📣 INVITATION TO SUBMIT TECHNICAL AND COMMERCIAL OFFERS
Mud Logging Services

Mud Logging Services

We hereby invite qualified and experienced companies to submit their technical and commercial proposals for the provision of Mud Logging Services in accordance with the scope of work outlined in the attached document.

The scope includes, but is not limited to:

- Provision of a Mud Logging Unit equipped with certified sensors, gas detection systems, and real-time data acquisition software.

- Deployment of qualified personnel including Data Engineers and Mud Loggers operating on a 24/7 rotation.

- Supply of all necessary equipment for geological monitoring, gas analysis, cuttings processing, and reporting.

- Capability to operate under extreme climatic conditions (0°C to 50°C).

- Delivery of daily reports, master logs, and final well documentation in both hard and electronic formats.

- Compliance with Libyan safety and operational standards, including insurance and personnel protection obligations.

- Execution of services for one well re-entry and two exploration wells in the Ghadames Basin, Block 95/96.

Submission Guidelines:

- Offers must be submitted in sealed envelopes waxed in red.

- Both technical and commercial proposals must be included.

- Pricing details must be confined to the commercial offer only.

- Deadline for submission: within five (5) days from the date of this announcement.

For full technical specifications and requirements, please refer to the attached document.

We look forward to receiving your proposals.

4.2 SPECIFICATIONS OF EQUIPMENT AND SERVICES SUPPLIED BY THE CONTRACTOR

4.2.2 MUD LOGGING SERVICES

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4.2.2.1 Work Description

In order to meet the Client's requirements, the Contractor must provide the following:

- Supply of a Mud Logging Unit, Personnel and associated services for two (02) wells + one well re-entry on 95/96 area located in Libya.

- The Contractor must have knowledge of the geographical and climatic conditions on this area.

The Contractor must provide a Mud Logging Unit with equipment operational in climatic conditions where the ambient temperature is highly variable (8 - 50° C),

- The Contractor must provide a new Mud Logging unit or seen very little used (very recent and in very good condition),

This service shall include (but not be limited to):

- Supply of a Mud Logging Unit, Personnel and services to the Customer's specification and requirements,

- All works, supervision, technical support, materials, supplies (products), equipment, transport and any other items necessary to carry out the service,

- Provision of input, advice and technical procedures relating to Mud Logging in accordance with the drilling program,

- Accurate provision of Job Report detailing all aspects of appropriate operations relating to the installation and use of the contractor's equipment.

4.2.2.2 Mud Logging Equipment

The list of equipment proposed below is not exhaustive, the Customer may require other equipment, if necessary, especially optional equipment and dedicated services.

The Contractor may be asked to provide a listing of any equipment and services that may improve drilling and optimize operations.

The equipment to be supplied must be in good working order to meet the Customer's requirements.

Mud Logging and Cabin Store unit:

The onshore Mud Logging Unit must consist of steel laboratory cabin, approximately 24 to 30 ft x 8ft x 8.5 ft in size, fitted with a door, emergency hatch and window, meeting DNV A0 2.7.1 standards and all specifications required in the oil industry.

The interior of the unit must include a work area for the Well Site Geologist, a work area for the processing of cuttings and a space for the acquisition, recording and display of acquired data.

The unit must be designed to accommodate all the equipment required for geological monitoring of drilling operations.

- The Mud Logging Unit (UML) must be equipped with :

Certified lifting rings	04	For lifting by crane
Fork passage	02	
Positive pressurisation system	01	Explosion Proof
Smoke detectors	01	Connected to an audible alarm
Explosive gas mixture detector	01	Connected to an audible alarm
Emergency interior lighting system	01	
Evacuation system	01	(Extractor, extractor hood or ventilation duct), with fireproof motor (EExd), to evacuate gases to the outside
Electric emergency stop button	01	Complies with international safety standards
Approved electrical transformer	01	Equipped with a selector that provides the power (current and voltage) and electrical frequency required to operate the UML.)
Intrinsically safe power supply cable	01	De 4 x 10 mm^2 et de 393.6ft (120m) de longueur.
Fire-fighting extinguishers	03	Two (02) easily accessible carbon dioxide (CO2) fire extinguishers for the UML. One (01) other CO2 fire extinguisher must be installed in the booth-store.
Air conditioners	02 +01 back up	Split system 24,000 BTU each, to maintain a stable temperature (22 to 24°C) inside UML whatever the outside conditions.
Uninterruptible Power Supply (UPS)	02	UPSs must have an operating time of at least 20 minutes in the event of a loss of electrical power.
Laboratory bench with stainless steel sink	01	
Storage space	01	Cupboards / drawers inside the unit, for storing light materials and supplies
Rack or storage stand	01	To accommodate all data acquisition equipment and the gas system
Fridge	01	Adapted to the dimensions of the UML ~160 litres
Office chairs	02	Robust and very comfortable for a 12h shift
Laboratory stool	01	
Medicine box	01	Containing everything you need for first aid
Complete toolbox	01	Containing a series of spanners, screwdrivers and other small tools essential for maintaining the unit

- Cabin store: Used to store backup equipment, bulky consumables (crates, bag s, etc.) an as a work area for the Mud logger (processing cuttings, cores, etc.).

Auxiliary container (Cab blind) **(ISO 10 FEET dimensions)**	**01**	Structure suitable for all onshore exploration locations. The unit is made entirely of steel and has the following features: • Four top corners with pad eyes for crane loading, • Pockets for forklift loading, • Steel door (large size), • Large window (emergency exit) (2.46 x 1.64 ft) with steel protection, • Non-slip stainless steel floor, • Robust work table approx. 2.3 x 4 ft (70cm x 120cm) with fixed vice, • Overhead lighting, • Four (04) earthed universal wall sockets (20A), • 4x4mm power supply connection cable with plug for connection to the Mud logging unit (33ft min), • Electrical protection by main circuit breaker and secondary protection elements for loads. (The tenderer must be able to submit the basic electrical diagram of the blind cabin if applicable).

System and Associated Programs

The Mud unit must be equipped with a complete software library, consisting essentially of:

Items	Quantity	Description
Software, designed for data acquisition, processing, recording and display.	**01**	The software must be reliable and meet the following requirements: • Real-time data acquisition, • High frequency data acquisition and storage (up to 10 times / second), • Playback display of numerical or graphical data on screens or virtual printers.
Database management software	**01**	With this software, the Data Engineer can: • Calibrate all sensors and gas analysis equipment, • Create, initialize, activate, duplicate or delete records in the database, • Configure and manage data storage; • Backup and retrieve the Database and system data in real time; • Export time and depth data in ASCII, LAS, XLS, etc. format; • Extract time data and filter it to obtain data based on depth; • Present and display data on screens;
Recent office software	**01**	Microsoft office 2003 / 2007 collection or more recent (word, Excel, Power point...), Adobe reader, Adobe writer... for the elaboration of the various reports.
Assistance and Engineering Programs:		

Real-time hydraulics program	**01**	Using several models (Bingham, Newtonian & Power Law, etc.), it must be able to simulate and/or calculate, in real time, all the pressure losses through the elements of the drill string and annulus. This program must also be able to calculate all volumes (well and drill string), equivalent circulation density, predict mud circulation regimes (laminar, turbulent, etc.), and must be able to print the corresponding detailed hydraulic report.
Kick control program	**01**	It should make it possible to calculate the formation pressure (pores), the new sludge density required to control the inflow, the volume of baryte required, the circulation pressures and the time needed to replace the contaminated sludge with new sludge.
Surge & Swab" calculation program in real time	**01**	The system must be able to calculate precisely the maximum speed of the seal at a given depth without causing downward and/or upward pistoning (Surge & Swab).
Program to calculate pore pressures and "D" Exponent in real time and off-line	**01**	It must enable: • Real-time analysis of the "D" Exponent during drilling; • Continuously calculate the formation pore gradient; • Continuously calculate the fracturing gradient; • Immediately recognise formation change; • Immediately recognise an increase in the formation pore gradient.
Log generation program	**01**	Software dedicated to the production of geological logs (Master log, gas log, drilling log, core log, etc.), which must meet the following criteria : • Easy to use, with the option of configuring logs according to depth or time, • Possibility of customizing lithological symbols, engineering figures and log headers, • The system must be able to define log templates and modify them quickly to create documents tailored to the customer's needs, • Multi-user: the software can be used without interference by different users. utilisateurs simultanément, • Prise en charge des fonctionnalités d'Export des data en ASCII format
Multi-well correlation program	**01**	It enables geological correlations to be made between at least two wells by unrolling them simultaneously.
Diversion program	**01**	For monitoring deviated wells (directional and horizontal)
Programs to monitor the operation and lowering of casings	**01**	Casing/pipe run
Cement monitoring program	**01**	

IT equipment:

- The IT equipment must be recent, manufactured by internationally renowned companies, designed for industrial use and meet the most rigorous technical standards.
- The UML must be equipped with the following hardware:

Items	Quantity	Description
Main station (Server)	**01+01**	High-tech, high-performance, with redundant power supply, highly integrated network and high-capacity hard disk. (One (01) operational and one (01) other or Server hard disk in back up)
Computers (online) (Geological monitoring)	**02**	Equipped with a high-resolution 17-inch minimum color screen, for real-time display of all drilling parameters, mud and gas readings, etc. (real time monitoring).
Computers (offline)	**02**	Equipped with a high-resolution 17-inch minimum color screen, for drawing up reports and other documents.
Computers (workstations)	**02**	Installed in the offices of the Customer's representatives: one (01) for the Well Site Geologist and one (01) for the Drilling Supervisor. Equipped with a high-resolution color screen, at least 17 inches in size, connected to the main server. They must be able to display alphanumeric and graphical data on recorded parameters in real time. These stations must also be equipped with office software (Microsoft Office, Adobe Reader, etc.).
Color repeater screens	**01**	Installed in the rig manager's office to display drilling operations in real time (high resolution - 17" minimum), it can be configured according to requirements (drilling, maneuvring, cementing screen, etc.).
Explosion-proof repeater screen	**01**	Installed at rig floor level for the foreman and configurable according to the type of operation in progress (drilling, maneuvring, cementing, etc.). Explosion-proof and protected by a watertight, shock-proof casing.
Virtual printers (min. 17" LCD flat-screens)	**02**	These virtual printers must be visually attractive and easy to read, and must have the following features: - Real-time display of configured drilling parameters; - Real-time data update (every 5 seconds); - Configurable as required (parameters, colors....); - Can be printed on request.
Monochrome laser printer	**01**	Recently manufactured with high quality A4 printing.
Color inkjet printer	**01**	High resolution, equipped with a paper feed carriage for listing paper or rolls, dedicated to printing logs on site.
Multi-function printer: printer, scanner and photocopier	**01**	Newly manufactured, high resolution, for the Geological Supervisor

Gas system (gas equipment):

The Mud Logging unit must be fitted with the following gas equipment:

Items	Quantity	Description
QGM (Quantitative Gas Measurement) deaerator	**01+01**	One degasser in operation and another QGM degasser as a back-up. The Contractor may propose a more recent deaerator than the QGM.
Gas lines	**01+01**	Composed of flexible hoses with a reduced internal diameter, able to withstand extreme temperatures 122°F (+50°C) and prevent contamination of gas samples. One operational and one back-up.
Distribution panel and gas flow control	**01+01**	Fitted with a vacuum gas sampling device, it must be able to : - Measure and regulate all gas flows through the analysers; the flow rate must be measured using a high-resolution flowmeter (0 to 15 CFH or 450 l/h) placed at the pump outlet; - Trigger alarms in the event of obstruction of the gas line and automatically stop the suction pump.
Flame ionization total gas detector (FID)	**01+01**	Highly reliable and accurate, with the following characteristics: **Measurement system:** - -Sensor type: FID; - Sampling time: less than 5 seconds **Measurement quality:** - - Accuracy: +/- 1% (full scale); - - Resolution 20 ppm; - - Response time: less than 90 seconds (from sampling to detection). **Calibration:** - Unit: equivalent methane in air (EMA), calibration will only be performed with methane gas; N.B.: one operational and the other in back-up.
Chromatograph	**01+01**	**Measurement System:** - Sensor type: FID; - Analysis type: Chromatographic analysis of alkanes [from methane (C1) to normal pentane (nC5)]; - Analysis cycle time from C1 to nC5: 40 to 60 seconds; - System flame: self-ignition; **Measurement Quality:** - Unit of measurement: ppm; - Measurement ranges: 0 - 1%, 0 - 10%, and 0 - 100%; - Acceptable saturation limits: 100% C1, 30% C2, 15% C3 to C5; - Accuracy: +/- 1% full scale; - Resolution: 20 ppm; - Detection threshold: 20 ppm; **Calibration:**

		- Calibration with certified gas mixture, consisting of seven components (from C1 to nC5); **N.B:** One operational and the other as backup.
Specific software for integration of analyses (associated with the chromatograph):	**01**	It must allow real-time visualization of analyses and store them in the database
Real-time gas data quality control software	**01**	Allows real-time verification and display of the quality of acquired gas data (gas quality control application). (An advantage for the provider)
Software for calculating and displaying gas ratios:	**01**	The system must have the capability to automatically calculate and display in real-time the main gas ratios: Wetness (Wh), Balance (Bh), Character (Ch), and interpretation plots (Pixler)
H2S Detectors:	**03**	Capable of measuring H2S concentrations in open air and in the air-gas sample. They are installed on the rig floor, near the vibrating screens, and on the gas line in the UML. These detectors must have the following characteristics: - Unit of measurement: ppm; - Measurement range: 0 to 50/60 ppm; - Resolution: 1 ppm; - Accuracy: +/- 1 ppm (Full Scale); - Response time: 30 seconds max; - Compliant with safety standards in the oil industry. **Alarm**: - External audible (siren) and internal (buzzer); - External visual (rotating beacon).
CO2 Sensor	01	- Accuracy: +/- 1% Full scale; - Response time: 30 seconds max; - Compliant with safety standards in the oil industry. **Alarm** : - External audible (siren) and internal (buzzer).

Geology Equipment

Items	Quantity	Description
Binocular microscope with variable intensity light.	01	- Zoom: From 6.3x to 40x (from 2x to 320x); - Interchangeable eyepiece lenses or zoom control (minimum magnification should be 20x); - System polarization; - Variable light intensity; - Built-in 12 MPX or higher digital camera.
Digital camera 12 MPX or higher	01	Provided to the Client's representatives (Geologist, drilling supervisor, etc.).

Fluoroscope with detachable head	01	Ultraviolet wavelength = 2500 – 3650 Angstroms.
Automatic calcimeter with display screen	01	Meeting the strictest safety standards (standards for chemistry laboratories), fully automatic with internal data storage (Well name, depth, date, time, measurement values). The measurements must be automatically exportable to the server database, etc.
Electronic balance	01	Must have the following characteristics: - Power supply: 220 VAC; - Maximum weight: 200 grams; - Accuracy: +/- 1% full scale; - Scale: in grams.
Electric hot plate	01	Approximately 2000 watts, powered by 220 V AC, 50/60 Hz, compliant with safety standards.
Ventilated oven	**01**	For drying cuttings: - Space for 8 samples at a time; - Temperature from 50° to ~ 300°C; - 220 VAC, 50/60 Hz; - With temperature selector/thermostat; - With current temperature display; - With thermal protection.
Set of stainless-steel sieves	01	Various mesh sizes (0.063, 0.125, 0.250, 0.5, 2 and 5 mm).
Geologist's hammer	01	Made of a single block of very resistant steel with one flat side and one pointed side.
Electric water bath container	01	For paraffin melting
Various chemicals needed for cuttings analysis. **N.B:** All chemicals must be accompanied by safety data sheets (e.g., MSDS).	sufficient quantities	- Concentrated hydrochloric acid (HCL) 100%; - Nitric acid (HNO3); - Sulfuric acid; - Chloroform (CHCL3); - Alizarin Red S; - Methylene blue; - Phenolphthalein (C20H14O4); - Barium chloride (BaCl2); - Silver nitrate (AgNO3); - Potassium chromate (K2CrO4); - Methanol (methyl alcohol) (CH3OH); - Iron sulfide (FeS2); - Deionized (distilled) water; - Calcium carbonate (CaCO3) (*); - Magnesium carbonate (MgCO3).
Set of glassware Dropper bottles Glass beakers Glass plasma bottles Graduated polypropylene tubes Glass test tubes Polypropylene test tubes	**Sufficient quantity**	

Graduated glass pipettes		
Ceramic mortar and pestle	**01**	
Bent tweezers	**02**	Made of stainless steel, approximately 4.92 inch (125mm) long
Straight tweezers	02	Made of stainless steel, approximately 4.92 inch (125mm) and 5.91inch (150 mm) long.
Mounted needles	02	
Sampling trowel	01	Made of stainless steel
Ceramic honeycomb plates	02	Approximately 4.53 x 3.54 inch (115 x 90 mm) in size with 12 holes.
Sampling cups	30	Made of stainless steel, 1 mm thick, approximately 5.31 x 2.95 x 2.36 inch (135 x 75 x 60 mm) in size
Aluminum plates	30	For drying drill cuttings
Triple meter graduated in centimeters	01	

Sensors:

The UML must be equipped with certified sensors that are independent of the Contractor's sensors.

- **Standard listing of drilling parameter sensors**

Note:

1- For all sensors: 01+01 means 01 in operation and 01 as backup.

1- This list is considered standard. Optional sensors may be required by the Client if necessary.

Items	Quantity	Description
Draw work sensor	**01+01**	Must be a robust proximity sensor. Resolution: 0.39inch (1 cm) (full scale) Accuracy: +/- 0.39 inc (1 cm)
Hook load sensor	**01+01**	Resolution: 100 kg, accuracy: +/- 1% (full scale).
Rotation-RPM sensor	**01+01**	Resolution: 1 rpm, accuracy: +/- 1 pulse.
Torque sensor	**01+01**	Resolution: 50 kg*m / 1A, accuracy: +/- 1% full scale.
Standpipe pressure sensor	**01+01**	Resolution: 1 bar, accuracy: +/- 1% full scale.
Casing pressure (annular pressure) sensor	**01+01**	Resolution: 1 bar, accuracy: +/- 1% full scale.
Mud pump stroke sensors	**03+01**	(For 03 pumps + 01 backup). Resolution: 1 spm, accuracy: +/- 1 spm

Mud Monitoring Sensor:

Items	Quantity	Description
Density sensor "In"	**01**	Resolution: 10 g/l, accuracy: +/- 1% full scale
Density sensor "Out"	**01**	Resolution: 10 g/l, accuracy: +/- 1% full scale
Temperature sensor "In"	**01**	Resolution: 0.1°C, accuracy: +/- 1% full scale
Temperature sensor "Out"	**01**	Resolution: 0.1°C, accuracy: +/- 1% full scale
Mud flow-out sensor	**01+01**	The Contractor will propose the latest sensor available

Mud resistivity "In"	**01**	Accuracy: +/- 1% full scale
Mud resistivity "Out"	**01**	Accuracy: +/- 1% full scale
Mud pit level sensors, including trip tank (sonic type or newer technology)	**05+02**	Resolution: 0.39 inch (10 mm), accuracy: +/- 1% full scale **N.B:** Five (05) operational and two (02) as backup.

Internal Communication System

Items		Quantity	Description
Wireless communication system. (The wired system could be used; however, preference is given to wireless)		**01**	It will be installed to connect the Mud Logging unit, the rig floor, the drilling supervisor's office, the geological supervisor's office, and the site manager's office. (A wired system could be used, but preference is given to wireless).
Internal telephone system (multi-station)		**01**	Switch for a minimum of six lines
	Desk telephones	**05+01**	To be installed in the Mud Logging unit and the offices of the Drilling Supervisor, Geological Supervisor, Site Manager, and Mud Engineer. A sixth phone should be available as a backup in the UML.
	Rig floor telephone	**01**	It must be an explosion-proof, certified type, easily accessible to the shift supervisor.

Miscellaneous Consumables:

The Mud Logging unit must also be equipped with the consumables listed below:

Items	Quantity	Description
Aluminum foil rolls	Sufficient quantities	
Cellophane film rolls	Sufficient quantities	
Permanent markers	Sufficient quantities	
H2S bottles/ampoules	Sufficient quantities	For testing/calibration
CO2 bottles/ampoules	Sufficient quantities	For testing/calibration
Hydrocarbon calibration gas bottles	Sufficient quantities	Methane (C1) and mixed gas (C1-nC5) with calibration certificates provided by the supplier

Gas sampling balloons (Gas bags)	Sufficient quantities	
Various office supplies and computer consumables	Sufficient quantities	Pens, pencils, erasers, tape, rulers, scissors, glue, etc. CDs and DVDs, printer cartridges, listing paper and A4 paper, etc.

Equipment for Geological Treatment:

Items	Description
Wooden boxes or plastic cartons (green box)	For packing cuttings: approximately17.4 x 17.4 x 9.85 In.
Paraffin	Sufficient quantity.
Kraft paper envelopes	For washed and dried cuttings of size: approximately 2.75 in x 4.72 in with tie closure.
Plastic bags (polyethylene) (Small size)	For unwashed, uncleaned cuttings, dimensions: Small size (L x W x T): approximately 5.7 x 3.93 x 0.02 in.
Plastic bags (polyethylene) (Large size)	For unwashed, uncleaned cuttings, dimensions: Large size (L x W x T): approximately 11.81 x 6.5 x 0.02 in.
1-liter glass bottles	For sampling formation fluids.
5-liter plastic jerrycans	For sampling formation fluids.
Cloth bags	For unwashed, uncleaned cuttings, dimensions: approximately 10.24 x 6.5 mm.

Additional Equipment/Services:

At the request of the Client, the Contractor will provide the additional equipment/services listed below: (non-exhaustive list which the Contractor is expected to enrich).

Items	Planned quantity
Connected workstation	1
Offline microcomputer with office software (Windows, MS Office, Adobe Reader, etc.)	1
A4 monochrome laser desktop printer	1
Multifunction desktop printer (printer, copier, scanner)	1
WITS (Transmission from the unit to third parties	Service
WITS (Reception by the unit from third parties)	Service
Real-time transmission of Mud logging data via the internet on a secure medium	Service
SO2 sensor	1
Portable device for detecting harmful gases (H2S, CO2, SO2, Explosive mixture)	One (01) of each

Final Report and Documents:

Items	Planned quantity
Final report hard copy	6
Final Report electronic copy CD or DVD	6

4.2.2.3 Personnel

The Contractor must:

- Have a sufficient number of qualified personnel to ensure the proper functioning of the Mud Logging unit. The Mud logging team is made up of two (02) Data Engineers and two (02) Mud Loggers working 24/7 with a 2 x 12 hour and 04-week rotation system.

N°	Personnel	Qualifications required	Remarks
01	Data Engineer (02)	• University graduates (Geosciences), • Proficiency in Drilling, • Proficiency in Mud Logging and acquisition systems, • Three (03) to five (05) years of experience as a Data Engineer, • Proficiency in English, • Proficiency in HSSE aspects on drilling sites, • Good knowledge in the field of geology.	
02	Mud Logger (02)	• University graduates (Geosciences, Drilling), • Proficiency in Drilling, • Proficiency in Mud Logger tasks (cuttings and core processing, calcimetry, geological description and interpretation...), • Three (03) years of experience as a Mud Logger, • Proficiency in HSE aspects on drilling sites, • Good knowledge in the field of geology.	

Drill site personnel will perform the following tasks:

- Sampling, washing, drying, and preparing drilling cuttings and cores according to the frequencies defined in the implementation report and/or as instructed by the Geological Supervisor.

- Packaging and storing cuttings, cores, and formation fluids recovered during formation tests (DST).

- Lithological description of cuttings and core samples under the responsibility of the Geological Supervisor.

- Calcimetry and Dolometry of samples.

- Preparation and dosing of solutions with chemical reagents (Hydrochloric Acid, Phenolphthalein, Alizarin, etc.).

- Examination of direct and indirect fluorescence of cuttings and cores.
- Continuous detection and analysis of gas shows.
- Visual determination of porosity.
- Extraction, handling, and packaging of cores (conventional coring or other methods).
- Marking cores and labeling boxes.
- Assisting the Geological Supervisor during the handling and sampling of cores.
- Sampling and analysis of fluids recovered during DST operations or while drilling.
- Recording and monitoring of drilling, mud, and gas parameters throughout all drilling operations. The following parameters must be continuously recorded in real-time (this list is not exhaustive; other parameters may be required by the Client depending on the ongoing operation).

-The table below details the parameters to be recorded.

Recorded Parameters	
Rate of penetration	Rate of penetration ROP
Depth	Measured and vertical depths
Hook load	Weight on hook (hook load)
Weight on bit	Weight on bit
Hook position	Hook position in the drilling mast
Bit position	Bit position (while tripping)
Trip speed	Trip (in & out) speed
Rotary table RPM/TD RPM	Rotary table RPM/TD RPM
Rotary table torque/TD torque	Rotary table torque/TD torque
Pits level	Pits level
Trip tank level	Trip tank level
Mud weight In/out	Mud weight In/out
Mud temperature In/out	Temperature in/out
Mud Flow out	Mud Flow out
Mud resistivity/conductivity In/out	Resistivity / conductivity in /out
Actual and differential volume	Actual and differential volume

Pump strokes and mud flow calculation	Pump(s) strokes and calculation of mud flow in
Stand pipe pressure	Stand pipe pressure
Annular pressure	Annular pressure
Total Gas	Total Gas
Chromatographic gas analysis C1 to nC5	Chromatographic gas analysis C1 to nC5
Detection and quantification of H2S	Detection and quantification of H2S
Detection and quantification of CO2	Detection and quantification of CO2

- Maintenance and repair of Mud Logging unit equipment,

- Daily inspection and maintenance of gas analyzers; chemical desiccants must remain operational at all times,

- Calibration and adjustment of gas devices (Primary calibration of total gas detector and chromatograph will be conducted before drilling commences. Calibration verification will be performed at least once per drilling phase and once weekly during reservoir phase),

- Engineering support (hydraulic report, pressure, cementing, surge & swab, etc.),

- Detection of any anomalies related to drilling, mud, or geological parameter variations, including abnormal changes in mud pit levels, increase in gas percentage (GT, C1, C2, ...), direct and indirect fluorescence, drilling break, and immediate notification of Geologist and Drilling Supervisors,

- Daily and ongoing updating of various records,

- Storage of all Mud Logging data in the database, conducting backups, and updating it at the end of each shift,

- Establishment and updating of the Site Log (Master Log, Drilling Log, Gas Log, or other as per client requirements (format and content). It must include the following main information:

- Header ----------

  - o Client and Mud Logging service company acronyms,
  - o Document Name (Master Log, Drilling Log...) & scale (1/500),
  - o Well Name, Acronym, Block, Permit, Basin, well status (exploration, delineation, development),
  - o Drilling rig (Contractor designation and rig type),
  - o Geographic coordinates & U.T.M. of the well,
  - o Elevations (Z table & Z ground),
  - o Start date, end of drilling, end of logging,
  - o Data regarding drilling phases, casing diameters, and mud types,
  - o Legends for lithological and engineering figures,
  - o Date,
  - o Rate of penetration (ROP) in the form of a curve (in min/m),
  - o Tool characteristics and drilling parameters,

- Mud data (density, viscosity, filtrate, oil/water, etc.),
- Depth (in meters),
- Percentage of cuttings,
- Fluorescence (direct and solvent extraction),
- Casing diameters and shoe dimensions,
- Deviation measurements,
- Zones of loss or gain (depths, rates, and volumes),
- Test results (S.B.T, L.O.T, F.I.T, etc.),
- Electric logs (logging),
- Coring (Core number, cored interval, % recovered, or other),
- DST / bottom samplers (MDT, RCI, RDT...),
- Total Gas (GT) percentage as a curve,
- Gas chromatograph analyzed percentage (C1 to nC5) as a curve,
- Calcimetry & Dolometry,
- Lithological interpretation,
- Cuttings description,
- Formation tops and stages,
- Any other parameter deemed necessary by the Geologist Supervisor.

- Preparation of Daily Mud Logging Report. It must include the following data:
  - Well Name, acronym, status,
  - Geographic coordinates or UTM, Elevations (Z ground & Z table),
  - Drilling rig (Contractor designation and rig type),
  - Report number and date,
  - Midnight depth, drilled or cored meterage, drilling or coring time,
  - Tool diameter and number, number and diameter of nozzles or TFA,
  - Drilling parameters, mud data, and others (ROP with and without adding rods);
  - Chronology of operations during the 24 hours,
  - Hydraulic data,
  - Lithological description of drilled or cored intervals,
  - Gas indices (% GTC, C1, C2, C3, iC4, nC4, iC5, and nC5),
  - Fluorescence (direct and solvent extraction),
  - Volume and elevation of mud losses or gains,
  - Any other parameter deemed necessary by the Drilling Supervisor.
- Deliver copies of the Master Log or any other partial or final document in PDF format,
- Deliver any other document or log upon request of the Geologist Supervisor / Drilling Supervisor,

- Establish shipping invoices and technical sheets for all boxes of cuttings or cores to be sent to the Client's premises,
- Establish final logs (Master Log, Drilling Log, Gas Log) and end-of-well report,
- Submit daily to the Geologist Supervisor:
    - o A Mud Logging Daily Report (at the time required by the latter);
    - o An updated electronic copy of the Master Log scale 1/500 in PDF format of the section traversed during the 24 hours;
    - o An electronic copy in ASCII or Excel format of all drilling parameters and recorded gas indices;
    - o A situation report at 2 PM as per the requirements of the Geologist Supervisor;
    - o Other documents upon request of the Geologist Supervisor.

In the absence of the Geologist Supervisor, the report intended for them shall be submitted to the Testing Supervisor (during completion phase), Drilling Supervisor, or any other personnel acting in a technical capacity for the Client.

- To the Drilling Supervisor:
    - o A daily Mud Logging report (at the time required by the latter),
    - o A hydraulic report,
    - o An electronic copy in ASCII or Excel format of all drilling parameters and recorded gas indices,
    - o A situation report at 2 PM as per the Drilling Supervisor's requirements,
    - o Other documents upon request of the Drilling Supervisor.
- At the end of drilling, submit to the Geologist Supervisor:
    - o Two (02) color copies (on listing paper) of the complete Master Log scale 1/500;
    - o Two (02) CD/DVDs containing all well data (drilling, mud, and gas parameters) recorded in ASCII or Excel format, and the Master Log in PDF format.
    - o Deliver to the Client's representative within twenty-one (21) days following the end of drilling, the final report with annexes, prepared in French language (reviewed and corrected as necessary), in six (06) copies including the following information:

I. Introduction:

I.1. Purpose of the well drilling,

I.2. Well location,

I.3. General data,

I.4. Contractors,

I.5. Rig description,

II. Drilling & Mud Data:

II.1. Phase reports,

II.2. Deviation measurements,

II.3. Tool performance,

II.4. BHA (Bottom Hole Assembly) reports,

II.5. Mud reports,

II.6. Casing and cementing reports,

II.7. Time analysis,

II.8. Drilling costs,

III. Geological Data:

III.1. Lithostratigraphic overview,

III.2. Detailed description of cuttings and indices,

III.3. Description of cores and indices,

III.4. Well stratigraphic log,

IV. Electrical Operations (Logging):

V. Production Results (Testing & Completion):

Annexes:

- Daily drilling reports;
- Casing tally;
- Master log (scale 1/500);
- Gas log (scale 1/500 or as per client's request);
- Drilling log (scale 1/500);
- Pressure log (scale 1/500 or as per client's request).

This final report will also be provided in digital format (CD, DVD) in six copies (06 CDs or 06 DVDs), with all data in Word, ASCII, Excel, LAS as applicable, and PDF for logs.

Furthermore, the Contractor undertakes to:

- Erase and keep confidential all facts, information, and documents provided by the Client in accordance with the provisions of Article ... of this Contract.

4.2.2.4 Special Operational Provisions:

1. The Mobilization rate is compensation for providing Mud Logging Unit and personnel at the drilling site from the supplier's base, and it is a lump sum amount.
2. The Demobilization rate is compensation for demobilizing the Mud Logging Unit and personnel from the drilling site back to the supplier's base, and it is a lump sum amount.
3. The Operational rate applies when the Mud Logging unit is fully assembled and operational on site (the drilling rig is operational). Personnel work in shifts of 12 hours on, 12 hours off.
4. The Stand-by rate applies (to the unit, equipment, and personnel) when the unit is available to the client but not operational, as specified in point C (the unit is on the drilling site during assembly/dismantling, in transit from one drilling site to another, or packed awaiting assembly or transport).
5. The Stand-by rate also applies to the unit, equipment, and personnel during waiting periods assigned by the Client, even if the unit is assembled and ready for operation.
6. The client reserves the right to work with a reduced team (2 people) during specific periods (e.g., during tests). In such cases, only the present personnel will be invoiced by the Contractor to the Client.

7. Personnel are invoiced from their arrival at the drilling site. Invoicing stops upon their departure from the drilling site.
8. The Client reserves the right not to charge for any defective item if the malfunction exceeds 24 hours.