifting and breaks up of Gondwana Land is situated on the East Coast of India. The onland part of the basin is limited to North West and West by Pre-Cambrian outcrops. The Northern plateau and Eastern Ghats are hilly regions covered well with forests. The erosion plains of the Central Table Land are traversed by the river Mahanadi and its tributaries.

The main objectives of the survey are to study hydrocarbon assessment of Tertiary sediments.

6. Ganga

Ganga: The Ganga basin is a part of the composite Ganges-Brahmaputra-Meghna basin. The basin is bounded by Himalaya or lower parallel ranges towards the north, Indus basin and the Aravalli ridge on the west and the Vindhyas and Chota Nagpur Plateau on the south. On the east the Ganges merges with the Brahmaputra through a complex system of common distributaries into the Bay of Bengal.

The main objectives of the survey are to know the sediment thickness as well as extension of the Ganga basin towards south and to map Tertiary and Proterozoic sediments.

7. Deccan Syneclise North

Deccan Syneclise North: Deccan Syneclise is located in the western and south-central part of India. The Syneclise is considered to have good potential for hydrocarbons. The main rock exposures in the basin consist of a number of basaltic lava flows which have been poured on to earth's surface during Cretaceous-Paleocene period, blanketing all pre-existing rocks ranging in age from Precambrian to Cretaceous. Some of the lines are passing along very steep slope and continuous hills on the western side. The area is thickly cultivated.

The main objectives of the survey are to map sub-basalt Paleozoic-Mesozoic, Gondwana and Proterozoic sediments and study hydrocarbon prospectivity.

For delineation of subtrappean basement configuration, 2D Long offset (16 -18 kms) data along 4 lines isplanned to be acquired.

8. Deccan Syneclise South, Bhima and Kaladgi

Deccan Syneclise South: Deccan Syneclise is located in the western and south-central part of India. The Syneclise is considered to have good potential for hydrocarbons. The main rock exposures in the basin consist of a number of basaltic lava flows which have been poured on to earth's surface during Cretaceous-Paleocene period, blanketing all pre-existing rocks ranging in age from Precambrian to Cretaceous. Some of the lines are passing along very steep slope and continuous hills on the western side. The area is thickly cultivated.

The main objectives of the survey are to map sub-basalt Paleozoic-Mesozoic, Gondwana and Proterozoic sediments and study hydrocarbon prospectivity.

For delineation of subtrappean basement configuration, 2D Long offset (16 -18 kms) data along 4 lines is planned to be acquired.

Bhima: The NE trending irregularly sinuous Bhima basin consisting dominantly of limestone covers and is situated to the northwest of Cuddapah basin and northeast of Kaladgi basin. It overlies the granitic basement of Eastern Dharwarcraton with a profound unconformity and has faulted contacts at many places. Deccan Trap overlies Bhima basin in the north. The area has no major hill ranges but some part of the proposed lines are passing through forests.

The main objectives of the survey is to map sub-basalt Paleozoic-Mesozoic, Gondwana and Proterozoic sediments and study hydrocarbon prospectivity.

Kaladgi: Kaladgi is an E-W trending irregular basin underlain by the basement granitoids (Peninsular Gneiss and Dharwar Batholith) of the Dharwarcraton in the south and east and overlain by the Deccan Trap in the north. Some part of the northerly and westerly extension of the basin is concealed under the Deccan Traps, where the traps are removed by weathering and erosion.

The main objectives of the survey are to map sub-basalt Paleozoic-Mesozoic, Gondwana and Proterozoic sediments and study hydrocarbon prospectivity.

9. Vindhyan-A, Narmada and Satpura

Vindhyan-A: TheVindhyan basin is a Proterozoic intracontinental basin that developed in the central part of the Indian shield along with several other basins such as Cuddapah, Chattisgarh, etc. The Vindhyan rocks are covered by Deccan volcanics. The area has discontinuous chain of mountain ridges, hill ranges, highlands and plateau escarpments in west-central India.

The main objectives of the survey are to map deeper Proterozoic sediments and extension of the Vindhyan basin below the Ganga valley towards north and Mesozoic sediments towards south.

Narmada: The basin is bounded on the north by Vindhyans, on the east by Maikala range and on the south by Satpuras. Physiographically, the basin can be divided into hilly and plain regions. The hilly regions are in the upper part of the basin as well as in the lower middle reach and are forested.

The main objectives of the survey is to map deeper Proterozoic sediments and their thickness within the basin.

Satpura: The Satpura basin is located south of Narmada River and extends from Jabalpur to Lokartalai, Mohapani, The lower Gondwana sediments are exposed in syncline whose southern limb is marked by Pench-Kanhan and Tawa coalfields and Mohapani is located on the northern limb. The shape of the basin is governed by the intersection of the three prominent tectonic trends (i) the ENE/WSW fault parallel to the Narmada-Son lineament in the north, (ii) the NW-SE trend conforming to the Dharwar tectonic grain in the west and (iii) the NE-SW trend parallel to the Eastern Ghat tectonic grain.

The main objectives of the survey are to map Gondwana and Proterozoic sediments.

10. Vindhyan B, South Rewa –Damodar and Chattisgarh

VindhyanB: TheVindhyan basin is a classic example of Proterozoic intracontinental basin that developed in the central part of the Indian shield along with several other basins such as Cuddapah, Chattisgarh, etc. The Vindhyan rocks are covered by Deccan volcanics. It refers to a discontinuous chain of mountain ridges, hill ranges, highlands and plateau escarpments.

The main objectives of the survey are to map deeper Proterozoic sediments and extension of the Vindhyan basin below the Ganga valley towards north and Mesozoic sediments towards south.

South Rewa –Damodar: The south Rewa basin is an E-W trending intracratonic basin in the central part of subcontinent. It is delimited to the north by Son Narmada lineament and to the east and southeast by Precambrian metamorphics. Gondwana sediments ranging in age from Early Permian to Early Cretaceous are exposed. The major fault system in the basin is aligned parallel to the Satpura trend.

The main objectives of the survey is to map Gondwana and Proterozoic sediments.

Chattisgarh: Chhattisgarh basin is situated on the northern edge of Bastarcraton. It is bounded by the Kotri-Dongargarhorogen in the west, Satpura mobile belt in the north, Gondwanagraben of Mahanadi in the northeast and the Eastern Ghats mobile belt in the southeast. It consists of high plateau area separated by the intermittent narrow valleys and steeply sloping plains.

The main objectives of the survey are to explore Gondwana and Proterozoic sediments and its thickness.

11. Himalayan Foreland, Karewa and Spiti- Zanskar

Himalayan Foreland: Himalayan Foothills basin is a NW-SE aligned basin located in the NW Himalayan Foothills region. The basin borders with Pakistan to the NW and Nepal to the SE. Northern and southern limits are demarcated by terrain defining faults namely, the Main Boundary Thrust (MBT) and the Himalayan Frontal Fault (HFF). Area is having rugged topography which contains the greatest number of high peaks, complex mosaic of forest-covered ranges and fertile valleys. The proposed area is adjoining to Tibet Border.

The main objectives of the survey are to map Tertiary sediments in northern side of MBT and its thickness as well as to study hydrocarbon potential.

Karewa: The Kashmir Paleozoic-Mesozoic basin, spread over an area of about 5,200 sq. km, lies in an intermontane valley formed by bifurcation of the Great Himalayan Range west of the Ravi River. It occupies an oval-shaped depression between the PirPanjal Range in the SW and Zanskar Range in NE. The Paleozoic-Mesozoic succession rests over the crystalline rocks of the Salkhala. Proposed area extends nearer to the Line of Control in J&K. The general topography of the valley is as rugged and mountainous.

The main objectives of the survey is to map Paleozoic, Mesozoic carbonates and study hydrocarbon potential.

Spiti- Zanskar: The Spiti Valley, located north of the PirPanjal Range, exposes an excellent section of Neoproterozoic-Cretaceous rocks in the Tethyan Himalaya in Himachal Pradesh. The SpitiTethyan rocks towards NW through the Lahaul Valley extend into the Zanskar area where Paleocene-Eocene sequences are also preserved. The terrain has an immature topography and is traversed by deep valleys and high hill range.

The main objectives of the survey is to map Paleozoic, Mesozoic sediments and study hydrocarbon potential.

12. Assam, Arunachal Pradesh, Mizoram, Tripura and Manipur

The Assam – Arakan sedimentary Basin is a shelf-slope-basinal system. The shelf part of the basin spreads over the Brahmaputra valley and the Dhansiri valley, the latter lying between the Mikir hills and the Naga foothills, from the Digboi, the shelf-to-basinal slope, i.e., the hinge zone lies below the Naga Schuppen belt. The basinal (Geo-synclinal) part is occupied by the Cachar, Tripura, Mizoram and Manipur fold belts.

The main objective is to map and study: a) Tertiary sediments and fractured basement prospects, and b) Strati-structural and sub-thrust prospects in North Bank, Naga- Schuppen belt and Assam –Arakan fold belt.

Operational areas of Assam and Arunachal Pradesh are the alluvium covered Foreland part and Areas with moderate to high vegetation cover and inaccessibility in few parts. Some part of operation areas in Arunachal Pradesh and Assam are Hilly/Foothills Region with undulating topography and logistically difficult areas having near surface pebbles / boulder bed. In general, areas of operation especially in Arunachal Pradesh, Mizoram Tripura and Manipur are forest covered mountains with elevations varying from 100 – 2000 m. There are access constraints with scanty road network and wide river catchment areas which are basically boulder bed areas. Areas falling in Mizoram-Tripura are covered with hills and valleys with typical series of parallel tight fold belt topography. These areas are logistically difficult, technically challenging and geologically complex thrust fold areas and available fair weather working in these areas is normally 5-6 months.

Note: For additional Geological & Geophysical information on the above basins please visit

www.dghindia.org**and** www.ndrdgh.gov.in

Annexure - 2

VOLUME OF WORK & AREA DETAILS

A. ONGC

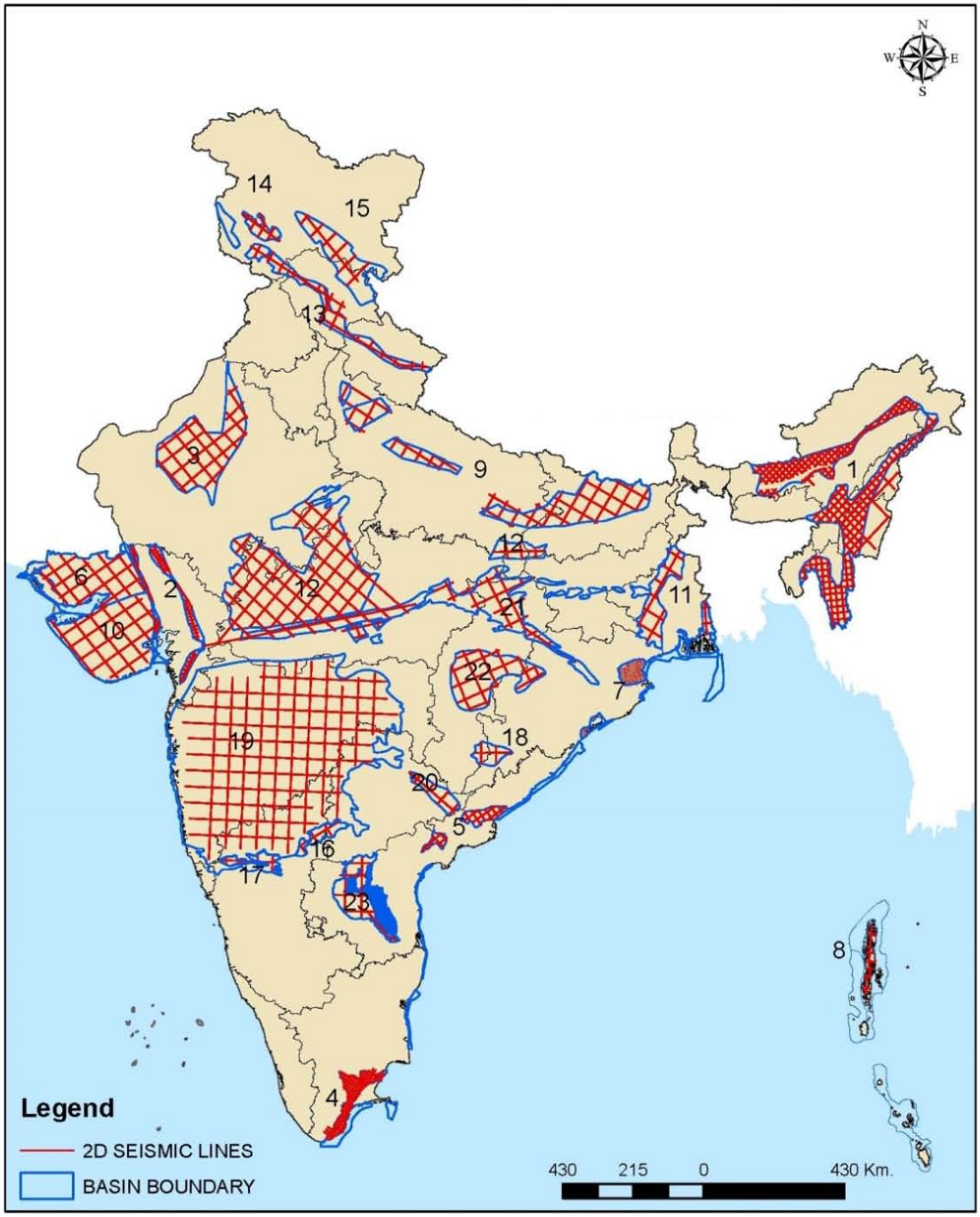
Sector	Basin/Area	Area LKM	No of Lines	Sector LKM	Group LKM	Elevation (m)	Zone of Interest (Km)
1	Cambay	1240	41	3520	18310	15 to 225	0.5 to 4
	Saurashtra	2280	11			2 to 221	1.5 to 6
2	Rajasthan	2260	15	4020		175 to 340	3 to 5
	Kutch	1760	14			2 to 175	3 to 6
3	Pranhita- Godavari	350	5	3940		65 to 387	2 to 7
	Krishna-Godavari	600	15			20 to 282	2 to 5
	Cuddapah	850	8			240 to 585	3 to 9
	Bastar	240	3			480 to 1065	3 to 6
	Cauvery	1900	41			20 to 200	1 to 5
4	Andaman-Nicobar	310	9	310		10 to 300	3 to 7
5	Bengal	860	11	3390		10 to 105	4 to 8
	Mahanadi -NEC	2530	55			10 to 500	1 to 5
6	Ganga	3130	31	3130		55 to 250	1 to 5
7	Deccan Syneclise-N	5683	16	5683	22525	200 to 600	1 to 4
8	Deccan Syneclise-S	5127	15	5717		200 to 600	1 to 4
	Bhima	280	4			350 to 652	1 to 4
	Kaladgi	310	5			540 to 900	1 to 4
9	Vindhyan A	4953	22	5865		200 to 600	2 to 6
	Narmada	667	1			150 to 490	2 to 6
	Satpura	245	4			200 to 1000	2 to 6
10	Vindhyan B	300	4	3160		120 to 560	2 to 6
	South Rewa -Damodar	1460	13			200 to 1100	1 to 3
	Chattisgarh	1400	14			130 to 685	1 to 5
11	Himalayan Foreland	1300	20	2100		600 to 5000	4 to 6
	Karewa	300	6			1600 to 4100	4 to 6
	Spiti- Zanskar	500	7			3500 to 5400	4 to 6

B. OIL

Area/ Sector	**Area**	**Target Volume LKM**
Area-1 Sector – I	Assam & Arunachal Pradesh	2360
Area-1 Sector – II	Arunachal Pradesh& Assam	870
Area-2 Sector - I	Nagaland	670
Area-2 Sector - II	Manipur	870
Area-2 Sector - III	Karbi-Anglong& North Cachar Hills	875
Area-2 Sector - IV	Mizoram & Tripura	1763
	Total (LKM)	**7808**

Annexure-3

LOCATION MAP WITH PROPOSED 2D SEISMIC LINES IN THE "TO BE APPRAISED" AREAS OF INDIAN SEDIMENTARY BASINS



Continued

Annexure-4

SCOPE OF WORK

Background

A total of 48243 LKM data has been identified by MoP&NG to be covered by 2D seismic Survey under "To be Appraised Areas" of Indian Sedimentary Basins where no/scanty geo-scientific data is available. For this purpose, two National Oil Companies, namely ONGC and OIL have been entrusted to carry out 2D seismic data Acquisition, Processing and Interpretation (API) for the entire quantum of 48243 LKM in "un-appraised" areas of Indian Sedimentary Basins (onshore areas).

OIL has been assigned to carry out 2D seismic API of 7408 LKM falling identified in four sectors in North eastern part of India covering states of Assam, Arunachal Pradesh, Nagaland, Manipur, Tripura and Mizoram. ONGC has been assigned to carry out 2D seismic API of approx. 40835 LKM seismic data spread over 11 sectors in onland part of 22 sedimentary basins of India viz; Cambay, Kutch, Saurashtra, Rajasthan, Pranhita-Godavari, Krishna-Godavari, Cuddapah, Bastar, Cauvery, Vindhyan, Narmada, South Rewa, Satpura-Damodar and Chattisgarh, Bengal, Mahanadi-NEC, Ganga, Deccan Synclise, Bhima-Kaladgi, Himalayan Foreland, Spiti-Zanskar, Karewa and Andaman-Nicobar basins. Sector-wise details of **assigned** to-be-appraised areas to ONGC and OIL are given in **Annexure—1, 2 and 3.**

The objective of this wide spaced 2D Seismic Survey for appraisal of unapprised areas of Indian Sedimentary Basins is mapping and studying of different geological sequences/horizons like Deep Tertiary, Deeper Paleozoic plays, Syn-rift Mesozoic plays, Sub-basalt, Gondwana sediments and Proterozoic sediments, fractured basement prospects, Strati-structural, sub-thrust prospects etc.

ONGC has commenced / to be commenced data acquisition work through service providers in 11 sectors **(Annexure-5)** . OIL has commenced / to be commenced data acquisition work in 6 sectors**(Annexure-5)**.

Scope of QA/QC Work

This section sets out the scope of QA/QC work to be performed by the contractor and describes references to specifications, instructions and standards which the contractor shall satisfy or adhere to in the performance of the work.

- The main objective is to perform Quality Assurance/Quality Control (QA/QC) of the seismic data which are being acquired by ONGC and OIL in their respective assigned areas or sectors of 2D seismic survey work. The aim is to gather good quality seismic data in the specified areas so as to obtain meaningful subsurface geological information that will help in regional understanding of respective basins and more particularly in delineating the structure, associated faults/ thrusts, unconformities, fold closures, as well as stratigraphic features of interest.
- The Scope of Work of 3rd party QA-QC is to examine the acquired 2D seismic data with respect to the quality norms/conditions as per the signed/to be signed contract(s) between ONGC/OIL and their service provider(s) for the respective areas. (**Annexure----**)

- The bidder is required to analyze the acquired data on Field processing units and accordingly required to give feedback and suggestions for the processing.

- **Reporting and Schedules of Performance**: Provide regular report through e-mail and by other standard (hard/soft copy) means to DGH.
    a. Report fortnightly (from 1st to 15th and 16th to end of a calendar month) on data quality as per "Scope of Work" in their respective area or sector.
    b. Shall also provide comprehensive Quality Assurance report in both soft/hard copies at the end of each field season for respective contract areas to DGH within 1 month from the date of completion of data acquisition. The report should include but not limited to evaluation of data with acceptable quality under the contractual norms/metrics and identification of areas/sections/lines with poor/unacceptable data quality with reasons thereof.
    c. Provide suggestions for improvement for processing of these acquired data.

Annexure-5

BASIN/AREA/SECTOR WISE DETAILS OF SEISMIC CREWS

Sector	Basin/Area	LKM	Total LKM	No. of crews	Present location of the crew
ONGC					
1	Cambay	1240	3520	1	Junagarh
	Saurashtra	2280			
2	Rajasthan	2260	4020	1	Bikaner
	Kutch	1760			
3	Pranhita- Godavari	350	3700	2	LOA issued on 23.03.2017. Work will commence within 90 days.
	Krishna-Godavari	600			
	Cuddapah	850			
	Cauvery	1900			
4	Andaman-Nicobar	310	230	1	To be finalized
5	Bengal	860	3390	1	Bhadrak
	Mahanadi -NEC	2530			
6	Ganga	3130	3130	2	LOA issued on 23.03.2017. Work will commence within 90 days.
7	Deccan Syneclise-N	5683	5683	2	Bhusawal & Hingoli
8	Deccan Syneclise-S	5127	5717	2	Yadgir & Mudkhed
	Bhima	280			
	Kaladgi	310			
9	Vindhyan A	4953	5865	2	Dewas & Bhopal
	Narmada	667			
	Satpura	245			
10	Vindhyan B	300	3400	2	To be finalized
	South Rewa - Damodar	1460			
	Chattisgarh	1400			
	Bastar	240			
11	Himalayan Foreland	1300	2100	2	Bageshwar & Gwaldma
	Karewa	300			
	Spiti- Zanskar	500			
Total(ONGC)		**40755**		**18**	

OIL				
Area-1/ Sector-I	Assam & AP	2360	3	Crew-1: Pathsala Crew-2: Nalbari Crew-3: Dudhnoi
Area-1/ Sector-II	AP & Assam	870	2	Crew-1: Miao Crew-2: Pasighat
Area-2/ Sector-II	Manipur	870	2	Crew-1: Jiri bam Crew-2: Jiri bam
Area-2/ Sector-III	NC Hills	875	2	Crew-1: Kheruni Crew-2: Kheruni
Area-2/ Sector-IV	Mizoram & Tripura	1763	2	Crew-1: Champai Crew-2: Lunglei
Area-2/ Sector-I	Nagaland	670	2	-
Total (OIL)		**7408**	**13**	
Total(ONGC+OIL)		**48243**	**31**	

The location of crews may change depending on the operational activities and survey locations.

Annexure-6

EXPERIENCE OF THE QA/QC DOMAIN EXPERT/SPECIALIST FOR 3RD PARTY QA/QC WORK

The Bidder shall provide adequate number of competent personnel having requisite experience for the entire project. The Domain Expert and Specialists will be required to make visits to the operation area/field of the respective contract areas of ONGC and OIL for effective execution of QA/QC work.

Experience of QA/QC Domain Expert/Specialist to be assigned for 2D QA/QC in an Area.

QA-QC Domain Expert:

Experience: QA/QC Domain Expert should have minimum 20 years experience of on-land seismic data acquisition as field geophysicist/observer/QC specialist and should be conversant with all aspects of seismic data acquisition under different logistics/surface conditions and having expert knowledge of various seismic acquisition technologies. He should also have knowledge of seismic data processing.

QA-QC Specialist:

Experience: Minimum 10 Years of experience in the on-land Seismic data acquisition and in-field QA/QC processing. The person must have worked in the 2D/3D seismic crew at least for 10 years as an observer/field geophysicist/QC personnel.

Note: The bidder must provide bio-data/resume of personnel along with documentary evidence in support of experience of QA/QC Domain Expert/Specialist.

DGH reserves the right to approve Contractor's personnel before commencement of work. The QA/QC Domain Expert/Specialists shall maintain strict discipline and good conduct with other CONTRACTOR's employees and shall abide by and conform to all rules and regulations promulgated by the DGH and OIL/ONGC governing the operations.

Note: The bidder must provide a list of personnel along with their bio-data/resume to be assigned in each of the area/crew.

Annexure-7

TECHNICAL SPECIFICATIONS

A. OIL AND NATURAL GAS CORPORATION LIMITED (ONGC)

(TERM OF REFERENCE FOR QC MEASURES AS STIPULATED BY ONGC IN THE SIGNED/TO BE SIGNED SERVICE CONTRACT BETWEEN ONGC AND SERVICE PROVIDERS)

For a detailed elaboration on various technical specifications and QC measures to be adopted in survey areas under signed/to be signed contract between ONGC and service providers. Below is a summary of some key aspects meant to be indicative and not exhaustive.

NOISE:

Controllable noise such as that due to movement of crew equipment and personnel and source generated noise shall be reduced as much as possible.

Ambient noise such as wind, natural earth vibrations, power line noise, traffic and industrial noise shall be kept to a minimum.

DEFECTIVE TRACES:

A trace shall be considered defective under any one (or more) of the following conditions:

1. A trace is dead.

2. Controllable noise is more than 12 db above as exhibited w.r.t. the adjacent traces for a continuous period of one second during recording cycle.

3. The recording system does not meet the manufacturer's specifications

4. Its polarity is reversed.

5. Leakage worse than half mega ohm.

Note: Dead traces, due to natural or man-made obstacles to geophones planting shall not be considered as defective traces. Reasons for not planting the geophones at such places may be recorded on observer's log.

Onsite representatives of CORPORATION shall be informed in advance about such obstacles. However, suitable receiver types shall be deployed in water covered areas / swamps with data gaps restricted to minimum.

DEFECTIVE RECORDING:

A record shall be considered defective if:

1. No detonation of charge occurs.

2. Data are recorded with incorrect instrument settings.

3. Data is not identifiable to the recorded shot or not retrievable from magnetic cartridges.

4. Loss of magnetic recording occurs during designated record length.

5. Shot with charge at depth less or more than pre-decided optimum depth

6. Partial detonation / Floating of explosive in a hole.

7. Data is recorded without performing periodic instruments and field tests (e.g. geophone impulse test, leakage test etc)

8. The number of defective traces exceeds the limit as defined in Clause A 7.11

9. Data recorded with only internal time break.

10. The number of defective traces exceeds limit.

ACCEPTABLE RECORDING CONDITIONS:

Recording shall commence only when the following conditions are present:

Defective traces are limited as defined in clause “Defective Traces” mentioned above.

Sufficient key personnel are present to conduct operations efficiently, safely and without detriment to the standards and specifications.

- Prior to each shot, the CONTRACTOR shall have taken all reasonable and prudent measures to ensure that:
  - The recording system is in proper working order.
  - The source and detectors are properly placed.
  - All monitoring devices are functioning.
  - Prescribed system tests and field test have been conducted.
  - Shot holes are drilled to +/- 2m of required optimum depth.
  - Each seismic receiver is planted to achieve good coupling and proper vertical position. Intra array elevation difference will be limited to a maximum of 2 meters by shortening the array wherever necessary

- **DATA GAPS:**
  - There shall be no gaps / skipped shots even in dense vegetation, water covered areas, paddy fields, and marshy areas where suitable technique shall be used and full spread shall be laid in advance.

- In such areas, loss of multiplicity shall be restricted to minimum using suitable recovery techniques in consultation with CORPORATION representatives. Contribution from near offsets may be relaxed in case of recovery shots. Skips/Recovery plan should be communicated to onsite CORPORATION representative in advance.
- CONTRACTOR shall re-shoot at his expense where re-shooting / recovery shots are required to maintain the optimum fold specification in areas around natural and manmade obstructions.
- No payment shall be made for shots required for fold build-up and fold taper at the end of lines. However the additional shot hole drilling charges and additional explosive consumption are payable for shots required for run –in and run-out shots. Similarly, the deduction shall be made for meterage less than the optimum depth or /and charge size less than optimum charge size for these shot points.

- **WORK SHALL NOT CONTINUE ON ANY DAY IF:**
  1. There are more than 2 % of active traces are defective (it does not include dead channels due to logistics reasons)
  2. Polarity of geophone/ hydrophone/node with external geophone is not correct.
  3. Controllable ambient noise exceeds 12 dB (as compared to adjacent traces) on more than 2% of the active traces on the spread, as displayed on the noise strip recorded at the beginning of each day.
  4. Monitor device is inoperative.
  5. Any adjacent traces are defective.
  6. Five consecutive records are defective.

B. OIL INDIA LIMITED (OIL)

(TERMS OF REFERENCE FOR QC MEASURES AS STIPULATED BY OIL IN THE SIGNED/TO BE SIGNED SERVICE CONTRACT BETWEEN ONGC AND SERVICE PROVIDERS)

For a detailed elaboration on various technical specifications and QC measures to be adopted in survey areas under contract by Geophysical Service Provider with OIL. Below is a summary of some key aspects meant to be indicative and not exhaustive.

QUALITY OF WORK & QUALITY CONTROL MEASURES:

- **NOISE:** Controllable noise such as that due to movement of crew equipment and personnel and source generated noise shall be reduced as much as possible. Sufficient precautions shall be taken for ambient noise such as wind, natural earth vibration, power line noise, traffic and industrial noise to be kept minimum.
- **DEFECTIVE TRACES:** A Trace shall be considered defective under any one (or more) of the following conditions:

  (a) A trace is dead.
  (b) Controllable noise is more than 12 db above as exhibited w.r.t. adjacent traces for a continuous period of one second during recording cycle.

(c) The recording system/sensors do not meet the OEM's specifications.
(d) Its polarity is reversed.
(e) Leakage worse than half mega ohm.

- **DATA GAPS:**

a) There shall be no gaps / skipped shots even in dense vegetation, water covered areas, paddy fields, and marshy areas where suitable technique shall be used and full spread shall be laid in advance.
b) In such areas, loss of multiplicity shall be restricted to minimum using suitable recovery techniques in consultation with Company.
c) Contribution from near offsets may be relaxed in case of recovery shots Skips/Recovery plan should be communicated to Company in advance.
d) The Geophysical Service Provider shall re-shoot at its expense where re-shooting/recovery shots are required to maintain the minimum fold specification in areas around natural and manmade obstructions.
e) In the event of requirement of modification/deviation/termination of a particular profile in the presence of obstacle such as Wild life Sanctuaries, Defense Installations, Military/Army camps the same shall be finalized in consultation with Company.
f) The Geophysical Service Provider will put all effort to take recovery for each skip shot at the nearest possible point. In case of recovery shots, information regarding position of recovery and tolerance of S/N ratio should be available at site.

- **WORK SHALL NOT CONTINUE ON ANY DAY IF:**

a) There are more than 2% of active traces are defective
b) Polarity of geophone/hydrophone/node is not correct.
c) Controllable ambient noise exceeds 12 dB (as compared to adjacent traces) on more than 2% of the active traces on the spread, as displayed on the noise trip recorded at the beginning of each day.
d) Monitor device is inoperative.
e) Five consecutive records are defective.

Note:

1. **Dead traces, due to natural or man-made obstacles to geophones planting shall not be considered as defective traces. Reasons for not planting the geophones at such place may be recorded on observer's log.**
2. **Company shall be informed in advance about such obstacles. However, suitable receiver types shall b e deployed in water covered areas/swamps with data gaps restricted to minimum.**
3. **Company, under exceptional conditions, may permit relaxation to above work standards, without sacrificing data quality. These conditions shall be logged on Observer's sheet.**

BAD RECORDS:

A record having any one of the following will be considered as bad record and shall not be considered for the daily progress:

i. More than 2% dead channels of total channels recorded, per record. Geophysical Service Provider shall put all his efforts to rectify the dead/bad channels as early as possible. However, the Contractor shall start every day's operation with all good traces.
ii. Records with more than 6 consecutive dead channel in any record, however total no of dead channels in a record cannot exceed more than 2% of total channels recorded, per record.
iii. Record with sync. Error.
iv. Record with parity Error.
v. Record with appreciable cross feed, leakage and spread noise etc.
vi. If there are more than 25% of the records per ground line kilometers are bad, then the same shall be re-shoot by the Contractor.
vii. The Contractor will re-shoot the bad records at the advice of Company's representatives at site.
viii. No detonation of charge occurs.
ix. Data are recorded with incorrect instrument settings.
x. Data is not identifiable to the recorded shot or not retrievable form magnetic cartridges.
xi. Loss of magnetic recording occurs during designated record length.
xii. Shot with charge at depth less or more than pre-decided optimum depth.
xiii. Partial detonation/Floating of explosive in a hole
xiv. Data recorded with only internal time break.

Note:

1. Above specifications are extracted from signed/to be signed contract between ONGC / OIL and their service providers.

Annexure-8

DATA ACQUISITION PARAMETERS

A. ONGC

Parameters	Parameters	Remarks
Group Interval (m)	10 / 20	Cambay: 10m
Shot / I (m)	40 / 60	Cambay: 40m
Fold	150	
Active Channels (Nos)	900/1200	Cambay: 1200 Nos
Spread	Split-Spread / Asymmetric Split Spread	Long Offset data upto 18 Km in Sectors 1,2,7 & 8
Source Type	Mainly Explosives	Rajasthan: Vibroseis Kutch: partly Vibroseis
Estimated Optimum Shothole Depth (m)	25-35	
Estimated Optimum Charge Size(Kgs)	5 to 10	
Receivers Natural Frequency (hz)	10	Sector-7 &8 : 4.5Hz Low Frequency
Receivers per Channel (no's)	12(6x2)	
Recording Length (sec)	8	
Sampling Interval (ms)	2	
Recording Format	SEG-D Demult/ SEGY	
Receiver Pattern	Array/Bunched	
Shot Hole Pattern	Single	Multiple holes at places

Note:

1. The recording polarity Compression (first arrival) will give a negative number on tape and trough on monitor records.
2. Long offset data acquisition will be done on few lines to image deeper sub-surface events with asymmetric spread or end-on with respect to the shot/vibro point.

B. OIL

Parameters	Parameters	Remarks
Group Interval (m)	20	
Shot / I (m)	60	
Fold	100	
Active Channels (Nos)	300+300	
Spread	Symmetric Split-Spread /	Long Offset data upto 12 Km
Source Type	Explosives	
Estimated Optimum Shothole Depth (m)	20-24m	
Estimated Optimum Charge Size(Kgs)	5 to 10	
Receivers Natural Frequency (hz)	10	
Receivers per Channel (no's)	12(6x2)	
Recording Length (sec)	8	
Sampling Interval (ms)	2	
Recording Format	SEG-D Demult/ SEGY	
Receiver Pattern	Array/Bunched	
Shot Hole Pattern	Single	Multiple holes at places