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BP-HZN-2179MDL00055567

BPD110-003390



**CONTRACT FOR
GULF OF MEXICO
STRATEGIC PERFORMANCE UNIT
OFFSHORE WELL SERVICES**

BETWEEN

BP EXPLORATION AND PRODUCTION, INC.

AND

HALLIBURTON ENERGY SERVICES, INC.

BPM-09-00255

**Section 1 – Agreement
Halliburton for GOM**

AGREEMENT

This CONTRACT is made between the following PARTIES: BP EXPLORATION AND PRODUCTION, INC., a company having its office at 501 WESTLAKE PARK BLVD., HOUSTON, TEXAS 77079 hereinafter called COMPANY and HALLIBURTON ENERGY SERVICES, INC. having its main or registered office at 1401 MCKINNEY STREET, SUITE 2400, HOUSTON, TEXAS 77010 hereinafter called CONTRACTOR. PARTY or PARTIES shall mean individually the COMPANY or CONTRACTOR or collectively as both COMPANY and CONTRACTOR.

WHEREAS:

- 1) COMPANY wishes that the WORK shall be carried out, all as described in the CONTRACT; and
- 2) CONTRACTOR wishes to carry out the WORK in accordance with the terms and conditions of this CONTRACT.
- 3) CONTRACTOR represents that it has the requisite skills, experience and resources to carry out the WORK to the reasonable satisfaction of COMPANY in accordance with the terms and conditions specified herein,

NOW THEREFORE, the PARTIES hereto agree as follows:

- 1) In this CONTRACT all capitalized words and expressions shall have the meanings assigned to them in this AGREEMENT or elsewhere in the CONTRACT.

The following Sections shall form and be read and construed as the CONTRACT:

- | | |
|-----------|---|
| Section 1 | Agreement |
| Section 2 | General Conditions of Contract |
| | <ul style="list-style-type: none">• Appendix 1: Special Conditions of Contract• Appendix 2: Local Tax Provision |
| Section 3 | Scope of Work (including Appendices) |
| | <ul style="list-style-type: none">• Appendix 1: Supplier Performance Management• Appendix 2: WORK ORDER Form• Appendix 3: CHANGE ORDER Form• Appendix 4: SUBCONTRACTORS / CONTRACTOR's Key Personnel• Appendix 5: Description of the WORK• Appendix 6: Functional and Technical Specifications• Appendix 7: Technical Integrity |
| Section 4 | Remuneration (including Appendices) |
| | <ul style="list-style-type: none">• Appendix 1: Special Local Invoicing• Appendix 2: Lost in Hole Charges• Appendix 3: Sub-Sector Terms and Conditions• Appendix 4: Schedule of Rates and Charges |

Section 1 – Agreement

Section 5	Integrity Management
Section 6	Quality Assurance and Quality Control
Section 7	Health, Safety, Security, and the Environment (including applicable Appendices)
	<ul style="list-style-type: none">• Appendix 1: Getting HSE Right (GHSER)• Appendix 2: BP's Golden Rules for Safety• Appendix 3: Substance Abuse Policy• Appendix 4: Scope Specific HSSE Issues• Appendix 5: Minimum HSSE Requirements
Section 8	Code of Conduct

- 2) The Sections shall be read as one document, the contents of which, in the event of ambiguity or contradiction between Sections, shall be given precedence in the order listed, with the exception that the Special Local Conditions of Contract as stated in Appendix 1 to Section 2 – Special Conditions of Contract shall take precedence over the General Conditions of Contract.
- 3) In accordance with the terms and conditions of the CONTRACT, CONTRACTOR shall perform and complete the WORK and COMPANY shall pay the CONTRACT PRICE.
- 4) The EFFECTIVE DATE OF THE CONTRACT shall be April 15, 2009. Notwithstanding the EFFECTIVE DATE of the CONTRACT, the WORK is scheduled to commence on the date specified in each individual WORK ORDER issued pursuant to the provisions of Section 3 ("COMMENCEMENT DATE") and shall continue until completed to the reasonable satisfaction of COMPANY. Subject to the terms and conditions contained in Section 2 – General Conditions of Contract, the CONTRACT duration shall be for a term of three (3) years from the EFFECTIVE DATE OF THE CONTRACT. COMPANY shall have the option to extend this CONTRACT for up to two (2) consecutive one year options following the expiration of the three (3) year term.
- 5) This CONTRACT constitutes the entire agreement between the PARTIES hereto with respect to the WORK and supersedes all prior negotiations, representations, or agreements related to the CONTRACT, either written or oral. No amendments to the CONTRACT shall be effective unless evidenced in writing and signed by the PARTIES to the CONTRACT.

The authorized representatives of the PARTIES have executed the CONTRACT in duplicate upon the dates indicated below:

For COMPANY

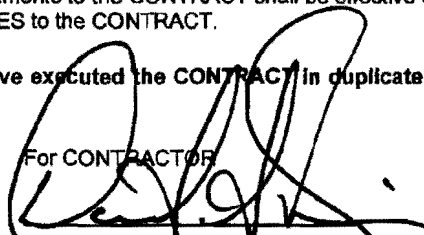


Name: Wilbert Long Jr.

Title: CPO

Date: 4/15/09

For CONTRACTOR



Name: DAVID S. KING

Title: Division President

Date: 4/16/09

Section 1 – Agreement

**Section 2 – General Conditions of Contract
Halliburton for GOM**

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APPENDICES

- APPENDIX 1 SPECIAL CONDITIONS OF CONTRACT
- APPENDIX 2 LOCAL TAX PROVISIONS

FAIR NOTICE DISCLOSURE STATEMENT

BOTH PARTIES TO THIS CONTRACT ACKNOWLEDGE THAT THIS STATEMENT COMPLIES WITH ANY REQUIREMENT TO EXPRESSLY STATE LIABILITY FOR NEGLIGENCE OF THE INDEMNITEE (EXPRESS NEGLIGENCE RULE), IS CONSPICUOUS AND AFFORDS FAIR AND ADEQUATE NOTICE. BOTH PARTIES TO THIS CONTRACT REPRESENT TO EACH OTHER THAT THEY HAVE CONSULTED AN ATTORNEY CONCERNING THE CONTENTS OF THIS CONTRACT AND ARE SATISFIED THAT THEY FULLY UNDERSTAND THEIR RIGHTS AND OBLIGATIONS HEREUNDER AND IF THEY HAVE NOT CONSULTED AN ATTORNEY, CONFIRM THAT THEY WERE PROVIDED THE OPPORTUNITY AND HAD THE ABILITY TO CONSULT AN ATTORNEY, BUT MADE A KNOWLEDGEABLE DECISION NOT TO OBTAIN SUCH CONSULTATION.

1. DEFINITIONS

The following definitions shall be used for the purpose of interpreting the CONTRACT. Further definitions not contained in this Clause shall apply to the Section in which they are stated and subsequent Sections.

- 1.1 "AFFILIATE" of a company means a person or entity directly or indirectly controlling, controlled by, or under common control with such company. "Control" for this purpose shall, in the case of a corporation with outstanding voting stock, require the direct or indirect ownership of, or power to vote with respect to, outstanding shares of a corporation's capital stock constituting fifty per cent (50%) or more of the votes of any class of such corporation's outstanding voting stock.
- 1.2 "CHANGE ORDER" shall mean the written instruction in the form similar to Section 3, Appendix 3 issued by COMPANY in accordance with the provisions of Clause 11 describing a change or variation to the WORK or a specific WORK ORDER.
- 1.3 "COMPANY GROUP" shall mean COMPANY, its CO-VENTURERS, its and their respective AFFILIATES and its and their respective directors, officers, and employees (including agency personnel), but shall not include any member of CONTRACTOR GROUP.
- 1.4 "COMPANY REPRESENTATIVE" shall mean that person referred to in Clause 3.
- 1.5 "CONTRACT" shall have the meaning described in Section 1 - Agreement.
- 1.6 "CONTRACT PRICE" shall mean the price for the WORK calculated in accordance with Section 4 – Remuneration and where applicable as set forth in any WORK ORDER, as modified by any CHANGE ORDERS, issued hereunder.
- 1.7 "CONTRACTOR GROUP" shall mean CONTRACTOR, its SUBCONTRACTORS their subcontractors of any tier, its and their respective AFFILIATES or co-venturers and, its and their respective directors, officers, and employees (including agency personnel), but shall not include any member of COMPANY GROUP.
- 1.8 "CONTRACTOR REPRESENTATIVE" shall mean that person referred to in Clause 3.
- 1.9 "CO-VENTURERS" shall mean any co-venturers and / or Co-Lessees with COMPANY from time to time having an interest in the exploration and production license under which the WORK is being performed and the successors in interest of such CO-VENTURERS or the assignees of any interest of such CO-VENTURERS as more fully defined in Appendix 1 to this Section 2.

Section 2 – General Conditions of Contract

- 1.10 "DEFECTS LIABILITY PERIOD" shall mean the period from the commencement of the WORK up to ninety (90) days after completion of the WORK during which CONTRACTOR shall remain liable for the correction of defects to the WORK or services as provided for under Clause 10.
- 1.11 "SERVICE COMPANY(IES)" shall mean any contractor(s) other than CONTRACTOR who have entered into contract(s) with COMPANY and are engaged by COMPANY to provide services or perform WORK at the WORKSITE or engaged by COMPANY to provide services or perform work in connection with the WORK.
- 1.12 "SERVICE COMPANY GROUP" shall mean any SERVICE COMPANY, its sub-contractors of any tier, its and their AFFILIATES, and its and their respective directors, officers and employees (including agency personnel), but shall not include any member of COMPANY GROUP or CONTRACTOR GROUP.
- 1.13 "SUBCONTRACT" shall mean any contract between CONTRACTOR and any party or between such party and its SUBCONTRACTORS of any tier (other than COMPANY or any employees of CONTRACTOR) for the performance of any part of the WORK.
- 1.14 "SUBCONTRACTOR" shall mean any party (other than CONTRACTOR) to a SUBCONTRACT.
- 1.15 "TECHNICAL INFORMATION" shall mean all such information provided by or caused to be provided by COMPANY pursuant to the CONTRACT.
- 1.16 "WARRANTY PERIOD" in respect of equipment and products provided by CONTRACTOR hereunder shall mean a period of 12 months from date of installation or 24 months from date of shipment of any product, whichever first occurs, as provided for under Clause 29.
- 1.17 "WORK" shall mean all work, including each service to be rendered, related equipment or materials supplied, or products provided pursuant to each WORK ORDER (as modified by any CHANGE ORDER), that CONTRACTOR is required to carry out in accordance with the provisions of the CONTRACT.
- 1.18 "WORK ORDER" shall mean the written instruction in a form similar to Section 3, Appendix 2 that will be issued by COMPANY in accordance with the provisions of the CONTRACT describing the WORK required to be performed at a specific WORKSITE.
- 1.19 "WORKSITE" shall mean the lands, waters and other places on, under, in or through which the WORK is to be performed including COMPANY owned, leased or operated premises, land drilling and production sites, offshore installations, floating construction equipment, vessels (including the area covered by approved anchor patterns) or places where equipment, materials or supplies are being obtained, stored or used for the purposes of the CONTRACT.

2. INTERPRETATION

- 2.1 All instructions, notices, agreements, authorizations, approvals, and acknowledgements shall be in writing. All such documentation together with all correspondence and other documents shall be in the English language.

Nevertheless, if for any reason it is considered necessary by COMPANY to give an instruction to CONTRACTOR orally in the first instance, CONTRACTOR shall comply with such instruction. Any such oral instruction shall be confirmed in writing as soon as is possible under the circumstances, provided that, if CONTRACTOR confirms in writing any such oral instruction

Section 2 – General Conditions of Contract

which is not contradicted in writing by COMPANY without undue delay, it shall be deemed to be an instruction in writing by COMPANY.

- 2.2 Any reference to statute, statutory provision, or statutory instrument shall include any re-enactment or amendment thereof for the time this CONTRACT is in force.

3. COMPANY AND CONTRACTOR REPRESENTATIVES

3.1 General

- (a) COMPANY REPRESENTATIVE and CONTRACTOR REPRESENTATIVE are the persons named as such in Appendix 1 to this Section 2.
- (b) Such representatives, or delegates appointed in accordance with the provisions of this Clause, shall be readily available to enable both COMPANY and CONTRACTOR to discharge their obligations under the CONTRACT.
- (c) COMPANY REPRESENTATIVE and any person authorized by him shall have access at all reasonable times to the WORKSITE and CONTRACTOR shall afford every facility for and every assistance in obtaining the right of access.

3.2 COMPANY REPRESENTATIVE

- (a) COMPANY REPRESENTATIVE has the authority to commit COMPANY in all matters under the CONTRACT and, subject to any delegation of such authority, shall be responsible for issuing to and receiving from CONTRACTOR all notices, information, instructions and decisions.
- (b) By notice to CONTRACTOR, COMPANY REPRESENTATIVE may at any time delegate any of his authority to any nominated deputy. Such notice shall specify the precise authority of any such deputy and shall be sent to CONTRACTOR REPRESENTATIVE.
- (c) COMPANY may change COMPANY REPRESENTATIVE at any time and shall notify CONTRACTOR of any change.
- (d) Except as expressly stated in the CONTRACT, COMPANY REPRESENTATIVE has no powers to amend the CONTRACT or to relieve CONTRACTOR from any of its obligations under the CONTRACT.

3.3 CONTRACTOR REPRESENTATIVE

- (a) CONTRACTOR REPRESENTATIVE has the authority to commit CONTRACTOR to any course of action within the rights and obligations of CONTRACTOR under the CONTRACT and, subject to any delegation of such authority, shall be responsible for issuing to and receiving from COMPANY all notices, information, instructions and decisions.
- (b) CONTRACTOR REPRESENTATIVE may delegate any of his authority to any nominated deputy, the terms of such delegation being subject to the prior approval of COMPANY which shall not be unreasonably withheld or delayed.

Section 2 – General Conditions of Contract

(c) CONTRACTOR shall not change CONTRACTOR REPRESENTATIVE without cause or any nominated deputy without the prior approval of COMPANY which shall not unreasonably be withheld or delayed.

(d) CONTRACTOR REPRESENTATIVE has no powers to amend the CONTRACT.

4. CONTRACTOR's GENERAL OBLIGATIONS

4.1 CONTRACTOR shall in accordance with Section 3, carry out all of its obligations under the CONTRACT and provide all management, supervision, personnel, materials and equipment, (except materials and equipment specified to be provided by COMPANY), plant, consumables, facilities and all other things whether of a temporary or permanent nature, so far as the necessity for providing the same is expressed with reasonable clarity in the CONTRACT.

4.2 CONTRACTOR shall carry out all of its obligations under the CONTRACT and shall execute the WORK with all due care and diligence and with the skill to be expected of a reputable contractor experienced in the types of work to be carried out under the CONTRACT.

4.3 CONTRACTOR shall take full responsibility for the adequacy, stability, health, safety, and environmental protection of all its operations and methods necessary for the performance of the WORK and shall keep strictly to the provisions of Section 7 – Health, Safety, Security, and Environment.

4.4 Except to the extent that it may be illegal or physically impossible or create a hazard to safety CONTRACTOR shall comply with COMPANY's instructions and directions on all matters relating to the WORK.

4.5 In order to ensure that performance and completion of the WORK are not delayed or impeded CONTRACTOR shall be responsible for the timely provision of all matters referred to in Clause 4.1 and, where provided for elsewhere in the CONTRACT, for the timely request of COMPANY provided materials, services, and facilities.

4.6 COMPANY reserves the right to let other contracts for work or services to be performed coincidentally with the WORK at the WORKSITE. CONTRACTOR shall afford COMPANY and SERVICE COMPANY(IES) reasonable access and opportunity for the performance of their work or contracts and shall cooperate fully with SERVICE COMPANY(IES).

4.7 CONTRACTOR shall be responsible for the programming of the WORK.

4.8 On completion of the WORK or any portion thereof and subject to any modifications set forth in Section 3, Scope of Work, CONTRACTOR shall without delay clear and remove all equipment and materials owned or in the custody and control of CONTRACTOR (other than equipment and material addressed in Clause 4.9) including debris, thereby leaving the WORKSITE in a clean, tidy and safe condition consistent with the provisions of Section 7 – Health, Safety, Security, and Environment. Nothing contained herein shall oblige CONTRACTOR to dispose of hazardous waste unless expressly stated otherwise. Notwithstanding the foregoing, nothing in this CONTRACT shall obligate the CONTRACTOR to raise and recover any item of sunken equipment whether lost overboard in transit or on location unless CONTRACTOR is required by statute or regulation to raise and recover such item or where COMPANY requires such item to be recovered as interfering with COMPANY's future operations at the location.

4.9 Surplus COMPANY material in the possession of CONTRACTOR on completion of the WORK shall be disposed of by CONTRACTOR in accordance with the instructions of COMPANY

REPRESENTATIVE which shall be the subject of a CHANGE ORDER in accordance with Clause 11.

5. TRANSPORTATION

The responsibility and obligations of COMPANY with respect to the provision of onshore or offshore transportation, where applicable, for CONTRACTOR provided personnel, equipment and materials are as stated in Section 3 - Scope of Work.

6. CONTRACTOR TO INFORM ITSELF

- 6.1 CONTRACTOR shall be deemed to the extent reasonably possible to have satisfied itself, before entering into the CONTRACT, as to the extent and nature of the WORK including but not limited to the services, personnel, materials and equipment, plant, consumables and facilities required for the WORK, the correctness and sufficiency of the rates and prices entered in Section 4 - Remuneration, general and local conditions, and all other matters which could affect progress or performance of the WORK.
- 6.2 Any failure by CONTRACTOR to take account of matters, which affect the WORK, will not relieve CONTRACTOR from its obligations under the CONTRACT.
- 6.3 CONTRACTOR shall check all TECHNICAL INFORMATION in accordance with good oilfield practice and advise COMPANY of any errors or inconsistencies it finds. COMPANY shall resolve those errors or inconsistencies as soon as reasonably possible and CONTRACTOR shall thereafter be entitled to rely on all TECHNICAL INFORMATION furnished to CONTRACTOR by COMPANY (as corrected by COMPANY if applicable).
- 6.4 The COMPANY shall without undue delay provide to CONTRACTOR all information affecting the WORK which CONTRACTOR reasonably requires from COMPANY in order to properly perform the WORK in accordance with the CONTRACT.

7. CONTRACTOR TO INFORM COMPANY

- 7.1 CONTRACTOR shall notify COMPANY without undue delay of all things, which in the opinion of CONTRACTOR appear to be deficiencies, omissions, contradictions, or ambiguities in the CONTRACT or conflicts with applicable law. COMPANY shall review these items and issue the necessary instructions before CONTRACTOR proceeds with any part of the WORK affected. Subject to the provisions of Clause 11, COMPANY shall issue a CHANGE ORDER if CONTRACTOR can show that it has suffered delay and/or incurred additional cost as a result of any such instruction.
- 7.2 In addition to the requirements of Section 7 – Health, Safety, Security, and Environment, CONTRACTOR shall notify COMPANY without delay of any health, safety and environmental incidents and accidents that occur in connection with the carrying out of the WORK. CONTRACTOR shall also notify COMPANY of any other incidents which occur which might affect the carrying out of the WORK or the CONTRACT.
- 7.3 CONTRACTOR shall notify COMPANY immediately of any proposed or actual stoppages of work, industrial disputes, or other matters affecting or likely to affect the carrying out or completion of the WORK.

When requested by COMPANY, CONTRACTOR shall also supply to COMPANY other information in connection with the WORK relating to industrial relations.

8. ASSIGNMENTS AND SUBCONTRACTING

8.1 Assignment

- (a) COMPANY is entitled to assign the CONTRACT or any part of it or any benefit or interest in or under it to any CO-VENTURER or AFFILIATE of COMPANY. In addition, COMPANY may make any such assignment to any other third party but only with the prior agreement of CONTRACTOR which shall not unreasonably be withheld or delayed.
- (b) CONTRACTOR undertakes that, in the event of any assignment described above, it will execute without delay a formal assignment of interest in the CONTRACT to the relevant party, to be effective upon the written assumption by the assignee of all obligations of COMPANY under the CONTRACT.
- (c) CONTRACTOR shall not assign the CONTRACT or any benefit or interest therein, whether in whole or in part, except to a CONTRACTOR AFFILIATE without the prior approval of COMPANY, which approval shall not be unreasonably withheld or delayed.

8.2 Subcontracting

- (a) CONTRACTOR shall not subcontract the whole of the WORK. CONTRACTOR shall not subcontract any material part of the WORK without the prior approval of COMPANY which approval shall not unreasonably be withheld or delayed.
- (b) Before entering into any SUBCONTRACT as provided in 8.2 (a), COMPANY shall be given an adequate opportunity to review the form of SUBCONTRACT, the choice of SUBCONTRACTOR, the part of the WORK included in the SUBCONTRACT and any other relevant details requested by COMPANY.

Where COMPANY will be required to reimburse to CONTRACTOR the sum paid to the SUBCONTRACTOR, any procedure for award of such SUBCONTRACTS included in the CONTRACT shall be followed and COMPANY shall be entitled to review all relevant aspects of the SUBCONTRACT.

- (c) No SUBCONTRACT shall bind or purport to bind COMPANY or the CO-VENTURERS. CONTRACTOR shall ensure that any SUBCONTRACTOR shall be bound by and observe the provisions of the CONTRACT in so far as they apply to the SUBCONTRACT.

Each SUBCONTRACT shall expressly provide for CONTRACTOR's unconditional right of assignment of the SUBCONTRACT to COMPANY in the event that COMPANY terminates the CONTRACT or the WORK.

- (d) CONTRACTOR shall be responsible for all work, acts, omissions, and defaults of any SUBCONTRACTOR as fully as if they were work, acts, omissions, or defaults of CONTRACTOR.

9. CONTRACTOR PERSONNEL

- 9.1 CONTRACTOR undertakes to provide sufficient personnel at all times to ensure performance and completion of the WORK in accordance with the provisions of the CONTRACT.

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- 9.2 All personnel employed on the WORK shall, for the work they are required to perform, be competent, properly qualified, skilled and experienced in accordance with good industry practice.

CONTRACTOR shall verify all relevant qualifications of such personnel. This includes, but is not limited to, CONTRACTOR's:

- a) Site based personnel,
 - b) Shore base / shop personnel who prepare equipment and materials pre-job,
 - c) QA/QC personnel,
 - d) HSSE personnel,
 - e) Logistics personnel,
 - f) Technical support staff.
- 9.3 Where CONTRACTOR's key personnel are specified in the CONTRACT, they shall not be replaced without prior COMPANY approval which shall not unreasonably be withheld or delayed. Any replacement shall work with the person to be replaced for a reasonable handover period.
- 9.4 CONTRACTOR shall maintain full and up to date records of its personnel employed on the WORK and register all periods worked offshore by its personnel and make records available to COMPANY if or when required.
- 9.5 CONTRACTOR shall be solely responsible for and shall meet all costs incurred in connection with the employment and administration of its personnel, local or otherwise, together with all necessary and routine medical services to be provided for its personnel, and all other matters relating thereto, including making all travel arrangements (reservations, onshore transport, lodging, maintenance, etc) except as set out in Section 3 hereof, obtaining all necessary passports and visas (and renewals thereof) and all to satisfy the requirement of all applicable laws, rules, regulations and decrees of any governmental or regulatory body having jurisdiction over its WORK.
- 9.6 CONTRACTOR shall also be solely responsible for the timely payment of wages, salaries, and allowances for its personnel including the withholding of any taxes required by any governmental or regulatory body having jurisdiction over the WORK and/or the WORKSITE. CONTRACTOR shall make and file all returns and reports in connection therewith and account thereafter to the appropriate authorities.
- 9.7 Except as otherwise provided herein, CONTRACTOR shall be responsible for all matters and costs associated with rest periods for its personnel including all crew changes which may take place during the period of the WORK. CONTRACTOR is responsible for ensuring that all personnel are properly rested in order to carry out the WORK in a safe, efficient, and environmentally responsible manner.
- 9.8 CONTRACTOR shall, as its own expense, provide its personnel with all necessary protective clothing and safety equipment suitable for the working conditions. For duty offshore/onshore such clothing/equipment shall be in accordance with statutory requirements.
- 9.9 CONTRACTOR shall ensure that such key personnel and supervisory personnel of CONTRACTOR and SUBCONTRACTORS shall read, write, and speak fluent English.
- 9.10 CONTRACTOR shall be as responsible for any WORK performed by any CONTRACTOR agency personnel and by any other person provided by CONTRACTOR in connection with the WORK as if the WORK was performed by the CONTRACTOR's employees.

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- 9.11 CONTRACTOR shall ensure that all employees of CONTRACTOR and any SUBCONTRACTOR engaged in the performance of the WORK comply with applicable laws including immigration laws and where required are in possession of a valid work permit, travel permits, for the duration of the CONTRACT. When requested, details of such work permits shall be submitted to COMPANY.
- 9.12 COMPANY may verbally or in writing instruct CONTRACTOR to remove from the WORKSITE any CONTRACTOR GROUP personnel engaged in any part of the WORK who in the reasonable opinion of COMPANY is either:
- (a) incompetent or negligent in the performance of their duties; or
 - (b) engaged in activities that are contrary or detrimental to the interests of COMPANY; or
 - (c) not conforming with relevant safety procedures described in Section 7 – Health, Safety, Security, and Environment or persists in any conduct likely to be prejudicial to safety, health or the environment.

CONTRACTOR shall remove or lawfully secure such removal of any such person forthwith from the WORKSITE. COMPANY shall state the reason for such removal in a subsequent written instruction if requested by CONTRACTOR. CONTRACTOR shall provide a suitable replacement for any such person within 24 hours or longer time as may be agreed by COMPANY.

Any person removed for any of the above reasons shall not be engaged again in the WORK or on any other work of COMPANY without the prior informed approval of COMPANY

- 9.13 CONTRACTOR shall forthwith at its cost and expense replace any such person removed under the provisions of Clause 9.12 hereof with such replacement being a person qualified and capable of performing in an efficient manner the duties of any such person being replaced. This Clause shall also apply to CONTRACTOR's and SUBCONTRACTOR's personnel leaving of their own volition.
- 9.14 CONTRACTOR shall take all requisite precautions and use its best endeavors to prevent any riotous or unlawful behavior by or amongst any of CONTRACTOR's personnel.

10. DEFECTIVE PERFORMANCE

- 10.1 If at any time within the DEFECTS LIABILITY PERIOD and without prejudice to COMPANY's other rights under Clause 23, where COMPANY has found that the WORK or part thereof or any re-work performed by CONTRACTOR has not been performed in accordance with the CONTRACT, COMPANY shall detail in writing such fault or defect ("DEFECTS"), the specific nature of the DEFECTS and the Clause and Section of the CONTRACT that contains the obligation that CONTRACTOR has failed to meet.
- 10.2 Starting on the date set out in COMPANY's notice under Clause 10.1 to CONTRACTOR (or if no such date is specified, commencing immediately upon such notice becoming effective), CONTRACTOR shall expeditiously take all necessary action to remedy the DEFECTS. CONTRACTOR's obligations under this Clause shall continue until the DEFECTS have been remedied in full compliance with the requirements of the CONTRACT.
- 10.3 Subject to Clause 10.4 and without prejudice to COMPANY's other rights under Clause 23, if following receipt of COMPANY notification as set out in Clause 10.1, CONTRACTOR is unwilling or unable to perform the work necessary to correct the DEFECTS in a time which is reasonable

Section 2 – General Conditions of Contract

in all circumstances then COMPANY may decide that CONTRACTOR's failure to correct such DEFECTS will be prejudicial to its interests. In such cases COMPANY may at its option either:

- a) at CONTRACTOR's expense, either re-perform the defective WORK or have the defective WORK remedied by others at best market rates available to COMPANY taking into account HSSE, technical and cost considerations. CONTRACTOR's liability in respect of this Clause 10.3(a) shall extend to the full amount of the incremental cost, meaning the amount by which the cost of procuring such alternative performance exceeds the CONTRACT PRICE, incurred by COMPANY in procuring alternative performance of the defective WORK as aforesaid; or
 - b) terminate the CONTRACT or WORK ORDER as provided under Clause 23.1 (b)
- 10.4 For the purposes of Clause 10.2, 10.3 and 23.5, CONTRACTOR shall not be liable to COMPANY for the costs of any items which are specified in the CONTRACT or WORK ORDER as items to be provided by COMPANY or items which were previously provided by COMPANY.
- 10.5 CONTRACTOR's limit of financial liability expressed under Clause 10.3(a) shall be limited to a sum equivalent to the costs incurred by COMPANY and in any event to a sum not greater than thirty percent (30%) of the price of the element of the WORK or services in respect of which a notice of DEFECTS has been issued pursuant to Clause 10.1 plus all reasonable and documented third party mobilization (and de-mobilization, as applicable) costs necessary to re-perform the WORK or services in question.
- 11. CHANGES TO THE WORK**
- 11.1 COMPANY has the right to issue instructions in the form of a CHANGE ORDER to CONTRACTOR at any time to make any variation or changes to the WORK which are within the capability and resources of CONTRACTOR. CONTRACTOR shall proceed immediately as instructed.
- 11.2 CONTRACTOR shall notify COMPANY if any CHANGE ORDER issued pursuant to Clause 11.1 will result in an adjustment to CONTRACT PRICE. Any adjustment to the CONTRACT PRICE resulting from any CHANGE ORDER shall be valued at the appropriate rates and prices included in the CONTRACT, or in the absence of any appropriate rates and prices, a fair valuation shall be mutually agreed by COMPANY and CONTRACTOR.
- 11.3 Any additions or modifications to the schedule of rates defined in the remuneration section shall be treated as contractual amendments requiring the approval of both PARTIES' authorized representatives.
- 12. FORCE MAJEURE**
- 12.1 Neither COMPANY nor CONTRACTOR shall be responsible for any failure to fulfill any term or condition of the CONTRACT (other than any obligation to make payment when due for WORK already carried out) if and to the extent that fulfillment has been delayed or temporarily prevented by a force majeure occurrence, as herein defined, which has been notified in accordance with this Clause and which is beyond the control and without the fault or negligence of the PARTY affected and which, by the exercise of reasonable diligence, the said PARTY is unable to provide against.
- 12.2 For the purpose of this CONTRACT, force majeure as defined in Clause 12.1 shall be considered to include, but not be limited to, the following:

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- (a) Riot, war, invasion, act of foreign enemies, hostilities (whether war be declared or not), acts of terrorism, civil war, rebellion, revolution, insurrection of military or usurped power;
 - (b) Ionizing radiations or contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel or radioactive, toxic, explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof;
 - (c) Earthquake, flood, fire, explosion, Acts of God and/or other natural physical disaster; but excluding weather conditions as such, regardless of severity, for which operational contingency plans exist;
 - (d) Strikes at a national or regional level or industrial disputes at a national or regional level, or strikes or industrial disputes by labor not employed by the affected PARTY its subcontractors or its suppliers and which affect a substantial or essential portion of the WORK;
 - (e) Maritime or aviation disasters;
 - (f) Changes to any general or local Statute, Ordinance, Decree, or other Law or any regulation or bye-law of any local or other duly constituted authority or the introduction of any such Statute, Ordinance, Decree, Law, regulation, or bye-law.
- 12.3 In the event of a force majeure occurrence, the PARTY that is or may be delayed in performing the CONTRACT shall notify the other PARTY without delay giving the full particulars thereof and shall use all reasonable endeavors to remedy the situation without delay.
- 12.4 Save as otherwise expressly provided in the CONTRACT, no additional payments of whatever nature shall be made in respect of a force majeure occurrence.
- 12.5 Following notification of a force majeure occurrence in accordance with Clause 12.3, the PARTIES shall meet at appropriate intervals to agree on a mutually acceptable course of action to minimize the impact and effects of such an occurrence to either PARTY.
- 12.6 In the event that a force majeure occurrence causes the WORK to be halted for a period longer than thirty (30) days, the PARTIES shall meet and agree to:-
- (a) extend the term of the CONTRACT in accordance with Clause 11.1, with appropriate adjustments in remuneration to compensate for delayed completion, or
 - (b) reschedule the WORK.

Failing agreement either PARTY shall be entitled to terminate the WORK ORDER or CONTRACT in accordance with Clause 23.6.

13. SUSPENSION

- 13.1 COMPANY shall have the right, by notice to CONTRACTOR, to suspend the WORK or any part thereof to the extent detailed in the notice, for any of the following reasons;
- (a) subject only to Clause 13.3, in the event of some default on the part of CONTRACTOR;
or

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- (b) in the event that suspension is necessary for the proper execution or safety of the WORK, or persons or;
 - (c) to suit the convenience of COMPANY.
- 13.2 Upon receipt of any such notice, CONTRACTOR shall, unless instructed otherwise:
 - (a) discontinue the WORK or the part of the WORK detailed in the notice, on the date and to the extent specified; and
 - (b) properly protect and secure the WORK as required by COMPANY.
- 13.3 In the event of default on the part of CONTRACTOR and before the issue by COMPANY of a notice to suspend the WORK or any part thereof COMPANY shall give notice of default to CONTRACTOR giving details of such default. If CONTRACTOR, upon receipt of such notice, does not commence and thereafter continuously proceed with action reasonably satisfactory to COMPANY to remedy such default COMPANY may issue a notice of suspension in accordance with the provisions of Clause 13.1.
- 13.4 Unless the suspension arises as a result of default on the part of CONTRACTOR, CONTRACTOR shall be reimbursed in accordance with the provisions of Section 4 - Remuneration or, in the absence of such provisions, in accordance with Clause 11.
- 13.5 COMPANY may, by further notice, instruct CONTRACTOR to resume the WORK to the extent specified.
- 13.6 In the event of any suspension, COMPANY and CONTRACTOR shall meet at not more than 7 day intervals with a view to agreeing upon a mutually acceptable course of action during the suspension.
- 13.7 If the period of any suspension not arising as a result of default on the part of CONTRACTOR exceeds thirty (30) days hereto, CONTRACTOR may serve a notice on COMPANY requiring permission within fourteen (14) days from the receipt of such notice to proceed with the WORK or that part thereof subject to suspension. If within the said fourteen (14) days COMPANY does not grant such permission CONTRACTOR, by a further notice, may (but is not bound to) elect to treat the suspension as either:
 - (a) where it affects part of the WORK, an omission of such part under Clause 11; or
 - (b) where it affects the whole of the WORK, termination in accordance with Clause 23.1 (a).
- 14. **TERMS OF PAYMENT**
- 14.1 For the performance and completion of the WORK, COMPANY shall pay or cause to be paid to CONTRACTOR the amounts provided in Section 4 - Remuneration at the times and in the manner specified in Section 4 - Remuneration and in this Clause.
- 14.2 Except where it is expressly provided that COMPANY shall carry out an obligation under the CONTRACT at its own cost, all things to be supplied or performed by CONTRACTOR under the CONTRACT shall be deemed to be included in the rates and prices included in Section 4 - Remuneration. All obligations of CONTRACTOR pursuant to the provision of Clause 10 shall be performed by CONTRACTOR at its sole cost and expense.

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- 14.3 CONTRACTOR shall invoice COMPANY for WORK performed in accordance with the provisions stated in Appendix 1 to Section 4 - Remuneration. All invoices will be submitted no later than ninety (90) days after the completion of the whole of the WORK or such longer period as mutually agreed.
- 14.4 To the extent payments to be made under the CONTRACT attract any national and/or local government, federal or state sales and/or service type tax, the invoicing provisions for such sales and/or taxes shall be as stated in Appendix 1 to Section 4 - Remuneration.
- 14.5 COMPANY shall pay CONTRACTOR's invoice(s) within the period, in the currency, in the manner, and at the address stated in Appendix 1 to Section 4 - Remuneration.
- 14.6 CONTRACTOR shall submit all documentation reasonably required by COMPANY to substantiate all invoices.
- 14.7 If COMPANY disputes any items on any invoice in whole or in part or if the invoice is prepared or submitted incorrectly in any respect, COMPANY shall promptly notify CONTRACTOR of the reasons and request CONTRACTOR to issue a credit note for the disputed part pending resolution of the dispute or whole of the invoice as applicable. Upon receipt of such credit note, COMPANY shall be obliged to pay the undisputed part of a disputed invoice.

If any other dispute connected with the CONTRACT exists between the PARTIES, COMPANY may withhold from any money which becomes payable under the CONTRACT the amount which is the subject of the dispute. COMPANY shall not be entitled to withhold monies due to CONTRACTOR under any other contracts with COMPANY as set off against disputes under the CONTRACT, nor shall it be entitled to withhold monies due under the CONTRACT as set off against disputes under any other contract.

On settlement of any dispute CONTRACTOR shall submit an invoice for sums due and COMPANY shall make the appropriate payment in accordance with the provisions of this Clause 14.

- 14.8 Neither the presentation nor payment nor non-payment of an individual invoice shall constitute a settlement of a dispute, an accord and satisfaction, a remedy of account stated, or otherwise waive or affect the rights of the PARTIES hereunder.

In particular, COMPANY may correct or modify any sum previously paid in any or all of the following circumstances:

- (a) any such sum was incorrect;
 - (b) any such sum was not properly payable to CONTRACTOR;
 - (c) any WORK in respect of which payment has been made and which does not comply with the terms of the CONTRACT.
- 14.9 If COMPANY, at any time, incurs costs which, under the provisions of the CONTRACT, COMPANY is entitled to recover from CONTRACTOR, COMPANY may invoice CONTRACTOR for such costs, provided always that COMPANY may deduct the amount of such costs from any amount due, or that may become due to CONTRACTOR under the CONTRACT.

CONTRACTOR shall pay COMPANY within thirty (30) days of receipt of invoice any undisputed sums outstanding after such deduction.

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- 14.10 For the purposes of Clause 14.9, and elsewhere in the CONTRACT, wherever one PARTY is entitled to recover from the other PARTY any costs incurred then the amount of such costs shall be the amount of all claims, loss, damages, charges, disbursements, costs (including amounts paid to third parties), overheads and expenses directly resulting from the matter in question, but no element of profit.

15. TAXES

- 15.1 CONTRACTOR shall co-operate with COMPANY and at the request of COMPANY, CONTRACTOR or its permitted assigns shall use its best efforts to supply and shall procure any SUBCONTRACTOR or supplier hereunder to supply to COMPANY such information (including documentary information) in connection with its activities or its SUBCONTRACTORS' or suppliers' activities hereunder as may be required by COMPANY for any of the following purposes:

- (a) to enable COMPANY to comply with the lawful demand or requirement for such information by appropriate taxing authority having jurisdiction over the area in which the WORK is to be performed to ensure that all requirements of the applicable law are being complied with by CONTRACTOR.
- (b) to enable COMPANY to conduct, defend, negotiate or settle any claim arising out of, or in connection with, such activities, whether or not such claim shall have become the subject of arbitration or judicial proceedings,
- (c) to enable COMPANY to make any application (including, but without limitation, any claim for any allowances or relief) or representation in connection with, or to contest any assessment on, or liability of COMPANY to any taxes,

COMPANY's request for such information and documents shall allow CONTRACTOR a reasonable time to prepare, provide, and submit that information requested.

- 15.2 The obligations of CONTRACTOR set forth above shall exist for a period of six (6) years commencing with the date of agreement by COMPANY of CONTRACTOR's final statement of account under the CONTRACT, and CONTRACTOR shall retain and shall procure any SUBCONTRACTOR or supplier hereunder to retain, all information and documents in connection with its activities under or pursuant to the CONTRACT as shall enable CONTRACTOR to comply with its above obligations.

- 15.3 Except as specifically addressed elsewhere in CONTRACT including without limitation Appendix 2, CONTRACTOR shall assume full and exclusive liability for payment, and shall procure that its SUBCONTRACTORS shall assume full and exclusive liability for payment of all taxes properly and lawfully assessed or imposed on CONTRACTOR or its SUBCONTRACTORS by any competent Government or regulatory authority having jurisdiction over the WORKSITE and any other areas where the WORK is to be performed in connection with the carrying out of the WORK.

Notwithstanding the foregoing, the CONTRACTOR's liability for any claims or liability of the COMPANY in respect of taxes is subject to the following: If the COMPANY receives any demand or request for payment of any levies, charges, taxes or contributions of the type referenced in this Clause 15.3 for which it would seek indemnity or reimbursement from CONTRACTOR, the COMPANY shall forthwith notify the CONTRACTOR in writing of such demand or request. The COMPANY shall consult with the CONTRACTOR on its response to such demand or request and the COMPANY shall use its reasonable endeavors to appeal against such demand or request.

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- 15.4 **CONTRACTOR shall indemnify and keep indemnified COMPANY against all liabilities incurred as a consequence of breach by CONTRACTOR or any SUBCONTRACTOR or supplier of any of the obligations under Clauses 15.1, 15.2 and 15.3 hereof and all actions, proceedings, claims, damages, charges, costs and expenses whatsoever in relation thereto.**
- 15.5 Except as specifically addressed in Appendix 2 to Section 2, Local Tax Provision, or elsewhere in this CONTRACT, CONTRACTOR is considered to have taken into account in the CONTRACT PRICE all taxes, levies or contributions having effect on the EFFECTIVE DATE.
- 15.6 If, on or after the EFFECTIVE DATE, there shall be any change in the level or in the incidence, or any new incidence or abolition, of any tax applicable to the WORKSITE, levy or contribution excluding any tax on profits or gains, which are by law payable by CONTRACTOR or any SUBCONTRACTOR or supplier hereunder in respect of its employees working wholly on the WORK or in respect of CONTRACTOR's or any SUBCONTRACTORs or supplier's activities under the CONTRACT or any SUBCONTRACT or purchase order hereunder, the net amount of such change or new incidence or abolition shall constitute an addition to, or deduction from, the sums payable to CONTRACTOR under the CONTRACT.
- 15.7 CONTRACTOR shall submit to COMPANY with its monthly statements full details of any addition or deduction to be made pursuant to the above, and all payments after submission of such details shall take account of the additions or deductions to which such details shall relate.
- 15.8 CONTRACTOR shall insert provisions into each SUBCONTRACT or purchase order hereunder imposing on each SUBCONTRACTOR or supplier obligations, which will enable CONTRACTOR to comply with its obligations under Clauses 15.1 to 15.6 hereof. The net amount due to, or from, any SUBCONTRACTOR or supplier hereunder as a result of any change, new incidence or abolition arising from the provisions of Clause 15.6 hereof shall be paid to, or recovered from CONTRACTOR by COMPANY as though such increase or decrease had directly affected CONTRACTOR.
- 15.9 CONTRACTOR, its SUBCONTRACTORs and suppliers or its and their permitted assigns shall comply with laws and regulations concerning all COMPANY's branch office registration requirements, local taxes and levies including maintaining the proper accounting records, filing and properly paying all fiscal dues on its or their activities. CONTRACTOR, its SUBCONTRACTOR's and suppliers or its and their permitted assigns shall declare in a timely manner all custom duties, local sales tax if any and satisfying all indirect taxes that may be due hereunder.
- 15.10 In the event that CONTRACTOR benefits from a deduction in taxes paid in CONTRACTOR's country of fiscal residence by way of receiving a tax credit, offset, deduction or otherwise in respect of any tax withheld from payments due under the CONTRACT and which is borne or paid for by COMPANY on behalf of CONTRACTOR, its SUBCONTRACTOR or its or their personnel, such reimbursement of the aforesaid tax savings shall be made to the COMPANY at the amount of net savings and after the payment of tax deduction is made by the fiscal authority to CONTRACTOR.
- 15.11 For the purposes of this Clause only, "tax" shall mean and include any tax, duty or charge and any penalty or interest thereon and any other costs and charges whatsoever assessed or imposed by any competent Government or regulatory authority having jurisdiction over the WORKSITE and any other areas where the WORK is to be performed.

16. OWNERSHIP

16.1 COMPANY shall retain title to COMPANY provided items and information, including but not limited to, TECHNICAL INFORMATION and materials and equipment.

16.2 All equipment, materials and supplies provided by CONTRACTOR for permanent incorporation into the WORK shall become and be clearly identified as the property of COMPANY upon delivery to the WORKSITE or payment by COMPANY whichever is the earlier. Risk of loss and title to this property passes to COMPANY at this time.

CONTRACTOR shall ensure that all CONTRACTOR provided items are free from all liens and/or retention of title claims from any third party.

16.3 Title

(a) Title in any equipment, materials and supplies provided by CONTRACTOR which do not comply with the requirements of the CONTRACT and which are rejected by COMPANY, shall re-vest immediately in CONTRACTOR.

(b) Title in items provided by CONTRACTOR for which no payment has been made by COMPANY and which are no longer required for the purposes of the CONTRACT, shall re-vest in CONTRACTOR.

16.4 Where designs, drawings, reports, sketches and other documents and data to be provided by CONTRACTOR hereunder are created and stored electronically, CONTRACTOR shall provide to COMPANY such designs, drawings, reports, sketches and other documents and data on a CD-ROM (2 copies minimum) or other mutually agreed electronic media compatible with COMPANY's systems at the times specified in Section 3 – Scope of Work or if no times specified, when reasonably required by COMPANY. If required by COMPANY, files will be provided in original format (i.e. Word, Excel, CAD, etc.) and if mutually agreed for specific work in a PDF Format. COMPANY and CONTRACTOR shall mutually agree upon the system compatibility requirement applicable to the WORK.

16.5 Without prejudice to CONTRACTOR's right to compensation hereunder, title to all data, test results, charts, and reports of whatever nature in respect of COMPANY's wells including information on wellbore, production, reservoir, geology and formations encountered in the well that have been created by CONTRACTOR in the performance of the WORK shall vest in COMPANY with effect from the date of creation. Upon completion, suspension or abandonment of each well or if earlier upon completion of CONTRACTOR's WORK in connection with that well, CONTRACTOR shall issue to COMPANY all such documents in its possession.

17. PATENTS AND OTHER PROPRIETARY RIGHTS

17.1 Neither PARTY shall have the right of use other than for the purposes of performing WORK pursuant to the CONTRACT, whether directly or indirectly, of any patent, copyright, proprietary right or confidential know how, trademark or process provided by the other PARTY.

17.2 Where any potential patent or registrable right in any country in the world results from:

(a) developments by the CONTRACTOR which are based wholly on data, equipment, processes, substances and the like in the possession of the CONTRACTOR or its AFFILIATES at the EFFECTIVE DATE or otherwise produced outside of the CONTRACT or,

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- (b) enhancements of or in the existing intellectual property rights of the CONTRACTOR or its AFFILIATES

such rights shall vest in the CONTRACTOR and COMPANY agrees to take such action as may be reasonably requested by CONTRACTOR, including execution of assignments, to enable CONTRACTOR to perfect such rights and to obtain the full benefit of this Clause.

17.3 Where any potential patent or registrable right in any country in the world results from:

- (a) developments by the COMPANY or its AFFILIATES or CO-VENTURERS which are based wholly on data, equipment, processes, substances and the like in the possession of the COMPANY at the EFFECTIVE DATE or otherwise produced outside the CONTRACT or,
- (b) enhancements of or in the existing intellectual property rights of the COMPANY or its AFFILIATES or CO-VENTURERS,

such rights shall vest in the COMPANY and CONTRACTOR agrees to take such action as may be reasonably requested by COMPANY, including execution of assignments, to enable COMPANY to perfect such rights and to obtain the full benefit of this Clause.

17.4 Except as otherwise provided in Clauses 17.2 and 17.3, during the term of the CONTRACT, and in the course of performance of the CONTRACT, in an effort to address and provide solutions for problems that are specifically related to the performance of the CONTRACT, employees of COMPANY and/or CONTRACTOR may conceive or make new inventions, ideas, or discoveries that may be protected by patent or copyright or maintained as a trade secret (hereinafter "Intellectual Property"). Subject to the obligation of the respective employees of COMPANY or CONTRACTOR to assign their interest in such Intellectual Property to the employing party, COMPANY and CONTRACTOR agree that the right, title, and interest in and to any such Intellectual Property shall be allocated as set forth below:

- (a) COMPANY shall own all Intellectual Property conceived or made during the term of the CONTRACT solely by any COMPANY employee(s).
- (b) CONTRACTOR shall own all Intellectual Property conceived or made during the term of the CONTRACT solely by any CONTRACTOR employee(s).
- (c) COMPANY and CONTRACTOR shall each have an equal, undivided interest in the right, title and interest in and to any Intellectual Property that is jointly conceived or made during the performance of the CONTRACT by any COMPANY employee(s) along with any CONTRACTOR employee(s).
 - i) In the event that either PARTY believes that a patent application should be filed on such a joint invention, they shall then attempt in good faith to agree upon filing a patent application on the same.
 - ii) In the event that either PARTY does not wish to share equally in payment of the costs for preparing, filing and prosecuting such jointly owned application, the PARTY paying such costs shall be the assignee of that patent application and subsequent patent or patents issuing therefrom, if any, and the other, non-paying PARTY and its affiliates shall have an irrevocable, royalty-free license, without the right to sublicense, to practice but not sell or lease the subject joint invention to third parties. Both COMPANY and CONTRACTOR agree to co-operate fully in the preparation, filing and prosecution of subsequent judicial or administrative

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proceedings involving such and to pay its share of all necessary fees to maintain any jointly owned application or patent assigned to it in force throughout its full term; provided, however, that a PARTY may elect to notify the other PARTY that it intends to discontinue payment of such fees and thereafter promptly assign such patent to the other PARTY, retaining no interest therein in exchange for an irrevocable, royalty free license for the remainder of the term of each such patent.

- (d) CONTRACTOR agrees to grant the COMPANY and its AFFILIATES a non-exclusive, royalty free, irrevocable, non-sublicensable, non-transferable, worldwide license to use any patent or other registrable right vesting in CONTRACTOR pursuant to clause 17.4(b) above, but which was solely conceived and developed on COMPANY owned or operated wells and for which COMPANY engaged the services of CONTRACTOR. COMPANY agrees to grant the CONTRACTOR and its AFFILIATES a non-exclusive, royalty free, irrevocable, non-sublicensable, non-transferable, worldwide license to use any patent or other registrable right vesting in COMPANY pursuant to clause 17.4(a) above but which was solely conceived and developed during the provision of services by CONTRACTOR to COMPANY.
- 17.5 Both COMPANY and CONTRACTOR shall, on request, disclose promptly to the other all inventions, ideas, and discoveries which it or its employees may conceive or make to address and provide solutions for problems that are specifically related to the performance of WORK pursuant of the CONTRACT.
- 17.6 Subject to Clause 17.7 below, COMPANY and CONTRACTOR may decide to jointly develop Intellectual Property which may or may not be related to the WORK, in which case COMPANY and CONTRACTOR shall enter into a separate technology collaboration agreement (unless an agreement has been previously entered into) addressing each PARTY's obligations with respect to joint development costs, ownership and licensing rights of any registrable item or idea arising out of or invented during the term of that agreement as a direct or indirect result of joint cooperation between COMPANY and CONTRACTOR.
- 17.7 The technology collaboration of the PARTIES described in Clauses 17.6 above shall be preceded by a mutually acceptable confidentiality agreement, and neither PARTY shall acquire any Intellectual Property rights unless a separate technology collaboration agreement is fully agreed and executed.
- 17.8 CONTRACTOR shall save, indemnify, release, defend and hold harmless COMPANY GROUP from all claims, losses, damages, costs (including legal costs), expenses, and liabilities of every kind and nature for, or arising out of, any alleged infringement of any patent or proprietary or protected right, arising out of or in connection with the performance of the obligations of CONTRACTOR under CONTRACT except where such infringement necessarily arises from the TECHNICAL INFORMATION and/or COMPANY's instructions. However, CONTRACTOR shall, when specifically requested, use its reasonable endeavors to identify any infringement in the TECHNICAL INFORMATION and/or COMPANY's instructions of any patent or proprietary or protected right, and should CONTRACTOR become aware of such infringement or possible infringement then the CONTRACTOR shall inform COMPANY immediately.
- 17.9 COMPANY shall save, indemnify, release, defend and hold harmless the CONTRACTOR GROUP from all claims, losses, damages, costs (including legal costs), expenses, and liabilities of every kind and nature for, or arising out of, any alleged infringement of any patent or proprietary or protected right arising out of or in connection with the performance of the obligations of the COMPANY under the CONTRACT or the COMPANY's instructions to CONTRACTOR or the use by the CONTRACTOR of TECHNICAL INFORMATION or materials or equipment supplied by the COMPANY.

However, COMPANY shall, when specifically requested, use its reasonable endeavors to identify any infringement in the CONTRACTOR furnished information, and should COMPANY become aware of such infringement or possible infringement, then the COMPANY shall inform CONTRACTOR immediately.

18. LAWS AND REGULATIONS

- 18.1 CONTRACTOR shall conduct its operations in accordance with all applicable laws, rules, regulations and decrees of any governmental or regulatory body having jurisdiction over the WORK and/or the WORKSITE; provided that nothing in the CONTRACT is intended or should be construed to require CONTRACTOR to act or fail to act if such action or failure to act would be inconsistent with or penalized by (1) the laws and regulations of CONTRACTOR's or COMPANY's country of incorporation and /or (2) the laws and regulations of the country of incorporation of any direct, indirect or ultimate parent company of CONTRACTOR or COMPANY.
- 18.2 CONTRACTOR shall obtain all licenses, permits, temporary permits and authorizations required by the applicable laws, rules and regulations for the performance of the WORK, save to the extent that the same can only be legally obtained by COMPANY.
- 18.3 Notwithstanding Clause 15.6, should changes in any applicable laws, rules and regulations made after the EFFECTIVE DATE, result in increases or decreases in the cost to CONTRACTOR of performing the WORK, then except where there is provision contained within Section 4 – Remuneration, the PARTIES shall mutually agree to the appropriate changes necessary to the CONTRACT PRICE.
- 18.4 CONTRACTOR shall endeavor to ensure that neither it nor any other entity or person in CONTRACTOR GROUP has: a) given any commissions, payments, gifts of substantial value, kickbacks, lavish or extensive entertainment, or other things of value to any officer, director, employee, agent, or representative of COMPANY, or any family member thereof, or received same from any vendor, supplier, or contractor in connection with this CONTRACT or b) paid any fee, commission, rebate, or anything of value to or for the benefit of any official or functionary of the government having jurisdiction over the WORKSITE and acknowledges that the giving or receiving of any such payments, gifts, kickbacks, extensive entertainment or anything of value is strictly in violation of COMPANY's corporate policy and may result in the cancellation of this CONTRACT and other contracts. CONTRACTOR shall notify COMPANY's security department of any such solicitation at the following corporate number in the USA 1-800-225-6141 or in the UK 0 (20) 7 496 4496.

CONTRACTOR's compliance with the provisions of this Clause 18.4 is subject to audit by COMPANY.

19. INDEMNITIES

19.1 Personal Injury or Property Damage suffered by CONTRACTOR GROUP

CONTRACTOR shall be responsible for and shall save, indemnify, release, defend and hold harmless COMPANY GROUP and SERVICE COMPANY GROUP from and against all claims, losses, damages, costs (including legal costs) expenses and liabilities in respect of:

- (a) except as otherwise provided herein, loss of or damage to property or equipment of CONTRACTOR GROUP not including any equipment provided by any member of SERVICE COMPANY GROUP whether owned, hired, leased or otherwise

provided by CONTRACTOR GROUP arising from or relating to the performance of the CONTRACT located at the WORKSITE including ingress, egress, loading, and unloading of personnel or cargo;

- (b) personal injury including death or disease to any person employed by CONTRACTOR GROUP arising from or relating to the performance of the CONTRACT including ingress, egress, loading, and unloading of personnel or cargo.

19.2 Personal Injury or Property Damage suffered by COMPANY GROUP

COMPANY shall be responsible for and shall save, indemnify, release, defend and hold harmless CONTRACTOR GROUP from and against any claims, losses, damages, costs (including legal costs) expenses, and liabilities in respect of:

- (a) loss of or damage to property or equipment of COMPANY GROUP whether owned, hired, leased or otherwise provided by COMPANY GROUP, not including any equipment provided by any member of SERVICE COMPANY GROUP arising from or related to the performance of CONTRACT located at the WORKSITE including ingress, egress, loading, and unloading of personnel or cargo;
- (b) personal injury including death or disease to any person employed by COMPANY GROUP arising from or relating to the performance of the CONTRACT including ingress, egress, loading, and unloading of personnel or cargo.

19.3 Loss, Damage, Injury or Death suffered by Third Parties

- (a) Subject to Clause 19.4(a), CONTRACTOR shall be responsible for and shall release, save, indemnify, defend and hold harmless COMPANY GROUP and SERVICE COMPANY GROUP from and against all claims, losses, damages, costs (including legal costs) expenses and liabilities in respect of personal injury including death or disease or loss of or damage to the property or equipment of any Third Party to the extent that any such injury, loss or damage is caused by the negligence or breach of duty (whether statutory or otherwise) of CONTRACTOR GROUP. For the purpose of this Clause, "Third Party" shall mean any party which is not a member of COMPANY GROUP or CONTRACTOR GROUP.
- (b) Subject to Clause 19.4(b), COMPANY shall be responsible for and shall release, save, indemnify, defend and hold harmless CONTRACTOR GROUP from and against any claims, losses, damages, costs (including legal costs) expenses and liabilities in respect of personal injury including death or disease or loss of or damage to the property or equipment of any Third Party to the extent that any such injury, loss or damage is caused by the negligence or breach of duty (whether statutory or otherwise) of COMPANY GROUP. For the purposes of this Clause, "Third Party" shall mean any party which is not a member of CONTRACTOR GROUP or COMPANY GROUP.

19.4 Pollution

- (a) Notwithstanding the provisions of Clause 19.3(a) and except as provided by Clause 19.1(a), Clause 19.1(b) and Clause 19.4(b) COMPANY shall save, indemnify, release, defend and hold harmless CONTRACTOR GROUP from and against any claim of whatsoever nature arising from pollution and/or contamination including without limitation such pollution or contamination from

the reservoir or from the property or equipment of COMPANY GROUP arising from or related to the performance of the CONTRACT.

- (b) Notwithstanding the provisions of Clause 19.3(b) and except as provided by Clause 19.2(a) and Clause 19.2(b) CONTRACTOR shall save, indemnify, release, defend and hold harmless COMPANY GROUP and SERVICE COMPANY GROUP from and against any claim of whatsoever nature arising from pollution occurring on the premises of CONTRACTOR GROUP or originating from the property or equipment of CONTRACTOR GROUP located above the surface of the land or water arising from or relating to the performance of the CONTRACT.

19.5 CONTRACTOR's Tools and Equipment

Without limiting CONTRACTOR GROUP's obligation to furnish equipment which is in good working order and notwithstanding the provisions of Clause 19.1(a), COMPANY shall be responsible for and shall reimburse CONTRACTOR GROUP in respect of loss of or damage to property, materials or equipment (tools) or component part thereof, of CONTRACTOR GROUP's tools and equipment which occurs whilst in-hole below the rotary table other than normal wear and tear. COMPANY's liability for such loss or damage shall, subject to the provisions contained in Section 4 – Remuneration and its appendices, be either the actual repair or replacement cost, whichever is the lesser, as substantiated by CONTRACTOR to COMPANY REPRESENTATIVE.

Notwithstanding the reasons for any loss or damage to CONTRACTOR's equipment, nothing herein contained shall absolve CONTRACTOR from its obligation to provide such equipment as and when reasonably required by COMPANY

19.6 Other COMPANY Responsibilities

Subject to Clauses 19.1 and 19.4(b), but notwithstanding anything contained elsewhere in the CONTRACT to the contrary, COMPANY shall save, indemnify, release, defend and hold harmless CONTRACTOR GROUP against all claims, losses, damages, costs (including legal costs) expenses and liabilities resulting from:

- (a) loss or damage to any well or hole (including the cost to re-drill);
- (b) blowout, fire, explosion, cratering, or any uncontrolled well condition (including the costs to control a wild well and the removal of debris);
- (c) damage to any reservoir, aquifer, geological formation or underground strata or the loss of oil or gas therefrom;
- (d) the use of radioactive sources in relation to the WORK or any contamination resulting therefrom (including retrieval and/or containment, clean up and /or containment of contamination from naturally occurring radioactive materials).

19.7 Indemnities in their Entirety

All exclusions, releases of liabilities and indemnities given under this Clause (save for those under Clauses 19.3(a) and 19.3(b)) and Clause 21 shall apply irrespective of cause and notwithstanding the negligence or breach of duty (whether statutory or otherwise) of the indemnified PARTY or any other entity or party and shall apply whether or not the claim, liability, damage, or expense in question is:

- (a) predicated on sole, joint or concurrent fault, negligence (whether active, passive or gross), strict liability, statutory duty, contractual indemnity or otherwise at law, or
- (b) sought directly or indirectly by way of recovery, indemnification, or contribution by any person or entity against COMPANY GROUP, SERVICE COMPANY GROUP, or CONTRACTOR GROUP as the case may be.

19.8 Claims

If either PARTY becomes aware of any incident likely to give rise to a claim under the above indemnities, they shall notify the other and both PARTIES shall co-operate fully in investigating the incident.

19.9 It is the intent of the PARTIES hereto that the releases of liability and indemnities furnished by CONTRACTOR in this Clause and in Clause 21 and the releases of liability and indemnities given by SERVICE COMPANY in COMPANY contracts shall apply:

- (a) save as provided below for the benefit of the SERVICE COMPANY GROUP in the case of the releases of liability and indemnities furnished by CONTRACTOR; and,
- (b) for the benefit of CONTRACTOR GROUP in the case of the releases of liability and indemnities given by the SERVICE COMPANY in COMPANY contracts.

The releases of liability, indemnities, defense, save and hold harmless provisions given by CONTRACTOR in Clauses 19 and 21 herein in favor of SERVICE COMPANY GROUP shall be provided by CONTRACTOR on the express understanding that they shall apply in favor only of such SERVICE COMPANY(IES) who have provided substantially similar reciprocal releases of liability, indemnities, defense, save and hold harmless provisions in favor of CONTRACTOR GROUP in their respective contracts with COMPANY. The releases of liability, indemnities, defense, save and hold harmless provisions provided by CONTRACTOR in Clauses 19 and 21 herein in favor of SERVICE COMPANY GROUP shall become effective from such time and for such duration as such SERVICE COMPANY(IES) become bound by substantially similar reciprocal releases of liability, indemnities, defense, save and hold harmless provisions in favor of CONTRACTOR GROUP in their respective contracts with COMPANY.

In fulfillment of this objective, COMPANY shall use its reasonable endeavors to ensure that in its respective contracts with SERVICE COMPANY(IES), the releases of liability, indemnities, defense, save and hold harmless provisions contained in such contracts in favor of CONTRACTOR GROUP shall be substantially similar to the releases of liability, indemnities, defense, save and hold harmless provisions given by CONTRACTOR in Clauses 19 and 21 herein in favor of SERVICE COMPANY GROUP.

In the event that COMPANY is unable to fully fulfill the foregoing objective, COMPANY shall, without delay, notify CONTRACTOR in writing with details of the additional risk being assumed by CONTRACTOR, as soon as is reasonably practicable thereafter and the PARTIES further undertake to meet to discuss ways of minimizing the impact of such a notification within the overall requirements of the CONTRACT. Failure by COMPANY to issue such written notification as required herein will constitute a material breach of the terms of the CONTRACT.

In the event that COMPANY advises CONTRACTOR that one or more SERVICE COMPANY(IES) have declined to provide substantially similar releases of liability, indemnities, defense, save and hold harmless provisions in favor of CONTRACTOR

GROUP in their respective contracts with COMPANY, the PARTIES shall meet to discuss and agree ways of minimizing the impact of such additional risks as may be identified by either PARTY which may include: alternative working practices or arrangements to minimize the impact of such risks; a separate mutual hold harmless agreement applicable at the WORKSITE or additional compensation to enable CONTRACTOR to insure against such additional risks.

Notwithstanding the foregoing, the failure of one of more SERVICE COMPANY(IES) to provide substantially similar releases of liability, indemnities, defense, save and hold harmless provisions in favor of CONTRACTOR GROUP in its respective contracts with COMPANY as envisaged herein shall cause such SERVICE COMPANY(IES) to be considered a Third Party for the purpose of Clause 19.3 herein.

- 19.10 CONTRACTOR and COMPANY expressly acknowledge that the indemnities and releases of liability contained in this CONTRACT require assumption of liability for the negligence of the other party. In the event this CONTRACT is subject to the indemnity limitations in Chapter 127 of the Texas Civil Practices and Remedies Code (or any successor statute), and so long as such limitations are in force, each party covenants and agrees to support the mutual indemnity and release obligations contained in Clauses 19.1 and 19.2 above, by carrying equal amounts of insurance (or qualified self-insurance) of the types and in the amounts not less than those specified in Appendix 1 for the benefit of the other party as indemnitee.

20. INSURANCE BY CONTRACTOR

- 20.1 CONTRACTOR shall arrange as a minimum the insurances set out in the CONTRACT and ensure that they are in full force and effect throughout the life of the CONTRACT.

All such insurances shall be placed with reputable and substantial insurers, reasonably satisfactory to COMPANY.

All insurances (including insurances provided by SUBCONTRACTORS), other than Employers Liability Insurance / Workmen's Compensation only, shall to the extent of the liabilities assumed and indemnities offered by CONTRACTOR under the CONTRACT, include COMPANY, CO-VENTURERS and its and their respective AFFILIATES as additional assureds.

All insurances shall, to the extent of the liabilities assumed and indemnities offered by CONTRACTOR under the CONTRACT, be endorsed to provide that underwriters waive any rights of recourse, including in particular subrogation rights against COMPANY, CO-VENTURERS, SERVICE COMPANY(IES), and its and their respective AFFILIATES in relation to the CONTRACT.

Such insurances shall also where possible, provide that COMPANY shall be given not less than thirty (30) days notice of cancellation of or material change to cover. The provisions of this Clause 20 shall in no way limit the liability of CONTRACTOR under the CONTRACT.

COMPANY's insurances in respect of the operations under the CONTRACT shall, to the extent of the liabilities assumed and indemnities offered by COMPANY under the CONTRACT, contain waivers of subrogation in favor of CONTRACTOR GROUP.

Notwithstanding the above paragraph, the provision that CONTRACTOR's underwriters waive any right of recourse against SERVICE COMPANY(IES) and their AFFILIATES,

including in particular subrogation rights against the SERVICE COMPANY(IES) and their AFFILIATES, in relation to the CONTRACT, are given with the express understanding that they shall only apply where such SERVICE COMPANY(IES)' underwriters have provided reciprocal waivers of rights of recourse including subrogation rights against CONTRACTOR GROUP and only from such time as such SERVICE COMPANY(IES)' underwriters become bound by such reciprocal waivers of rights of recourse including subrogation rights and only for the duration they remain bound by such reciprocal waivers.

20.2 The following insurance policies and coverages are required:

- (a) Workers' Compensation Insurance satisfying the legal requirements of each state and/or location in which WORK is to be performed, including an Alternative Employer endorsement (when applicable) with minimum limits in accordance with applicable legislation to meet CONTRACTOR's obligation for the payment of statutory benefits to its workers as set forth and required by applicable law in the area of operation or area in which CONTRACTOR may become obligated to pay benefits, and Employer's Liability Insurance with minimum limits of \$1,000,000 per occurrence.
- (b) Commercial General Liability Insurance, including bodily injury and property damage, with minimum limits not less than \$1,000,000.00 per occurrence. The Commercial General Liability policy shall include the following coverages as they apply to the WORK to be performed; each with minimum limits not less than \$1,000,000.00 per occurrence.
 - i) Independent Contractors' and Contractual Liability coverage required for all WORK, without exception;
 - ii) Products Liability/Completed Operations coverage required for any WORK that results in a finished product or that involves or results in the construction, erection, or installation of structures, buildings, or equipment;
 - iii) Explosion, collapse, and underground hazards coverage required for any WORK involving excavation, blasting, use of explosives, or construction, erection, or installation of buildings, structures, or equipment; and
 - iv) Deletion of non-owned watercraft exclusion if any WORK is performed on or over navigable waters or involves maritime workers or vessels.
- (c) Automobile Liability Insurance with minimum limits not less than \$1,000,000.00, and including bodily injury, property damage, and auto liability, for all owned, hired, and non-owned vehicles that will be used in the performance of WORK under this CONTRACT.
- (d) In the event any of the WORK to be performed under this CONTRACT involves maritime workers or the provision of vessels by CONTRACTOR or is performed on or over navigable waters, CONTRACTOR shall or shall require the owner or operator of vessels to obtain the following additional coverage:
 - i) Workers' Compensation Insurance in accordance with applicable legislation to meet CONTRACTOR's obligation for the payment of statutory benefits to its workers as set forth and required by applicable law in the area of operation or area in which CONTRACTOR may become obligated to pay

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benefits including the following endorsements and Employer's Liability Insurance with minimum limits of \$1,000,000 per occurrence.

- Maritime coverage B and coverage for maritime employer's liability, including Jones Act, transportation, wages, and maintenance and cure;
 - United States Longshore and Harbor Workers Compensation Act endorsement and Outer Continental Shelf Lands Act endorsement; and
 - "In rem" endorsement treating "in rem" claims as claims against the insured.
- ii) Protection and Indemnity insurance on each vessel owned or chartered by CONTRACTOR with minimum limits of \$2,000,000, or an amount equal to the declared value of each vessel owned or hired by CONTRACTOR, whichever is greater, and including coverage for collision and tower's liability, third party bodily injury and property damage liability, and pollution liability.
- iii) Hull and Machinery insurance on each vessel owned or chartered by CONTRACTOR in the amount of the declared value of the vessels owned or hired by CONTRACTOR.
- iv) All primary and excess Protection and Indemnity and Hull and Machinery insurance shall be endorsed to provide full coverage to COMPANY GROUP as additional insured without limiting coverage to liability "as owner" of the vessel and to delete any "as owner" clause and any other language purporting to limit coverage to liability of an insured "as owner" of the vessel. For clarification purposes, the reference to "full coverage to COMPANY GROUP as an additional insured" is intended to limit coverage to COMPANY GROUP only to and to the extent of the liabilities assumed by CONTRACTOR under this CONTRACT.
- v) Excess or Umbrella liability insurance with minimum limits not less than \$1,000,000.00 inclusive of and, following the terms and conditions at least as broad as underlying coverage.
- 20.3 CONTRACTOR shall supply COMPANY with evidence of such insurance on demand in the form of certificates of insurance on industry standard forms.
- 20.4 CONTRACTOR shall ensure that SUBCONTRACTORS are insured to appropriate levels as may be relevant to their work.

21. CONSEQUENTIAL LOSS

For the purposes of this Clause 21, the expression "Consequential Loss" shall mean consequential loss or damages under applicable law and/or any indirect, special, incidental, punitive, or consequential losses or damages, including without limitation loss of production, loss of product, loss of use, loss of business and business interruption and loss of revenue, profit or anticipated profit whether direct or indirect arising from or related to the performance of the CONTRACT and whether or not such losses were foreseeable at the time of entering into the CONTRACT except to the extent such consequential, indirect, and/or special damages, loss of profits, loss of production, or loss of use are part of a Third Party claim for which a party is seeking contribution or indemnification pursuant to this CONTRACT. For the purpose of this Clause, "Third Party"

shall mean any party which is not a member of COMPANY GROUP or CONTRACTOR GROUP and "Third Party claim" shall mean any claim raised by a Third Party not claiming, directly or indirectly, by or through any member of COMPANY GROUP or CONTRACTOR GROUP.

Notwithstanding any provisions to the contrary elsewhere in the CONTRACT and except to the extent of any agreed liquidated damages or any termination fees provided for in the CONTRACT, COMPANY shall save, indemnify, release, defend and hold harmless CONTRACTOR GROUP from COMPANY GROUP's own Consequential Loss and CONTRACTOR shall save, indemnify, release, defend and hold harmless COMPANY GROUP and SERVICE COMPANY GROUP from CONTRACTOR GROUP's own Consequential Loss. CONTRACTOR's obligation with respect to SERVICE COMPANY GROUP shall be subject to the provisions of Clause 19.9.

22. CONFIDENTIALITY

22.1 CONTRACTOR shall at no time without the prior agreement of COMPANY either:

- (a) make any publicity releases or announcements concerning the subject matter of the CONTRACT; or
- (b) publish or permit to be published either alone or in conjunction with any other person any articles, photographs or other illustrations relating to the WORK hereunder, or COMPANY's business generally, without prior reference to and approval in writing from COMPANY. Such consent shall only apply to each specific application and relate only to that application. The accuracy of any information which was not supplied directly by COMPANY shall be the absolute responsibility of CONTRACTOR; or
- (c) except as may be necessary to enable CONTRACTOR to perform its obligations under the CONTRACT, use, reproduce, copy, disclose to, place at the disposal of or use on behalf of any third party or enable any third party to use, peruse or copy any information including, but not limited to, drawings, data, and computer software which:
 - (i) is provided to CONTRACTOR by or on behalf of COMPANY, the CO-VENTURERS or its or their AFFILIATES in or in relation to the CONTRACT; or
 - (ii) vest in COMPANY in accordance with the CONTRACT; or
 - (iii) CONTRACTOR prepares in connection with the WORK.

In the event CONTRACTOR discloses any information to any third party under the provisions of Clause 22.1(b), CONTRACTOR shall be responsible for ensuring that such third party keeps any such information confidential and complies with all requirements of this Clause 22.1.

22.2 The provisions of Clause 22.1 shall not apply to information which:

- (a) is or becomes part of the public domain; or
- (b) was in the possession of CONTRACTOR prior to award of the CONTRACT and which was not subject to any obligation of confidentiality owed to COMPANY; or
- (c) was received from a third party whose possession is lawful and who is under no obligation not to disclose; or

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- (d) is required to be disclosed in order to comply with the requirements of any law, rule or regulation of any governmental or regulatory body having jurisdiction over the WORK or CONTRACTOR, or of any relevant stock exchange; or
 - (e) is used or disclosed by CONTRACTOR five (5) years, or such other period specified in Appendix 1 to Section 2, after the completion of the WORK.
 - (f) was owned exclusively, developed exclusively or developed independently by CONTRACTOR and does not mention COMPANY or WORK in any respect.
- 22.3 CONTRACTOR shall ensure that the provisions of this Clause are incorporated in any SUBCONTRACT and that the officers, employees, and agents of CONTRACTOR and of the SUBCONTRACTORS comply with the same.
- 22.4 All information provided by CONTRACTOR which CONTRACTOR wishes to remain confidential shall be clearly marked as being confidential but no markings shall be required for CONTRACTOR's pricing information and trade secrets. COMPANY shall nevertheless be entitled, subject to CONTRACTOR's consent which shall not be unreasonably withheld or delayed, to use and disclose any such confidential information to third parties to the extent necessary for the execution and maintenance of the project in connection with which the WORK is to be performed and in relation to any statutory or other legal requirement.

With the above exceptions COMPANY will take all reasonable measures to protect the confidentiality of such information.

23. TERMINATION

- 23.1 COMPANY shall have the right by giving notice to terminate all or any part of the WORK or the CONTRACT at such time or times as COMPANY may consider necessary for any or all of the following reasons:
- (a) to suit the convenience of COMPANY;
 - (b) in the event of i) a default on the part of the CONTRACTOR; or ii) any DEFECTS in the WORK, subject to the provisions of Clause 10; and
 - (c) in the event of CONTRACTOR becoming bankrupt or making a composition or arrangement with its creditors or a winding-up order of CONTRACTOR being made or (except for the purposes of amalgamation or reconstruction) a resolution for its voluntary winding-up passed or a provisional liquidator, receiver, administrator or manager of its business or undertaking appointed or presenting a petition or having a petition presented applying for an administration order to be made, or possession being taken by or on behalf of the holders of any debenture secured by a floating charge of any property comprised in or subject to the floating charge, or any equivalent act or thing should be done or suffered under any applicable law.
- 23.2 In the event of default on the part of CONTRACTOR and before the issue by COMPANY of an order of termination of all or any part of the WORK or the CONTRACT, COMPANY shall give notice of default to CONTRACTOR giving the details of such default. If CONTRACTOR upon receipt of such notice does not commence and thereafter continuously proceed with action satisfactory to COMPANY to remedy such default COMPANY may issue a notice of termination in accordance with the provisions of Clause 23.1.

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- 23.3 In the event of COMPANY giving CONTRACTOR notice of termination of all or any part of the WORK or the CONTRACT, such notice shall become effective on the date specified therein (or in the absence of any specified date at the date of receipt of the notice) whereupon CONTRACTOR shall immediately:
- (a) cease performance of the WORK or such part thereof as may be specified in the notice and may remove its equipment from WORKSITE;
 - (b) allow COMPANY or its nominee full right of access to take over the WORK or the relevant part of the WORK;
 - (c) assign to COMPANY, or its nominee, to the extent desired by COMPANY all or the relevant parts of the rights, titles, liabilities, and SUBCONTRACTS relating to the WORK which CONTRACTOR may have acquired or entered into.
- 23.4 In the event of termination under Clause 23.1(a) CONTRACTOR shall be entitled to payment as set out in Section 4 - Remuneration for the part of the WORK performed in accordance with the CONTRACT together with such other payments and fees as may be set out in that Section or such reasonable costs as agreed between the PARTIES at the time of termination.
- 23.5 In the event of termination of part or all of the WORK or the CONTRACT in accordance with Clause 23.1(b) or Clause 23.1(c) the following conditions shall apply:
- (a) CONTRACTOR shall cease to be entitled to receive any money or monies on account of the CONTRACT until the costs of completion and all other costs arising as a result of CONTRACTOR's default or other events giving rise to the termination have been finally ascertained;
 - (b) thereafter and subject to any deductions that may be made under the provisions of the CONTRACT, CONTRACTOR shall be entitled to payment only as set out in Section 4 - Remuneration for the part of the WORK completed in accordance with the CONTRACT up to date of termination and;
 - (c) any additional costs reasonably incurred by COMPANY as a direct result of such termination shall be recoverable from CONTRACTOR. CONTRACTOR's liability in respect of the foregoing shall be limited to thirty percent (30%) of the price of the specific element of the WORK leading to the notice of termination plus all reasonable and documented third party mobilization (and de-mobilization, as applicable) costs necessary to re-perform the WORK or services in question or to remedy the default.
- 23.6 In the event that a single period of force majeure continues longer than thirty (30) days unless the PARTIES have agreed alternative arrangements as described in Clause 12.6, then either PARTY shall be entitled to terminate the WORK ORDER or CONTRACT by giving the other PARTY ten (10) days written notice of termination and the PARTIES will have no additional obligations to each other as a result of said termination.
- 24. AUDIT**
- 24.1 During the course of the WORK and for a period ending twenty-four (24) months after the date of its termination, or final payment, whichever occurs last, COMPANY or its duly authorized representative shall have the right to audit at all reasonable times and, upon request, take copies of all of CONTRACTOR's records (written or electronic form or media), books, personnel records, accounts, correspondence, memoranda, receipts, vouchers and other papers of every kind relating to;

- (a) all invoiced charges made by CONTRACTOR on COMPANY, and
- (b) any provision of this CONTRACT under which the CONTRACTOR has obligations, the performance of which is capable of being verified by audit including without limitation COMPANY ethical conduct expectations expressed in Section 8 – Code of Conduct.

In this respect, COMPANY shall not generally be entitled to investigate the make up of rates and lump sums included in the CONTRACT except to the extent necessary for the proper evaluation of any CHANGE ORDERS, CONTRACTOR shall also have the right to exclude any trade secrets, formulas or processes from such audit by COMPANY nor will COMPANY be allowed access to CONTRACTOR's proprietary or trade secret information unless otherwise specifically agreed between the PARTIES.

- 24.2 CONTRACTOR shall co-operate fully with COMPANY and/or its representatives in the carrying out of any audit required by COMPANY. COMPANY will conduct any audit in a manner, which will keep to a reasonable minimum any inconvenience to CONTRACTOR.

In the event that such audit or audits reveal any error or discrepancy of any nature whatever, such error or discrepancy will be promptly corrected and any amount owing or due to either COMPANY or CONTRACTOR, will be promptly paid by the other PARTY. COMPANY shall have this right to audit CONTRACTOR's accounts and records only after delivery of written notice to CONTRACTOR in accordance with the provisions for notices set forth above.

- 24.3 CONTRACTOR shall obtain equivalent rights of audit to those specified above from all SUBCONTRACTORS and will cause such rights to extend to COMPANY

25. LIENS

- 25.1 CONTRACTOR shall not claim any lien, charge or the like on the WORK or on any property of COMPANY in the possession of CONTRACTOR or at the WORKSITE.

- 25.2 Without prejudice to any other provisions of this Clause, CONTRACTOR shall save, indemnify, release, defend and hold harmless COMPANY from and against all liens, attachments, charges or claims by any of its SUBCONTRACTORS or persons alleging to be SUBCONTRACTORS in connection with or arising out of the CONTRACT.

- 25.3 CONTRACTOR shall immediately notify COMPANY of any possible lien, attachment, charge or claim which may affect the WORK or any part thereof.

- 25.4 If at any time there is evidence of any lien, attachment, charge or claim to which, if established, COMPANY or its property might be subjected, whether made by any persons against CONTRACTOR or made by any of its SUBCONTRACTORS or person alleging to be a SUBCONTRACTOR against COMPANY, then COMPANY shall have the right to withhold and/or set off or otherwise recover from CONTRACTOR such sum of money as will fully indemnify COMPANY against any such lien, attachment, charge or claim.

- 25.5 Before taking any action in accordance with Clause 25.4, COMPANY shall give to CONTRACTOR a reasonable opportunity to demonstrate that the purported lien, attachment, charge or claim is either unenforceable or is covered by the provisions of an enforceable policy of insurance.

- 25.6 For the purpose of this Clause reference to COMPANY shall include the CO-VENTURERS and its and their AFFILIATES.

26. BUSINESS ETHICS

- 26.1 CONTRACTOR shall perform the WORK for COMPANY's exclusive benefit. This obligation shall be applicable to CONTRACTOR's agents and employees; they must provide the diligence and care required to prevent any action or condition which might result in a conflict with COMPANY's interests. CONTRACTOR's efforts shall include, but not be limited to, the establishment of measures to prevent its personnel from giving or receiving gifts, payments, loans, or any other inducement, for any purpose whatsoever from any person, firm, corporation or other body in connection with the performance of the CONTRACT.
- 26.2 COMPANY's Code of Conduct is entitled "Our commitment to integrity" (hereafter referred to as the "BP Code of Conduct"). A copy of the BP Code of Conduct can be obtained using the web link highlighted Section 8 – Code of Conduct. COMPANY requires CONTRACTOR and each SUBCONTRACTOR to carefully review the BP Code of Conduct. In connection with CONTRACTOR's and each SUBCONTRACTOR's performance of this CONTRACT, CONTRACTOR and each SUBCONTRACTOR undertakes and agrees to act consistently with the BP Code of Conduct, and with any updated or amended version of the BP Code of Conduct provided to CONTRACTOR from time to time, and to adhere to the principles set out within it. CONTRACTOR accepts and acknowledges that compliance with ethical practices is a core business value of COMPANY and accordingly any failure on the part of CONTRACTOR or any SUBCONTRACTOR to act in a manner consistent with the BP Code of Conduct shall be considered a material breach of this CONTRACT. CONTRACTOR and all SUBCONTRACTORS shall ensure that their personnel are made aware of the BP Code of Conduct.

27. GENERAL LEGAL PROVISIONS

27.1 Waiver

None of the terms and conditions of the CONTRACT shall be considered to be waived by either COMPANY or CONTRACTOR unless a written waiver is given by one PARTY to the other. No failure on the part of either party to enforce any of the terms and conditions of the CONTRACT shall constitute a waiver of such terms.

27.2 Retention of Rights

Subject to the provisions of Clauses 19, 21, 27.10, 29, and 33 unless otherwise specifically stated in the CONTRACT, both COMPANY and CONTRACTOR shall retain all rights and remedies, both under the CONTRACT and at Law, which either may have against the other.

CONTRACTOR shall not be relieved from any liability or obligation under the CONTRACT by any review, approval, authorization, acknowledgement or the like, by COMPANY.

27.3 CONTRACTOR's AFFILIATES

Any limitation of liability given by COMPANY to CONTRACTOR under the CONTRACT shall include the AFFILIATES of CONTRACTOR.

27.4 Independence of CONTRACTOR

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CONTRACTOR shall act as an independent contractor with respect to the WORK and shall exercise control, supervision, management, and direction as to the method and manner of obtaining the results required by COMPANY.

In all cases where CONTRACTOR's EMPLOYEES (defined to include CONTRACTOR's and its SUBCONTRACTOR's direct, borrowed, special, or statutory employees) are performing work in or offshore the State of Louisiana or are otherwise covered by the Louisiana Workers' Compensation Act, La. R.S. 23:1021 et seq., COMPANY and CONTRACTOR agree that all WORK and operations performed by CONTRACTOR and CONTRACTOR's EMPLOYEES pursuant to this CONTRACT are an integral part of and are essential to the ability of COMPANY to generate COMPANY's goods, products, and services for the purpose of La. R.S. 23:1061 (A) (1). Furthermore, COMPANY and CONTRACTOR agree that COMPANY is the statutory employer of CONTRACTOR's EMPLOYEES for purposes of La. R.S. 23:1061 (A) (3) and that COMPANY shall be entitled to the protections afforded a statutory employer under Louisiana law. Irrespective of COMPANY's status as the statutory or special employer (as defined in La. R.S. 23:1031 (C)) of CONTRACTOR's EMPLOYEES, CONTRACTOR shall remain primarily responsible for the payment of Louisiana workers' compensation and medical benefits to its employees, and shall not be entitled to seek contribution for any such payments from COMPANY or any member of COMPANY GROUP, and CONTRACTOR further agrees that it will indemnify COMPANY and any member of COMPANY GROUP for any such payments and that CONTRACTOR will be obligated to release, defend, and indemnify COMPANY GROUP for any personal injury, death, disease or property damage claims relating to CONTRACTOR's EMPLOYEES pursuant to the provisions of Clause 19.1 of this CONTRACT even if any such employee of CONTRACTOR is also held to be an employee (whether a statutory, special or borrowed employee, or otherwise) of COMPANY or any member of COMPANY GROUP.

27.5 Governing Law and Language

This CONTRACT shall be construed and enforced in accordance with the GENERAL MARITIME LAW of the United States wherever permissible; otherwise, the laws of the State of Texas shall apply, excepting therefrom any conflicts of laws rules which might provide for the application of the laws of another jurisdiction. Subject to Clause 28, the PARTIES agree to submit any dispute arising hereunder to the jurisdiction of the courts of the State of Texas and further agree that venue for the resolution of any such dispute shall be found in Harris County, Texas.

27.6 Notices

All notices in respect of the CONTRACT shall be given in writing and delivered by hand, by telefax or by first class post to the relevant address specified in Appendix 1 hereto and copied to such other office or offices of the PARTIES as shall from time to time be nominated by them in writing to the other.

Such notices shall be effective:

- (a) if delivered by hand, at the time of delivery;
- (b) if sent by telefax, on the first working day at the recipient address following the date of sending;
- (c) if sent by first class post, 48 hours after the time of posting.

27.7 Status of COMPANY

COMPANY enters into the CONTRACT either:

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- a) for itself and as agent for and on behalf of its other CO-VENTURERS; or
- b) as agent for and on behalf of an AFFILIATE and the CO-VENTURERS of that AFFILIATE (in which case this CONTRACT other than this Clause 27.7 shall be interpreted as though all references to "COMPANY" were references to that AFFILIATE).

Notwithstanding a) above:

- (c) CONTRACTOR agrees to look only to COMPANY for the due performance of the CONTRACT and nothing contained in the CONTRACT will impose any liability upon, or entitle CONTRACTOR to commence any proceedings against any CO-VENTURER other than COMPANY;
- (d) COMPANY is entitled to enforce the CONTRACT on behalf of all CO-VENTURERS as well as for itself. For that purpose COMPANY may commence proceedings in its own name to enforce all obligations and liabilities of CONTRACTOR and to make any claim which any CO-VENTURER may have against CONTRACTOR.

Notwithstanding b) above:

- (e) CONTRACTOR agrees to look only to the AFFILIATE of COMPANY for the due performance of the CONTRACT and nothing contained in the CONTRACT will impose any liability upon, or entitle CONTRACTOR to commence any proceedings against COMPANY or CO-VENTURER of an AFFILIATE other than the AFFILIATE;
- (f) the AFFILIATE of COMPANY is entitled to enforce the CONTRACT on behalf of COMPANY and all CO-VENTURERS of that AFFILIATE as well as for itself. For that purpose the AFFILIATE may commence proceedings in its own name to enforce all obligations and liabilities of CONTRACTOR and to make any claim which COMPANY or CO-VENTURER of that AFFILIATE may have against CONTRACTOR.

27.8 Entire Agreement

The CONTRACT constitutes the entire agreement between the PARTIES hereto with respect to the WORK and supersedes all prior negotiations, representations, or agreements related to the CONTRACT, either written or oral. No amendments to the CONTRACT shall be effective unless evidenced in writing and signed by the PARTIES to the CONTRACT.

27.9 Mitigation of Loss

Both COMPANY and CONTRACTOR shall take all reasonable steps to mitigate any loss resulting from any breach of CONTRACT by the other PARTY.

27.10 Extent of Exclusion or Limitation of Liability

Any exclusion or limitation of liability under the CONTRACT shall exclude or limit such liability not only in contract but also in tort or otherwise at law.

27.11 Invalidity and Severability

If any provision of this CONTRACT shall be found by any court or administrative body of competent jurisdiction to be invalid or unenforceable, the invalidity or unenforceability of such provision shall not affect the other provisions of this CONTRACT and all provisions not affected

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by such invalidity or unenforceability shall remain in full force and effect. COMPANY and CONTRACTOR hereby agree to attempt to substitute, for any invalid or unenforceable provision, a valid or enforceable provision which achieves to the greatest possible extent, the economic, legal, and commercial objectives of the invalid or unenforceable provision.

27.12 CONTRACTS (RIGHTS OF THIRD PARTIES) ACT

- (a) Subject to Clause 27.12 (c), the PARTIES intend that no provision of the CONTRACT shall confer any benefit on, nor be enforceable by any person who is not a party to the CONTRACT.
- (b) For the purpose of this Clause 27.12, "Third Party" shall mean any member of COMPANY GROUP (other than COMPANY) or CONTRACTOR GROUP (other than CONTRACTOR) or in respect only of the provisions of Clauses 19, 20 and 21 hereof, the SERVICE COMPANY GROUP.
- (c) Subject to the remaining provisions of the CONTRACT,
 - i) Clause 17.7, Clause 17.8, Clause 19, Clause 20 and Clause 21 are intended to be enforceable by a Third Party; and
 - ii) Clause 27.3 is intended to be enforceable by the AFFILIATES of CONTRACTOR.
- (d) Notwithstanding Clause 27.12 (c), the CONTRACT may be rescinded, amended or varied by the PARTIES to the CONTRACT without notice to or the consent of any Third Party even if, as a result, that Third Party's right to enforce a term of this CONTRACT may be varied or extinguished.
- (e) The rights of any Third Party under Clause 27.12 (c) shall be subject to the following:
 - i) any claim, or reliance on any term of the CONTRACT by a Third Party against a party to the CONTRACT shall be notified in writing in accordance with the requirements of Clauses 19.8 and 27.6 by such Third Party to each party to the CONTRACT as soon as such Third Party becomes aware that an event is likely to give rise to such a claim and such notification shall contain the following information as a minimum:
 - details of the occurrence giving rise to the claim; and
 - the right relied upon by the Third Party under the CONTRACT,
 - ii) the provisions of Clause 28 shall apply in respect of any claim by a Third Party in that the relevant PARTIES agree to resolve any dispute between them in a prompt and amicable manner by adopting the provisions of Clause 28.
 - iii) the Third Party's written agreement to submit irrevocably to the jurisdiction of the State of Texas in respect of all matters relating to such rights.
- (f) In enforcing any right to which it is entitled and the provisions of this CONTRACT, the remedies of a Third Party shall be limited to damages.
- (g) A Third Party shall not be entitled to assign any benefit or right conferred on it under this CONTRACT.

28. RESOLUTION OF DISPUTES

- 28.1 In the event of a commercial dispute between the PARTIES arising out of or relating to this CONTRACT, or the breach thereof, the PARTIES shall submit the dispute to non-binding mediation and shall make a good-faith effort to resolve the dispute through the mediation process. No suit may be filed relating to a commercial dispute arising pursuant to this CONTRACT until the mediation requirements of this provision have been fulfilled. If such a suit is filed, the PARTIES shall again submit the dispute to non-binding mediation prior to the trial of the suit. Each party shall pay its costs of mediation. Expressly excluded from the requirements of this Clause 28 are claims, suits, or disputes arising out of or relating to tort suits, indemnity, insurance, or assumption of liability issues or provisions.
- 28.2 Whilst any matter or matters are in dispute, CONTRACTOR shall proceed with the execution and completion of the WORK and both CONTRACTOR and COMPANY shall comply with all the provisions of the CONTRACT.

29. WARRANTY

29.1 CONTRACTOR warrants and guarantees that:

- (a) it shall exercise all reasonable skill, care and diligence in the performance of the WORK and shall carry out the WORK in accordance with the requirements of the CONTRACT and to internationally recognized good oilfield practices and standards;
- (b) it shall exercise diligence to ensure the completeness and safe transportation of all acquired information including well logs, test and other information ("DATA"), arising out of the performance of the WORK. CONTRACTOR does not warrant the accuracy of DATA transmitted by electronic process, and CONTRACTOR will not be responsible for accidental or intentional interception of such DATA by third parties;
- (c) any equipment and/or related spare parts provided or supplied by CONTRACTOR or its SUBCONTRACTORS for the account of COMPANY: (i) shall meet the detailed specification set forth in the CONTRACT; or (ii) where no detailed specification is provided by COMPANY, shall be of good quality and workmanship and fit for the intended purpose where a specific purpose is defined in the CONTRACT or, where no specific purpose is defined, in fulfillment of the application for which it was designed. CONTRACTOR warrants that all equipment and/or related spare parts provided or supplied by CONTRACTOR or its SUBCONTRACTOR's and suppliers shall be free from defects in material and/or workmanship during the WARRANTY PERIOD;
- (d) consumable materials and/or products provided or supplied by CONTRACTOR for the account of COMPANY under the terms of the CONTRACT shall meet the detailed specification as defined in this CONTRACT and where no such specification is defined, shall conform to (1) where applicable, recognized industry standards or (2) the standard grade and quality of products in the region.

29.2 The warranties and guarantees provided under Clause 29.1 shall not apply to:

- (a) consumable materials and/or products that have been modified and/or subjected to improper handling, storage, installation, operation or maintenance by any party other than CONTRACTOR and/or its SUBCONTRACTOR's and suppliers;

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- (b) equipment, spare parts, consumable materials, and/or products provided by COMPANY and free issued to CONTRACTOR in connection with the WORK;
 - (c) samples which are provided by CONTRACTOR to COMPANY as examples or illustrations only of the general properties of CONTRACTOR's products and/or workmanship; and
 - (d) damage to the equipment, materials and/or products caused by improper use by any party other than CONTRACTOR and/or its SUBCONTRACTOR's and suppliers by way of abrasive materials, corrosion due to aggressive fluids, lightning, improper voltage supply, mishandling or misapplication and the like.
- 29.3 CONTRACTOR may give COMPANY the benefit of its judgment based on its experience interpreting information and making recommendations, either written or oral, as to DATA or amount of material or type of oilfield service to be provided by CONTRACTOR, or the manner of performance or in prediction of results. Notwithstanding the foregoing, all such recommendations and/or predictions shall be received by COMPANY as opinions only, and no warranty expressed or implied shall be inferred by COMPANY from such recommendations and or in view of the impracticability of obtaining first-hand knowledge of the many variable conditions, the reliance on inferences, measurements and assumptions which are not infallible, and/or the necessity of relying on facts and supporting oilfield services provided by others.
- 29.4 Save as expressly provided herein all warranties, conditions or other terms implied by applicable law or otherwise are excluded to the fullest extent permitted by law (including without limitation, implied warranties of merchantability and/or fitness for a particular purpose) and, for the avoidance of doubt, no warranty condition or other term is given that DATA resulting from the performance of the WORK will be fit for any particular purpose (including without limitation, implied warranties of merchantability and/or fitness for a particular purpose).
- 29.5 CONTRACTOR shall ensure that similar warranty undertakings are included in all purchase orders with vendors and contracts entered into with its SUBCONTRACTORS and/or suppliers who supply consumable materials/products and/or equipment and spare parts in respect of the WORK. The foregoing obligation shall not apply to purchase orders with vendors and contracts entered into with SUBCONTRACTORS and / or suppliers in those instances where CONTRACTOR and COMPANY have agreed to use a specific vendor and/or supplier and CONTRACTOR has obtained COMPANY's advance written approval to modify the foregoing warranty undertakings.
- 29.6 In the event that any equipment and/or related spare parts or consumable materials provided or supplied by CONTRACTOR do not conform to the warranties set forth in Clause 29.1, COMPANY shall notify CONTRACTOR promptly upon the failure of such warranty, and in any event during the WARRANTY PERIOD, specifying the nature and extent of the failure in question. Upon receipt of such notice, CONTRACTOR shall expeditiously proceed to repair or replace, at CONTRACTOR's sole cost, the equipment and/or related spare parts or consumable materials in question.
30. ACCESS TO LOCATIONS
- COMPANY shall secure for CONTRACTOR and its SUBCONTRACTOR's rights of access to and from the WORKSITES. COMPANY shall use its best endeavors to advise CONTRACTOR of any limitations, restriction or conditions which may affect such access and CONTRACTOR shall abide by such limitations, restrictions, and conditions as aforesaid.

31. HEALTH, SAFETY, ENVIRONMENT AND THE WELFARE OF PERSONNEL

31.1 COMPANY places prime importance on health, safety, security, and environmental (HSSE) issues and requires that CONTRACTOR, SUBCONTRACTORS, and their subcontractors subscribe to and actively pursue the highest standards of HSSE performance. CONTRACTOR shall observe and comply with COMPANY Health, Safety, Security, and Environment Policy, Regulations and Procedures as amended from time to time, copies of which will be provided by COMPANY REPRESENTATIVE. CONTRACTOR shall familiarize itself with the following documents:

- a) Getting HSE Right (gHSEr)
- b) BP's Golden Rules for Safety
- c) Drilling and Wells Operations Policy
- d) Specific local HSSE policies as defined in Appendix 5 to Section 7

It shall be the responsibility of CONTRACTOR to ensure that its personnel comply with said policy, regulations, and procedures.

31.2 CONTRACTOR's personnel may be required by COMPANY to attend site induction for Health, Safety and Environmental Policy, Regulations and Procedures before entering a WORKSITE where any part of the WORK is to be performed and it shall be CONTRACTOR's responsibility to establish with COMPANY which personnel must be inducted and to ensure their attendance.

31.3 CONTRACTOR shall ensure that its personnel are aware of and carry out their own obligations with regard to health, safety, and environment including the strict obligation to report unsafe working conditions, hazards, dangerous incidents, accidents, and environmental issues.

31.4 CONTRACTOR shall ensure that its personnel:

- (a) observe and comply with all relevant statutory obligations regarding health and safety at work, environmental protection and all applicable safety regulations and requirements;
- (b) are fully conversant with and comply with the working conditions, safety regulations and policies at all locations where the WORK is to be performed;
- (c) are familiar with all local safety instructions, regulations and policies applicable to the WORKSITE where the WORK is to be performed and comply with same;
- (d) endeavor to advise CONTRACTOR supervisor of any pre-existing medical disability or condition which may adversely effect their own health and safety or the health and safety of others;
- (e) endeavor to advise CONTRACTOR of over the counter drug warnings for medication they are taking and shall endeavor to ensure that personnel immediately advise CONTRACTOR supervisor where such usage may impact the individual's ability to perform safely.

31.5 CONTRACTOR's personnel shall obey and comply with all reasonable instructions or order given to them by COMPANY REPRESENTATIVE or any officer of COMPANY in all matters relating to health, safety, and the environment.

31.6 If requested by COMPANY and prior to mobilization of CONTRACTOR's personnel to the WORKSITE, CONTRACTOR shall submit to COMPANY a certificate of a fully registered

Section 2 – General Conditions of Contract

medical practitioner indicating medical fitness for duty at the WORKSITE. Cost associated with the supply of this medical certificate shall be borne by COMPANY unless specifically addressed in Section 3, Scope of Work.

- 31.7 WORK provided by CONTRACTOR personnel shall be conducted in accordance with the prevailing health, safety, and environmental protection requirements in force in the WORKSITE and in full accordance with statutory and local requirements.
- 31.8 CONTRACTOR shall endeavor to ensure that its personnel and recommendations for performing the WORK are in accordance with World Health Organization recommendations.
- 31.9 If CONTRACTOR's personnel are required by COMPANY to work offshore or at remote sites and are required to be evacuated to a medical facility for medical treatment, the costs of evacuating CONTRACTOR's personnel to COMPANY's onshore supply base shall be borne by COMPANY. In the event that medical evacuation was for a pre-existing medical condition that was not disclosed by CONTRACTOR to COMPANY, the costs of evacuating CONTRACTOR's personnel to COMPANY's onshore supply base shall be borne by CONTRACTOR. COMPANY reserves the right to recover on a cost recoverable basis within the scope of CONTRACTOR's insurances for medical evacuations. All other transportation and medical treatment costs shall be borne by CONTRACTOR.
- 31.10 CONTRACTOR shall impose on its SUBCONTRACTORS the same obligations as are described in this Clause 31 and shall ensure that its SUBCONTRACTORS comply therewith.
- 31.11 For the purposes of this Clause 31, all obligations of CONTRACTOR shall include its SUBCONTRACTOR, AFFILIATES, its and their employees, servants, and agents.
- 31.12 CONTRACTOR shall observe and comply with the provisions of Section 7 – Health, Safety, Security, and Environment and failure to meet these requirements or to satisfy COMPANY with regard to the control of HSSE risks in respect of the CONTRACT will be regarded as due cause for termination of the CONTRACT without notice and without financial penalty to COMPANY in accordance with the provisions of Clause 23.1.
- 31.13 Nothing contained herein will affect the application of Clause 19 and 21 of the CONTRACT.

32. PERFORMANCE MANAGEMENT

- 32.1 CONTRACTOR and COMPANY agree that there are certain Key Performance Indicators (KPI), measures which are set out in Section 3 - Scope of Work. The successful closeout of COMPANY and CONTRACTOR's corrective actions to remedy performance gaps shall be mutually agreed.
- 32.2 For the measures referred to in Clause 32.1 above, well specific targets and objectives, together with any agreed deliverables, timescales or milestones will be mutually agreed between CONTRACTOR and COMPANY prior to commencement of any well and shall be fully documented.
- 32.3 CONTRACTOR shall participate in COMPANY's Supplier Performance Management (SPM) system. This process shall include, but not be limited to, the work scope review, risk review, mutual setting of KPIs and objectives, the timely completion of any agreed scorecards or measurement tools and the agreement of annual Performance Contracts where appropriate. The second phase shall include a post-job evaluation and submittal / approval. Data and associated scorecards gathered will be used to support reviews outlined in Clause 32.4.

- 32.4 Performance Review Process (PRM) – PRMs shall be held on a quarterly basis, or other frequency as mutually agreed, the COMPANY's REPRESENTATIVE, sector Team (if applicable), CONTRACTOR's management team, and CONTRACTOR's REPRESENTATIVE, shall meet formally to discuss the previous quarter's performance and identify any performance gaps and opportunities for improvement. This PRM shall also be an opportunity to discuss the next period to determine risks to delivery of work programs or projects. The focus shall be on information sharing and identifying key risks, then agreement on a risk management and action plan for the next period. Previous quarter's performance shall be formally agreed at this meeting and recorded for future reference. Progress of follow up actions from the PRM will be recorded and monitored on a monthly CAR (Corrective Action Reporting) register maintained by the CONTRACTOR.
- 32.5 If requested by COMPANY, a performance contract shall be mutually agreed upon for the projected WORK scope prior to WORK commencement. This performance contract shall include sections to address, but not limited to, HSSE, People, Cost, Quality, Delivery, and Innovation. Each section will have measurable targets and reflect KPIs referenced in Clause 32.1.
- 32.6 CONTRACTOR's Safety Management System (SMS) shall be reviewed by COMPANY prior to award. Any gaps identified during this review will be reported to CONTRACTOR as compulsory improvement actions. CONTRACTOR will develop an SMS gap closure plan and the mutually agreed upon actions and completion dates shall be monitored and updated via the scorecard and PRM process. Failure to successfully complete the actions or close the gaps by the agreed due dates shall be deemed to be a failure of the CONTRACTOR to perform the services and COMPANY shall have the right to suspend the WORK in accordance with Clause 13 or terminate the WORK or the CONTRACT in accordance with Clause 23. The SMS gap closure plan shall be maintained by CONTRACTOR and updated after each interim SMS evaluation has been completed.
- 32.7 If requested by COMPANY, CONTRACTOR's Environmental Management System (EMS) shall be reviewed by COMPANY prior to award. CONTRACTOR will develop an EMS gap closure plan and the mutually agreed upon actions and completion dates shall be monitored and updated via the scorecard and PRM process. Failure to successfully complete the actions or close the gaps by the agreed due dates shall be deemed to be a failure of the CONTRACTOR to perform the services and COMPANY shall have the right to suspend the WORK in accordance with Clause 13 or terminate the WORK or the CONTRACT in accordance with Clause 23. The EMS gap closure plan shall be maintained by CONTRACTOR and updated after each interim EMS evaluation has been completed.
- 33. AGGREGATE OF LIABILITY**
- CONTRACTOR's cumulative liability hereunder in respect of liabilities incurred pursuant to Clause 10.3 and 23.5 shall not exceed in aggregate (i) fifty percent (50%) of the CONTRACT PRICE where all WORK to be performed under the CONTRACT is set forth in Section 3, Scope of Work independent of WORK ORDERS or, (ii) where WORK ORDERS are issued, fifty percent (50%) of the price of all WORK to be performed under the individual WORK ORDER.
- 34. CONTINUING OBLIGATIONS**
- In the event of termination or expiration of this CONTRACT, for any reason, any provision which by its own express terms reflects an intent that it shall continue to apply beyond the term of this CONTRACT shall continue in full force and effect, including without limitation Clauses 19, 21, 22, and 24.

35. ANTI-CORRUPTION UNDERTAKINGS

35.1 CONTRACTOR and COMPANY each agree and undertake one to the other that in connection with the CONTRACT and the transactions contemplated by this CONTRACT, they will each respectively comply with all applicable laws, rules, regulations, decrees and/or official governmental orders of the United Kingdom and the United States of America relating to anti-bribery and anti-money laundering.

35.2 CONTRACTOR agrees, undertakes and confirms that it, and each of its AFFILIATES, and its and their respective directors, officers, employees, agents and every other person acting on its or their behalf, has not, in connection with the transactions contemplated by this CONTRACT or in connection with any other business transactions involving COMPANY in the United States of America, made, offered or promised to make, and will not make, offer, or promise to make, any payment or other transfer of anything of value, including without limitation the provision of any service, gift or entertainment, directly or indirectly,

- a) to any government official (including directors, officers and employees of government-owned and government-controlled companies and public international organizations);
- b) to any director, officer or employee of COMPANY or of BP plc or any of its other subsidiaries;
- c) to any political party, official of a political party, or candidate for public office;
- d) to an agent or intermediary for payment to any of the foregoing; or
- e) to any other person or entity

for the purpose of obtaining or influencing the award of or carrying out this CONTRACT if and to the extent that to do so is or would be either in violation of or inconsistent in any material way with the anti-bribery or anti-money laundering laws of any relevant jurisdiction, including, without limitation, the U.S. Foreign Corrupt Practices Act, the U.K. Anti-Terrorism, Crime and Security Act 2001 and successor legislation, the applicable country legislation implementing the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions and/or the anti-corruption laws of the United States of America.

For the purposes of this Clause 35, the term "government official" shall mean any director, officer, or employee of any government or any department, agency or instrumentality thereof, and/or of any enterprise in which a government owns an interest, and/or of any public international organization. This term also includes any person acting in any official, administrative or judicial capacity for or on behalf of any such government or department, agency, instrumentality, company, or public international organization.

35.3 CONTRACTOR agrees and undertakes that in connection with this CONTRACT and in connection with any other business transactions involving COMPANY in the United States of America, CONTRACTOR and each of its AFFILIATES shall:

- (a) have and will apply, in respect of its dealings with COMPANY under this CONTRACT, effective disclosure controls and procedures;
- (b) have and will maintain books, records, and accounts which, in reasonable detail, accurately and fairly reflect the transactions undertaken and the disposition of assets; and
- (c) have and will maintain an internal accounting controls system that is sufficient to ensure the proper authorization, recording and reporting of all transactions and to provide reasonable assurance that violations of the anticorruption laws of the applicable jurisdictions will be prevented, detected and deterred.

35.4 In the event that COMPANY has any reasonable basis for a good faith belief that

Section 2 – General Conditions of Contract

CONTRACTOR and/or any of its AFFILIATES may not be in compliance in any material way with the undertakings and/or requirements set forth in sub-clauses 35.1, 35.2 and/or 35.3, COMPANY shall advise CONTRACTOR in writing of its good faith belief and CONTRACTOR shall cooperate fully with any and all enquiries undertaken by or on behalf of COMPANY in connection therewith, including the provision by CONTRACTOR of personnel and supporting documents and affidavits if reasonably deemed necessary by COMPANY (provided, however, that CONTRACTOR may withhold from any such request for disclosure any investigative personnel working under the direction of the CONTRACTOR'S legal department and documents which are subject to legal privilege).

- 35.5 Subject to the requirements of sub-clause 35.4, and without prejudice to any other rights or remedies the COMPANY may have hereunder or at law (including, as applicable, the right to damages for breach of contract), COMPANY shall have the right to terminate this CONTRACT with immediate effect if COMPANY reasonably believes in good faith that any of the foregoing agreements, undertakings or requirements set forth in this Clause 35 have not been complied with or fulfilled by CONTRACTOR or any of its AFFILIATES; PROVIDED, HOWEVER, that COMPANY shall have provided CONTRACTOR with written notice of its intention to terminate the CONTRACT under the provisions of this Clause 35 together with the reasons therefore and that CONTRACTOR has been unable within fifteen (15) business days of delivery of such notice to provide COMPANY with evidence which demonstrates, to the reasonable satisfaction of the COMPANY, that CONTRACTOR and its AFFILIATES have not failed to comply with or fulfill any of the foregoing agreements, undertakings or requirements.
- 35.6 All payments by COMPANY to CONTRACTOR shall be made in accordance with the terms of payment specified in the CONTRACT. In the absence of any such specific payment instructions elsewhere in the CONTRACT, payments by COMPANY to CONTRACTOR shall only be made by check or wire transfer to a bank account, details of which shall be provided by CONTRACTOR to COMPANY in writing.
- 35.7 Any dispute arising hereunder as the result of COMPANY exercising its rights under sub-clause 35.5 hereof shall be settled in accordance with the provisions of CLAUSE 28 – SETTLEMENT OF DISPUTES.
- 35.8 CONTRACTOR shall take all reasonable measures to apply the provisions of this CLAUSE 35 in its contracts with SUB-CONTRACTORS in order to give effect to the agreements, undertakings, and requirements set forth in this CLAUSE 35.

36. SPECIAL CONDITIONS

Any additional special conditions applicable to the CONTRACT shall be as listed in Appendix 1 hereto and shall be numbered consecutively with these General Conditions of CONTRACT.

Section 2 – General Conditions of Contract
Appendix 1 – Special Conditions of Contract

Appendix 1 – Special Conditions of Contract

In the event of any ambiguity or contradiction between the General Conditions of Contract and the Special Conditions of Contract, the latter shall take precedence.

Section1	Agreement
Clause 4	The EFFECTIVE DATE of the CONTRACT is April 15, 2009
Clause 4	The scheduled COMMENCEMENT DATE of the WORK is – Will be specified as the date of each WORK ORDER
Clause 5	The duration of the CONTRACT is three (3) years from the EFFECTIVE DATE of the CONTRACT. COMPANY shall have the option to extend the CONTRACT for up to two (2) consecutive one-year options following the expiration of the three (3) year term.
Section 2	General Conditions of Contract
Clause 1.9	"CO-VENTURERS" shall mean – Not Applicable
Clause 3.1(a)	COMPANY REPRESENTATIVE is Mr. Sundaram Srinivasan Manager – GOM PSCM Drilling and Wells (281) 504-4277 (OFFICE PHONE) (281) 366-7130 (FAX) sundaram.srinivasan@bp.com
Clause 3.1(a)	CONTRACTOR REPRESENTATIVE is Merv Swan Vice-President, BP Account (281) 575-3020 (OFFICE PHONE) (281) 935-9238 (CELL PHONE) merv.swan@halliburton.com
Clause 27.6	The addresses for the service of notices are: i) COMPANY: BP Exploration and Production, Inc. 200 Westlake Park Boulevard Westlake 4 Houston, Texas 77079 ATTN: Sundaram Srinivasan ii) CONTRACTOR: Halliburton Energy Services, Inc. 1401 McKinney Street, Suite 2400 Houston, Texas 77010 ATTN: Merv Swan

Section 2 – General Conditions of Contract
Appendix 2 – Local Tax Provisions

Appendix 2 – Local Tax Provisions

CONTRACTOR agrees to defend, indemnify, and hold harmless COMPANY, jointly and severally, from and against, and to accept full and exclusive liability for, the payment of its legally due contributions or taxes for unemployment insurance, old age retirement benefits, annuities, wage and income taxes, business and occupation taxes, now or hereafter imposed by the Government of the United States or any State or political subdivision thereof, however measured.

CONTRACTOR agrees to be responsible for and indemnify, and hold harmless COMPANY, jointly and severally, from any liability for contract, inventory, ad valorem, business and occupational, or other taxes which are imposed upon CONTRACTOR for the performance of this CONTRACT or the ownership or use of any property employed by CONTRACTOR in the performance of this CONTRACT.

Section 2 – General Conditions of Contract
Appendix 2 – Local Tax Provisions

Section 3 – Scope of Work

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1.0 GENERAL

- 1.1 CONTRACTOR has been selected for the performance of the WORK on the understanding that it is qualified in the class of work involved and that CONTRACTOR shall exercise all reasonable skill, care, and diligence in the performance of the WORK and shall carry out the WORK in accordance with the requirements of the CONTRACT and to internationally recognized good oilfield practices and standards.
- 1.2 The WORK which is to be provided by CONTRACTOR shall comprise but not necessarily be limited to, the provision of management, engineering, supervision, labor, plant, equipment, and materials to support COMPANY's operations, all as generally described herein.

2.0 THE WORK

- 2.1 COMPANY may from time to time request CONTRACTOR to carry out certain work or services, or provide supplies, equipment, or materials in accordance with the terms of the CONTRACT as more specifically defined in each job request issued by COMPANY ("WORK ORDER"). A WORK ORDER shall mean any of the following document types issued pursuant to this CONTRACT either on paper or electronic form.
 - 2.1.1 WORK ORDER Template, as set forth by example in Section 3, Appendix 2 – WORK ORDER. Other written forms of this template are acceptable so long as it provides sufficient detail, including as a minimum:
 - identification of CONTRACTOR
 - reference to the CONTRACT number
 - the date of the WORK ORDER
 - details of the WORK to be performed
 - any other terms the PARTIES deem appropriate
 - 2.1.2 Specific direction / instruction to CONTRACTOR to proceed with WORK via e-mail, or an otherwise electronically transmitted Microsoft Word or Excel document with the same minimum requirements as noted in Clause 2.1.1 herein above. Said direction / instruction to CONTRACTOR shall require electronic acknowledgement of receipt as well as acceptance from CONTRACTOR in order to be deemed to be a WORK ORDER.
 - 2.1.3 Pursuant to a verbal request by COMPANY to initiate WORK under this CONTRACT, a request by CONTRACTOR to proceed with WORK shall be presented to COMPANY via e-mail, or an otherwise electronically transmitted Microsoft Word or Excel document with the same minimum requirements as noted in Clause 2.1.1 herein above. Said request made by CONTRACTOR shall require electronic acknowledgement of receipt as well as acceptance from COMPANY in order to be deemed to be a WORK ORDER.
 - 2.1.4 Purchase Orders for the procurement of materials that includes sufficient details, including as a minimum:
 - identification of CONTRACTOR
 - reference to the CONTRACT number
 - the date of the Purchase Order
 - details of the materials to be procured
 - any other terms the PARTIES deem appropriate

Section 3 – Scope of Work

2.1.5 Nothing contained in a WORK ORDER, in any acceptable format, shall be construed as an Amendment to the terms of the CONTRACT. Accordingly, WORK ORDERS, in any acceptable format, shall NOT be used to add new services, equipment, or materials to the CONTRACT, all of which may only be added to the CONTRACT by formal Amendment.

2.2 It is agreed and understood that COMPANY is not obligated to request WORK hereunder, and that CONTRACTOR is not obligated to accept any WORK ORDER issued by COMPANY hereunder; however, COMPANY and CONTRACTOR agree that the following general provisions shall at all times apply to and control all WORK which may be conducted or carried out by CONTRACTOR for COMPANY under any WORK ORDER until such WORK ORDER is cancelled. With respect to WORK performed under this CONTRACT, the Schedule of Rates and Charges in Section 4 – Remuneration, shall apply.

CONTRACTOR shall use reasonable commercial efforts during the term of the CONTRACT or any WORK ORDER, to ensure that the costs of the final completion of the WORK shall not exceed the estimate. In the event that the WORK is performed on an unsupervised basis, e.g., rental tools, COMPANY and CONTRACTOR will jointly monitor costs for expenditure tracking. If CONTRACTOR determines that the estimate is likely to be exceeded, CONTRACTOR shall promptly notify COMPANY of the same and provide an estimate of the additional cost. Such notification shall constitute a request for a CHANGE ORDER to revise the original estimate. Upon receipt of such notice, COMPANY shall promptly (1) issue a CHANGE ORDER revising the original estimate before such estimate is exceeded or (2) release CONTRACTOR's personnel and equipment. However, in no event shall CONTRACTOR make or incur total expenditures and charges for the WORK in excess of such estimates unless and until a written request is approved by COMPANY.

2.3 From time to time COMPANY may clarify, modify, expand, or reduce the scope of the WORK ORDER by a CHANGE ORDER. CONTRACTOR will comply with instructions in such CHANGE ORDER. A CHANGE ORDER shall mean any of the following document types issued pursuant to this CONTRACT either on paper or electronic form.

2.3.1 CHANGE ORDER Template, as set forth by example in Section 3, Appendix 3 – CHANGE ORDER. Other written forms of this template are acceptable so long as they provide sufficient detail, including as a minimum:

- identification of CONTRACTOR
- reference to the CONTRACT number
- reference to the WORK ORDER number
- the date of the CHANGE ORDER
- details of the changes to the WORK to be performed
- any other terms the PARTIES deem appropriate

2.3.2 Specific direction / instruction to CONTRACTOR to change the WORK ORDER via e-mail, or an otherwise electronically transmitted Microsoft Word or Excel document with the same minimum requirements as noted in Clause 2.3.1 herein above. Said direction / instruction to CONTRACTOR shall require electronic acknowledgement of receipt as well as acceptance from CONTRACTOR in order to be deemed to be a CHANGE ORDER.

2.3.3 Pursuant to a verbal request by COMPANY to change the WORK ORDER under this CONTRACT, a request by CONTRACTOR to proceed with WORK shall be presented to COMPANY via e-mail, or an otherwise electronically transmitted Microsoft Word or Excel document with the same minimum requirements as noted in

Section 3 – Scope of Work

Clause 2.3.1 herein above. Said request made by CONTRACTOR shall require electronic acknowledgement of receipt as well as acceptance from COMPANY in order to be deemed to be a CHANGE ORDER.

- 2.3.4 Nothing contained in a CHANGE ORDER, in any acceptable format, shall be construed as an Amendment to the terms of the CONTRACT. Accordingly, CHANGE ORDERS, in any acceptable format, shall NOT be used to add new services, equipment, or materials, to the CONTRACT, all of which may only be added to the CONTRACT by formal Amendment.
- 2.4 The provision, utilization, and management of the WORK shall be the sole responsibility of CONTRACTOR always accepting that CONTRACTOR shall meet the Scope of Work. The WORK shall be provided in accordance with the service specific requirements contained in this Section 3.
- 2.5 CONTRACTOR shall liaise with, and ascertain from COMPANY, all forward programming and planning information for COMPANY's well operations to enable CONTRACTOR to provide all the resources required to meet its obligations under the CONTRACT. CONTRACTOR shall be solely responsible for ensuring that personnel, equipment, and all other items are provided so that no disruption occurs to the well operation.
- 2.6 CONTRACTOR shall seek out expertise from within CONTRACTOR's organization, COMPANY's organization, and from Third Parties to enable CONTRACTOR to maximize operating performance. Said involvement of Third Parties for purposes of this Clause shall not be for COMPANY's account or reimbursable under the provisions of Section 4 – Remuneration.
- 2.7 CONTRACTOR shall pro-actively monitor, evaluate, and promote the use of new technology to improve cost effectiveness and add value to the WORK.
- 2.8 COMPANY is committed to making its technology and knowledge of 'best practices' available to CONTRACTOR. It is expected that CONTRACTOR will avail itself of this opportunity to use COMPANY data and knowledge in the course of the CONTRACT. Likewise, it is expected that CONTRACTOR will provide to COMPANY its knowledge of industry best practices and technology.
- 2.9 CONTRACTOR shall provide an organization to plan, monitor, and optimize the performance of the WORK in full compliance with the requirements of COMPANY. This shall include, but not be limited to, the management of CONTRACTOR's and SUBCONTRACTOR's health, safety, security, environment, quality assurance, and legal obligations.
- 2.10 CONTRACTOR shall ensure optimal utilization of equipment, in that, equipment shall be back loaded at the earliest opportunity if no longer required. CONTRACTOR shall render all assistance to COMPANY in this regard. Nevertheless, equipment and / or materials shall only be shipped and back loaded with the prior consent of COMPANY. The effectiveness and benefits of the actions taken may be measured as part of the Performance Management System.

3.0 PERSONNEL

Section 3 – Scope of Work

- 3.1 CONTRACTOR shall provide fully trained, competent personnel to perform the WORK in accordance with the applicable WORK ORDER. The number of personnel required will be determined by operational and engineering need as agreed by COMPANY and CONTRACTOR. To ensure continuity and operational learning(s), personnel assigned to a WORKSITE shall not be replaced without COMPANY's approval which shall not be unreasonably withheld.
- 3.2 CONTRACTOR may be required to provide co-located engineering or technical support in COMPANY's local offices. "Co-located" support is defined as those personnel working on COMPANY operations and located in one or more of COMPANY's various local offices. CONTRACTOR staff designated for such positions will be pre-qualified and approved by COMPANY. Such CONTRACTOR staff is expected to perform as members of multi-discipline COMPANY teams, with shared accountability for team performance.
- 3.3 CONTRACTOR will supply a nominated Account Manager who is accountable for the performance of all personnel provided by CONTRACTOR. The Account Manager is expected to provide a single point of contact for contractual issues, HSSE performance, and for issues relating to compliance with the Scope of Work contained herein.
- 3.4 CONTRACTOR, with approval from COMPANY, will develop and deploy a program to maximize savings at the WORKSITE by employing multi-skilled personnel and thereby reducing the number of personnel required to an absolute minimum. Such reductions shall not at any time compromise safety, efficiency, or quality.
- 3.5 Additional personnel may be provided as required by CONTRACTOR and or COMPANY for operational or other reasons. The requirement for such additional personnel must be agreed to in advance and shall be affected by a CHANGE ORDER at rates as specified in Section 4 – Remuneration.
- 3.6 A Personnel Plan may be requested from time to time for various activities (e.g., large development projects). These Personnel Plans may include – but not be limited to – number of personnel by category required to discharge all duties needed to complete the WORK; organization charts; manner in which any applicable local content requirements will be satisfied; and other items that may be specified.
- 3.7 Personnel shall be trained appropriately for the duties for which they will be responsible. Specifically, this requirement shall include, as applicable, all statutory and COMPANY requirements relating to WORKSITE safety, survival, and well control. In addition, supervisors shall be capable of performing Behavioral Safety Audits on CONTRACTOR tools, processes, and equipment. All applicable CONTRACTOR personnel shall participate in COMPANY sponsored initiatives and must comply with safety training requirements as defined or required by COMPANY.

4.0 EQUIPMENT

Section 3 – Scope of Work

- 4.1 CONTRACTOR shall provide all equipment necessary to perform the WORK. CONTRACTOR shall be fully responsible for implementation of the techniques and equipment used which must be entirely consistent with good oilfield practice and meet all COMPANY standards as stated herein.
- 4.2 CONTRACTOR shall be required to mobilize and demobilize its tools and equipment in accordance with the specific requirements of each operation. Unless agreed to in advance by COMPANY, CONTRACTOR shall provide adequate back up tools, equipment, spares and consumables to ensure that service disruption is minimized due to tool or equipment failures.
- 4.3 Upon receipt of a WORK ORDER, or CHANGE ORDER to a WORK ORDER from COMPANY, CONTRACTOR shall provide, or procure the requested tools, equipment, spares, or materials, to be available for transport by the specified time. Where CONTRACTOR cannot supply such tools or equipment from its own inventory, it shall notify COMPANY, and upon receipt of COMPANY's written approval, shall procure same through a Third Party and supply to COMPANY at the rates contained in this CONTRACT.
- 4.4 CONTRACTOR shall develop and maintain an up to date inventory and utilization report in Microsoft Excel or other acceptable format for:
 - 4.4.1 all CONTRACTOR owned tools and equipment used during all or a portion of the CONTRACT term.
 - 4.4.2 all COMPANY owned equipment used during all or a portion of the CONTRACT term, inclusive of those items being held on consignment for future use and their respective Purchase Order value.
 - 4.4.3 all materials consumed during the then current invoice period and collectively throughout the entire term of the CONTRACT.
 - 4.4.4 In addition, CONTRACTOR shall make the above referenced inventory and utilization reports available for inspection by COMPANY as and when requested.
 - 4.4.5 Further, this inventory and utilization report must be maintained on a well by well basis, and must be submitted to COMPANY when invoicing for services. Failure to provide the specifics of inventory and utilization shall be deemed to be a breach of Section 2 – General Conditions of Contract, Clause 14.6.
- 4.5 CONTRACTOR shall be responsible at its own cost for stock control, maintenance, and servicing of its equipment, and shall use best efforts to ensure that sufficient spares are available for maintenance requirements and to meet contingency requirements.
- 4.6 COMPANY shall have the right to inspect CONTRACTOR's equipment, materials, and supplies at any time to observe their condition and to ensure that no deficiencies exist. Such inspection by COMPANY shall not imply any acceptance of the condition of the said equipment, materials, and supplies by COMPANY and CONTRACTOR shall not be relieved of its obligations under this CONTRACT by any such inspection.
- 4.7 CONTRACTOR shall provide equipment that meets the requirements outlined in Section 6 – Quality Assurance and Quality Control (QA/QC) and Section 3, Appendix 7 – Technical Integrity herein.

4.8 All tools, material, and equipment used for the execution of the WORK shall be fit for purpose and maintained in accordance with manufacturers' recommendations. In addition, a full history record and certification shall be maintained in accordance with CONTRACTOR's existing preventive maintenance and quality management systems.

4.9 CONTRACTOR shall create and implement a 'Total Quality Management' process or use an existing approach for the process of recording and reporting the history of tools and equipment from procurement to end use.

Features of the system shall include:

4.9.1 Capable of Audit.

4.9.2 Record full traceability from mill material test reports and test certificates, through manufacture, procurement, and subsequent service life.

4.9.3 Ability to manage and control stock levels.

4.9.4 Identifies items under repair as potential stock.

4.9.5 Ability to reserve or allocate items in stock for specific well service / completion requirements and subsequently complete transfer and amend stock level.

4.9.6 Record and display tools and equipment in specific generic groupings, i.e., packers, safety valves etc., for ease of reviewing availability.

4.9.7 Ability to record tool or equipment history by well.

4.9.8 Show the well file as the final reconciliation for well costs with a summary statement showing all items consumed and associated service costs. The final reconciliation shall be submitted with CONTRACTOR's invoice to COMPANY.

4.10 All work shall be conducted under agreed procedures and fully in accordance with COMPANY Technical Integrity requirements.

5.0 TRANSPORTATION OF EQUIPMENT AND MATERIALS

5.1 If the WORK includes marine transportation of equipment and materials, CONTRACTOR shall be required to give not less than the SPU-specific minimum notice time for offshore transportation requirements. COMPANY's decision as to the availability of vessel and / or helicopter transportation at any particular time shall be final.

5.2 In supplying equipment and materials to COMPANY's designated supply base, CONTRACTOR shall take due consideration of the magnitude and urgency of each consignment. CONTRACTOR shall liaise with COMPANY's nominated supply base sufficiently in advance of each consignment to agree timing of collection and delivery.

5.3 CONTRACTOR shall at all times comply with appropriate regulations and guidelines for the transportation of dangerous and hazardous goods. Copies of Material Safety Data Sheets (MSDS) for all products shall be made available to COMPANY upon demand by COMPANY

or its delegate.

- 5.4 All packaging is to be of suitable quality to withstand operating area climatic conditions. All materials shall be palletized, strapped, and shrink-wrapped. COMPANY shall have the right to reject any materials deemed unsuitably packaged for the conditions or where the packaging is of poor quality. Materials received by COMPANY without the required packaging will not be accepted and will be returned to CONTRACTOR for CONTRACTOR's account.

All packaged equipment shall be externally marked using suitable means so as to allow ready identification of the enclosed items:

- 5.4.1 Parts and equipment shall have exposed metallic surfaces protected against corrosion.
 - 5.4.2 Exposed seals, seal surfaces, threads, and operating parts shall be protected from mechanical damage during shipping.
 - 5.4.3 Loose components shall be separately packed and identified.
 - 5.4.4 Exposed hydraulic end fittings shall be capped.
 - 5.4.5 Special provisions for shipment and storage of electronic items in accordance with manufacturer instructions shall be made.
 - 5.4.6 Units and assemblies shall be securely crated or mounted on skids to suit the proposed shipment method. These shall be designed to prevent damage and to facilitate handling.
 - 5.4.7 Special provisions for transportation vibration protection for both land and sea shall be made to ensure no damage to equipment.
 - 5.4.8 The packaging / shipment method shall take into account any limitations in maximum or minimum allowable temperature, UV, and humidity protection. This shall include storage for extended periods in the local climate.
- 5.5 CONTRACTOR will be responsible for loading equipment efficiently into its Cargo Carrying Units (CCU) at its local facility and will endeavor to minimize the number of CCUs used. Equipment transported within CCUs shall be adequately secured such that there is no risk of injury through either opening the CCU or equipment falling out or through accessing equipment within the CCU.

6.0 FACILITIES

- 6.1 CONTRACTOR shall support the WORK from local facilities that provide comprehensive warehousing, laboratory, workshop, and service support. The services to be provided by CONTRACTOR at the local facility will include but would not be limited to the storage, preservation, handling, preparation, inspection, testing, maintenance, and repair of CONTRACTOR's tools, equipment, and materials.
- 6.2 Where CONTRACTOR is unable to comply fully with the requirements of Clause 6.1 above, CONTRACTOR shall identify the exceptions and provide details of alternative support services to be offered to enable CONTRACTOR to perform the WORK in a manner

satisfactory to COMPANY.

7.0 SPECIFICATIONS AND PROCEDURES

- 7.1 CONTRACTOR shall perform WORK as specified in Section 3, Appendix 6 – Functional and Technical Specifications (for those Sub-Sectors where Functional and Technical Specifications exist, including: Cementing Services; Stimulation Services; Coiled Tubing Services; Well Placement; Wireline Services; and Completions).
- 7.2 CONTRACTOR, during the performance of WORK, shall adhere to the methods and procedures as specified in Section 3, Appendix 7 – Technical Integrity and in Section 6 – Quality Assurance and Quality Control.

8.0 COMPANY'S GENERAL OBLIGATIONS

The following items shall be for COMPANY's account for all offshore WORK:

- 8.1 Accommodation and messing for CONTRACTOR's personnel while onboard any COMPANY offshore facility.
- 8.2 Installed services required to perform WORK, including diesel fuel, air, water, and electricity.
- 8.3 Marine and air transport of CONTRACTOR's materials, tools, equipment, and personnel between COMPANY's designated marine and air supply bases and the offshore location. COMPANY shall select type of transport.

Appendix 1 – Supplier Performance Management

In accordance with Section 2, Clauses 32.1 through 32.7, performance management will be integral to the WORK. The mandatory global Key Performance Indicators (KPIs) includes metrics for HSSE, Cost, Efficiency, Quality, and Incremental Benefit Delivered (IBD).

1.0 SUPPLIER PERFORMANCE MANAGEMENT

1.1. Definition of Supplier Performance Management

Supplier Performance Management (SPM) is one of eight COMPANY common processes and it is the process by which COMPANY gains assurance that CONTRACTOR's performance is meeting or exceeding the CONTRACT requirements. The process, as more fully described herein, comprises the measurement of CONTRACTOR's performance against predefined targets, rating of performance, identification of gaps in performance, and implementation of actions that are required in order to ensure CONTRACTOR's achievement of the agreed performance levels. By implementing the SPM process and through working in a cooperative manner, COMPANY and CONTRACTOR shall create the potential for CONTRACTOR's performance to exceed COMPANY's expectations and targets.

1.2. Key Objectives of SPM

The SPM process is implemented in order to deliver the following objectives:

- 1.2.1 To drive continuous performance improvement;
- 1.2.2 To ensure CONTRACTOR's alignment with COMPANY's business processes, objectives, drivers and expectations;
- 1.2.3 To encourage a culture of performance enhancement and assist in identifying performance gaps;
- 1.2.4 To create transparency of performance allowing COMPANY to benchmark performance over a wider sector;
- 1.2.5 To ensure that focus is maintained on performance through regular, structured, and significant performance reviews;
- 1.2.6 To assist in the development of a long term relationship which promotes enhanced delivery; and
- 1.2.7 To allow management of the relationship between COMPANY and CONTRACTOR at the various levels of:
 - (a) Well Section
 - (b) Well;
 - (c) Project; and
 - (d) Product Line / Supply Market Sector

1.3. COMPANY Commitment to Supplier Performance Management

The SPM process is a key element of COMPANY's Procurement and Supply Chain Management process. Accordingly, COMPANY places a high level of importance on implementing a robust process that is designed to sustain and enhance the overall delivery. COMPANY shall work cooperatively with CONTRACTOR in order to promote continuous improvement.

1.4. CONTRACTOR Commitment to Supplier Performance Management

CONTRACTOR shall work with COMPANY in order to implement SPM throughout the various phases of each individual product line or sector. The measures described herein shall be subject to ongoing monitoring and review by COMPANY in conjunction with CONTRACTOR. As such, CONTRACTOR shall work in a cooperative manner with COMPANY in order to implement appropriate changes to the measures and targets that may be required in sustaining continuous improvement.

2.0 SUPPLIER PERFORMANCE MANAGEMENT PROCESS

2.1 General

In implementing a successful SPM process, three key elements require consideration:

2.1.1 Organizational Support and Competency

A fundamental requirement of the SPM process is to develop a relationship between COMPANY and CONTRACTOR which enables the delivery of extraordinary performance. This relationship shall be developed at three levels:

- (a) Management level within the individual Wells programs or Strategic Performance Units (SPU);
- (b) Management level within individual Projects; and
- (c) Executive level beyond the Project to the Product Line / Supply Market Sector

2.1.2 Measures and Targets

- (a) Clear and objective targets against which performance can be measured shall be set and where appropriate, corrective action taken. The key to successful implementation of SPM is to have clearly defined and agreed targets and a measurement system that will provide visibility of actual performance against a predefined benchmark. To this end COMPANY and CONTRACTOR have agreed a series of balanced score cards which are fed by the measurement and recording of performance against lower level Key Performance Indicators (KPIs); and
- (b) The balanced score cards and KPIs will be agreed between COMPANY and CONTRACTOR. From time to time, both the balanced score card and the KPIs will be subject to change in order to improve performance monitoring to increase the quality of the results for subsequent analysis.

2.1.3 Performance Review

Section 3 – Scope of Work
Appendix 1 – Supplier Performance Management

Formal meetings to cover performance shall be held at the SPU level and executive level. The requirements and function of the performance reviews are detailed under Clause 3.2 and 3.3 herein.

2.2 Balanced Score Card

COMPANY and CONTRACTOR will agree on a balanced score card which shall be used by the PARTIES to monitor and record CONTRACTOR's performance. The balanced score card considers a range of metrics which are designed to provide an objective view of CONTRACTOR's overall performance. Each element within the score card is assigned a value which is a weighting that represents its importance in determining the overall standard of performance of CONTRACTOR. The minimum performance metrics utilized within the balanced score card are:

- 2.2.1 HSSE;
- 2.2.2 Quality;
- 2.2.3 The specific SPU and / or service line content;
- 2.2.4 Technical and Operational Performance;
- 2.2.5 Commercial;
- 2.2.6 People;
- 2.2.7 Innovation; and
- 2.2.8 Incremental Benefit Delivered (IBD)

The weightings of the balanced score card may be adjusted in order to represent changes in risk and / or priorities. COMPANY and CONTRACTOR shall review the relevance of the weightings during the scheduled Performance Reviews and prior to the commencement of WORK. However, to ensure some level of consistency across all of COMPANY SPUs, score cards will only be reviewed for material changes to the metrics, KPIs, weightings, and / or score card appearance on an annual basis. If such changes have a valid business case and show a positive return on the investment, and do not materially impact the SPM process at other SPUs, they will be submitted for modification.

2.3 Key Performance Indicators (KPIs)

2.3.1 At a level below the balanced score card as described under Clause 2.2 herein, a series of KPIs will be developed to enable meaningful and accurate measurement. At the outset of the CONTRACT, the KPIs will be established by COMPANY as being of importance in determining the overall standard of CONTRACTOR's performance. In agreeing to the KPIs, each PARTY has given consideration to:

- (a) Identification of risks to the overall success of the individual Projects and mitigation of same;
- (b) What processes need to be measured in order to demonstrate that the identified risks are being managed and mitigated effectively;
- (c) What performance levels represent a benchmark for current performance;

Section 3 – Scope of Work
Appendix 1 – Supplier Performance Management

- (d) What the performance target shall be;
- (e) Establishing a targeted balance of forward looking KPIs and retrospective KPIs;
and
- (f) The contribution and relationship each individual KPI has in determining the performance rating at balanced score card level.

2.3.2 During the term of the CONTRACT the applicability, risks, and priority may change. Equally, as performance levels become visible it will be necessary for targets and benchmarks to be reset in order to drive continuous improvement. Accordingly the KPIs will be subject to an ongoing process of review and refinement throughout the CONTRACT.

2.3.3 The relevance of the KPIs shall be reviewed by COMPANY and CONTRACTOR during the scheduled Performance Reviews and prior to the commencement of each individual project.

2.3.4 Notwithstanding anything else contained herein, CONTRACTOR recognizes that the implementation of SPM is an integral part of COMPANY's business processes. As such, COMPANY seeks to ensure that a level of consistency is maintained across its CONTRACTORS working within the same sector. Accordingly, CONTRACTOR acknowledges and accepts that the establishment and agreement of KPIs will be influenced by COMPANY's sector benchmarking requirements. To this end, COMPANY has the right to implement such KPIs with or without CONTRACTOR's explicit agreement. In these circumstances CONTRACTOR shall continue to provide COMPANY with such information, reporting, and support that it would otherwise have provided shall the KPI have been agreed to in advance by CONTRACTOR.

2.4 Weighting of Score Cards and KPIs

Weightings are used to recognize the relationship and more particularly the importance of individual aspects of the balanced score card and individual KPIs. KPI weightings will be established at the outset of the CONTRACT and may be adjusted during the term of the CONTRACT.

2.5 CONTRACTOR Personnel

CONTRACTOR shall assign one member to assume overall responsibility for reporting performance, liaising with COMPANY on SPM issues, developing action plans for continuous improvement, and working with COMPANY in order to refine the KPIs and balanced score cards. Further, the individual shall have responsibility for increasing awareness of SPM within CONTRACTOR's wider project team. Such an individual shall be classified as a member of CONTRACTOR's key personnel and shall be assigned to SPM duties on a part-time basis.

CONTRACTOR shall commit other appropriate personnel as may be required to support the SPM process and to participate in the appropriate performance review meetings. Such personnel shall be at the appropriate management level.

2.6 COMPANY Personnel

COMPANY shall notify CONTRACTOR of the specific roles and responsibilities of the personnel appointed to implement and manage the SPM process on behalf of COMPANY. General roles that may be performed may include, but not necessarily be limited to the following:

- 2.6.1 Relationship Manager (REM) – Works at a high level with CONTRACTOR's senior management in order to ensure alignment with COMPANY's expectations and objectives for delivery;
- 2.6.2 Sector Team Lead (STL) / Sub-Sector Specialist – Provides input regarding sector strategy, performance targets, and achievements for the relevant sector and ensures SPM supports the business strategy;
- 2.6.3 Contract Accountable Manager (CAM) – Responsible for monitoring CONTRACTOR's performance and is the focal point for interaction with CONTRACTOR;
- 2.6.4 Specialists – Responsible for providing assistance in appropriate performance areas such as HSSE, Quality, Technical, Supply Chain Management, etc. Such personnel may be engaged to suit particular needs or focus.
- 2.6.5 Supplier Performance Management Champion – Each Strategic Performance Unit (SPU) may designate an individual that is accountable for providing support to the SPM process, liaising with the SPU Line and Management, ensuring efficacy of system and being the focal point for score card / metrics issues and improvements and communication of same to Drilling and Completions Wells Services;
- 2.6.6 Drilling and Completions Wells Services SPM Administrator – Accountable for system architecture and compliance to COMPANY Common Processes. Liaison between SPUs and software provider to troubleshoot, manage score card and system additions and changes and management of the KPI libraries. Responsible for improving user interfaces, relevant reporting output, and compliance to budgeted system maintenance and support costs.

3.0 PERFORMANCE REVIEW

3.1 KPI Scoring Process

- 3.1.1 At least every six months, COMPANY shall review and score CONTRACTOR performance against the KPIs. Where appropriate, the scoring shall be supplemented with information, documentation, and feedback from other COMPANY personnel.
- 3.1.2 CONTRACTOR's overall performance shall be assessed by collating and reviewing the individual score cards and KPIs. COMPANY shall use this information in order to generate an overall balanced score card which shall be used to monitor CONTRACTOR's performance. CONTRACTOR's performance, trends, divergences in performance between projects and wells and any resultant action plans shall be discussed as part of the formal performance review meeting.

3.2 Performance Review Process

Section 3 – Scope of Work
Appendix 1 – Supplier Performance Management

COMPANY's relationships with CONTRACTORS occur at different levels of each party's organization. The Supplier Performance Management (SPM) process is focused at operational and performance-based levels. To manage the relationship at these hierarchically higher levels the SPM process drives continuous performance through Performance Review Meetings (PRM). The most important of those are described as follows:

3.2.1 Performance Review Meetings (PRMs);

- (a) On a quarterly basis, or other frequency as mutually agreed, a performance review meeting shall be conducted where CONTRACTOR's performance shall be benchmarked for the prior KPI measurement period; and
- (b) The PRM meeting shall provide a forum to discuss issues related to performance, management, future workload and organizational issues. While COMPANY shall offer a summary view of CONTRACTOR's quarterly performance, the focus of the PRM is on identifying future actions required, misalignment between the PARTIES, corrective action, risk mitigation actions, performance improvement, or re-establishing KPIs and targets in order to ensure that the performance standards are achieved if not exceeded.
- (c) The output from the PRM shall be a clear and concise action list, which shall include, but not be limited to, the following information: action description; action party; date raised; target date for completion; actual date completed; action status; and issues
- (d) CONTRACTOR shall be responsible for implementing, populating, updating and maintaining the action log and tracking system and provide COMPANY with unrestricted access to this information at all times. CONTRACTOR shall also prepare regular analysis of the entire system in order to identify recurring actions, trends, and common themes. This information will be presented at the PRM and will be used to demonstrate the effectiveness of the remedial actions implemented.

3.2.2 Global Business Reviews (GBR)

For certain strategic CONTRACTORS, Global Business Reviews may be held in addition to the regular PRM. The GBR is conducted between the Senior Leadership of COMPANY and CONTRACTOR, either annual or biannually. The intent of these meetings is to create strategic alignment and drive performance-based relationships by considering local, regional, and global trends against globally consistent KPIs and "best in class" performers.

4.0 KEY PERFORMANCE INDICATORS

In reference to Section 3 – Scope of Work, Appendix 1 – Supplier Performance Management, Clause 2.3, above, Key Performance Indicators (KPIs) have been developed for several Sub-Sectors. This information is found in Section 3 – Scope of Work, Appendix 5 – Description of the Work.

Appendix 2 – Work Order

Section 3 – Scope of Work
Appendix 2 – Work Order

WORK ORDER

Date: _____

WORK ORDER requested by: _____
(Name)

This WORK ORDER is subject to the terms and conditions of CONTRACT No. _____
between COMPANY, _____, and CONTRACTOR,
_____, effective (MM/DD/YYYY). NOTHING CONTAINED IN THIS WORK
ORDER SHALL BE CONSTRUED AS AN AMENDMENT TO THE TERMS OF THE
REFERENCED CONTRACT.

CONTRACTOR: _____

WORK ORDER No: _____

Pay Key No, if applicable. _____

Project Identification: _____

Value of WORK ORDER: _____

Estimated Maximum Price: _____

Expected completion date: _____

Description / Scope of Work: _____

Forward invoices / statements to: _____

Attention: _____
WORK ORDER No. _____
Pay Key No. _____

ACCEPTED BY: _____

CONTRACTOR

Date: _____

APPROVED BY: _____

COMPANY

Date: _____

Notices: _____

Attention: _____
Mail Code: _____
Office Phone: _____
Cell Phone: _____
Fax: _____
Email: _____

Attention: _____
Mail Code: _____
Office Phone: _____
Cell Phone: _____
Fax: _____
Email: _____

Appendix 3 – Change Order

Section 3 – Scope of Work
Appendix 3 – Change Order

CHANGE ORDER

NOTHING CONTAINED IN THIS CHANGE ORDER SHALL BE CONSTRUED AS AN
AMENDMENT TO THE TERMS OF THE REFERENCED CONTRACT.

CHANGE ORDER Number: type number
WORK ORDER Number: type number
CONTRACT Number: type number
Project Code / Identification (if applicable): type number
Date: _____
WORK ORDER requested by: _____
(Name)

1. DESCRIPTION OF CHANGE OF WORK

*(A summary of clarification, modification, expansion, or reduction of Work will be stated,
and attachments, if any, will be listed.)*

2. COMPENSATION

(Any changes thereto will be stated.)

3. COMPLETION DATE

(Any change to the Completion Date stated in the Work Order.)

4. ORIGINAL WORK ORDER VALUE

VALUE OF APPROVED CHANGE ORDERS TO DATE

THIS CHANGE ORDER VALUE

TOTAL CURRENT WORK ORDER VALUE

COMPANY APPROVAL

DATE

CONTRACTOR ACCEPTANCE

DATE

Appendix 4 – Subcontractors / Contractor's Key Personnel

A. Cementing Services

1.0 SUBCONTRACTORS

CONTRACTOR intends to employ the following SUBCONTRACTORS, which, collectively, account for a minimum of 80% of the WORK to be outsourced. This list of SUBCONTRACTORS must be a rank-order of SUBCONTRACTORS in descending order of anticipated total payments.

Subcontractor	Work to be Performed	% Value of Work
This table is not applicable to this CONTRACT.		

2.0 CONTRACTOR KEY PERSONNEL

2.1 COMPANY designates the following as key positions of CONTRACTOR.

Position	Quantity	Minimum Competency Requirements
Key Personnel are identified in Section 3, Appendix 5, Description of the Work		

2.2 In the event that CONTRACTOR or COMPANY determines that Key Personnel need to be replaced, CONTRACTOR shall provide and agree with COMPANY a management of change

Section 3 – Scope of Work
Appendix 4 – Subcontractors, Suppliers and Contractor's Key Personnel

procedure. A replacement person shall work with the person to be replaced for a period of time determined by COMPANY. All expenses associated with the replacement of key personnel shall be for CONTRACTOR account. For the avoidance of any doubt, this means that CONTRACTOR shall not charge COMPANY for any person's time or expenses while they are being trained and / or assuming duties for any person being replaced.

B. Fluids Services

1.0 SUBCONTRACTORS

CONTRACTOR intends to employ the following SUBCONTRACTORS which, collectively, account for a minimum of 80% of the WORK to be outsourced. This list of SUBCONTRACTORS must be a rank-order of SUBCONTRACTORS in descending order of anticipated total payments.

Subcontractor	Work to be Performed	% Value of Work
This table is not applicable to this CONTRACT.		

2.0 CONTRACTOR KEY PERSONNEL

2.1 COMPANY designates the following as key positions of CONTRACTOR.

2.1.1 Gulf of Mexico

Position	Minimum Competency Requirements
Project Coordinator	<ul style="list-style-type: none">• Bachelors degree in a science or engineering discipline, or have commensurate industry experience.• Must have Drilling Fluids School• Proven ability to analyze drilling programs / operations and integrate objectives into fluids programs.• Current knowledge of drilling fluid products, applications, and Innovations.• Engineer has worked as an in-house offshore operations engineer for a minimum of 7 years, of which 3 must have been in the GoM.• Desired field experience 10 years• Familiar with COMPANY procedures for ordering, receiving, shipping, and documenting.• Be capable of manage several PFM projects in GoM Deepwater.
Project DESC Engineer	<ul style="list-style-type: none">• Bachelors degree in a science or engineering discipline, or have

Section 3 – Scope of Work
Appendix 4 – Subcontractors, Suppliers and Contractor's Key Personnel

Position	Minimum Competency Requirements
	<p>commensurate industry experience.</p> <ul style="list-style-type: none"> • Must have Drilling Fluids School • Proven ability to analyze drilling programs / operations and integrate objectives into fluids programs. • Current knowledge of drilling fluid products, applications and Innovations • Engineer has worked as an in-house offshore operations engineer for a minimum of 3 years of which 2 must have been in the GoM. • Desired field experience – 9 years with 2 wells using Synthetic Based Mud system • Good understanding of sub salt drilling practices in GoM, and is capable of discussion salt drilling issues with the team. • Ability to use or willing to learn COMPANY DIMS reporting system. • Have general knowledge of and actively contribute to COMPANY well planning tools (e.g., Risk Analysis Tool – RAT, Drilling & Completion Uncertainty Statement – DCUS, Well Plan, Well Control toolkit)
Lead Mud Engineer	<ul style="list-style-type: none"> • Bachelors degree in a science or engineering discipline, or have commensurate industry experience. • Must have Drilling Fluids School • Proven ability to analyze drilling programs / operations and integrate objectives into fluids programs. • Current knowledge of drilling fluid products, applications and Innovations • Engineer has worked as field offshore fluids engineer for a minimum of 7 years of which 4 must have been in the GoM. • Desired field experience – 7 years with 2 wells using Synthetic Based Mud system • Good understanding of sub salt drilling practices in GoM, and is capable of discussion salt drilling issues with the team. • Ability to use or willing to learn COMPANY DIMS reporting system. • Proven knowledge of COMPANY deepwater well control procedures • Ability to provide drilling hydraulics planning and real time analysis.
PFM Compliance Engineer	<ul style="list-style-type: none"> • Bachelors degree in a science or engineering discipline, or have commensurate industry experience. • Must have Drilling Fluids School • Proven ability to analyze drilling programs / operations and integrate objectives into fluids programs. • Current knowledge of drilling fluid products, applications and Innovations • Engineer has worked as field offshore compliance engineer for a minimum of 3 years of which 1 must have been in the GoM. • Desired minimum field experience – 5 years. • Desired to have certified TFP training. • Proven knowledge of Best Management Practices and Waste

Section 3 – Scope of Work
Appendix 4 – Subcontractors, Suppliers and Contractor's Key Personnel

Position	Minimum Competency Requirements
	Management Programs. Must have experience in regulatory discharge compliance.
Mud Engineer	<ul style="list-style-type: none">• Should have sufficient industry experience to execute project requirements.• Must have Basic Drilling Fluids School• Proven ability to analyze fluid programs / operations and identify potential for reducing waste stream.• Must have worked as Mud Engineer or PFM Specialist for a minimum of 3 years in GoM.• Desired field experience – 5 years.
Completions Fluid Engineer	<ul style="list-style-type: none">• Should have sufficient industry experience to execute project requirements.• Must have Drilling Fluids and Completion Fluid School• Proven ability to analyze brine programs / operations and identify potential for reducing waste stream.• Must have worked as completion engineer for a minimum of 5 years in GoM.• Desired field experience – 7 years.

C. Well Placement

1.0 SUBCONTRACTORS

CONTRACTOR intends to employ the following SUBCONTRACTORS which, collectively, account for a minimum of 80% of the WORK to be outsourced. This list of SUBCONTRACTORS must be a rank-order of SUBCONTRACTORS in descending order of anticipated total payments.

Subcontractor	Work to be Performed	% Value of Work
This table is not applicable to this CONTRACT.		

2.0 CONTRACTOR KEY PERSONNEL

Position	Minimum Competency Requirements
Key Personnel are identified in Section 3, Appendix 5, Description of the Work	

D. Wireline Services

1.0 SUBCONTRACTORS

CONTRACTOR intends to employ the following SUBCONTRACTORS which, collectively, account for a minimum of 80% of the WORK to be outsourced. This list of SUBCONTRACTORS must be a rank-order of SUBCONTRACTORS in descending order of anticipated total payments.

SUBCONTRACTOR	Work to be Performed	% Value of Work
This table is not applicable to this CONTRACT.		

2.0 CONTRACTOR KEY PERSONNEL

Position	Minimum Competency Expectation
Senior Logging Engineer	Bachelors degree in engineering or physical sciences or the equivalent practical experience; minimum of 5 years experience in Open, Cased Hole and Perforating services; CONTRACTOR sponsored formal training in all tools the Sr. Logging Engineer will run on behalf of COMPANY
Senior Logging Operator	Minimum of 5 years experience in Open, Cased Hole and Perforating services.

E. Completions

1.0 SUBCONTRACTORS

CONTRACTOR intends to employ the following SUBCONTRACTORS which, collectively, account for a minimum of 80% of the WORK to be outsourced. This list of SUBCONTRACTORS must be a rank-order of SUBCONTRACTORS in descending order of anticipated total payments.

Subcontractor	Work to be Performed	% Value of Work
This table is not applicable to this CONTRACT.		

2.0 CONTRACTOR KEY PERSONNEL

2.1 COMPANY designates the following as key positions of CONTRACTOR.

2.1.1 Gulf of Mexico

Position	Minimum Competency Requirements
Account Manager	<ul style="list-style-type: none">- At the discretion of COMPANY, an Account Manager may be required. If required, candidate qualifications shall be consistent with Section 3, Appendix 5
Technical and Engineering Support	<ul style="list-style-type: none">- At the discretion of COMPANY, Technical and Engineering Support personnel may be required. If required, candidate qualifications shall be consistent with Section 3, Appendix 5
Upper Completions Specialist	<ul style="list-style-type: none">- Expert knowledge of products, applications, and innovations related to Upper Completions- Must have worked as a lead Upper Completions Specialist for a minimum of three (3) years- Desired minimum field experience five (5) years
Sand Face Tool Specialist	<ul style="list-style-type: none">- Expert knowledge of products, applications, and innovations related to Sand Face Tools- Must have worked as a lead Sand Face Tools Specialist for a minimum of three (3) years- Desired minimum field experience five (5) years

Section 3 – Scope of WORK
Appendix 4 – Subcontractors, Suppliers and CONTRACTOR's Key Personnel

Position	Minimum Competency Requirements
TCP / DST Tool Specialist	<ul style="list-style-type: none">- Expert knowledge of products, applications, and innovations related to Tubing Conveyed Perforating / Drill Stem Testing- Must have worked as a lead TCP / DST Specialist for a minimum of three (3) years- Desired minimum field experience five (5) years
Pumping Supervisor	<ul style="list-style-type: none">- Expert knowledge of products, applications, and innovations related to Pumping- Must have worked as a lead Pumping Supervisor for a minimum of three (3) years- Desired minimum field experience five (5) years
Offshore Laboratory Technician (Sand Control Services)	<ul style="list-style-type: none">- Expert knowledge of products, applications, and innovations related to Offshore Laboratory activities / work- Must have worked as a lead Offshore Laboratory Technician for a minimum of three (3) years- Desired minimum field experience five (5) years
Coordinator (Single Trip Gravel Pack Systems)	<ul style="list-style-type: none">- Expert knowledge of products, applications, and innovations related to Coordinator for single trip gravel pack systems- Must have worked as a lead Coordinator for single trip gravel pack systems for a minimum of three (3) years- Desired minimum field experience five (5) years

- 2.2 In the event that CONTRACTOR or COMPANY determines that Key Personnel need to be replaced, CONTRACTOR shall provide and agree with COMPANY a management of change procedure. A replacement person shall work with the person to be replaced for a period of time determined by COMPANY. All personnel time and personnel expenses associated with the replacement of key personnel shall be for CONTRACTOR account. For the avoidance of any doubt, this means that CONTRACTOR shall not charge COMPANY for any person's time or expenses while they are being trained and / or assuming duties for any person being replaced.

Appendix 5 – Description of the Work

A. Cementing Services

1.0 GENERAL

- 1.1 CONTRACTOR shall as requested by COMPANY provide cementing materials, engineering, mixing and pumping services, hereinafter referred to as "Cementing Services" as defined herein, which shall include but not be limited to:
 - 1.1.1 Primary cementing of all casing strings,
 - 1.1.2 Placement of cement plugs,
 - 1.1.3 Placement of loss circulation material,
 - 1.1.4 FIT or LOT operations remedial cementing,
 - 1.1.5 Pressure testing of equipment as required,
 - 1.1.6 Well control pumping services,
 - 1.1.7 Contingency slurry injection for the purpose of cuttings injection wells,
 - 1.1.8 Well intervention work,
 - 1.1.9 Real time data transmission and analysis using COMPANY's bandwidth on the rig communication system with CONTRACTOR's software and interface equipment in combination with software and interface equipment provided by others.
 - 1.1.10 CONTRACTOR's cement unit pumps shall only be used as rig pumps if requested by COMPANY in the event of a critical well condition.
- 1.2 Provide onshore engineering support to the operation, with a full and comprehensive technical back up to the operation. This shall include as a minimum:
 - 1.2.1 Development and update the cement Basis of Design (BOD),
 - 1.2.2 Slurry and spacer design,
 - 1.2.3 Job planning and design,
 - 1.2.4 Engineering simulations (pressures / temperatures / placement / mechanical failure),
 - 1.2.5 Operational management / supervision, and
 - 1.2.6 Job evaluation and reporting.
- 1.3 Provide and maintain fully operational cementing and pumping package suitable for all required cementing, pumping and pressure testing (surface and subsurface) and make immediate provision of cementing bulks and additives suitably bulked, sacked, or drummed necessary to provide all slurries and spacers as to COMPANY specification.

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- 1.4 Provide cement and additives suitably bulked, sacked, or drummed which are necessary for all slurries and spacers.
- 1.5 Provide tools, equipment, spares, or material as agreed by COMPANY either as rental or procurement item. These items shall include, but not be limited to the following:
 - 1.5.1 Casing consumables (floats, plugs, darts, etc.), and
 - 1.5.2 Dedicated cementing equipment (sub sea cement heads, plug launchers etc and related pipe work);

The above shall be available for transport by such means as mutually agreed by COMPANY and CONTRACTOR. Where CONTRACTOR cannot supply such tools, equipment, spares or materials from its own inventory, it shall offer to COMPANY an alternative tool, equipment, spare or material;
- 1.6 Provide services for a complete range of cement and slurry testing requirements;
- 1.7 Establish a program to provide (24) twenty-four hour technical support in order to provide an immediate response to problems arising during operations;
- 1.8 Provide access to COMPANY for audit of all services, equipment, materials, personnel, procedures, facilities. Where action items are identified during an audit, these shall be monitored using an action tracker and closed out in a timely manner;
- 1.9 Ensure the WORK is performed in accordance with COMPANY's Drilling and Well Operations Policy and Engineering Technical Practices and aligned with COMPANY Recommended Practices where available;
- 1.10 Propose alternate equipment and materials at the WORKSITE with the understanding that it has been previously approved by COMPANY and received written acceptance to a level to allow inclusion in the CONTRACT;
- 1.11 COMPANY reserves the right to request substitution of any material or service provided by CONTRACTOR which COMPANY deems unacceptable. CONTRACTOR shall ensure that such substituted material or service is compatible with the material and services supplied by CONTRACTOR;
- 1.12 Availability at the WORKSITE of the following which shall be provided to COMPANY and drilling unit contractor in respect to performance of the WORK:
 - 1.12.1 All pertinent plans and recommendations;
 - 1.12.2 Operating manual and laminated MSDS and product data sheets for all tools, equipment and materials;
 - 1.12.3 All shipping manifests for equipment and chemicals.

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2.0 PERSONNEL AND ENGINEERING

2.1 Account Coordinator

2.1.1 Roles and Responsibilities

CONTRACTOR shall designate an Account Coordinator to provide technical assurance regarding the quality of the service provided, and provide input to performance reviews as required by COMPANY. The Account Coordinator shall be required to review all programs to ensure standardization of engineering design and to ensure the best and appropriate technology is supplied. Responsibilities shall include, but not limited to:

- (a) Coordination of the WORK across the SPU;
- (b) Preparation and submission of the performance data;
- (c) Utilization of standardized processes minimizing the approaches being implemented;

The Account Coordinator shall be the primary point of contact for Contractual issues, and serve as a primary point for coordination of the WORK with COMPANY REPRESENTATIVE;

Prior to replacement of the Account Coordinator, a management of change document shall be submitted to COMPANY REPRESENTATIVE detailing the agreed upon handover of all responsibilities and timeline;

2.1.2 Competencies

A competency assessment for any proposed Account Coordinator or onshore engineering personnel shall be completed by CONTRACTOR as per Attachment A – Competence Assessment for Onshore Engineers. The assessment shall be completed and approved by COMPANY, prior to performing work on COMPANY's behalf. In the event the proposed individual does not meet the assessment requirements, CONTRACTOR shall comply with COMPANY's rectification plan.

The minimum requirements for this position are as follows:

- 2.1.3 Five years office based engineering experience, including experience in a development drilling project. A minimum of 50% of this experience shall have been as a lead account engineer on a drilling project;
- 2.1.4 Six years total experience in well cementing services industry;
- 2.1.5 Educated to University standards in science or engineering or posses sufficient industry equivalency as determined by COMPANY;
- 2.1.6 Fluent in English both written and oral;
- 2.1.7 Fully competent in all offered CONTRACTOR cement software modeling packages;
- 2.1.8 Understanding of management systems used to control service quality;

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2.1.9 Capable of performing all reporting requirements as designated by COMPANY;

2.1.10 STOP or Observation system trained;

2.1.11 Capable of performing behavior based safety audits;

2.2 Onshore Engineering

2.2.1 Roles and Responsibilities

CONTRACTOR shall provide to COMPANY an Onshore Engineer to work either in COMPANY's or CONTRACTOR's offices as required by COMPANY. This individual shall be a member of COMPANY's well planning team and:

- (a) Provide Safety Leadership training to all CONTRACTOR and SUBCONTRACTORS personnel performing work under the CONTRACT;
- (b) Participate in all COMPANY's safety initiatives and setting of safety targets and goals for all CONTRACTOR's and SUBCONTRACTORS personnel performing work under the CONTRACT;
- (c) Take full accountability for the technical quality, safety and environmental performance of all sub-contracted services managed by CONTRACTOR;
- (d) Ensure all CONTRACTOR or third party supplied equipment; bulks, chemicals, consumables and laboratory testing comply with agreed Quality Assurance and Quality Control standards;
- (e) Ensure that all produced documentation pertaining to COMPANY resides in a document control system where signatory authorities shall be described through the Responsible, Accountable, Consulted, Informed (RACI) process. Digital copies of all documentation shall be required, copies of which shall reside with COMPANY;
- (f) Produce and update a BOD document for the project. The objective of this document is to record the major decisions and their process of determination. The document shall be controlled and auditable;
- (g) Apply risk based engineering processes to prepare the BOD, individual well programs and all associated engineering and documentation;
- (h) Produce cost estimates for all services supplied by CONTRACTOR for individual wells or a time related program. The estimates shall be based on P₁₀, P₅₀ and a P₉₀ durations supplied by COMPANY. All such cost estimations shall include all associated costs for the project. This shall include as a minimum, personnel, (pump) equipment utilization and consumables;
- (i) Provide engineering support for all aspects of the service provided and fully competent in running all engineering software models offered to support the service, including the ability to run CONTRACTOR's cementing software from COMPANY's office;

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- (j) Provide solutions where conventional cement design and procedures are not suitable, such as blend and foam cement;
- (k) Make recommendations on fit for purpose slurry designs to meet agreed specification;
- (l) Participate in the review of the previous days drilling activities with COMPANY's onsite and offsite drilling management as required;
- (m) Work with other service providers such as drilling/completion fluids and directional drilling;
- (n) Provide technical input to the selection and operation of cementing equipment provided by CONTRACTOR;
- (o) Conduct a review with COMPANY and other CONTRACTOR personnel for BOD and the final program on critical wells;
- (p) Participate in risk assessments as required by COMPANY;
- (q) Participate in pre-spud and well close out meetings, including the presentation of the cement part of well program highlighting critical issues;
- (r) Perform rig visits on an ad-hoc basis but as a minimum once per 6 months. The purpose of the visit is to ensure that CONTRACTOR's personnel are working in a safe and workmanlike manner. An inspection system is to be developed which shall cover as a minimum chemical storage and handling, equipment maintenance, record keeping, bulk transfer procedures, quality of service provided to COMPANY and interface skills with the rig contractor;
- (s) Provide and maintain close out of inspection and failure / problem analysis reports as agreed by COMPANY and CONTRACTOR. CONTRACTOR shall provide full details on problems and issues in order to ensure capture of successes, lessons learned and continuous improvement;
- (t) Develop project / study reports as necessary upon Identification of Issues by COMPANY or CONTRACTOR. Such projects / studies shall have an agreed scope of work, objective, and deliverable prior to commencement. This type of work shall be part of CONTRACTOR's commitment to improve drilling performance. As mutually agreed between CONTRACTOR and COMPANY, this work will be paid for by COMPANY at the agreed hourly rate for laboratory support only when the work is considered to be outside that as described as "normal" for CONTRACT support;
- (u) Supervise all onshore make-up and loading of cementing and equipment as required by COMPANY (e.g., installation of plug and darts in wellhead and casing hanger running tools and cement heads);
- (v) Submit COMPANY PERFORMANCE SCORE CARDS within 28 days of well completion (or suspension of well if longer than 30 days);
- (w) CONTRACTOR's Onshore Engineer shall ensure the equipment is fit to perform the planned work;
- (x) Produce or ensure the following documents are prepared, approved, and issued:

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Cement Program

Cement program including:

- Specific well details which impact cementing design (depths/casing sizes/temperatures (static and circulating), hole sizes, proposed excess)
- Agreed Drilling and Completions SPM score card objectives as found in Attachment D – Global Drilling and Completions SPM Score Card.
- Slurry designs and expected properties
- Proposed spacers (volumes/formulations/properties)
- Assumed mud properties
- Temperature simulation results
- Predicted circulating densities and pressures at any potential loss zones
- Centralizer details (type and placement)
- Logistical, bulk and additive requirement
- Cementing hardware needed on location (cement head/water bushings etc.)
- Commercial breakdown of program covering:
 - i. Cement and chemicals
 - ii. Rental equipment
 - iii. Consumables
 - iv. Third party equipment being supplied
 - v. Personnel charges
- Recommended procedures and techniques
- Agreed contingencies

Detailed Cement Report

- Actual well details
- Slurry recipes
- Laboratory test results on rig materials
- Spacer design, volumes and recommended properties
- Equipment requirements
- Job execution procedures, including chemical handling bulk transfers and surface lines pressure testing
- Pumping schedule
- Displacement simulation and ECD prediction
- Frequency – Per cement job - 24 hours prior to execution

End of Well Reports

- A well synopsis (summary on well drilled, highlights and lowlights)
- Section job reports
- Detailed section discussion (what was achieved/lessons learnt/recommended changes)
- Discussion of any NPT or any incremental benefit
- Commercial Analysis/Reconciliation by section (all elements provided by CONTRACTOR shall be reported)
- Regional reporting requirements (e.g., legislative requirements including environmental reporting)
- Evaluation of cement jobs (TOC achieved, cement quality etc)
- Service breakdown
- Personnel breakdown
- Chemical breakdown
- Equipment breakdown
- Performance Measures
- Service quality during execution using a Quality Assessment

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- Frequency – Per well or batch program within four weeks of completion

Basis of Design

- Objectives - What needs to be achieved (e.g., what objective would incur cementing NPT if not achieved?)
- Boundaries - What are the design limits that need to be considered (e.g., fracture gradient or local legislative requirements?)
- Assumptions – What engineering decision have already been made (e.g., mud weight/casing size and setting depths?)
- Risks – What are key risks?
- Mitigations – How can the major risks be managed?
- Options – What cement design options exist?
- Selection – Based on technical / HSSE / commercial and identified risks, what are the best options for the project?
- Measurement – How can we evaluate cementing operation met objectives successfully?
- Frequency – Per well or batch program within four weeks of completion
- Project / Study Updates as required

Notes:

Depending on the volume of work, these duties may be performed by the Account Coordinator.

For new-to-CONTRACTOR engineering personnel being considered for work at COMPANY's locations, an induction system based on CONTRACTOR's and COMPANY's standards of performance shall be provided to and complied with by said personnel;

Service Company personnel shall complete a (2) two year term on COMPANY account and shall remain as a CONTRACTOR's resource to COMPANY for purposes of internal transfer and shall not be removed without mutual agreement by CONTRACTOR and COMPANY. Prior to any move a management of change document shall be submitted to COMPANY detailing the signed handover of all responsibilities and time line for move.

2.2.2 Onshore Engineer Competency

The minimum requirements for this position are but not limited to the following:

- (a) Three years office based engineering experience, including experience in a development project. A minimum of 50% of this shall have been spent as a lead account engineer on an offshore project
- (b) Six years total experience in cementing with at least three years working in a technically complex area with a major operator.
- (c) Educated to University standard in science or engineering or possess sufficient industry equivalency as determined by COMPANY.
- (d) Fluent in English verbal and writing
- (e) Be capable of performing all reporting in a highly proficient manner.

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- (f) STOP or Observation system trained.
- (g) Be capable of performing behavior based safety audits.

All proposed engineers shall be required to complete a competency assessment as per Attachment A – Competency Assessment Onshore Engineer; suitability may be further assessed via interview by COMPANY.

2.3 Offshore Engineering

2.3.1 Roles and Responsibilities

CONTRACTOR shall provide dedicated cementers assigned to each rig as requested by COMPANY. Prior to the start of the WORK on any rig, the cementer shall be thoroughly inducted into operational and technical functions and processes of the rig and also the technical issues associated with the WORK on the rig. It shall be the responsibility of CONTRACTOR to provide this induction. The process should include an induction pack, the Basis of Design and Guide Book for the project plus a thorough briefing on the program of work to be carried out.

During the term of CONTRACT nominated lead cementers shall serve a minimum of (18) eighteen months at an agreed location. No CONTRACTOR personnel shall be removed from WORKSITE for purposes of internal transfer without mutual agreement by CONTRACTOR and COMPANY. Prior to any move a management of change document shall be submitted to COMPANY detailing the signed handover of all responsibilities and time line.

The number of CONTRACTOR's personnel shall be dictated by operational need as required by COMPANY. The role of the offshore cementer shall include but not be limited to the following responsibilities:

- (a) Safety Leadership role – Rig site engineers shall be expected to take an active part in all aspects of safety on the drilling rig including STOP/Observation card system or other such campaigns, risk assessments and safety auditing. All engineers shall be STOP/Observation system trained. No engineers shall be allowed to work on COMPANY operations unless this has been completed. In addition, all Lead cementers shall attend safety training to ensure compliance with COMPANY's standard on Integrity Management. If this has not been completed prior to the Lead cementer starting to work offshore, the time frame by which this shall be completed shall be agreed at the competency assessment interview;
- (b) All SUBCONTRACTOR personnel shall report through the Lead cementer as their first line of reporting in addition to having a reporting line to COMPANY's representative on the drilling rig. The Lead cementer shall be accountable for the safety, technical and environmental performance of any SUBCONTRACTOR personnel working for CONTRACTOR on the drilling rig;
- (c) Competent operation of CONTRACTOR supplied equipment on the rig;
- (d) Routine/preventative maintenance of all CONTRACTORS supplied equipment;
- (e) Execution of all cementing programs;

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- (f) Pressure testing and pumping;
- (g) Pre-job tests and checks of CONTRACTOR, COMPANY and Drilling Contractor supplied equipment where this applies to the cement unit and its associated systems;
- (h) Plan all cement jobs delivering detailed procedures in written format to COMPANY, including all cementing calculations, chemical handling, bulk transfer and specialist equipment procedures;
- (i) Provide expertise for all operational cementing issues on the rig;
- (j) Accurately prepare and or supervise the preparation of cement mix water and CONTRACTOR supplied spacers. All spacers shall have density and rheology confirmed prior to pumping and information recorded in job report;
- (k) Ensure a chloride analysis is completed on any fresh water used for cementing offshore;
- (l) Supervise acquisition, handling, packaging, labeling and shipping of samples of all slurry ingredients to CONTRACTOR laboratory for testing in timely manor;
- (m) Be capable of performing offshore cement tests when required by COMPANY;
- (n) Take the following samples using "best practices";
 - i. Bulk cement
 - ii. Spacer for onsite verification
 - iii. Slurry and component materials pumped.
- (o) In the event of multi service operators, deploy down hole tools in all well types; including but not limited to:
 - i. Bridge plugs
 - ii. Cement retainers
 - iii. Retrievable packers
 - iv. Competent in all the calculations necessary for setting and testing all down hole tools;
- (p) Produce service reports and pressure test charts after each service job including those of sub-contracted services as per COMPANY specification in a timely and professional manner. This shall be using CONTRACTOR's reporting system or as specified;
- (q) Maintain a daily job record of activities during his period on the rig;
- (r) Provide inventory management and daily reporting;

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- (s) Make regular recommendations for continuous performance improvement and reporting lessons learned, good and bad, with respect to the well program, the implementation of the program, equipment and logistics;
- (t) Provide economical management of costs;
- (u) Provide service related "Tool Box" talks to the rig crew covering services provided by CONTRACTOR;
- (v) Compile a rig specific historical document to capture all rig specific working practices and project lessons learned to be made available to new CONTRACTOR personnel assigned to the operation.

2.3.2 Offshore Cementing Competency

CONTRACTOR shall supply CV and job history for proposed offshore cementing operators and where possible verification of competence by an industry or CONTRACTOR qualification.

The following are the minimum requirements for an offshore cementing position:

- (a) Eight years cement field experience, four years of which should have on semi submersibles, a minimum of three years as a lead cementer including one year on a deep water project;
- (b) Experience with low density blend slurries and nitrogen cementing; experience of pre job preparation and calculations associated with both options and mixing and pumping of them;
- (c) Rated within the top quartile of CONTRACTOR's cementers;
- (d) Trained and experienced with operating automatic Liquid Additive System if installed.

2.4 Other Personnel

CONTRACTOR personnel working offshore shall carry a documented record with them detailing the following items: technical/operational training; experience; safety and environmental training; and specific areas of competence (e.g., high pressure testing, operating down-hole tools)

2.4.1 Pump Operator

COMPANY shall from time to time, require on the rig, a Pump Operator with auditable competency for high pressure pumping and testing.

2.4.2 Ad Hoc Specialists

CONTRACTOR, shall as required by COMPANY, provide technically competent and experienced specialist personnel on an ad-hoc basis. Additional personnel may include but are not limited to: additional cement operator; cementing helper; bulk operators; mechanics; down-hole tool engineer; instrument technicians; HSSE professionals; laboratory technicians; and cementing supervisor

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3.0 EQUIPMENT

3.1 Cement Mixing and Pumping Package – General

A cement mixing and pumping package shall be available from CONTRACTOR suitable for all required cementing, pumping and pressure testing (surface and subsurface) as required by COMPANY.

3.2 Cement Mixing and Pumping Package – Specifications

3.2.1 Unit minimum requirements – Offshore

Cementing and Pumping Package shall have all necessary certification of compliance with local environmental regulations. Free placement units shall be capable of meeting the original design specifications for pressure and mixing rate. Cement units shall have the following minimum following components/requirements:

- (a) Re-circulating mixer with minimum 6 bbl capacity
- (b) Data recording pressure, rate and flow (real time and a permanent copy)
- (c) Automatic density controlled mixing with control better than +/- 0.2 ppg
- (d) Martin Decker recorder
- (e) Pipe work valves and connections necessary for cement mixing and pressure testing
- (f) A contingency mixing system (e.g., jet mixer)
- (g) Displacement tanks shall be calibrated and a plate affixed showing true volumes including sump volume
- (h) Displacement tanks shall be fitted with Lightning mixers or some equivalent agitation system.
- (i) All power units shall conform to the applicable zoning specifications detailed in the rig-operating manual. All such systems shall be correctly installed to applicable certification standards.
- (j) Twin pump skid
- (k) Liquid Additive System (LAS)
- (l) Minimum pressure rating 10,000psi
- (m) A pumping capability of: 2 bpm @ 10,000 psi; 3.6 bpm @ 4900 psi; and 18 bpm @ 1000 psi
- (n) Mixing performance of: 12 bpm @ 11 ppg; 6 bpm @ 16 ppg; and 2 bpm @ 22 ppg
- (o) Low pressure gauge (0-500psi)

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(p) Solid fraction analyzer when slurries <12.6 ppg are to be used

Notes:

All recording devices on the cement unit or associated cementing equipment e.g., Martin-Decker units, flow meters, gauges, densitometers etc. shall be maintained and calibrated according to manufacturers recommendations. Documentation of calibration shall be submitted to COMPANY on request.

Where a Liquid Additive System (LAS) is provided, it shall be fully calibrated and the calibration record retained at the Rig fixed to the unit. The LAS shall have the capability to meter at least (4) four additives into either displacement tank through dedicated pipe work. There should be the ability to agitate the additives in the storage tanks and allow heating if necessary in cold weather. The LAS shall be configured to prevent overfilling of any dump tank or to ensure any spillage is contained. Dump tanks shall not allow filling and emptying to occur at the same time. Where an automated LAS has been installed prior to each job CONTRACTOR shall supply evidence that LAS system has been programmed and shall accurately add the recommended additive concentrations within +/- 5% of the required rate irrelevant of mixing rate.

Where the cement unit is a Free Placement item, CONTRACTOR shall assume all cost for installation and removal of the unit.

Density calibration of any automatic density mixing and recording system shall occur prior to every job with water and a heavier fluid than the anticipated slurry weight.

Where lightweight blend slurries are pumped with a density of <12.6ppg an alternative method of controlling density based on solids shall be available.

- 3.2.2 CONTRACTOR shall have written maintenance procedures and schedules for all cement units and associated equipment used in provision of the WORK. These procedures and schedules should be based on recommendations of equipment manufacturers. Records of maintenance kept up to date shall be available for inspection by COMPANY.
- 3.2.3 CONTRACTOR shall ensure that adequate spare parts, required for the cementing equipment, are held at the rig.
- 3.2.4 Where a batch mixer is supplied a minimum of 100 bbl of pump able slurry is required having two (2) separate compartments with paddles and a re-circulating pump. Mixing directly into either side of the batch tank should be possible. It should be possible to mix from big bags into the batch tank through a mixing system.
- 3.2.5 Where a surge canister is provided as part of the cementing package, it shall be fitted with a weight indicator and shall be fully compatible with existing rig bulk system.
- 3.2.6 Where bulk tanks are also provided they shall be capable of supplying cement in an uninterrupted flow to the surge tank and shall not adversely affect the cement properties through aeration.
- 3.2.7 CONTRACTOR and rig contractor shall jointly develop low risk plans for the transfer of base oil, glycol and diesel fuel to the unit for pumping downhole.

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3.2.8 CONTRACTOR shall review pressure testing and pumping procedures to ensure alignment with COMPANY and owner installation policies.

3.2.9 Unit shall be equipped with suitable pressure relief valves.

4.0 CEMENT AND ADDITIVES

Cementing bulks and additives may be supplied by CONTRACTOR suitably containerized, sacked, or in tote tanks necessary to provide all slurries and spacers as to COMPANY specification.

4.1 Bulk Cement and Blends

CONTRACTOR shall supply bulk cement and prepare proprietary blends. The cement and blending processes are expected to meet the following minimum standards:

- 4.1.1 Air supply shall produce oil free air and air intakes shall be positioned to prevent damage to the cement due to draw in of CO₂. The dry bulk facilities shall have a dust collection system;
- 4.1.2 Air dyers shall be used for all air on the plant; these must be appropriate for the volume of air being used and have maintenance records available to confirm efficient operation;
- 4.1.3 Blending tanks should be appropriately sized for the amount of blend to be prepared with a suitably sized weight indicator accurate to +/- 2.5% of the smallest component of the blend to be added to the blender;
- 4.1.4 Permanent bulk silos shall have weight indicators with scales; these shall be suitable for size of the tanks on which they are installed. These shall be calibrated as a minimum on an annual basis and evidence of calibration shall be available on request of COMPANY;
- 4.1.5 CONTRACTOR shall provide an automatic in-line sampling device (or approved Y sampler) for use while transferring cement and blends. Samples of all cements taken shall be held for a minimum of 28 days prior to disposal. Samples should be sent to the laboratory in a sample kit to the same standard as referred to in Clause 5.2 of this Part A. Cementing Services of Appendix 5;
- 4.1.6 When providing blended product containing silica flour, not more than twelve percent (12%) by weight of silica shall be retained on 200 mesh. Approval for other blended products shall be required with COMPANY;
- 4.1.7 Blending procedures for proprietary lightweight blends must be agreed to by COMPANY. These blends shall meet the specifications outlined in Attachment B – Lightweight Proprietary Blends;
- 4.1.8 The bulk cement selected shall take into account service and service quality e.g., degradation due to high sulfate groundwater, strength retrogression due to exposure to high temperature during production, minimal batch to batch variability to ensure reliable performance, materials supplied as meeting an API/ISO Specification shall have all manufacturer supplied batches checked according to the appropriate API/ISO Specification, and a retarder response test is to be agreed to by COMPANY and used as an additional QA/QC check on bulk supplied.

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- 4.1.9 No additions shall be made to bulk cements supplied apart from the additive required to meet the agreed slurry specification without prior approval of COMPANY,
- 4.1.10 CONTRACTOR shall have a suitable facility to accept returned unused cement; the acceptability of this repository for re-supply shall be determined by COMPANY, if a cement is supplied out of specification by CONTRACTOR this shall be returned for full credit, and
- 4.1.11 CONTRACTOR shall confirm the acceptability and cleanliness of the bulk tanks and verify volumes prior to transferring to and from marine vessel, drilling rig, and cement unit. CONTRACTOR shall ensure that a comprehensive updated procedure for the transfer of bulks is available at the relevant transfer points.
- 4.1.12 Bulk facilities shall be located quay side to allow direct transfer to the supply vessel. The air compressor shall be of sufficient capacity to fully discharge the silos to within 5 percent of the nominal capacity. The compressor shall be capable of achieving discharge to the boat in a reasonable time (minimum acceptable rate 60 Ton/hour).

4.2 Additives and Chemicals

For offshore locations COMPANY's preferred approach will be using liquid additives wherever possible. Dry blends for offshore locations shall only be accepted where no equivalent liquid additive is available.

- 4.2.1 COMPANY reserves the right to specify any supplementary third party products in conjunction with the products supplied by CONTRACTOR. These products shall be those for which COMPANY deems CONTRACTOR does not have a suitable alternative. CONTRACTOR shall check that those products are compatible with CONTRACTOR's products by testing prior to their use.
- 4.2.2 All additives supplied under the CONTRACT shall comply with all local regulation and in any case, shall have been environmentally tested and found to be acceptable under the USA Chemical control system.
- 4.2.3 CONTRACTOR is to have in place a QA system for chemicals supplied to COMPANY. All supplied chemicals are to have a QA performance test prior to shipment to WORKSITE.
- 4.2.4 For additives loaded on the rig in bulk, a QA/QC check shall be performed upon return onshore to determine acceptability for restocking or for load out to next COMPANY location.
- 4.2.5 All supplied chemicals shall have traceability and batch coding.

5.0 FACILITIES, LOGISTICS, LABORATORY, AND TESTING

5.1 Onshore Base, Materials, and Logistics

- 5.1.1 CONTRACTOR shall provide an onshore warehousing and service support facility as mutually agreed by COMPANY and CONTRACTOR. The services to be provided by CONTRACTOR shall include but shall not be limited to the storage, handling, and preparation and restocking of equipment, chemicals, blends, bulks, and fluids.

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- 5.1.2 CONTRACTOR shall be responsible for ensuring that competent CONTRACTOR supervision is present when shipping or taking receipt of COMPANY materials and equipment at CONTRACTOR premises. CONTRACTOR shall ensure that said Supervision is available to suit operational requirements and shall be available seven (7) days a week, twenty-four (24) hours a day. COMPANY will not accept responsibility for supervising loading or off loading operations within the confines of CONTRACTOR premises. COMPANY shall retain the right to refuse to accept or return CONTRACTOR equipment when supervision is not provided. CONTRACTOR equipment shall be returned to COMPANY premises and shall be the responsibility for CONTRACTOR to arrange collection at CONTRACTOR cost. COMPANY shall reserve the right to incur no additional rental costs when CONTRACTOR equipment is returned to COMPANY premises due to no supervision.
- 5.1.3 CONTRACTOR shall be responsible for providing to COMPANY prior to shipment, listings / manifests quoting volumes, descriptions, serial / identification numbers on all equipment and material delivered to COMPANY's nominated supply base or heliport.
- 5.1.4 CONTRACTOR shall ensure that it has made appropriate provision for back-up materials, equipment, spare parts, and tools to ensure the WORK is not disrupted due to equipment failures or other problems associated with CONTRACTOR's processes.
- 5.1.5 CONTRACTOR shall continuously examine all steps of the supply chain to identify methods to reduce costs relating to logistics, transportation, handling, storage, inspection, and repair.
- 5.1.6 HSSE and competence audits shall be performed at CONTRACTORS facilities described above at least once per year during the course of the CONTRACT term, the findings made available to COMPANY. These audits should be performed by CONTRACTOR's competent personnel preferably from outside the region.
- 5.1.7 CONTRACTOR shall ensure that all equipment and materials are pre-slung, banded, packaged or containerized and protected, where necessary, ready for transportation and shipment by open deck supply boat or by air in accordance with the current shipping and or COMPANY requirements.
- 5.1.8 This Clause intentionally left blank.
- 5.1.9 CONTRACTOR shall ensure that all equipment and material deliveries identify the CONTRACT, Purchase Order or Call-Off reference numbers as applicable on 100% of packing lists and on material and equipment where practical.
- 5.1.10 CONTRACTOR shall provide Materials Safety Data Sheet (MSDS) for all applicable materials offered for shipment to the WORKSITE. Laminated copies shall be provided for use at the WORKSITE. CONTRACTOR shall ensure that a hard copy of the MSDS accompanies shipments to WORKSITE. CONTRACTOR shall ensure the MSDS is provided to COMPANY.
- 5.1.11 MSDS must be retained by CONTRACTOR on location for all offshore WORK.

5.2 Cement and Spacer Sampling and Testing

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The final results supplied to COMPANY prior to each job shall be available to COMPANY more than 24 hours before pumping cement and tests shall be completed using actual rig samples and not load out samples unless previously agreed with COMPANY. CONTRACTOR shall be responsible for the following:

- 5.2.1 For all cementing operations CONTRACTOR shall take, and protect from deterioration, representative field samples of cement, additives and mix water for confirmation testing. Correct packaging and dispatch of samples, in good time for testing is required. CONTRACTOR shall provide kit for the purpose of sampling and the transporting of samples of cement, mud, water, and additives for testing (relevant sections of the API Specification 10 stress the importance of correct sampling and protection of samples in transit and are a minimum requirement). CONTRACTOR shall ensure that sufficient samples and sample kits are available at all times to allow timely slurry design recommendations. Sample kits shall have airtight bottles specifically manufactured for transportation and protection of chemical samples. Cement shall be sent in air and moisture tight plastic bags in a container, which prevents damage to the bag containing the cement. Water samples shall be transported in bottles which have not been used for anything other than transport / storage of water. All samples for transportation by air must comply with FFA requirements, all regulatory requirements, and COMPANY regulations.
- 5.2.2 Bulk samples shall be taken at all relevant points by CONTRACTOR when transferring bulks to ensure quality is maintained during transport from CONTRACTOR base to the WORKSITE.
- 5.2.3 During job execution, representative samples of mix water; additives and dry cement shall be taken. These samples shall be retained until it is confirmed that all the objectives of the cementing operation have been achieved. Failure to provide these samples in the event of a post cementing investigation will prevent the root cause of the problems to be determined and inappropriate NPT allocation.
- 5.2.4 Where CONTRACTOR has supplied the cement spacer materials, CONTRACTOR is responsible for verifying that spacer systems are correctly made up and tested prior to pumping. The density determined using a pressurized mud balance and the 6-speed rheology of the spacer shall be reported either on COMPANY's and CONTRACTOR's Cement Report or the database on the rig.

5.3 Laboratory Testing and Reporting

- 5.3.1 CONTRACTOR shall have facility to perform the following tests in accordance with the latest API/ISO Specifications (as found in Appendix 6 – Functional and Technical Specifications, 2. The Minimum Testing for Cementing Operations) or COMPANY specific procedures.

Ultrasonic Cement Analyzers are permitted; however, cube strengths shall be reported when requested by COMPANY. Any deviations from API procedure are to be discussed and agreed to by COMPANY

Equipment shall be available to enable testing of slurries up to 500° F and 40,000 psi

- 5.3.2 Additional equipment shall be available to:

- (a) Measure densities of liquid additives and to determine chloride ion concentrations in mix waters;

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- (b) Measure the density of all cement blends to confirm blend constituents,
- (c) Determine the content of extender in a light weight pre-blend,
- (d) Complete COMPANY's settlement test (details available as requested by Company,
- (e) Assess cement mechanical properties under tri-axial conditions

5.3.3 From time to time there may be a requirement to supply equipment for testing of cement slurries offshore which will be detailed in a WORK ORDER. Sufficient laboratory equipment should be available to provide this offshore testing capability without impacting onshore service. The following testing (as per API/ISO procedures unless agreed differently) may be required at the rig site.

- (a) Rheology
- (b) Free Water
- (c) Fluid Loss

Tests for Thickening Time and tests for Compressive Strength will be completed in onshore laboratory facilities.

5.3.4 Bottom Hole Circulating Temperatures (BHCT) shall be determined from the best estimate of Bottom Hole Static Temperature available. For Deep Water, High Pressure High Temperature wells and where well measured depth > twice the true vertical depth the BHCT shall be determined using a temperature simulation using a COMPANY approved model. Bottom hole static temperature will be determined based on existing business unit data or using seabed temperature and a linear gradient to depth of interest using reservoir temperature as reference. After simulation the cement test temperatures will be agreed to by COMPANY. Test pressures should also reflect actual bottom-hole pressures and not those in API Schedules. For other wells API BHCT equations are acceptable.

5.3.5 A full set of calibration records for all laboratory testing equipment and procedures are to be kept and made available to COMPANY as required.

6.0 JOB EXECUTION, EVALUATION, AND PERFORMANCE

6.1 Job Execution

6.1.1 CONTRACTOR shall update the proposal in the program prior to execution, taking into account as a minimum:

- (a) Deviations in expected casing points
- (b) New temperature data
- (c) Hole condition

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- (d) Mud condition
- (e) Occurrence of losses during drilling
- (f) Deviation from expected formations encountered

6.1.2 The final slurry details shall be issued to COMPANY's Well team a minimum of (24) twenty four hours prior to starting to run casing and shall be countersigned by a competent CONTRACTOR engineer. COMPANY's minimum slurry testing requirements are detailed in Appendix 6 – Functional and Technical Specifications, 2. The Minimum Testing for Cementing Operations. When final slurry testing is complete the data should be submitted as directed by COMPANY's well team with the details covered in 5.3.1. If requested actual copies of the laboratory charts shall be made available. The data required in the final slurry proposal shall be agreed with COMPANY

6.1.3 CONTRACTOR shall be required to provide a pressurized mud balance to confirm the actual slurry density. This mud balance shall be calibrated at regular intervals, and should be calibrated with a calibration fluid of more than 1.56 SG (13 ppg) according to CONTRACTOR's procedures.

6.2 Job Evaluation

6.2.1 A report on job execution shall be completed by the offshore cementer within 2 working days using COMPANY preferred reporting system (DIMS) and CONTRACTOR preferred execution report (format to be agreed with COMPANY). In addition, for each offshore job, a Service Quality Assessment shall be provided. The contents of this assessment shall be agreed to by COMPANY.

6.2.2 At the end of each well CONTRACTOR shall provide COMPANY with an end of well report. This report is to be presented within 28 days of the suspension of each well.

6.2.3 For each well drilled, CONTRACTOR shall complete COMPANY's Drilling and Completions SPM score card for cementing services. The completed card shall be submitted to COMPANY's representative within 28 days of the completion of operations on the well or batch program by CONTRACTOR. The form and format of the score card shall be agreed to by COMPANY and CONTRACTOR.

6.2.4 Any incident investigation requested by COMPANY shall require a fully agreed scope of work prior to the commencement of the investigation.

6.2.5 All cementing NPT incidents in DIMS shall be investigated by CONTRACTOR and recommendations made to COMPANY to prevent reoccurrence.

6.3 Performance

6.3.1 The intent of the CONTRACT is for CONTRACTOR to deliver upper quartile performance and continuous improvement throughout the CONTRACT term.

6.3.2 On a quarterly basis CONTRACTOR shall present QPR data mutually agreed upon, detailing overall performance using Drilling and Completions SPM metrics.

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- 6.3.3 CONTRACTOR and COMPANY shall agree on annual performance assessment. Key performance criteria are listed in Attachment E – Global Cement KPI.

7.0 MANAGEMENT OF SERVICE

7.1 Technical Support

- 7.1.1 CONTRACTOR shall provide to COMPANY well-qualified personnel, best technology, processes, and equipment on a global basis.
- 7.1.2 CONTRACTOR shall have a system in place for prioritizing technical service work, internal costing of that work and resource allocation. When a piece of work is required by COMPANY, the scope shall be agreed between COMPANY and CONTRACTOR in writing.

7.2 Management Systems

- 7.2.1 CONTRACTOR shall have in place and demonstrate compliance with all of the systems specified as follows: HSSE Management System; Preventive Maintenance Systems; Personnel Development and Deployment System for COMPANY; and Quality Assurance and Quality Control plan for tools, bulks, equipment, and laboratory.
- 7.2.2 CONTRACTOR shall as required by COMPANY, perform a capability audit of the services provided to ensure strict adherence to the CONTRACT specifications, CONTRACTOR's policies and operating procedures performed in a manner so as to provide a professional and cost effective service.
- 7.2.3 Prior to the introduction of a new chemical to the WORK, MSDS sheets shall be reviewed by CONTRACTOR who shall ensure that the potential human health risk is assessed and provided to COMPANY. The chemical shall not be used or shipped to the WORKSITE until this processes in completed satisfactorily.

7.3 Third Party Services

- 7.3.1 CONTRACTOR may be required to subcontract and manage non-core services such as casing consumables, bulk cement, and mobile equipment. This requirement shall be at COMPANY's discretion and at that point when COMPANY assesses that CONTRACTOR is able to effectively manage such services in COMPANY's best interests. In such case CONTRACTOR shall demonstrate to COMPANY's satisfaction that CONTRACTOR
- (a) Has procured a cost effective service,
 - (b) Employed competent people by the SUBCONTRACTOR,
 - (c) Has HSSE management plans in place,
 - (d) Has managed the training of its personnel in a cost effective manner, and
 - (e) Has demonstrated good audit practices and control of the service.

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7.3.2 COMPANY shall produce a scope of work for any service which it wishes CONTRACTOR to perform or to subcontract.

7.3.3 Detailed scopes of work for the provision of third party services referred to above shall be mutually agreed between COMPANY and CONTRACTOR.

8.0 CONTRACTOR'S RESPONSIBILITIES / ACCOUNTABILITIES

8.1 Pump CONTRACTOR's Accountability (Unit Owner)

Pump CONTRACTOR shall be accountable for performance from completion of a successful FIT until commencement of the next casing or cementing operation. All relevant sections of Scope of Work shall apply.

Pump CONTRACTOR's responsibilities include:

- 8.1.1 Perform pumping and Pressure Testing as required.
- 8.1.2 Mix all cement slurries to the required density as specified by CONTRACTOR.
- 8.1.3 Provide and operate all permanently retained Pump CONTRACTOR's tools.
- 8.1.4 Assist in the preparation of all chemicals and spacers.
- 8.1.5 Collect all offshore samples (additives and cement) according to written instructions from CONTRACTOR.
- 8.1.6 Provide Weekly inventory check of all Pump CONTRACTOR's and CONTRACTOR's materials held onboard.
- 8.1.7 Check cement calculations (although not accountable for accuracy thereof).
- 8.1.8 Participate in all risk assessments.
- 8.1.9 Provide a second man for extended work period (e.g., pressure testing).
- 8.1.10 Provide all paperwork where Pump CONTRACTOR is accountable for the service.
- 8.1.11 Provide competent personnel to operate CONTRACTOR's equipment, as defined in Scope of Work.
- 8.1.12 Provide a designated point of contact for coordination of the WORK with CONTRACTOR.
- 8.1.13 Provide data, as required to complete the Drilling and Completions SPM Score Card, to CONTRACTOR e.g., total service cost, man-hours worked etc.

8.2 CONTRACTOR's Accountability

CONTRACTOR shall be accountable for performance during all flat spots associated with cementing and plug and abandonment operations.

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8.3 CONTRACTOR's Responsibilities (Cementing Service Supplier)

CONTRACTOR shall be responsible for the following which shall include but not be limited to:

- 8.3.1 Cementing calculations.
- 8.3.2 Providing all load out lists for cementing and casing operations.
- 8.3.3 Ensuring adequate stocks are held on the rig.
- 8.3.4 Providing a competent operator/engineer to go out and supervise cementing operations. This engineer is assigned to rig and is on call out.
- 8.3.5 Provide detailed program and work instructions and ensure all hazards are adequately debated prior to commencing operations. Participate in all COSHH and risk assessments associated with the casing and cement operation.
- 8.3.6 Assist Pump CONTRACTOR cement operator during mixing and displacement.
- 8.3.7 Operate all non- Pump CONTRACTOR's supplied cementing tools.
- 8.3.8 Assist Pump CONTRACTOR's operator in clean up of equipment.
- 8.3.9 Complete and submit Drilling and Completions SPM forms.
- 8.3.10 Coordinate casing and cementing operations with COMPANY at the WORKSITE
- 8.3.11 Assist in routine maintenance.
- 8.3.12 Prepare and submit all reports for casing and cementing operations.
- 8.3.13 Provide sampling kit.
- 8.3.14 Where competence has been demonstrated, perform pressure-testing operations to permit twenty four (24) hour coverage.
- 8.3.15 Check that Pump CONTRACTOR's maintenance program has been performed and is updated.
- 8.3.16 Witness the Pump CONTRACTOR perform spot checks on their equipment prior to the job.

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A. Cementing Services

Attachment A – Competence Assessment for Onshore Engineers

Score 0 – No experience in this area 3 – Some experience but not fully meeting requirement 6 – Meets expectation 10 – Exceeds requirements				
	Zero (0) No experience in this area	Three (3) Some experience but not fully meeting requirement	Six (6) Meets expectation	Comments Supporting Information
Visibility / Proactive – Has attended operations meetings, experienced in handling potential operational problems/questions, can lead cementing sessions in pre-Spud and during morning calls, Peer reviews, etc.				
Deals with operational requests and always provides recommendations which have demonstrably prevented reoccurrence				
Has followed a formal management of change process				
Logistics Aware of COMPANY logistic set up and requirements to get materials and equipment offshore				
Has constructed a Basis of Design as outlined in the WORK description for a development project				
Transaction Efficiency invoicing is complete correct and submitted on time				
Experience at introducing New Technology, can describe a case history of leading the implementation of a New Technology on a well				
Clear on local legislation				
Overall Score	(place score here)			
Are of focus – (Please put comments here)				

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Competency category			
Score			
0 – No experience in this area			
3 – Some experience but not fully meeting requirement			
6 – Meets expectation			
10 – Exceeds requirements			
Technical			
In this section the Technical Engineer will be evaluated on his/her competency as follows:			
		Score	Comment / Supporting Information
Details on technical training received relevant to the role Engineer is being proposed for (List training courses and outline relevance)			Score
Phase 1: Job Design and Evaluation		Score	Comment / Supporting Information
1	Can describe all data required to complete construction of Basis of Design and Well Specific Program		
2	Is fully aware of relevant additive systems particularly relating to the Deep Water / HPHT / ERD and Arctic Cementing		
3	Can run all COMPANY engineering tools (including hydraulics / temperature / placement and mechanical modeling software)		
4	Can describe difference in Cement Evaluation techniques and has participated in log evaluation and produced recommendations to improve operation.		
Phase 2: Execution		Score	Comment / Supporting Information
1	Can import field data into engineer models and update with actual well data		
2	Can generate request for relevant lab testing and can effectively interpret results. Can describe Company specific testing requirement and how to select test conditions for HPHT and Deep Water Wells		
3	Can import job play back details and evaluate against the job as planned and develop effective lessons to transfer to next operation		
4	Has worked in rig site team and can describe operational pre job checks particularly those required prior to a Deep Water Cementing Operation		

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Competency category			
Score			
0 – No experience in this area			
3 – Some experience but not fully meeting requirement			
6 – Meets expectation			
10 – Exceeds requirements			
Standalone Laboratory Operations		Score	Comment / Supporting Information
1	Acted as a lab technician for no less than (3) three weeks and can describe API tests used in design of a cement slurry.		
2	Can describe spacer compatibility testing procedures.		
3	Can describe in house sources to support selection of fit for purpose slurry designs.		
4	Can describe proprietary technologies used in dealing with Shallow Water Flows / Gas Migration and dealing with mechanical loading during production and appropriate testing.		
		Score	Comment / Supporting Information
1	Organize and service all location specific Squeeze tools including, but not limited to: permanent and retrievable packers and bridge plugs, cement retainers. If tools are required to be run on wire line, these must be adequately dressed for such purposes.		
2.	Can describe basic squeeze techniques and can make clear recommendations as to appropriate use.		

Attachment B – Lightweight Proprietary Blends

The lightweight blends must meet the following specification for 24-hour compressive strength at 120 degrees Fahrenheit:

10.0 – 10.5 ppg	> 500 psi
10.5 – 11.0 ppg	> 750 psi
11.0 – 11.5 ppg	>1,000 psi
11.5 – 12.0 ppg	>1,250 psi
12.0 – 12.5 ppg	>1,500 psi
12.5 – 13.0 ppg	>1,500 psi
13.0 – 13.5 ppg	>1,500 psi
13.5 – 14.0 ppg	>1,500 psi

It must be possible to formulate slurries, which have the following properties using the blends for the indicated temperature ranges:

COMPANY Settlement < 2%
API Fluid Loss < 100 ml
Pump time controllable between 4-12 hours
30 Bc - 100 Bc < 1 hr
Slurry mixable > 4 bpm using offshore mixing and pumping equipment

When necessary it must be possible to modify the blend to have a transition time < 45 min at 60 deg F (measured by SGSA or relevant equivalent using an agreed alternative procedure).

Other proprietary blends shall be agreed with COMPANY.

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A. Cementing Services

Attachment C – Intentionally Blank

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A. Cementing Services

Attachment D – Global Drilling and Completions Score Card

Drilling and Completions ^{SPM}

* Denotes Compulsory

Global D&C SCORECARD: Global Cementing Services

Region _____
 Business Unit _____
 Country _____
 Service Company _____
 Field _____
 * Well Name _____
 Unique Well Number _____
 * Start Date of Operation _____
 * End Date of Operation _____
 * Is the cementing unit owned by the contractor submitting the scorecard? _____

Yes
No

* Rig Name _____

HSE

- * Number of HSE related management rig visits
- * Number of dropped objects incidents

* Calculation of Number of HSE Proactive Inputs (Leading Indicators)

Number Completed

Recorded Safety Observations e.g. STOP Cards
 Safety Observations and Conversations (SOC's) / Safety Tours

- * Total Manhours
- * Days Away From Work Injuries
- * Recordable Injuries and Illnesses
- * First Aid Cases
- * Number of accidental, uncontained oil spills or discharge

Cost

Scope of Work Changes (number of occurrences)

Number of occurrences

* Planned Cost of Services

US Dollar

Sterling

Canadian Dollar

* Actual Cost of Services

US Dollar

Sterling

Canadian Dollar

Total Standby Costs [Offshore]

US Dollar

Sterling

Canadian Dollar

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Total Standby Time (days) [Offshore]

Job	Casing / liner / open hole size or Operation	Length of Cemented Interval	Total Volume of Cement Pumped	Total Cost of Cement and Additives	Total Cost of all Spacer Material Pumped	Total Personnel Costs	Total Cost of Cement Rental Equipment	Total Cost of Casing Consumables	Total Cost of 3rd Party Charges
Job 1									
Job 2									
Job 3									
Job 4									
Job 5									

Explanation of Cost Variance / Scope Changes

Explanation	Associated Financial Value
1	
2	
3	

Efficiency

* Total NPT recorded in DIMS incurred during product line operations (days) (supplier calculated) [Offshore]

* Planned time from spud to end of completion (days) [Offshore]

* Actual time from spud to end of completion (days) [Offshore]

* Total NPT recorded in DIMS incurred during product line operations (days) [Offshore]

* Planned Operating Time (days)

* Actual Operating Time (days)

* Supplier Related NPT for this Service (days)

* Total NPT incidents accountable to this service

* Overall Rig Cost / Day

US Dollar

Sterling

Canadian Dollar

* Total Drilled Interval

feet

metres

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Quality			
* Offshore Cementing Objectives (Offshore)			
	Select Objectives	Objectives Successfully Delivered	X Relative Importance (Weighting)
Basis of design complete/updated with options/risk assessment and recommended technical solution	Yes	No	
	No	Yes	
Cement program addresses all proposed slurries, engineering modelling, spacer design, compatibility testing, centraliser deployment and commercial aspects	Yes	No	
	No	Yes	
All computer modelling updated with actual well site conditions and confirmation testing of proposed slurries using field samples provided to drilling engineer 24 hours prior to pumping job	Yes	No	
	No	Yes	
All cement slurries mixed within +/- 0.25 ppg (0.03 SG) of target density with correct slurry design	Yes	No	
	No	Yes	
All job parameters recorded (density/pressure/rate) for all operations	Yes	No	
	No	Yes	
No losses initiated after start of mixing cement during primary cement jobs	Yes	No	
	No	Yes	
No NPT during cement mixing and placement as a result of failure of contractor supplied equipment or personnel	Yes	No	
	No	Yes	
All cement plugs (kick off/suspension/abandonment) are successful first time and do not require to be repeated	Yes	No	
	No	Yes	
All post job reporting submitted as agreed in scope of service	Yes	No	
	No	Yes	
All structural objectives of casing support achieved (e.g. conductor support/BOP support/support at casing window)	Yes	No	
	No	Yes	
All zonal isolation requirements of casing and liner cement jobs met with no impact on initial production and well operability due to reduced perforated interval or wellhead pressure	Yes	No	
	No	Yes	
Cement contractor NPT 1% of total well NPT	Yes	No	
	No	Yes	
No annular pressure or post cementing annular well control incidents due to sub surface flows	Yes	No	
	No	Yes	
No remedial cement squeezes needed for zonal isolation at casing shoes or permeable formations	Yes	No	
	No	Yes	
No stuck pipe as a consequence of cement	Yes	No	
	No	Yes	
No unplanned WOC during well	Yes	No	
	No	Yes	
TOC within 300ft of target on casing and liner jobs and / or no top ups required	Yes	No	
	No	Yes	

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A. Cementing Services

* Well Specific Objectives (Offshore) [Offshore]				
	Select Objectives	Objectives Defined	Objectives Successfully Delivered	X Relative Importance (Weighting)
1	Yes			
	No			
2	Yes			
	No			
3	Yes			
	No			

*No of Corrective Actions assigned to the Contractor during the course of the well [Offshore]

* No of Corrective Actions closed out by the Contractor during the course of the well [Offshore]

* Service Quality Assessment Score [Offshore]

Incremental Benefit Delivered

	Appropriate value of Incremental benefit delivered	Details of Cost Savings of successfully implemented incremental ideas submitted	benefit
1			
2			

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A. Cementing Services

Attachment E – Global Cement KPI

OFFSHORE CEMENT 2005-6	
General Details	NUMBER OF SCORE CARDS
General Details	TOTAL ACTUAL COST OF SERVICES
HSSE	TRIIF PER 200K MANHRS
HSSE	PROACTIVE SAFETY INPUT PER 200K MANHRS
Cost	ACTUAL COST/ DAY VS PLANNED COST/DAY
Cost	TOTAL CEMENT COST PER 10K FT
Cost	CEMENT AND ADDICTIVE + SPACER COST PER BBL CEMENT PUMPED
Efficiency	TOTAL NPT HRS PER WELL
Efficiency	NPT HRS PER 1000 BBL PUMPED
Quality	TOTAL WEIGHTED OBJECTIVES MET VS SET IN %
Incremental Benefit Delivered	IBD PER 1000 BBL PUMPED

Attachment F – Cement Units

1.0 Free Placement Cementing Unit – Pride Rig #2

CONTRACTOR shall provide a double-pump cementing unit equipped with an automatic density controlled, re-circulating mixer, a Liquid Additive System (LAS), and other components to be installed on the PS-2.

1.1 Cementing Unit Requirement

- Primary and remedial cementing operations
- Use of Cement Pump as temporary mud pump, for pumping downhole or boosting the drilling riser
- Unit must be manned with a qualified cement operator available on a 24-hour basis
- Unit must include all necessary treating iron and valves, plug containers, etc
- Data recording pressure, rate, and flow (real time and a permanent copy).
- Real time external data feed to Digital BOP Testing software, comprised of time stamp, pump pressure, pump flow rate, and cumulative volume updated at least once per second. Pressure measurement accuracy of $\leq 0.05\%$ of full scale and resolution of $\leq 0.025\%$.

1.2 General Cementing Unit System Specifications:

- Certification ABS + CDS
- Delivery to Geoje Island, Korea - Samsung Heavy Industries Shipyard, Firm date – August 12, 2009 (Pride PS-2)
- Sound Cladding - Cladding for high noise items (main motors/drivetrain, fluid end, HPUs)
- Equipment for Nitrogen Foamed Cement Jobs - Includes equipment considered for permanent installation which would aid the rig up of any temporary equipment brought out specifically for this type of job.
- Water Cooling - required to the extent possible to minimize ventilation noise, include water cooled as the primary option, air cooled only as secondary
- Solids fraction mixing - CONTRACTOR to include system for solids fraction mixing, to deal with high and low density slurries.
- Sampling points - CONTRACTOR to include sampling point systems as shipped loose items with victaulic couplings for connection to 5" lines. Note that the Pride drillships are coming with a National Oilwell Varco Procon bulk system, equipped with sampling points at both port and starboard boat loading stations. CONTRACTOR to provide units as required for supply lines to the cement unit room.

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A. Cementing Services

- Liquid Additive System - CONTRACTOR's best available, high specification continuous computer controlled, minimum 8 pumps
- Liquid Additive Tanks - 8 ea. Note the rig is being designed with a permanent location for LAS tank storage, either a permanent or marine portable tank solution is acceptable
- Batch Blender System - 2 ea. 100 bbl tanks, internally coated for brine service, electric powered. The intent is to use these tanks for mixing mud and brine pills, spacers, etc - in addition to typical cementing usage. Skid(s) to be equipped with additional inlet point (if required) for connecting brine, mud, and base oil, and additional outlet point downstream of pumps (if required) for connecting back to active mud pits
- Real Time Data Capture and Transmission - CONTRACTOR to provide a computer to capture real time job data on the rig and to provide capability to transmit the job data to a COMPANY shore-based system via use of COMPANY provided internet connection. Data format to be WITSML compatible, using Internet Protocol over COMPANY's 3rd party network.

1.3 Specifications - High Capacity Unit

- Electric Powered - Two or Three A/C motors with 2,300hp total minimum
- 15,000 psi pressure rating on all discharge piping, equipped one fluid end side minimum 15,000 psi for high pressure testing, and one fluid end side minimum 10,000 psi for higher volume pumping
- Dual Mixing System - CONTRACTOR's best available fully automated continuous mixing system.
- Dual Bulk Cement Surge Tanks, sized to match high mixing rate specification, equipped with rock catchers on inlets
- Single Dust Collector Tank System
- Dual HPUs

2.0 DELIVERY SCHEDULE

CONTRACTOR, at no cost or liability to COMPANY will ensure that the cementing unit ("Unit") described above will be delivered to Geoje Island, Korea – Samsung Heavy Industries Shipyard ("Shipyard"), on or before August 12, 2009 and installed onboard the new build rig, Pride PS-2.

3.0 COMPANY RESPONSIBILITY

Initial Placement of the units shall be accomplished by CONTRACTOR at no cost or liability to COMPANY including mobilization, installation, or other charges. COMPANY shall provide CONTRACTOR with all reasonable assistance with respect to the initial mobilization and installation of the Unit onboard the rig including provision of reasonable assistance at the Shipyard. Such assistance shall include facilitating access to craneage, labor, power, water, air, certified lifting facilities, etc. to aid in the installation of the unit.

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A. Cementing Services

4.0 SCOPE OF WORK (All Units)

- Using Equipment with COMPANY Products (i.e., pumping COMPANY's cement)
- Using Cement Pump as temporary mud pump, for pumping downhole or boosting the drilling riser
- Unit must be manned with a qualified cement operator available on a 24-hour basis
- Unit must include all necessary treating iron and valves, plug containers, etc
- Unit daily price will be all inclusive, no matter what type of work is being performed including, but not limited to, cementing, BOP testing, miscellaneous pumping, circulation of well, any pressure, any rate, any depth, and any temperature or type of product being pumped.
- Data recording pressure, rate, and flow (real time and a permanent copy). Real time external data feed to Digital BOP Testing software, comprised of time stamp, pump pressure, pump rate, and cumulative volume updated at least once per second. Pressure measurement accuracy of $\leq 0.05\%$ of full scale and resolution of $\leq 0.025\%$.

B. Fluids Services

1.0 GENERAL SERVICE REQUIREMENTS

- 1.1 CONTRACTOR shall provide some or all of the following services as requested by COMPANY: Performance Fluids Management (PFM) services, which include drilling fluids, completion fluids, waste management / solids control equipment, and if offshore, environmental compliance and monitoring, as well as associated engineering services in support of COMPANY operations. PFM services will include but not be limited to the provision of all necessary field management, support and engineering expertise, office and operational personnel, equipment, tools, spare parts, consumables, rig site optimization of drilling fluids systems, the management of associated waste and any other items or services necessary for the delivery of top quartile performance of the WORK described herein.
- 1.2 COMPANY reserves the right to design the fluid program as deemed appropriate by COMPANY. COMPANY may utilize CONTRACTOR provided Design and Evaluation Services for Clients (DESC) engineers when deemed appropriate.
- 1.3 In the event COMPANY designs a PFM Program, COMPANY shall notify CONTRACTOR of this election, and afford CONTRACTOR ten (10) business days from receipt of notice of election to review and approve said Program in advance of CONTRACTOR performing the WORK.
- 1.4 COMPANY reserves the option to evaluate CONTRACTOR's engineering personnel slated for rig site or office placement prior to or after CONTRACT award. COMPANY reserves the option to supply rig site fluid engineering services from other sources.
- 1.5 Prior to making any changes in personnel assignments associated with this CONTRACT, CONTRACTOR is required to provide COMPANY with the following;
 - A slate of not less than three (3) qualified candidates for the position to be back-filled
 - Their respective resume / CV
 - A completed skill assessment attached below
 - A Management of Change (MOC) document, compliant with COMPANY standards
- 1.6 CONTRACTOR, on request by COMPANY, will make immediate provision of drilling, completion, spacers and workover fluids, herein collectively referred to as "fluids" together with suitable bulked, sacked, or drummed chemicals as are necessary to maintain or alter the fluid properties as to COMPANY specification.
- 1.7 CONTRACTOR, on request by COMPANY will:
 - 1.7.1 Supply technical assistance on site in the form of laboratory testing and oral / written advice.
 - 1.7.2 Supply and maintain a complete range of fluid testing equipment on site to allow testing to API recommended practices (RP) 13 B-1 and 13 B-2 as applicable for drilling fluids;

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API RP 13 C for waste management / shaker screen designation; API RP 13 J for testing of heavy brines, or modified as required by COMPANY.

- 1.7.3 Supply and maintain all the necessary equipment and test kits to comply with all testing requirements and regulatory or COMPANY environmental regulations.
- 1.7.4 Provide PFM services as required by COMPANY at the WORKSITE or in COMPANY office.
- 1.7.5 Provide shaker screens in the event the Drilling Unit Contractor does not provide shaker screens, and any new solids control equipment as required by COMPANY; and CONTRACTOR shall provide technical recommendations in regards to performance improvements and necessary maintenance for any existing solids control equipment at the WORKSITE.
- 1.7.6 COMPANY reserves the right to select a different waste management COMPANY from CONTRACTOR; however, it is expected that CONTRACTOR will still be responsible for overall PFM performance and management.
- 1.7.7 COMPANY reserves the right to supply CONTRACTOR with completion fluids provided by Third Parties.
- 1.7.8 The Project Coordinator as described in Section 3, Appendix 5 Clause 9.1, shall in support of this role:
 - (a) be responsible for setting up an engineering planning process for COMPANY that is compatible with the planning process within COMPANY's System of Work (SoW). The planning process should include documents to be produced for the project and individual wells, information required to prepare the documentation; and
 - (b) shall ensure that all produced documentation pertaining to COMPANY comes under a document control system where signatory authorities will be described through the SoW process; and
 - (c) shall, in the event COMPANY designs a PFM Program, CONTRACTOR shall review and approve said Program in advance of CONTRACTOR performing the WORK. CONTRACTOR is expected to challenge any deficiencies noted in said Program, and bring notice of said deficiencies to the attention of COMPANY. Prior to execution of the Program, the PARTIES shall amend the Program, or otherwise reach mutual agreement on the Program.

2.0 PERFORMANCE FLUIDS MANAGEMENT SERVICES

- 2.1 CONTRACTOR shall define and optimize all aspects of the WORK to drill and complete the wells demonstrating a structured route for continuous performance improvement. CONTRACTOR shall provide all engineering support as it pertains to the WORK required to plan wells from conception through execution. In the event COMPANY designs the fluids program, CONTRACTOR will be involved with the review, provide feedback, recommendations, and endorse the plan prior to execution.
- 2.2 CONTRACTOR shall support the WORK and provide comprehensive warehousing, workshop and service support facilities. The services to be provided by CONTRACTOR at

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the various locations shall include but shall not be limited to the storage, handling, preparation, testing, and maintenance of CONTRACTOR's chemicals, fluids, and equipment.

- 2.3 CONTRACTOR shall provide a fast, effective, and efficient problem and failure investigation service that provides rapid feedback to COMPANY on the likely cause of operational problem(s), and a well documented root cause analysis.
- 2.4 CONTRACTOR shall only propose alternative equipment and services at the WORKSITE on the understanding that it has previously approached COMPANY and received written acceptance to a rate for the inclusion of such equipment or services in the CONTRACT. It is incumbent upon CONTRACTOR to proactively advise COMPANY of new equipment and services for potential inclusion in the CONTRACT.
- 2.5 CONTRACTOR shall develop and maintain procedures for the transfer and management of fluids in all aspects of performance of the WORK.
- 2.6 COMPANY reserves the right to procure products and services from a Third Party if in COMPANY's opinion CONTRACTOR's product or service does not meet the specifications required for performing the WORK or any other reason that COMPANY deems appropriate.
- 2.7 CONTRACTOR shall have available at the WORKSITE and provide to COMPANY and Drilling Unit Contractor the following in respect to performance of the WORK:
 - All pertinent plans and recommendations
 - Operating manual and laminated MSDS and product data sheets for all tools, equipment and materials
 - Inventory of equipment and material available at the WORKSITE
 - An inspection report with all equipment and tools sent to the WORKSITE to ensure the equipment is in satisfactory condition to be used
 - All shipping manifests for equipment and chemicals

3.0 PROVISION OF DRILLING FLUIDS AND / OR COMPLETION FLUIDS AND ENGINEERING SERVICES

- 3.1 CONTRACTOR on the request of COMPANY will provide, in a reasonable time, drilling and / or completions fluids together with suitable bulked, sacked or drummed chemicals as are necessary to build, maintain or alter the fluid properties to COMPANY's specification.
- 3.2 CONTRACTOR will be responsible for drilling and / or completion fluids and bulks until transferred to COMPANY at COMPANY's WORKSITE and the materials are actually used in COMPANY's down-hole drilling operations.

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- 3.3 Notwithstanding COMPANY providing transportation or warehousing of any sort, CONTRACTOR shall retain ownership and the attendant rights and obligations for said materials for all drilling and / or completion fluids and bulks provided under the terms of this CONTRACT. CONTRACTOR shall be encouraged to advise COMPANY on ways to optimize the transportation and warehousing logistics. The implementation of any recommendation for optimization shall be at the discretion of COMPANY.

- 3.4 CONTRACTOR shall provide assurance by developing and updating checklists and procedures covering effective management to reduce waste and losses. CONTRACTOR shall be encouraged to advise COMPANY on ways to minimize any loss of drilling and / or completion fluids and bulk while on the rig. The implementation of any recommendation to minimize losses shall be at the discretion of COMPANY.

- 3.5 CONTRACTOR shall confirm the acceptability and cleanliness of the tanks of marine vessels and verify volumes of drilling and / or completion fluids and bulks prior to transferring to and from the marine vessel, Drilling Unit, and fluid plant. CONTRACTOR shall ensure that a comprehensive up to date procedure for the transfer of drilling and / or completion fluids and bulks is available at the relevant transfer points.

- 3.6 CONTRACTOR shall provide the necessary personnel to manage the drilling and / or completion fluids and bulks at the WORKSITE. The number of personnel will be dictated by operational needs as agreed to by COMPANY and CONTRACTOR.

- 3.7 COMPANY reserves the right to supply CONTRACTOR with completion fluids provided by Third Parties.

- 3.8 CONTRACTOR shall provide Barite and Bentonite that meet API RP 13 B-1 and B-2 (with the exception of 4.1 specific gravity Barite).

- 3.9 COMPANY reserves the right to specify any chemicals provided by a Third Party for which COMPANY deems CONTRACTOR does not have a suitable alternative. CONTRACTOR shall ensure that such Third Party chemicals are compatible with the drilling and / or completion fluids supplied by CONTRACTOR prior to purchase by COMPANY.

- 3.10 CONTRACTOR shall provide, maintain, and re-supply as necessary a comprehensive mud kit per drilling unit to conduct regular fluid tests in accordance with COMPANY requirements. The test kit shall include all necessary chemical reagents plus associated glassware sufficient for the comprehensive testing of all water based and oil based drilling and completion fluids as determined by both COMPANY and CONTRACTOR in order to maintain the fluid properties as specified by COMPANY.

- 3.11 CONTRACTOR shall provide calcium carbonate that is metamorphic and not sedimentary.

- 3.12 Any oil based or synthetic based mud provided to WORKSITE or supply base, should have an oil based ratio of 70:30 to 90:10. COMPANY reserves the right to request fluids outside

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specification in which COMPANY will pay for additional base oil and / or products to meet COMPANY requests.

- 3.13 When COMPANY designs the PFM Program, COMPANY may request CONTRACTOR to run hydraulics analysis using COMPANY provided data and design parameters.

4.0 PROVISION OF WASTE MANAGEMENT AND SOLIDS CONTROL ENGINEERING SERVICES

- 4.1 CONTRACTOR shall be responsible for ensuring compliance with the relevant environmental regulations, standards, guidelines, and COMPANY Environmental Management System as based on ISO 14001 Environmental Management System. This shall be done in consultation with COMPANY's PFM champion or designate.
- 4.2 CONTRACTOR is encouraged to suggest ways to control the production of all discharges ranging from reduction in hole size, fluid type, drilling unit equipment, solids control management, closed loop mud systems and de-watering process and cuttings re-injection.
- 4.3 CONTRACTOR shall be required to provide expertise with respect to managing and minimizing all discharges including cement and sewerage.
- 4.4 CONTRACTOR shall provide the necessary personnel to manage the solids control and provide waste management service at the WORKSITE. The number of personnel shall be dictated by operational needs as agreed by COMPANY and CONTRACTOR.
- 4.5 Upon the commencement of the WORK, CONTRACTOR shall perform an audit of the solids control capability of the Drilling Unit and advise COMPANY of the necessary modifications required to achieve the required solids control and waste management efficiency as mutually agreed to by COMPANY and CONTRACTOR.

5.0 PROVISION OF WASTE MANAGEMENT AND SOLIDS CONTROL EQUIPMENT

- 5.1 CONTRACTOR shall be responsible for managing all CONTRACTOR supplied waste management and solids control equipment.
- 5.2 CONTRACTOR may be required to supply and install solids control equipment and waste management equipment as identified per the audit performed and as agreed by COMPANY.
- 5.3 CONTRACTOR shall be required to supply consumables such as screens not covered under the Drilling Unit contract for the performance of the WORK.
- 5.4 CONTRACTOR shall be required to supply consumables and spares associated with CONTRACTOR supplied waste management and solids control equipment in order to minimize disruptions in the performance of the WORK.

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- 5.5 CONTRACTOR shall provide the necessary personnel to manage CONTRACTOR supplied waste management and solids control equipment at the WORKSITE. The number of personnel shall be dictated by operational needs as agreed by COMPANY and CONTRACTOR.

6.0 DRILLING PERFORMANCE OPTIMIZATION AND INNOVATION

- 6.1 CONTRACTOR shall operate a formal post-analysis review of well performance so that lessons learned are fed back into the plans for the next section of the well or on subsequent wells. Where applicable, all relevant COMPANY specialists, technologies, and facilities shall be made available to CONTRACTOR to facilitate this process. Such assistance shall be provided at the sole discretion of COMPANY but shall not be unreasonably withheld.
- 6.2 CONTRACTOR shall provide an execution plan before a well is spud to monitor the achievement of the objectives, which shall be monitored and recorded using the PFM weekly report. The performance criteria with objectives shall be monitored whether CONTRACTOR has WORKSITE representation or providing engineering support elsewhere.
- 6.3 CONTRACTOR shall proactively execute, monitor, evaluate, and promote the use of new technology where appropriate.
- 6.4 CONTRACTOR shall provide a process for accessing its global engineering resources and shall analyze the data both at the WORKSITE for real-time decision-making and subsequently in the office to achieve a systematic improvement in performance.
- 6.5 Provide linkage to CONTRACTOR's global knowledge management and lessons-learned data bases for technical and HSSE issues.

7.0 REPORTING, RECORD KEEPING AND MEETINGS

- 7.1 CONTRACTOR shall be responsible for inputting all relevant PFM data on COMPANY's SPM tool and / or other system to be determined by COMPANY, in addition to fulfilling CONTRACTOR's own internal reporting requirements.
- 7.2 On completion of either a drilling phase or completion phase, CONTRACTOR shall prepare a Final Well Report consistent with COMPANY requirements as specified in the SoW. This shall be completed within two (2) weeks of completing the well.
- 7.3 CONTRACTOR may be required to submit one or more of the following reports in an electronic format compatible with COMPANY's computer software. These reports shall be distributed to the relevant COMPANY personnel. Hard copies of these reports may be requested by COMPANY.

Type	Frequency
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EMS Internal Observations / Potential Non-conformances	Bi-monthly
PFM Audits	Quarterly
Mud report	Daily
PFM Report, CRI Log, Discharge Log, ROC Report	Daily
PFM Report, Waste with Effluent Discharge	Weekly
Discharge model, PFM recap, SPM Tool	Per Well
Spill Reports, SPCC*	As required
Safety Reports	Quarterly
Performance Measures, SPM Tool	Per well and QPR
Inspection Reports	As required
Failure / Problem analysis	As required
Guide book update	Semi-annual
BOD	Updated every well
End of Well Reports	Per well
Project / Study reports	As required
Quality Improvement Plan Status	Updated Quarterly

* SPCC – Spill Prevention Containment and Countermeasure

The content, style, and structure of the above reports shall be agreed between COMPANY and CONTRACTOR. COMPANY will not entertain any charges for the above reports.

- 7.4 Inspection and Failure / Problem analysis reports shall be discussed and agreed on an individual basis by COMPANY and CONTRACTOR. CONTRACTOR must provide full details on problems and issues to ensure capture of lessons learned and continuous improvement.
- 7.5 Project / Study Reports shall be undertaken as necessary following identification of issues from the above reports. Such projects / studies shall have an agreed scope of work, objective, and deliverable prior to commencement. This type of work shall be part of CONTRACTOR's commitment to improve drilling performance.
- 7.6 CONTRACTOR's personnel may be required to attend a variety of meetings both in COMPANY office and at the WORKSITE. COMPANY encourages full, effective, open, honest, proactive participation in all meetings and encourages CONTRACTOR personnel to share this goal. Cost associated with these activities is covered under Section 4 – Remuneration, Appendix 3 – Sub-Sector Terms and Conditions, Clause 1.4.
- 7.7 Prior to a well or hole section, CONTRACTOR personnel shall lead briefings to introduce new technology tools / new mud systems / equipment to all personnel involved in the operations. CONTRACTOR personnel shall ensure that literature is available to familiarize rig floor personnel with any handling issues or hazards associated with the tools / equipment and mud systems.

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8.0 PERSONNEL REQUIREMENTS

The following positions listed herein are deemed to be Key Personnel and may be utilized during the term of the CONTRACT.

- 8.1 The Project Coordinator shall be competent in all the required skill sets necessary to support the activities listed herein. The roles and responsibilities shall include but shall not be limited to the following issues relating to compliance and execution of the WORK.
 - 8.1.1 Provides a single point of contact for all contractual issues including HSSE, quality, cost, people, and performance.
 - 8.1.2 Accountable for all personnel provided by CONTRACTOR and the preparation of a RACI chart covering all personnel and attendant processes.
 - 8.1.3 Responsible for instituting an engineering planning process that is compatible with COMPANY's System of Work (SoW). This planning process should include but not be limited to, documents to be produced for the project such as the SoW document, the PFM guide book, the PFM generic field program, the information required to produce these documents and the timeframe within which these documents would be produced and finalized.
 - 8.1.4 Ensures that all documentation pertaining to the CONTRACT is governed by a document control system where signing authorities will be described through the RACI process. Electronic copies of all documentation are required and must be filed within COMPANY's system.
 - 8.1.5 Ensures compliance to the project's SoW and PFM Programs as approved by COMPANY.
 - 8.1.6 Promotes the agreed safety program and actively follows up on action plans.
 - 8.1.7 Coordinates PFM activities to meet and exceed environmental standards outlined by CONTRACTOR and COMPANY.
 - 8.1.8 Ensures adherence to all QA / QC procedures.
 - 8.1.9 Ensures that personnel, material, and equipment are at the WORKSITE or shore base as agreed to by COMPANY.
 - 8.1.10 Provides technical support for all projects and ensures that lessons learned are transferred. Identifies potential problems and recommends solutions to maintain and improve the quality of service.
 - 8.1.11 Review and approves PFM programs generated by the Project Engineer.
 - 8.1.12 Attends all planning meetings for the project (risk assessment, SoW, section meeting, etc.) and ensures the transfer of pertinent information to all CONTRACTOR personnel involved in the performance of the WORK.
 - 8.1.13 In the event COMPANY designs the fluids program, the Project Coordinator will be involved with the review, provide feedback, recommendations, and endorse the plan prior to execution.

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8.2 The Project DESC Engineer, if used, shall be competent in all required skill sets necessary to support the activities listed herein. The roles and responsibilities shall include but shall not be limited to the following:

8.2.1 Produces and updates the SoW document for the project. This work shall include all background engineering required to develop the generic field PFM program and the PFM guide book which will incorporate as a minimum the following:

- area experience
- formation damage
- well bore stability
- hydraulics - swab / surge calculations, ECD management
- corrosion Monitoring and Management
- fluid displacements from one fluid to another
- logistics and rig constraints
- commercial balance (cost benefit analysis)
- cementing interface considerations
- environmental controls
- hole cleaning procedures including suggested gpm / max ROP and trip procedures
- lost circulation procedures - including a decision tree for expected lost circulation root causes.
- differentially stuck pipe-freeing procedures.

8.2.2 Updates the project PFM guidebook.

8.2.3 Generates PFM programs with reference to the PFM guidebook. The PFM program will include the projected cost for drilling and completions of wells, material consumption, and other subject areas specified by COMPANY.

8.2.4 Coordinates and distributes weekly PFM summaries and all other reports such as end of well recap, section reviews etc., to all relevant COMPANY personnel. There shall be special emphasis on recommendations for continuous performance improvement, and feedback to maintain and update the PFM Basis of Design (BOD).

8.2.5 Promotes the agreed safety program and actively follows up on action plans.

8.2.6 Ensures adherence to all QA / QC procedures.

8.2.7 Attends morning meetings, reviews all daily reports and ensures adherence to the PFM program.

8.2.8 Tracks, reports, and benchmarks drilling, waste management, and solids control performance measures as per SPM performance score cards. Pre-fills the SPM performance score cards prior to spudding the well and completes the SPM performance score cards at the end of each well.

8.3 The Lead Mud Engineer is the primary liaison with COMPANY and shall be competent in all required skill sets necessary to support the activities listed herein.

8.3.1 Production of daily drilling fluids and treatment reports to API 13-G standards as a minimum, or as required by COMPANY. This will be entered on COMPANY's DIMS / OpenWells reporting system or as specified. A minimum of one complete fluid test

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will be performed per 12 hour period – results of two tests will be recorded on the daily report. More frequent testing will be performed as necessary to maintain fluid specifications as established in the well plan.

- 8.3.2 Daily chemical and physical testing of drilling fluids and brines.
- 8.3.3 Making recommendations to COMPANY for continuous improvements as and when opportunities arise.
- 8.3.4 Making daily inventory checks and reconciling stocks, billing and credits at the end of the well.
- 8.3.5 Monitoring and assisting with the optimization of solids control equipment. If COMPANY puts in place a Third Party to fill this role, CONTRACTOR personnel will cooperate and assist as required.
- 8.3.6 Executing a corrosion monitoring and mitigation plan for the circulating system, pits, and drill string.
- 8.3.7 Accurately recording and documenting the solid and fluid waste streams produced from the well. CONTRACTOR rig site personnel will work proactively with COMPANY and Third Party personnel to minimize waste disposal volumes and costs.
- 8.3.8 Ensures that the fluid in the well (mud, drill-in fluid, brine, and spacers) is in the appropriate condition and used in the most effective manner.
- 8.3.9 Ensures that the agreed parameters as defined in the well PFM Program, approved by COMPANY, are carried out in a professional and cost effective manner.
- 8.3.10 Ensures that the goals of the PFM program are achieved while complying with all COMPANY's and CONTRACTOR's requirements regarding Quality, Health, Safety, and Environment (QHSE).
- 8.3.11 Promotes the agreed safety program and actively follows up on action plans.
- 8.3.12 Manages the personnel under his supervision.
- 8.3.13 Ensures adherence to all QA / QC procedures.
- 8.3.14 May supervise the PFM Compliance Engineer and the Mud Engineer and plans ahead for all fluids discharged from WORKSITE, as per environmental requirements and COMPANY guidelines
- 8.3.15 Monitors COMPANY's PFM waste stream management plan. This includes daily documentation of date, time, quantity, quality of material discharged, entry of solids control and waste management data into CONTRACTOR data base computer program for record keeping on the rig.
- 8.3.16 Monitors the material discharged. Ensures that the synthetic content of cuttings discharged on a daily and interval basis comply with and exceed environmental requirements and COMPANY guidelines.
- 8.3.17 Anticipates material movement, works closely with solids control personnel and mud engineer to reduce waste.

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- 8.3.18 Identifies potential problems and recommends solutions to maintain and / or improve the quality of service.
- 8.4 The PFM Compliance Engineer ensures that design parameters specified in the approved PFM program are obtained in a professional and cost effective manner. Complies with and ensures that the personnel under their supervision comply with all COMPANY's requirements regarding Quality, Health, Safety, and Environment (QHSE).
- 8.4.1 Ensures all QA / QC procedures are completed prior to commencement of the WORK.
- 8.4.2 Monitors discharge of fluids per environmental requirements and COMPANY guidelines. This includes daily documentation of date, time, quantity, and quality of material discharged. Also included is daily entry of solids control and waste management data into CONTRACTOR's and COMPANY's databases.
- 8.4.3 Ensures that the materials discharged comply with environmental and COMPANY requirements.
- 8.4.4 Monitors synthetic oil base mud content of cuttings discharged on a daily and interval basis.
- 8.4.5 Anticipates material movement, liaises with solids control personnel and mud engineers to reduce waste.
- 8.4.6 Identify potential problems and recommend solutions to maintain and / or improve the quality of service.
- 8.4.7 Maintains and communicates the PFM weekly report to CONTRACTOR and COMPANY personnel.
- 8.4.8 Promotes the agreed safety program and actively follows up on action plans.
- 8.5 The Mud Engineers shall be competent in both drilling and completion skill sets. The rig site mud engineering service provided will include, but not be limited to:
- 8.5.1 Production of daily drilling fluids and treatment reports to API 13-G standards as a minimum, or as required by COMPANY. This will be entered on COMPANY's DIMS / OpenWells reporting system or as specified. A minimum of one complete fluid test will be performed per 12 hour period – results of two tests will be recorded on the daily report. More frequent testing will be performed as necessary to maintain fluid specifications as established in the well plan.
- 8.5.2 Daily chemical and physical testing of drilling fluids and brines.
- 8.5.3 Making recommendations to COMPANY for continuous improvement as and when opportunities arise.
- 8.5.4 Making daily inventory checks and reconciling stocks, billing and credits at the end of the well.

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- 8.5.5 Monitoring and assisting with the optimization of solids control equipment. If COMPANY puts in place a Third Party to fill this role, CONTRACTOR personnel will cooperate and assist as required.
- 8.5.6 Executing a corrosion monitoring and mitigation plan for the circulating system, pits, and drill string.
- 8.5.7 Accurately recording and documenting the solid and fluid waste streams produced from the well. CONTRACTOR rig site personnel will work proactively with COMPANY and Third Party personnel to minimize waste disposal volumes and costs.
- 8.5.8 Supervision, evaluation, and optimization of the PFM processes including personnel involved in PFM operations at the WORKSITE.
- 8.5.9 Manages and coordinates all PFM services including cost analysis at the WORKSITE.
- 8.5.10 Promotes communication between all parties involved with the PFM process.
- 8.5.11 Communicates the PFM program emphasizing goals and objectives to all personnel at the WORKSITE.
- 8.5.12 Performs solids control engineering to ensure optimum use of all solids control equipment including shale shaker screens at the WORKSITE.
- 8.5.13 Manages PFM services to prevent high treatment costs and / or unnecessary chemical usage.
- 8.5.14 Co-ordinates the shipping of material (chemicals and mud samples) to and from the WORKSITE. This will include packaging, dispatching, and documenting as required.
- 8.5.15 Maintains inventory and performs daily inventory checks of fluids, chemicals, and equipment at the WORKSITE.
- 8.5.16 Inputs and updates all applicable sections within the SPM tool on a daily basis.
- 8.5.17 Produces the daily drilling fluid reports, PFM and completion fluid reports in a timely and professional manner.
- 8.5.18 Prepares daily and monthly reporting of all fluids and cuttings discharged from facilities.
- 8.5.19 Performs all necessary environmental and COMPANY compliance testing and reporting.
- 8.5.20 Performs daily sampling, chemical and physical testing of drilling fluid.
- 8.5.21 Performs static sheen test weekly or any time large quantities of mud are discharged.
- 8.5.22 Monitors well-bore stability and hole conditions and makes daily recommendations for continuous performance improvement.
- 8.5.23 Recommends the use of drilling and tripping practices, as agreed in the SOW.

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- 8.5.24 Manages all completions activities including well-bore displacement clean-up, tool make-up, tool operation, packer fluid, and pill construction.
 - 8.5.25 Ensures the transfer of lessons learned from WORKSITE to shore based team.
 - 8.5.26 Participate in the rig S.T.O.P. program or equivalent.
 - 8.5.27 Leads daily safety meeting regarding applicable aspects of the PFM services and equipment. Documents meeting and topics discussed on the mud check report every morning.
 - 8.5.28 Attends daily safety meeting and pre-tour meetings with COMPANY Representative, Toolpusher, and other Contractors.
 - 8.5.29 Performs and documents weekly safety audit of PFM operation.
 - 8.5.30 Monitors the oil content and total volume of shipped cuttings if required. Implements, supervises, and optimizes procedures for tracking volumes of oil / mud recovering systems.
- 8.6 The Completion Engineers shall be competent in both completion and drilling skill sets. The rig site completion engineering service provided will include, but not be limited to:
- 8.6.1 Supervision, evaluation, and optimization of the fluid processes including personnel and equipment involved in completion operations at the WORKSITE.
 - 8.6.2 Manages and coordinates all completion fluid services including cost analysis at the WORKSITE.
 - 8.6.3 Promotes communication between all parties involved with the completion process.
 - 8.6.4 Communicates the completions program emphasizing goals and objectives to all personnel at the WORKSITE.
 - 8.6.5 Performs fluid filtration supervision to ensure optimum use of the filtration unit equipment and personnel at the WORKSITE.
 - 8.6.6 Manages completion services to prevent high treatment costs and / or unnecessary chemical usage.
 - 8.6.7 Co-ordinates the shipping of material (chemicals and brine samples) to and from the WORKSITE. This will include packaging, dispatching, and documenting as required.
 - 8.6.8 Maintains inventory and performs daily inventory checks of completion fluids, chemicals, and equipment at the WORKSITE.
 - 8.6.9 Inputs and updates all applicable sections within SPM tool on a daily basis.
 - 8.6.10 Produces the daily completion fluid reports in a timely and professional manner.
 - 8.6.11 Prepares daily and monthly reporting of all completion fluids and cuttings discharged from facilities.

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- 8.6.12 Performs all necessary environmental and COMPANY compliance testing and reporting.
- 8.6.13 Performs daily sampling, chemical and physical testing of completion fluid.
- 8.6.14 Performs static sheen test weekly or any time large quantities of fluid discharged.
- 8.6.15 Manages all completions activities including well-bore displacement clean-up, tool make-up, tool operation, packer fluid, spacers and pill construction.
- 8.6.16 Ensures the transfer of lessons learned from WORKSITE to shore based team.
- 8.6.17 Participate in the rig S.T.O.P. program or equivalent.
- 8.6.18 Leads daily safety meeting regarding applicable aspects of the completion fluid services and equipment. Documents meeting and topics discussed on the completion fluid check report every morning.
- 8.6.19 Attends daily safety meeting and pre-tour meetings with COMPANY Representative, Toolpusher, and other Contractors.
- 8.6.20 Performs and documents weekly safety audit of completion operations.
- 8.6.21 Monitors the oil content and total volume of shipped waste if required. Implements, supervises, and optimizes procedures for tracking volumes of oil / brine recovering systems.

9.0 CONTRACTOR'S EQUIPMENT

- 9.1 CONTRACTOR's comprehensive listing of equipment and specifications to be used in connection with the WORK is described in Clause 11 of Section 3.
- 9.2 CONTRACTOR shall be responsible at its own cost for the stock control, maintenance and servicing of its equipment supplied for the WORK and shall ensure that sufficient spares and back up tools are available for all normal maintenance requirements and to meet any reasonably foreseeable contingency.
- 9.3 COMPANY shall have the right to inspect CONTRACTOR's equipment, spares, and supplies at any time to observe their condition and to ensure that no deficiencies exist therein. Such inspection by COMPANY shall not imply any acceptance of the condition of the said equipment, spares, and supplies provided by CONTRACTOR and CONTRACTOR shall not be relieved of its obligations under this CONTRACT by any such inspection.
- 9.4 All packaging shall be of suitable quality to withstand adverse weather conditions. COMPANY shall have the right to reject any equipment deemed unsuitably packaged for the conditions or where the packaging is of poor quality. The equipment shall be returned to CONTRACTOR at CONTRACTOR'S cost.

10.0 EQUIPMENT LIST AND SPECIFICATIONS

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10.1 The following list identifies the primary Solids Control and Waste Management equipment and the specification that shall be supplied by CONTRACTOR as may be requested by COMPANY.

- 10.1.1 Dryer System: Only vertical units verified to be able to handle one hundred and twenty five percent (125%) of the maximum expected cuttings and fluids from the well discharge and produce a cutting discharge ROC of less than four percent (4%).
- 10.1.2 Cuttings Transfer System from Shakers to Dryer: Engineered augers, vacuums, or pneumatic transfer equipment verified to be able to handle 125% of the maximum expected cuttings and fluids from the well discharge with a proven verified continuous discharge capability.
- 10.1.3 High Speed / High Volume Centrifuge: Variable speed centrifuge capable of minimum 500 g forces to a maximum of 3,000 g forces, with a mechanical solids process of about 200 GPM of drilling mud.
- 10.1.4 Orbital or Elliptical motion Shakers: Stand alone or integrated units with no less than 2.5 g force and minimum screening area of 20 sq ft per unit. Each unit must be capable of handling up to 80 mesh screens and process a minimum of 350 gpm 15 ppg EMW at 120 degrees F.
- 10.1.5 Linear Motion Primary Shakers: Linear motion machine capable of up to 6.5 g's with a screening area of no less than 30 sq. ft. and capable of decline to negative 1 degree and positive 5 degrees and ability to screen fluid with no loss over basket weir at a minimum of 300 gpm flow rate of 15 ppg EMW at 120 degrees F.
- 10.1.6 Triple Deck Shaker: Shaker must have 3 decks capable of running in parallel or series mode for LCM recovery, must be able to return discard material from second screen to active system in LCM recovery mode.

10.2 Typical use of solids handling and transfer equipment to meet the environmental regulations:

- 100 HP Vacuum system
- Cuttings dryer package
- Continuous feed system
- HS / HV Centrifuge package
- 14", 12" auger systems with all safety components
- Personnel

11.0 PERFORMANCE MEASUREMENT

11.1 The intent of the CONTRACT is for CONTRACTOR to deliver excellent performance and continuous improvement throughout the CONTRACT period. Key Performance Indicators (KPIs) as set forth below are to be used to manage CONTRACTOR's performance in Drilling Fluids, Completion Fluids, and Waste Management. At the start of the CONTRACT, COMPANY and CONTRACTOR shall agree on the targets for these KPIs measured against the delivery of the WORK. Targets shall be set to encourage the delivery of continuous improvement. CONTRACTOR shall supply all information required for the standard COMPANY reporting system. CONTRACTOR shall complete performance data score cards for every well, as detailed on COMPANY SPM website.

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11.2 KPI for Drilling Fluids:

- 11.2.1 Proactive safety input per 200,000 man-hours
- 11.2.2 Actual versus planned cost, with adjustments for any scope change.
- 11.2.3 Actual cost per 10,000 feet
- 11.2.4 Consequential NPC as a percent of actual cost
- 11.2.5 Total weighted objectives met versus set.

CONTRACTOR will select from COMPANY's SPM tool and COMPANY shall approve the following drilling fluids objectives, which cover forty percent (40%) of the well performance objectives. The remaining sixty percent (60%) of the well performance objectives will be selected from the balance of the performance objectives contained within COMPANY's SPM tool.

- (a) Consequential NPT less than seven and a half percent (7.5%) of the drilling NPT from DIMS
- (b) Drilling Performance: Down-hole mud losses to the formation to be no greater than those in the fluids program.
- (c) Drilling performance: Produce stable and clean hole for the specified hole sections measured by the ability to run casing to section depth first time and within planned time for the running of the casing.
- (d) Drilling Performance: No stuck pipe due to either hole cleaning or instability problems.

11.3 KPIs for Completion Fluids

- 11.3.1 Proactive safety input per 200,000 man-hours
- 11.3.2 Actual versus planned cost, with adjustments for any scope change.
- 11.3.3 Actual versus planned operating time
- 11.3.4 Direct NPT as percentage of operating time
- 11.3.5 Total weighted objectives met versus set.

CONTRACTOR will select from COMPANY's SPM tool and COMPANY shall approve the following completions fluids objectives, which cover forty percent (40%) of the well performance objectives. The remaining sixty percent (60%) of the well performance objectives will be selected from the balance of the performance objectives contained within COMPANY's SPM tool.

- (a) Rig site engineers of the required competence and quality available for the job.
- (b) Actual rig time to displace to completion fluids and clean the well to the programmed standard <= P50 planned time

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- (c) No COMPANY agreed supplier related NPT
- (d) Completion fluid and well cleaned to completion program.

11.4 KPIs for Waste Management

- 11.4.1 Proactive safety input per 200,000 man-hours
- 11.4.2 Actual versus planned cost, with adjustments for any scope change.
- 11.4.3 Actual cost per day
- 11.4.4 Direct NPT as percentage of operating time
- 11.4.5 Total weighted objectives met versus set.

CONTRACTOR will select from COMPANY's SPM tool and COMPANY shall approve the following waste management objectives, which cover forty percent (40%) of the well performance objectives. The remaining sixty percent (60%) of the well performance objectives will be selected from the balance of the performance objectives contained within COMPANY's SPM tool.

- (a) Rig-site engineers of the required competence and quality available for the job.
- (b) Waste Management system allows drilling at agreed system designed ROP excluding weather.
- (c) No wells team agreed product line NPT.
- (d) All planned maintenance done as per plan.

11.5 COMPANY and CONTRACTOR shall hold regular reviews, as agreed to by the PARTIES for their respective SPUs, to review performance against targets by well, operating unit (Field) and overall performance. COMPANY may re-allocate WORK based on performance. CONTRACTOR shall pre-fill the SPM score card prior to spudding the well with approval from COMPANY drilling engineer on objectives and their relative weighting. The objectives shall be tracked with the PFM weekly report. The SPM score card shall be submitted to COMPANY within fourteen (14) days of completing the well.

11.6 In addition to the prescribed set of KPIs and Weighted Objectives, each SPU is expected to have additional specific KPI requirements that shall be identified which would become part of their respective CONTRACT.

12.0 PREVENTATIVE MAINTENANCE

12.1 CONTRACTOR shall have a documented preventative maintenance plan for each piece of powered and non-powered equipment.

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12.2 COMPANY or designated COMPANY REPRESENTATIVE will review CONTRACTOR's preventative maintenance plan and schedule. The review will verify compliance to contractual requirements.

12.3 Preventative maintenance program shall include but not be limited to:

- Regularly scheduled inspection and maintenance procedures.
- Pre-Job equipment check.
- Post-Job equipment check.
- Performance standards.

13.0 ADDITIONAL GENERAL INFORMATION RELATIVE TO SPECIFIC SPUS

13.1 Gulf of Mexico

13.1.1 Drilling Fluids

(a) CONTRACTOR shall be required to perform the following functions:

- (i) follow COMPANY Salt Exit Strategy.
- (ii) CONTRACTOR shall record product usage/inventory, mud type, mud weight, footage drilled, bit O.D., surface discharges, other discharges and maximum fluid discharge rate, on a daily basis.
- (iii) CONTRACTOR shall supply and maintain mercury and cadmium certificates of analysis with each shipment of barite to be submitted to COMPANY at the end of each well.
- (iv) CONTRACTOR shall supply and maintain synthetic base oil stock limitation certificates identifying polynuclear aromatic hydrocarbon content, base oil 10 day sediment toxicity and, 275 day biodegradation rate for each shipment of synthetic base oil at the rig-site to be submitted to COMPANY at the end of each well.
- (v) CONTRACTOR shall maintain calibration certificates for retort, triple beam balance, thermometer, JP tubes, balance weights and maintain purity certificates 1% NIST Crude and IPA at the rig-site to be submitted to COMPANY at the end of each well.
- (vi) CONTRACTOR shall monitor and record refrigerator temperature daily when maintaining samples in refrigerator.
- (vii) CONTRACTOR shall monitor and record percent ROC (retention on cuttings) every 500 feet maximum 3 times per day, static sheen analysis on all discharged fluids and cuttings weekly.
- (viii) CONTRACTOR shall supply and maintain GC/MS certification of no formation oil contamination prior to drilling to be submitted to COMPANY at the end of each well.
- (ix) CONTRACTOR shall monitor formation oil content in SBM either using GCMS analysis or RPE test weekly when discharging.

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- (x) CONTRACTOR shall monitor contamination of drilling fluids using GCMS analysis. CONTRACTOR may perform analysis at CONTRACTOR laboratory or send samples to COMPANY approved laboratory.
- (xi) CONTRACTOR shall sample and submit for toxicity analysis (Aquatic and Sediment toxicity), samples of drilling fluid to COMPANY approved laboratory.
- (xii) CONTRACTOR shall monitor and record mud, cuttings, cement (at the sea floor) source water, and sand using visual sheen and static sheen analysis.
- (xiii) CONTRACTOR shall segregate all spent laboratory chemicals into an approved DOT waste container and maintain a COMPANY Hazardous Waste Generation Log for all spent fluids laboratory chemicals.
- (xiv) CONTRACTOR shall submit copies of all monitoring and measurement records to COMPANY at the end of each well.
- (xv) CONTRACTOR shall supply operating staff that have been adequately trained to perform discharge monitoring and waste handling duties as required by COMPANY.

13.1.2 Completion Fluids

- (a) CONTRACTOR shall perform the following functions:
 - (i) Static sheen analysis on each type of fluid discharged, daily when discharging.
 - (ii) CONTRACTOR shall sample and submit, for oil and grease analysis, samples of each type of fluid discharge to COMPANY approved laboratory.
 - (iii) CONTRACTOR shall perform static sheen or visual sheen analysis on diatomaceous earth filter media, daily when discharging.
 - (iv) CONTRACTOR shall submit copies of all monitoring and measurement records to COMPANY at the end of each well.
 - (v) For those fluids intended to discharge, CONTRACTOR shall provide a fluid free of priority pollutants.
 - (vi) CONTRACTOR shall supply operating staff that have been adequately trained to perform discharge monitoring and waste handling duties as required by COMPANY.
- (a) CONTRACTOR is responsible for:
 - brine weight at their shore base at ± 0.1 ppg, ± 0.0 ppg.
 - brine clarity of less than 20 NTU and un-dissolved solids content less than 0.1%.

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- ensuring boat tanks are satisfactory clean and isolated prior to loading completion fluids.
- designing and testing all spacers at 40 degree Fahrenheit and maximum bottom hole temperatures as required by COMPANY.

13.1.3 Waste Management

CONTRACTOR acknowledges that waste management equipment could be provided by a Third Party, which CONTRACTOR would be expected to supervise and manage.

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1.0 THE WORK

- 1.1 The WORK shall specifically comprise CONTRACTOR's provision of management, engineering, supervision, labor, plant, equipment, and materials at onshore and offshore locations to support COMPANY's operations.
- 1.2 CONTRACTOR shall provide directional drilling, MWD/LWD and mudlogging services comprising of: engineering, well planning, operations management, and support services together with drilling, surveying, survey management and data acquisition activities necessary for the satisfactory performance of the WORK. Notwithstanding this, COMPANY expectations are that the combined services shall help deliver the most cost effective, top quartile data acquisition and well-bores. The WORK shall comprise the principal following services:
 - Directional Drilling
 - Rotary Steerable Services
 - Specialist Rental Tools
 - Measurement while Drilling (MWD)
 - Logging while Drilling (LWD)
 - Directional Drilling Engineering (Well Planning and Drilling Optimization)
 - Survey Management (IFR, CA Corrections, DB Management)
 - Engineering Support and Services (NDS, Pore-pressure Modeling, Geological Steering)
 - Mud Logging
- 1.3 COMPANY has a program comprising development, appraisal, and exploration drilling projects. The wells will include vertical, directional, and horizontal/ERD drilling.
- 1.4 The provision, utilization, and management of the WORK shall be the sole responsibility of CONTRACTOR always accepting that CONTRACTOR shall meet the requirements of the Scope of WORK. The WORK shall be provided in accordance with the service specific statement of technical requirements stated in this Detailed Scope of Work.
- 1.5 CONTRACTOR shall liaise with, and ascertain from COMPANY, all forward programming and planning information for COMPANY's drilling operations to enable CONTRACTOR to provide all the resources required to meet its obligations under the CONTRACT. CONTRACTOR shall be solely responsible for ensuring that personnel, equipment, and all other items are provided so that no disruption occurs to the drilling operation.
- 1.6 CONTRACTOR shall provide all of the Technical Support Service related to the WORK which shall include provision of competent Technical Support Engineers and operationally experienced Field Engineers and Operators as required to execute the WORK.
- 1.7 CONTRACTOR shall provide an organization to plan, monitor, and optimize the performance of the WORK in full compliance with the requirements of COMPANY. CONTRACTOR shall ensure optimal utilization of equipment, for example, equipment shall be back loaded at the earliest opportunity if no longer required. CONTRACTOR shall render all assistance to COMPANY in this regard. Nevertheless, equipment shall only be shipped and back loaded with the prior consent of COMPANY. COMPANY may elect to measure the effectiveness and benefits of actions taken as part of a Performance Management System.

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- 1.8 Upon receipt of a request from COMPANY, CONTRACTOR shall provide or procure the requested tool, equipment, spare, or material available for transport by the mutually agreed specified time. Where CONTRACTOR cannot supply such tools, equipment, spares, or materials from its own inventory, it shall offer to COMPANY an alternative tool, equipment, spares or materials at contracted rates.
- 1.9 Where appropriate, CONTRACTOR is responsible for providing all necessary protection against the weather elements, mechanical protection, handling equipment, and appropriate transportation baskets.
- 1.10 An up to date inventory and utilization report of all equipment is required at all times and shall be available for inspection by COMPANY as and when requested. This inventory shall be maintained on a well by well basis, reported on monthly and shall be submitted to COMPANY to receive payment for services.
- 1.11 Inspections done by a third party inspection company must be accepted and approved by COMPANY. All inspections shall be in accordance with COMPANY's field inspection procedures. A specific set of inspections for MWD Tools and Mud Motors shall be produced by CONTRACTOR. CONTRACTOR shall provide inspection criteria and acceptance/rejection criteria to evaluate inspections.
- 1.12 COMPANY reserves the right to assign its own Third Party Inspectors to review daily operations or to witness tool break-down during failure investigations or following reports of running tools out of specification.
- 1.13 The WORK will be conducted in a safe and cost effective manner as described more fully herein.
- 1.14 COMPANY will not specify equipment lists for the performance of the WORK, nor will it prescribe the techniques that shall be used to perform the WORK. It is the intention that techniques used will be jointly developed and agreed by COMPANY and CONTRACTOR.
- 1.15 CONTRACTOR shall seek out expertise from within CONTRACTOR's organization, COMPANY's organization, and from Third Parties to enable CONTRACTOR to maximize drilling performance.
- 1.16 CONTRACTOR shall have in place or set up a program to provide 24 hour technical support, in order to have immediate response to problems arising in operations.
- 1.17 CONTRACTOR shall provide a process for accessing its local engineering resources and shall analyze the data both at the WORKSITE for real-time decision making and subsequently in the office to achieve a systematic improvement in performance, specifically with respect to drill string dynamics.
- 1.18 CONTRACTOR will be required to co-operate and work closely with other service providers during the project. In particular this may include working with the Drilling Contractor, and providers of Drilling Fluid, Cementing, and Electric Line services.
- 1.19 Where applicable, all relevant COMPANY specialists, technologies, and IT facilities shall be made available to CONTRACTOR to facilitate this process. Such assistance shall be provided at the sole discretion of COMPANY but shall not be unreasonably withheld.
- 1.20 CONTRACTOR is required to submit a detailed recommendation on equipment requirements and specifications to execute the WORK for each hole section, justifying said

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recommendation with the exact specifications and quantities of tools required for each of the possible hole sections. That recommendation shall be inclusive of CONTRACTOR's equipment and relevant Third Party equipment required to successfully execute the WORK.

- 1.21 CONTRACTOR shall proactively monitor, evaluate, and promote the use of new technology where appropriate, especially with regard to the application of drill string dynamics and reaming while drilling, real-time automated drilling systems and communications, high tier rotary steerable, and formation evaluation technologies.
- 1.22 Any new developments and/or innovations in equipment or processes which could improve the operations shall be proposed by CONTRACTOR to COMPANY. The application of any such new development or technology shall be the subject of an amendment and must be approved by COMPANY regional or Global Sector Specialist prior to implementation.
- 1.23 CONTRACTOR will only propose alternative equipment and services at the WORKSITE on the understanding that it has previously approached COMPANY (Global Sector Specialist or local Specialist where available) and received written acceptance to a rate for the inclusion of such equipment or services in the CONTRACT and to be provided upon signing of an Amendment to this CONTRACT by the Parties. It is incumbent upon CONTRACTOR to proactively advise COMPANY of new equipment and services for inclusion in the CONTRACT.
- 1.24 COMPANY reserves the right to procure equipment and services from a Third Party if in COMPANY's opinion CONTRACTOR's equipment or service does not meet the specifications required for performing the WORK.
- 1.25 Following well operations, CONTRACTOR shall operate a post-analysis review of well performance so that lessons learned are fed back into the plans for the next section of the well. Refer to Reporting and Record Keeping Clause 12 of Appendix 5 herein.
- 1.26 COMPANY reserves the right to audit CONTRACTOR facilities against their own Quality Management system to ensure compliance. This will include yet not be limited to HSSE, Operations, R&M & Quality (facilities, systems, calibrations (depth in particular) & workshops), HR (Competency), Legal, Finance, Sales and Tendering and Asset Management. The audit will be an open, jointly owned process between CONTRACTOR and COMPANY and all findings / observations will be shared between both organizations.
- 1.27 Operations shall be conducted in accordance with a standard set of joint operating procedures (JORPS) which either:
 - Have been jointly developed by COMPANY and CONTRACTOR, or
 - Shall be jointly developed by COMPANY and CONTRACTOR.

In the case above where CONTRACTOR does not have an approved JORPS in place with COMPANY, CONTRACTOR shall provide the WORK for COMPANY on a probationary status but shall be required to establish and complete JORPS within six (6) months of the EFFECTIVE DATE OF CONTRACT.

2.0 PERSONNEL

- 2.1 CONTRACTOR shall provide the following dedicated personnel for each SPU:
 - SERVICES COORDINATOR (DD, MWD, LWD, SURVEYING, Mud Logging).
 - DESC ENGINEER (Directional Drilling Engineering / Well Planning).

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COMPANY and CONTRACTOR may agree to reduce the numbers of the above.

- 2.2 CONTRACTOR shall provide a local SERVICES COORDINATOR who is to be accountable for the performance of all personnel provided by CONTRACTOR. They are expected to provide a single point of contact for all contractual issues, HSSE performance, and for all issues relating to compliance and execution of the WORK. This position can be split into an MWD/LWD, MUD LOGGING, and DD SERVICES COORDINATOR should volume of work dictate.
- 2.3 In support of this role, the SERVICES COORDINATOR shall be responsible for setting up an engineering planning process for COMPANY that is compatible with the system within COMPANY.
- 2.4 CONTRACTOR shall provide all of the Technical Support Service related to the WORK which will include provision of Technical Support Engineers and operationally experienced Field Engineers and Operators as required to execute the WORK. Personnel and support services shall be located in proximity to the operations and at locations agreed with COMPANY. Should CONTRACTOR be unable to fully support services from these locations CONTRACTOR shall identify the exceptions and provide details of alternative support services offered to enable CONTRACTOR to satisfactorily perform the WORK.
- 2.5 In the case of new technology equipment, CONTRACTOR is required to demonstrate adequate training and experience for assigned personnel. Where appropriate, development engineers shall provide support for the WORKSITE engineers.

2.6 PERSONNEL UTILIZATION

- 2.6.1 Utilization and number of personnel employed on any part of the WORK shall be at the discretion of CONTRACTOR but shall be sufficient to perform the WORK in an efficient, effective manner while complying with local HSSE regulations for maximum working hour limits. Additional personnel may be provided at the WORKSITE as and when required by CONTRACTOR for operational or other reasons. Any personnel requirement additional or otherwise shall be agreed in advance with COMPANY and its Rig-site Representative.
- 2.6.2 The crew change rotation schedule for the offshore personnel shall be agreed by COMPANY and CONTRACTOR and adhered to, with only COMPANY approved personnel being included in the rotation schedule.
- 2.6.3 CONTRACTOR shall, if applicable to this CONTRACT, employ local labor subject to availability and suitability of qualifications and experience. CONTRACTOR shall comply with all relevant governmental rules, regulations, and instructions with respect to the employment of local labor. All local employees shall undertake suitable induction training and work orientation and be familiarized with the HSSE aspects of their work.

2.7 COMPANY APPROVAL

- 2.7.1 The experience of all personnel to be used for the WORK shall be agreed with COMPANY before assignment to COMPANY operations. Curriculum Vitae of proposed lead personnel to be used in COMPANY operations shall be approved by COMPANY prior to commencement of the job and only the personnel therein described shall be employed in the performance of the WORK. If CONTRACTOR wishes to employ personnel not listed therein then CONTRACTOR shall obtain

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COMPANY's prior approval. Applications for any substitution of personnel shall be made to COMPANY's WORKSITE Representative in advance and shall be accompanied by detailed curriculum vitae relating to the proposed replacement personnel.

- 2.7.2 Depending on the nature and complexity of the WORK, CONTRACTOR may be required to provide, on request, personnel who work as embedded members of COMPANY wells team. This team is responsible for the planning and successful delivery of COMPANY drilling basis of design. Such a commitment may be required some time ahead of the spud date. CONTRACTOR shall not rotate personnel in this type of office position.

Individuals required may include a Directional / Well Planning Engineer, LWD Desk Engineer/Coordinator, Drilling Optimization Specialist, Log Analyst.

- 2.7.3 CONTRACTOR shall provide further assurance that the WORKSITE personnel, who spend time planning in the office and attend all the pre-spud briefings, are continuously available through the drilling phase of the project.

- 2.7.4 To ensure continuity and operational learning, CONTRACTOR personnel assigned to a rig shall not be replaced without COMPANY agreement.

- 2.8 CONTRACTOR, with approval from COMPANY, shall develop and deploy a program, to maximize savings in personnel at the offshore WORKSITE by multi skilled staff members and thereby reducing the number of personnel required to a minimum. Such personnel reductions shall not at any time compromise safety or efficiency. COMPANY shall, wherever possible, (but at COMPANY's sole discretion) provide offshore transportation and accommodation for CONTRACTOR's trainee personnel to facilitate ongoing training development at the WORKSITE.

- 2.9 All offshore/onshore operations personnel shall be trained in a recognized Safety Observation Program. In addition supervisors shall be capable of performing Safety Observation Conversations (SOCs) of CONTRACTOR tools, equipment, and operations. All CONTRACTOR personnel shall participate in COMPANY sponsored offshore/onshore safety initiatives and safety meetings. They are also encouraged to lead safety meetings, job risk assessments, and toolbox talks.

- 2.10 All offshore personnel shall have a "Passport" or similar record assigned to them detailing:

- Offshore Medical Certificate
- Offshore Survival Certificate including HUET
- Technical/operational training
- Experience level
- Safety training- SOC, STOP, FOCUS
- Drilling Contractor's Permit to Work system
- Risk Assessment training
- Manual handling training
- Fire fighting

- 2.11 Prior to starting work on any new rig, irrespective of whether the engineer has worked on other COMPANY installations, CONTRACTOR personnel shall be thoroughly inducted into the ways of working on the rig and also the technical issues associated with the WORK on the rig. It shall be the responsibility of CONTRACTOR to provide this induction. The process should include an induction pack, the Basis of Design for the project / program and thorough

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briefing on the program of work to be carried out. COMPANY reserves the right to test this understanding through a competency assessment.

- 2.12 COMPANY may ask CONTRACTOR's personnel to perform the WORK at the WORKSITE or any other places other than location stated above as instructed by COMPANY in writing. These shall include but not be limited to the following:

- Technical Limit Workshops
- Crew Engagement Sessions
- Team Building Events
- Well Pre-Spud Meetings

- 2.13 The SERVICES COORDINATOR shall have a CONTRACTOR supplied computer, complete with CONTRACTOR software, for all directional planning, drill string design and log interpretation.

- 2.14 CONTRACTOR's WORKSITE based Directional Drilling and MWD/LWD Engineers shall have a CONTRACTOR supplied computer, complete with CONTRACTOR software for drill string equipment inventory management, well-bore survey calculations, ant-collision analysis, BHA analysis and prediction and LWD log data QC and interpretation.

- 2.15 Cross Trained Engineers are individuals who have current competencies in both LWD/MWD and Directional Drilling disciplines, enabling the rationalization of personnel at the WORKSITE into two cross trained engineers.

2.16 ROLES AND RESPONSIBILITIES

- 2.16.1 Specific Roles and Responsibilities for SERVICES COORDINATOR include:

- (a) Producing a Basis of Design (BOD) document for the project which covers all background engineering required to put in place the generic field program. It shall cover previous area experience, relevant options, logistics, rig constraints, commercial balance, interface considerations and environmental controls with complementary or conflicting services or activities, development of recommended practices and procedures including a risk weighted decision tree and detailed optional procedures. The BOD document shall be required to be approved by COMPANY Representative. Individual well programs shall be written with reference to the BOD Document, the DWOP (Drilling & Well Operations Policy) manual and Engineering and Group Technical Practices;
- (b) Producing for all wells a cost estimate for the WORK for inclusion in COMPANY's Approval for Expenditure (AFE). Back up engineering shall be available to validate the proposal. All such estimates shall include all associated costs for the project.
- (c) Being an active part of COMPANY's project execution team. This shall involve attending planning meetings. Cooperative working relationships are expected and shall be maintained with other contractors and service providers.
- (d) Holding a peer review of the planning and the final Basis of Design or program as appropriate with CONTRACTOR's personnel of suitable technical standing.
- (e) Producing combined service End of Well Reports with recommendations for continuous performance improvement, problem description/analysis and cost analysis.

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- (f) Monitoring and controlling projected and actual equipment utilization on the project against the projected costs and requirements. The Services Coordinator shall advise COMPANY Representative in advance of any likely breach of the forecast cost.
- (g) Implementing a system for tracking variations from expected WORK levels and producing recommendations for future avoidance.
- (h) Undertaking rig visits on an ad-hoc basis but as a minimum once per well for single well programs and a minimum of two times per year for multi well projects. The purpose of the visit shall be ensuring that CONTRACTOR's personnel are working in a safe and efficient manner. The findings of these inspections shall be shared with COMPANY REPRESENTATIVE.
- (i) Coordination of all CONTRACTOR's personnel movement to and from the rig site. Keeping records of personnel hours worked per week on COMPANY's business. Records of this shall be provided once per month to COMPANY Representative.
- (j) Adherence to COMPANY's specific directional drilling & well bore survey procedures.
- (k) Drilling performance optimization recommendations.
- (l) Providing updates to formation evaluation logs as required.

2.16.2 General responsibilities of CONTRACTOR's WORKSITE Personnel (DDs and MWD/LWD engineers) shall include, but not necessarily be limited to:

- (a) Performing visual checks of all equipment, tubular goods, and connections prior to running. When a CONTRACTOR Representative is on location this check shall be performed in conjunction with the nominated COMPANY supervisor.
- (b) Ensuring that all power units and general make-up equipment are functioning correctly, before the tubular running operation begins.
- (c) Advising on the positioning of make-up and break-out rig tong system in conjunction with driller/rig crew.
- (d) Advising on the setting of elevators and slips on equipment in conjunction with the driller/rig crew.
- (e) Observing rig crews and drillers operating equipment to ensure safe and efficient deployment of equipment.
- (f) Applying torque to limits set by COMPANY with respect to values such as speed.
- (g) Determining acceptability of make up and break out of connections.
- (h) Advising on any equipment to be laid out for repairs or damage.
- (i) Conducting ad hoc audits in conjunction with COMPANY supervisors.

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- (j) Providing a written report on each job and data set to COMPANY's requirements; highlighting any difficulties, problem areas, points of concern or deviations from procedure.
 - (k) Attending pre-job safety or operational learning sessions, or other meetings with COMPANY's other contractors and COMPANY Representative at the location.
 - (l) Being involved in the safety management systems, including incident and accident reporting, of COMPANY's Drilling Contractor and COMPANY as they affect the WORKSITE.
 - (m) Taking due care and attention to the safety of others and themselves when on location and comply with all health, safety, security, and environmental requirements.
 - (n) Monitoring and recording real time and memory LWD and directional data and prepare data files and print outs while drilling to COMPANY's requirements.
 - (o) Ensuring full compliance with any agreed COMPANY Communications Protocol - informing the well site geologist and key drilling personnel in a timely manner of any operation or condition that may have a bearing on operations (such as equipment failures, safety issues, unexpected log responses, hydrocarbon indications etc.).
 - (p) Producing reports detailing daily and cumulative cost, operational performance, and equipment utilization.
 - (q) Making recommendations as to the optimization of CONTRACTOR equipment and monitor its performance unless COMPANY puts in place a Third Party whose specific job it is to do this. Under these circumstances CONTRACTOR shall work in co-operation with this Third Party.
 - (r) Providing guidance to the Drilling Contractor, COMPANY, or other Third Party as to the hazardous nature of CONTRACTOR's equipment, service, or activity specific hazards that are to be used.
- 2.16.3 CONTRACTOR may be required to provide a dedicated DESC engineer (Drilling Engineering Servicing Client) focusing on Directional Drilling Engineering, Well Planning and Survey Management activities to support the WORK. The DESC will be based in either COMPANY's or CONTRACTOR's office at COMPANY discretion.
- 2.16.4 Specific Roles and Responsibilities relating to Directional Drilling Engineering, Well Planning and Survey Management (DESC) shall include, but not necessarily be limited to:
- (a) Computation of well-bore trajectory to meet criteria requested by COMPANY geology, reservoir engineering and drilling departments including target sizing, selection and boundary conditions.
 - (b) Anti-Collision scanning of trajectory design against adjacent wells on platform, geological structure, and field. This includes all development, exploration, and appraisal wells that have definitive surveys. Although CONTRACTOR has risk models that are internationally accepted, all collision risk shall be generating using COMPANY supplied models and sanctioned software systems, and comply with all Strategic Performance Units specified regulations. Well-bore

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anti-collision & conductor slot utilization will fully comply with the Group Practice for Directional Drilling and Surveying (GP 10-05) using COMPASS or COMPANY approved alternative system to perform any pertinent engineering analysis.

- (c) Torque and Drag calculations to be supplied as requested by COMPANY and mandatory for all directional wells drilled.
- (d) Hydraulic modeling of all BHAs (Bottom Hole Assemblies) to ensure adequate hole cleaning, bit hydraulics, and total pressure drop requirements are met.
- (e) Magnetic Modeling of all BHAs shall be done to ensure adequate magnetic environment for accurate well-bore surveying.
- (f) Vibration analysis is done to facilitate the smooth operation of BHAs downhole in order to maximize rates of penetration and avoid down-hole tool failures.
- (g) Preparation of drilling and structure maps for posting in COMPANY offices and WORKSITE such as spider plots, traveling cylinder plots, plan and vertical section views.
- (h) BHA recommendations.
- (i) Tracking, reporting, and benchmarking of Directional Drilling Performance Measures, as required in Clause 12 of this document.
- (j) Report directional drilling & survey data on COMPANY data-store (Currently EDM/COMPASS).
- (k) Ensuring that for one-off wells, the same basic considerations are taken into account and documented in all COMPANY's operations.
- (l) The use of risk based engineering in preparing the Basis of Designs, individual well program and all associated engineering. The results of such risk based engineering shall be documented.
- (m) Being part of COMPANY's project execution team. This shall involve attending planning meetings. Cooperative working relationships are expected and shall be maintained with other contractors and service providers e.g., No Drilling Surprises and Technical Limits meetings.
- (n) Making recommendations for continuous performance improvement.

2.16.5 The specified role and responsibilities of the SERVICES COORDINATOR and DESC may be reassigned by an SPU, particularly as the SERVICES COORDINATOR position may be split or the DESC may take on additional coordination responsibilities. It is an expectation of COMPANY that independent of assignment the activities detailed above shall be completed, yet can be managed to suit the various operations.

2.17 COMPETENCY

2.17.1 CONTRACTOR personnel and its SUBCONTRACTOR's personnel shall be properly qualified, skilled, experienced, and competent in their respective disciplines to a recognized industry standard, where applicable.

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- 2.17.2 CONTRACTOR shall have in place a formal system of Competency Assurance for its personnel and for its SUBCONTRACTOR's personnel the scope of which will, as a minimum, cover:
- All trade/discipline skills employed in the performance of the WORK;
 - The details of its safe working practices which shall include communications, permit-to-work systems, risk assessment, and risk to the environment;
 - Include a means of confirmation that the system is effective and verification that all personnel and SUBCONTRACTOR's personnel are covered and have been assessed for competence.
 - Consider core and specialized technical competencies, behavioral and teams skills (non-technical skills),
 - Be a system able to assess current as well as new personnel particularly with respect to declining standards.
- 2.17.3 CONTRACTOR's formal process for the selection of its SUBCONTRACTORs shall include assessment of SUBCONTRACTOR's own Competence Assurance system.
- 2.17.4 CONTRACTOR shall submit names and Competency Assessments which will enable COMPANY to determine the suitability of the nominated personnel. Only personnel approved by COMPANY shall be employed by CONTRACTOR for the performance of the WORK. All personnel shall be competent and be fully trained to perform their assigned tasks. A training matrix shall be provided by CONTRACTOR altogether with the competency assessments.
- 2.17.5 COMPANY has the right to object to and require CONTRACTOR to remove from the performance of the WORK any personnel and/or SUBCONTRACTOR's personnel who, in the opinion of COMPANY, misconduct themselves or are incompetent or negligent in the proper performance of their duties and such personnel shall not be again employed upon the WORK without COMPANY's approval. At the instruction of COMPANY in writing CONTRACTOR shall remove from duties hereunder or lawfully secure such removal of any of CONTRACTOR's personnel or SUBCONTRACTOR's personnel who is unacceptable to COMPANY. COMPANY shall state the reason for such removal in the written instruction.
- 2.17.6 No CONTRACTOR personnel will be removed from the CONTRACT for purposes of internal transfer without agreement of COMPANY Representative. Prior to any move a management of change document shall be submitted to COMPANY Representative detailing the signed handover of all responsibilities. Three months prior to a change of the SERVICES COORDINATOR, CONTRACTOR will forward COMPANY the Curriculum Vitae of at least three candidates for COMPANY to choose from. Should none of the proposed candidates be suitable for COMPANY, CONTRACTOR will propose more Curriculum Vitae. Once one of the proposed candidates has been approved by COMPANY, the candidate will spend a month overlap with the current SERVICES COORDINATOR or the onshore well site personnel.
- 2.17.7 The set of seven competencies in which CONTRACTOR must show that it is proficient in are:
- (a) Documentation of directional drilling engineering practices including data transfer from COMPANY, planning procedures, drawings and collision tolerance setting and transfer of final well data back to COMPANY.
 - (b) Staff trained and assessed as competent to perform the WORK, including ongoing training program and succession plan in place.

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- (c) Survey management system in place, including: survey program design, instrument selection procedures, process for validating new tools, process in place for screening results and guaranteeing integrity of data.
 - (d) Implementation of a management and control system to ensure that the operations at the well site take place in accordance with the terms of the well design and that there is a mechanism in place to handle deviations from plan.
 - (e) Development of drilling engineering procedures to ensure that the operations optimization process is formalized and applied routinely including bit/BHA performance analysis, overall time performance, and management of losses such as drill string failure and stuck pipe.
 - (f) Accreditation of the whole engineering management system to a recognized Quality Standard (such as ISO 9001).
 - (g) General management and supervision of the service including additional location support, logistical organization and rig site supervision.
- 2.17.8 It is anticipated that COMPANY and CONTRACTOR will jointly agree on the attainment of these competencies at CONTRACT commencement. In addition to having the documentation and audit mechanisms in place, CONTRACTOR shall be required to demonstrate its relevant understanding of COMPANY's current policies, working standards and practices, and their implementation to the above stated competencies.
- 2.17.9 Should CONTRACTOR fail to achieve the required competencies within the agreed timescale, COMPANY shall have the right to terminate the CONTRACT (with cause) at its sole discretion.
- 2.17.10 CONTRACTOR shall comply with all other Regulatory or Governmental regulations as specified in each SPU.
- 2.17.11 Minimum Competencies are detailed in Technical and Functional Specifications Appendix 6

3.0 SERVICES and SUPPORT – Drilling Engineering, Optimization, and Well Planning

- 3.1 CONTRACTOR shall provide engineering support required to directionally plan wells from conception through execution and evaluation. The functions may include but will not be limited to:
- Generic Engineering Support
 - Preparation of Basis of Design documents.
 - Establishment of well shut-down requirements in accordance with COMPANY Directional Drilling and Surveying Group Practice (GP 10-05).
 - BHA design and optimization studies.
 - Drill string vibration mitigation and management studies.
 - Creation and maintenance of Joint Operations Procedures (JORPS) Manual.
 - Input to Technical Limit Programs.
 - Conceptual well planning and trajectory design studies.

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- Completion of 'end of well reports' with details of 'lessons learnt' and recommendations for continuous performance improvement.
- Tracking, reporting, and benchmarking of Directional Drilling Performance Measures.
- Cost management and inventory management.
- Service cost estimating.

3.2 Well Specific as follows:

- 3.2.1 Generation of detailed well designs and trajectories to meet criteria requested by COMPANY geology, reservoir engineering, and drilling departments.
- 3.2.2 Anti-Collision scanning of trajectory design against adjacent wells on platform, geological structure, and field. This includes all development, exploration, and appraisal wells that have definitive surveys. Wells known to be in the area but without a definitive survey will have a COMPANY/CONTRACTOR agreed specific error model attached to reduce collision risks. Although CONTRACTOR has risk models that are internationally accepted, all collision risk shall be generated using COMPANY supplied models and applications, presently EDM/Compass.
- 3.2.3 Develop well specific well-bore survey procedures (by parts).
- 3.2.4 Develop contingency sidetrack plans.
- 3.2.5 Establish MWD/LWD data acquisition plans.
- 3.2.6 Production of all working drawings for use at the WORKSITE and onshore office locations.
- 3.2.7 Generation of well specific operating procedures.
- 3.2.8 Maintenance of directional drilling and survey data on COMPANY database (in real-time where requested).
- 3.2.9 Provide collision avoidance assurance in real-time at the well site. (See also 4.0 SERVICES and SUPPORT - Survey Management).
- 3.2.10 Torque and Drag calculations to be supplied as requested by COMPANY and mandatory for all directional wells drilled.
- 3.2.11 Hydraulic modeling of all BHAs to ensure adequate hole cleaning, bit hydraulics, and total pressure drop requirements are met.
- 3.2.12 Comprehensive vibration analysis to be conducted on all BHAs to facilitate their smooth operation down-hole in order to maximize rates of penetration and avoid down-hole tool failures.
- 3.2.13 Provide updates to formation evaluation logs as required.
- 3.2.14 Implementation of procedures and practices to minimize drill string failures and/or optimize ROP.
- 3.2.15 Preparation of drilling and structure maps for posting in COMPANY offices and rig site using COMPANY approved applications, presently EDM/Compass.

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- 3.3 CONTRACTOR shall be responsible for securing all hardware and software to enable CONTRACTOR to access COMPANY's designated planning and database system. In the event that COMPANY requires CONTRACTOR to utilize software licensed to COMPANY and COMPANY is required to safeguard such software under the terms of its license, the following provisions shall apply:
- 3.3.1 On request of CONTRACTOR, COMPANY shall provide CONTRACTOR with copies of such licensed software and any associated bitlocks for use solely in conjunction with the WORK;
 - 3.3.2 CONTRACTOR shall notify COMPANY of the location of such software copies and bitlocks. CONTRACTOR shall notify COMPANY promptly of any changes to the location of such software copies and bitlocks. CONTRACTOR shall take all reasonable measures to ensure that copies of such software and bitlocks are kept in secure locations and protected against theft;
 - 3.3.3 CONTRACTOR warrants that it shall not copy such software except to the extent that this is required in performance of the WORK;
 - 3.3.4 CONTRACTOR warrants that it shall not disassemble or reverse engineer such software, and
 - 3.3.5 CONTRACTOR shall return such software and bitlocks on COMPANY's request, or on completion or termination of the CONTRACT, whichever is the sooner, and confirm such return to COMPANY in writing.

Such licensed software shall include but not be limited to software licensed by Landmark, including Compass and Wellplan.

- 3.4 The minimum expectations for the engineering performance:
- 3.4.1 Compass software and algorithms used in planning, anti-collision scanning and survey calculations. COMPANY maintains a Compass database that is designated as the Master Database for its operations. Separate working databases may be operated by CONTRACTOR at remote locations and offices outside COMPANY firewall, but CONTRACTOR is responsible for preparing their work to be transferred to the Master Database at the end of planning and operation phases.
 - 3.4.2 Survey planning: For those sections of a well where the consequences of a collision present a major risk (as determined by COMPANY and specified in COMPANY's Surveying Handbook) the survey program shall be planned to provide sufficient data redundancy to permit independent validation of the performance of each constituent survey.
 - 3.4.3 A geometrical positioning tolerance around each target location should be defined based on geological or engineering constraints. A reduced Driller's Target should be calculated in a way that makes allowance for well position uncertainty.
 - 3.4.4 An anti-collision scan against COMPANY's Master Database shall be performed on the planned well trajectory. CONTRACTOR's collocated engineers will perform such scans using Master Database. For engineering services not collocated, CONTRACTOR will provide data files and other support for COMPANY engineers to perform the scan within the Master Database.

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- 3.4.5 After each survey is taken, the as-drilled position and trend of the well shall be determined in relation to the pre-determined tolerances. Drilling tolerances should be represented on an anti-collision diagram, ideally a traveling cylinder plot, annotated with tolerance lines.
- 3.4.6 The value of magnetic declination shall be determined either from the latest version of the British Geological Survey Global Geomagnetic Model (BGGM) or direct measurement of the local field, with or without a time-varying correction (IFR).
- 3.5 CONTRACTOR shall obtain COMPANY approval for all proposed methods, tools, and/or equipment prior to mobilization or implementation.
- 3.6 CONTRACTOR shall have in place and demonstrate the necessary quality assurance systems to ensure that all engineering work is fully traceable and be able to demonstrate that the assumptions, objectives, and procedures made in the planning process are not violated during the drilling operations at the WORKSITE.
- 3.7 CONTRACTOR will provide signed assurance of all approved designs, drawings, programs, and procedures and will retain record of all approved well designs and associated calculations, and be prepared to surrender such documentation and electronic datasets at CONTRACT end.
- 3.8 CONTRACTOR shall produce all working drawings for execution of the WORK at the WORKSITE and COMPANY's office. These plots shall include but not be limited to the following:
- Well Trajectory Plots (VS, Plan and Spider)
 - North Orientated Anti-Collision Traveling Cylinder Plots, where applicable
 - BHA Diagrams and associated Torque and Drag and Hydraulics trend plots
 - Dimensional Drawings for CONTRACTOR's equipment
- 3.9 CONTRACTOR shall maintain up-to-date plans for the overall slot-target allocation master plan on COMPANY's directional drilling support system 'DIMS/COMPASS' or other system to be determined by COMPANY in accordance with the overall field development plan and keep the directional drilling basis of design document up to date as experience in the field grows and as the generic well design is developed.
- 3.10 CONTRACTOR will use all COMPANY and CONTRACTOR applicable procedures and instructions and must ensure its full compliance with the following procedures:
- COMPANY Directional Survey Handbook (Ref: BPA - D - 004)
 - COMPANY Drilling and Well Operations Procedure
 - COMPANY Directional Drilling and Surveying GP 10-05
 - COMPANY Offshore Site Investigation Guidelines

Copies of these documents are available on request.

In addition, survey programs shall be designed according to the principles in:

- COMPANY's Generic Directional Drilling Basis of Design
- COMPANY's Generic Well Program

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- 3.11 All critical processes in directional planning, directional drilling, and survey management will be performed according to a System for Technical Integrity, maintained by CONTRACTOR, and agreed with COMPANY.
- 3.12 CONTRACTOR shall provide a fast, effective and efficient problem / failure investigation service that provides rapid feedback to COMPANY on the likely cause of operational problem(s). This service will include a well documented root cause analysis with service or equipment failure mode identified, together with a means of correction and further work required to effect a total solution, or further equipment design life and performance studies to be undertaken to ensure a satisfactory solution.
- 3.13 CONTRACTOR shall undertake to:
 - 3.13.1 Investigate all CONTRACTOR related operational incidents/failures (e.g., personnel, tool, BHA, etc.) and report to COMPANY Well Operations any findings and recommendations.
 - 3.13.2 Keep a record on a daily basis of the critical operating and drilling parameters during WORKSITE operations (loads, make-up torque, weight, time in hole, mud type, etc.).
 - 3.13.3 Maintain operations histories, activity reports, service and history records, handover notes, and report on a well by well and monthly basis to COMPANY Representative all findings. In addition CONTRACTOR will advise COMPANY on personnel, service and equipment operation, and of inspection results or requirements, plus failure frequency and acceptance/rejection criteria.
- 3.14 CONTRACTOR shall respond in a timely manner to COMPANY on queries of a general nature relating to CONTRACTOR's services and products.
- 3.15 CONTRACTOR will provide to COMPANY's office and rig site the following:
 - 3.15.1 All pertinent plans and recommendations.
 - 3.15.2 Maintenance and Inspection procedures manual.
 - 3.15.3 Operating manuals
 - 3.15.4 Dimensional drawings (laminated sheets).
 - 3.15.5 Inventory list of equipment available.
 - 3.15.6 All equipment and tools sent to the rig sites shall be sent with the inspection report to ensure the equipment is in perfect condition to be used.
 - 3.15.7 All equipment shipping manifests.
- 3.16 As a minimum, CONTRACTOR shall use a Chartered/Registered Engineer or person of equivalent professional status to set assurance standards, monitor engineering performance and demonstrate how technical authorities are defined and delegated. This may be a corporate or global role within CONTRACTOR organization.
- 3.17 CONTRACTOR shall define the methods, equipment, and tools to be used to drill the wells in order to optimize performance. CONTRACTOR shall operate a formal process of BHA design and optimization demonstrating a structured route for continuous performance improvement.

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- 3.18 CONTRACTOR shall possess a suitable BHA analysis program, which has inputs for the dip and azimuth of the formation, along with a formation characteristic index in support of operations. CONTRACTOR shall be required to maintain validation of these systems in order to demonstrate continuous improvement.
- 3.19 CONTRACTOR shall interact with COMPANY specialists to access COMPANY bit selection and dynamics expertise to maximize drilling performance and minimize dynamics-induced losses. CONTRACTOR shall ensure its expertise is available to assist COMPANY when required.
- 3.20 CONTRACTOR will continually work towards improving the design and construction of downhole tools to be more resilient to Drilling Dynamics and work closely with COMPANY to improve its understanding for standardizing tool specifications across the service sector.
- 3.21 The performance criteria shall be monitored whether CONTRACTOR has WORKSITE representation or is providing engineering support from elsewhere. CONTRACTOR shall provide a plan before the well is spudded to monitor the achievement of these objectives.
- 3.22 CONTRACTOR shall provide a process for accessing its regional based engineering resources and shall analyze the data both at the WORKSITE for real-time decision making and subsequently in the office to achieve a systematic improvement in performance specifically with respect to the dynamics-related and drill bit optimization.

4.0 SERVICES and SUPPORT – Survey Management

- 4.1 CONTRACTOR shall design survey programs, manage survey operations and monitor progress using COMPANY's 'EDM/COMPASS' system or other system to be determined by COMPANY. In addition, CONTRACTOR shall manage surveying operations with equipment agreed by COMPANY in strict accordance with COMPANY Directional Survey Handbook (Ref: BPA - D - 004), The Directional Drilling and Surveying GP 10-05 and COMPANY approved CONTRACTOR "Joint Operating and Reporting Procedures" (JORPs), where agreed between COMPANY and CONTRACTOR.
- 4.2 CONTRACTOR shall provide all engineering support required to design survey programs and manage the acquisition and handling of survey data, including:
 - 4.2.1 Engineering design of survey programs and selection of survey tools.
 - 4.2.2 Coordination of and liaison with survey providers.
 - 4.2.3 Liaison with COMPANY drilling team through provision of a point-of-contact accountable for the survey management service.
 - 4.2.4 Survey data integrity analysis and reconciliation of inconsistencies, monitoring the execution of the survey program, recommending quality requirements where changes to the program are required to be implemented.
 - 4.2.5 Application of environmental and/or other corrections to the measured data to ensure adherence to specifications, when necessary. CONTRACTOR shall provide information regarding calibration standards, routines, and tolerances, charts and/or algorithms for the application of corrections to raw data to COMPANY when requested.

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- 4.2.6 Maintenance of COMPANY drilling database, 'EDM/COMPASS' or other system to be determined by COMPANY, as the definitive survey database for the drilling operation.
- 4.2.7 Carry out survey data validation checks and investigate discrepancies in and / or reduced quality of survey data including annual auditing.
- 4.2.8 Preparation and distribution of definitive surveys.
- 4.2.9 Creation and maintenance of a Well Survey File, containing a record of all survey data acquired in the well, and all information pertaining to its accuracy, consistency, and reliability.
- 4.2.10 Maintaining awareness of latest developments in survey technology and methodology and make appropriate recommendations which might benefit COMPANY.
- 4.2.11 Provide an interface between COMPANY and CONTRACTOR's technical departments to further the improvements of directional and / or drilling services provided to COMPANY.
- 4.2.12 Advise COMPANY personnel on survey operations and procedures as and when required, making recommendations to improve service quality and meet the individual objectives of the survey program.
- 4.3 CONTRACTOR shall be responsible for maintaining the integrity of COMPANY data while in its care. Particularly CONTRACTOR will use COMPANY's 'EDM/COMPASS' or other system to be determined by COMPANY.
- 4.4 CONTRACTOR shall execute the program and analyze performance as required to deliver a definitive survey meeting COMPANY accuracy specifications. CONTRACTOR shall take full responsibility and accountability for analyzing data, reconciling inconsistencies, and accommodating the consequences of failed runs.
- 4.5 CONTRACTOR agrees that the surveying tools to be used may be procured through a competitor of CONTRACTOR.
- 4.6 The Magnetic reference model will by default be the latest available British Geological Survey (BGS) BGGM model unless an improved magnetic reference model is available and approved for use by COMPANY.
- 4.7 CONTRACTOR shall provide competent personnel to provide IFR survey services if requested by COMPANY. Application of IFR data will be real-time, daily, or other time interval as agreed between CONTRACTOR and COMPANY. BGS IFR model data, static or time dependant, is COMPANY standard. BGS IFR source data shall be periodically reviewed for quality. CONTRACTOR shall ensure IFR source data has supporting quality assessment upon request. CONTRACTOR shall ensure IFR source data and application of IFR data is in agreement with COMPANY IPM model.
- 4.8 CONTRACTOR shall manage directional drilling and well bore surveying operations by providing adequate information to COMPANY. CONTRACTOR shall ensure the efficient drilling of the wells in accordance with the specified anti-collision tolerances and the performance criteria such that the definitive survey shows that the well meets COMPANY objectives, which are defined in terms of the following general performance criteria:
 - Well bore surveys which meet required accuracy and validation specification
 - Definitive well bore survey passing through drilling target

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- COMPANY anti-collision tolerances not violated
 - COMPANY dogleg limitations not exceeded
 - COMPANY tortuosity limitations not exceeded
 - COMPANY angular departure from plan not exceeded
 - No equipment failures
- 4.9 COMPANY policy requires that only qualified survey tools can be run, that is, tools whose performance and reliability have been demonstrated to COMPANY through the process of validation. This process is described in COMPANY's Directional Survey Handbook (BPA-D-004), available on request.
- 4.10 Surveying Standards and Competencies
- CONTRACTOR will have the following standards and competencies implemented by the EFFECTIVE DATE OF CONTRACT to ensure that the WORK is performed to COMPANY's requirements and satisfaction.
- 4.10.1 Documentation of surveying engineering practices including, transfer of intermediate section and end of well data to COMPANY (where requested), ongoing engineering research, accuracy and reliability of current monitoring systems and adherence to standard engineering practices for well site services to ensure that the operations optimization process is formalized and then applied routinely (the latter should be available in the form of a manual for COMPANY to review if required).
- 4.10.2 Staff trained and assessed as competent in the WORK, including an ongoing training program and succession plan in place. This is to include the personnel in the office and on the rig site as their ability to interpret and act upon the data from the well is particularly important.
- 4.10.3 Survey Management System in place, including survey program design, instrument selection procedures, process for validating new measurements, process in place for screening results and guaranteeing integrity of data. As the survey data is important to a number of COMPANY departments, the speed with which it is processed and issued is a consideration.
- 4.10.4 Implementation of a management and control system to ensure that there is a mechanism in place to handle and document new requirements of service. This could be due to a new measurement or alterations in the accuracy of monitoring.
- 4.10.5 Implementation of survey engineering procedures to a sufficiently high level of competency to ensure the achievement of a basic performance as defined in the performance criteria.
- 4.10.6 Accreditation of the survey services to a recognized Quality Standard, e.g., ISO9001.
- 4.10.7 General management and supervision of the whole service including office support, logistical organization and well site supervision. It is anticipated that CONTRACTOR will manage all equipment provided for their operations in accordance with a CONTRACTOR owned standard minimum technical specification. This specification may initially be based upon current COMPANY specifications.
- 4.10.8 It is anticipated that COMPANY and CONTRACTOR will jointly agree on the attainment of these competencies. In addition to CONTRACTOR having the documentation and audit mechanisms in place, COMPANY will be looking for

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CONTRACTOR to demonstrate their understanding of COMPANY's policies and working practices.

- 4.11 Regardless of whether COMPANY has in-house or external engineering, there are some minimum expectations for the engineering performance as detailed in Clause 3.3.

5.0 EQUIPMENT and SERVICES

- 5.1 CONTRACTOR shall provide:

- 5.1.1 All equipment at the WORKSITE necessary to perform the specified WORK safely, efficiently, in a timely manner. COMPANY shall agree with CONTRACTOR the actual equipment required for each particular program prior to mobilization of equipment or personnel. CONTRACTOR shall be responsible for the protection and supervision of the equipment used;
 - 5.1.2 Full technical information, all materials specifications, and support for its products, service, tools, and specialized equipment deemed useful to the operations that CONTRACTOR might wish to propose to be used under the CONTRACT, prior to the commencement of the WORK. CONTRACTOR shall be responsible for the provision of all specialist systems to perform the WORK, and
 - 5.1.3 All maintenance, spares, inspections, repair, testing, and certification for all equipment and tools provided for the WORK.
- 5.2 CONTRACTOR shall be proactive in the development of new tools/systems as may be required for the provision of the WORK. If any tool, system, or size is not currently available CONTRACTOR shall provide an estimated time of delivery and monthly updates detailing progress and development of such tools/systems.
- 5.3 COMPANY shall assess if the equipment, machinery, and tools supplied by CONTRACTOR are sufficient and reserves the right during performance of the CONTRACT to reject those that, in COMPANY's opinion, are inadequate. In such cases it shall be the responsibility of CONTRACTOR to replace or add necessary equipment to comply with requirements stipulated by COMPANY.
- 5.4 All equipment used for the provision of the WORK shall be 'as new' and preferably dedicated to the CONTRACT. Used equipment may be acceptable to COMPANY provided that full traceability is available and written details of service life inspection/overhaul history, certification and testing documents, shock, vibration and temperature exposures, by component part, is made available for COMPANY inspection prior to its use.
- 5.5 The certification strategy for equipment to be utilized in the provision of the WORK under the CONTRACT shall be provided by CONTRACTOR before the equipment is used in the provision of the WORK. The tools and equipment shall be to COMPANY acceptable agreed manufacturing standards at the date of commencement of the CONTRACT and shall have full traceability, service history and maintenance records, covering their total life span.
- 5.6 CONTRACTOR shall manage the mobilization and demobilization of the various equipment and packages throughout each phase of the drilling operation, in such a manner so as to ensure an overall efficient operation.
- 5.7 CONTRACTOR shall provide the relevant equipment at the WORKSITE prior to the commencement of drilling operations on each relevant section of the well. CONTRACTOR

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shall manage the movement of equipment by each designated section of the well. COMPANY shall not specify an equipment list for the performance of the WORK nor shall it prescribe the techniques to be used to construct, complete, manage, and intervene in the wells, rather it is the intention that techniques employed shall be jointly developed and agreed by CONTRACTOR and COMPANY.

- 5.8 CONTRACTOR shall be responsible for transportation requirements as set out in the Remuneration Terms and Conditions of this CONTRACT.
- 5.9 CONTRACTOR shall continuously examine all steps of the Supply Chain to identify methods to reduce costs relating to logistics, transportation, handling, storage, inspection, and repair. CONTRACTOR shall endeavor to continuously improve the utilization, manage out waste and other costs associated with rental equipment.
- 5.10 CONTRACTOR shall provide full documentation for all equipment and materials which CONTRACTOR may require to have transported to the WORKSITE for the execution of the WORK. The documentation shall comply with current regulation and with all other applicable statutory requirements. COMPANY shall have the right to refuse to accept any item submitted for transportation which COMPANY considers to be incorrectly or inadequately documented.
- 5.11 CONTRACTOR is required to submit a detailed recommendation on equipment requirements and specifications to execute the WORK for each hole section, justifying said recommendation with the exact specifications and quantities of tools required for each of the possible hole sections. That recommendation shall be inclusive of CONTRACTOR's equipment, COMPANY owned equipment, and Third Party equipment required to successfully execute the WORK.
- 5.12 As part of this Scope of Work it shall be the responsibility of CONTRACTOR to provide COMPANY at the WORKSITE and at COMPANY's Onshore Operations Center or office with a load out list of all BHA or drill string components that are required for each operation and the efficient execution of this Scope of Work. This load out list shall indicate which items of equipment are from CONTRACTOR's own inventory and which are to be accessed from the Third Party equipment inventory.
- 5.13 COMPANY shall as a minimum provide one fully serviceable back-up tool for all equipment at the rig site (not including 'dumb steel/iron') and sufficient back-up in town/port to provide uninterrupted service should failures arise. It is the responsibility of CONTRACTOR to assess onshore back-up requirements based on proven reliability statistics for the tools being offered in support of the Scope of Work.
- 5.14 COMPANY reserves the right to back-load or reduce the level of back-up equipment to improve efficiencies in the drilling operation, should the risks be acceptable to COMPANY.
- 5.15 COMPANY reserves the right to request CONTRACTOR to arrange for the provision of other Third Party down hole tool rental and maintenance services not expressly identified herein. These arrangements shall provide for all or part of other drill string or BHA components not provided for in this Scope of Work.
- 5.16 COMPANY shall arrange for the provision of other Third Party down hole tool rental and maintenance services not expressly identified herein. These arrangements shall provide for part of or all other drill string or BHA components not provided for in this Scope of Work.

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- 5.17 The equipment and tools identified in the Scope of Work shall be repaired in accordance with COMPANY's QC/QA requirements identified in Section 6 to the CONTRACT and the manufacturer's technical specifications.
- 5.18 All equipment and tools identified in the Scope of Work shall be provided in accordance with manufacturer's specifications. Further, if required by COMPANY, CONTRACTOR shall supply and agree with COMPANY the following specifications for all the tools and any accessories being supplied:
- Manufacturing specifications including Quality Plans.
 - Repair/Re-manufacturing specifications including Quality Plans.
 - General maintenance specifications, standards, and procedures.
 - Tool / connection Inspection specifications including acceptance/rejection criteria.
 - Operating and field site procedures and guidelines for day to day care, maintenance, and running, including any troubleshooting guidelines.
- 5.19 All changes to agreed specifications shall be documented, justified, and agreed between CONTRACTOR and COMPANY.
- 5.20 CONTRACTOR shall ensure that it has all the technical specifications required to perform the repair of the connections.
- 5.21 The following is a list of the minimum applicable standards and specifications which shall apply to the equipment and tools identified in this technical specification and Scope of Work:
- Manufacture, repair, and maintenance shall be carried out in facilities with implemented Quality Management Systems certified to API Q1, or ISO 9001:2000 by an internationally recognized certifying authority acceptable to COMPANY.
 - Materials to be used in H2S containing environments shall be compliant with ISO 15156 Parts 1, 2 & 3 or NACE MR 0175.
 - Inspection and repair to meet the requirements of DS-1 (or ISO 10407-2 when issued) and the original equipment manufacturer's (OEM's) requirements.
 - Only parts procured from approved vendors through the OEM recognized supply chain to be used.
- Rotary Drill Stem Elements to be in accordance with API Spec 7.
- Drilling and production hoisting equipment - manufacture to be in accordance with API Spec 8A & API Spec 8C.
 - Drilling and production hoisting equipment - inspection, maintenance, repair, and remanufacture to be in accordance with API Spec 8B.
- 5.22 The above list is a minimum expectation and all equipment and tools supplied by CONTRACTOR must comply with the latest edition of the above standards.
- 5.23 The following specific standards and specifications shall apply:
- 5.23.1 All near-bit and drill string stabilizers shall be integral blade (EXCEPT 24" or greater).
- 5.23.2 Use of sleeve-type stabilizers is permitted; "clamp-on-type" are not approved. The exception to this rule is the Density Neutron Equipment.

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- 5.23.3 All drill string connections shall be manufactured with API stress relief features, with the exception of MWD/LWD/Motor subs and crossovers, which are subject to DS-1 inspection.
- 5.23.4 All non-magnetic drill collars shall be subject to hot spot magnetic defect inspections on a six monthly basis.
- 5.23.5 Where hard facing is required for tool protection, COMPANY preferred material is chrome alloy 'casing friendly' hard metal. COMPANY Hard banding Guidelines are available upon request. Tungsten carbide hard facing shall not be used.
- 5.23.6 All API Regular connections shall be provided with stress relief grooves.
- 5.23.7 An intrinsically safe unit is also required for DD/MWD/LWD services situated within any hazardous zones.
- 5.23.8 COMPANY's preference is for the supply of new tools. In the event of refurbished tools being offered, this should be clearly stated and details of history and use provided.
- 5.23.9 In the event inspection criteria are excluded, DS-1 Category 5 standards apply.

6.0 DIRECTIONAL DRILLING TOOLS AND EQUIPMENT

- 6.1 CONTRACTOR shall provide equipment necessary to successfully execute directional drilling services which will include but will not be limited to surface specialty rental tools and equipment, subsurface downhole tools, and back-up tools to permit directional drilling, steering, motor drilling, open and cased-hole side-tracking and kick-offs as well as providing certain data acquisition equipment in the planned or contingent hole sizes and at the planned angles and dog-legs.
- 6.2 CONTRACTOR shall supply the Directional and Rental Equipment as listed in Table 1. The use of cross-overs shall be kept to an absolute minimum and will be no less than one meter in length.
- 6.3 Directional Drilling tools, RSS and Motors Specifications must conform to the operating ranges detailed in Technical and Functional Specs, Appendix 6 to the Scope of Work, and Well-Bore Information.
- 6.4 The following equipment list in Table 1 is not exhaustive and supplementary tools and services are expected to be available from CONTRACTOR's facility. Exact rental requirements will be determined based upon specific well requirements.

Table 1 – Directional Drilling and Rental Equipment	
1	Positive Displacement Mud Motors & Accessories
	Standard short radius
	Articulated short radius
	Standard power
	Standard power high speed
	Standard power low speed
	Thin Wall - Even Wall Thickness TVM-EWT motors
	TVM-EWT motors low speed
	TVM-EWT motors high speed

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Table 1 – Directional Drilling and Rental Equipment	
2	Rotary Steerable System (Performance, Standard, Vertical)
3	NMDC'S and Ferromagnetic steel DC's
4	NMHWDP and Ferromagnetic steel HWDP
5	NM and regular near bit & string stabilizers bored for floats
6	Bent subs
7	UBHO subs
8	Orienting Subs
9	Stabilizers fixed blade, welded, string and/or near bit
10	Adjustable stabilizers
11	Roller reamers
12	WORKSITE Computing Systems
13	Specialist Tool Slings & Thread protectors
14	Totco Rings
15	Float Subs & floats
16	Filter Subs
17	Cross overs
18	Circulating subs
19	Lifting Subs
20	Bit subs
21	Agitators
22	Thrusters
23	Under Reamers
24	Jars

6.5 CONTRACTOR should specify fishing tools required for this equipment prior to any use and ensure COMPANY is aware of these requirements prior to use at the rig site.

6.6 CONTRACTOR shall be fully responsible for the equipment used which must, as a prerequisite, be entirely consistent with competent practice and meet all relevant COMPANY and statutory standards, detailed below.

6.7 DIRECTIONAL DRILLING STANDARDS

CONTRACTOR will have the following standards and competencies implemented on the EFFECTIVE DATE of the CONTRACT to ensure that the WORK is performed to COMPANY's requirements and satisfaction.

6.7.1 CONTRACTOR shall have in place documentation identifying directional drilling engineering practices including: data transfer from COMPANY, planning procedures, drawings and collision tolerance setting, transfer of final well data back to COMPANY, engineering research ongoing, accuracy and reliability of current monitoring systems and building up of standard engineering practices.

6.7.2 Personnel trained and assessed as competent in the WORK, including ongoing training program and succession plan in place. This is to include the personnel in CONTRACTOR's service centre and on the WORKSITE as their ability to interpret and act upon the data from the well is particularly important.

6.7.3 Implementation of a management and control system to ensure that the operations at the well site take place in accordance with the terms of the well design and that there

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is a mechanism in place to handle deviations from the plan. The change of plan could be due to a target change or required by the conditions of the well.

- 6.7.4 Implementation of directional drilling engineering procedures to a sufficiently high level of competency to ensure the achievement of a basic performance as defined in the performance criteria. Development of directional drilling engineering procedures to ensure that the operations optimization process is formalized and then applied routinely including bit/BHA performance analysis, overall time performance and management of losses such as drill string failure and stuck pipe.
- 6.7.5 General management and supervision of the WORK including office support, logistical organization and WORKSITE supervision. It is anticipated that CONTRACTOR will manage all equipment provided for their downhole operations in accordance with a CONTRACTOR owned standard minimum technical specification. This specification will initially be based upon current COMPANY specifications.

7.0 MWD/LWD SERVICES REQUIREMENTS

- 7.1 The precise nature of the MWD/LWD equipment will depend upon the type and level of services requested by COMPANY, and full details will be determined prior to mobilization to COMPANY WORKSITE. However, CONTRACTOR will make provisions to provide the following MWD/LWD equipment and services which will include but will not necessarily be limited to:

- Surface Equipment
- Subsurface Equipment
- Data Acquisition, Interpretation, Pre and Post-Modeling
- Field Repair, Maintenance
- Operators, Engineers and Technicians
- Real time data transmission via internet / intranet / BP server system

- 7.2 All MWD and LWD tool and services specifications must conform to the operating ranges detailed in Technical and functional Specs, Appendix 6 to the Scope of Work and Well-Bore Information.

7.3 Surface MWD/LWD Equipment

- 7.3.1 CONTRACTOR shall provide full technical information on the equipment and specialized equipment deemed useful to the operations which CONTRACTOR might wish to propose to be deployed under the Scope of Work.
- 7.3.2 CONTRACTOR shall provide surface MWD/LWD equipment requirements at the WORKSITE including, but not necessarily limited to, those identified in Table 2 below.

TABLE 2 – MWD/LWD Surface Equipment	
1	An intrinsically safe MWD/LWD surface unit if situated within the hazardous zone
2	Surface decoding equipment
3	Surface computing equipment
4	Surface plotting equipment
5	Offshore remote display screens

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TABLE 2 – MWD/LWD Surface Equipment	
6	Depth tracking sensors
7	Hook load sensors
8	RPM sensor
9	Surface torque sensor
10	Pump stroke flow sensor
11	Pressure transducers
12	Rig floor displays
13	Real time data transmission equipment and software
14	Rig floor Real Time down-hole vibration "Traffic Light" warning unit
15	Cables
16	Equipment baskets

- 7.3.3 The surface equipment at the well site shall be capable of storing and retrieving all surface and down-hole digital data. In addition the surface equipment shall:
- (a) Merge, manipulate, and splice digital data.
 - (b) Export data to LAS, LIS, DLIS, TIF, and/or ASCII format on memory stick or other media such as tapes, CD etc.
 - (c) Surface equipment for signal acquisition, processing, and display shall be provided. A minimum of one (1) remote display will be provided (Rig Floor). Additional displays in COMPANY Representative's Office, Well Site Geologist work room, CONTRACTOR office or Mud Logging unit will be specified by each SPU.
 - (d) Real time sample, record and display both annular and standpipe and internal pressures in drillers console, and COMPANY's representative office.
 - (e) Upload all stored data to the surface computer after the run.
- 7.3.4 Where Vibration Monitoring Systems are procured they shall consist of the following as a minimum:
- (a) Vibration Monitoring Rig floor Alarm installed in the Rig floor – 1 ea.
 - (b) Vibration Monitoring System (graphic screen or other display) installed in Driller Doghouse – 1 ea.
 - (c) Vibration Monitoring System (graphic screen or other display) installed in COMPANY Representative Office – 1 ea.
 - (d) Sensors and instrumentation installed on the rig must be explosion proof or part of an intrinsically safe system throughout.
- 7.3.5 Drilling Sensors, to process, display and continuously record the following parameters:
- (a) Weight on hook sensor with output to recorder, digital display in graphic and alphanumeric.

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- (b) Standpipe and BHA internal pressure sensors with output to recorder, digital display in graphic and alphanumeric.
- (c) Torque sensor with output to recorder, digital display in graphic and alphanumeric.
- (d) Rotary speed with output to recorder, digital display in graphic and alphanumeric.

- 7.3.6 CONTRACTOR shall ensure that any offshore surface unit(s) provided is/are appropriate to accommodate working requirements of a potentially large well site team. This might include MWD/LWD engineers, Directional Drillers, Pore Pressure Specialists, new technology support specialists etc. In the case of a combined LWD/Mudlogging unit, this list would include Data Engineers, Mudloggers, Sample catchers, Well Site Geologist, etc.
- 7.3.7 COMPANY requires CONTRACTOR to demonstrate that the needs of this expanding offshore well site team are effectively addressed in the provision of working accommodation.

7.4 Downhole MWD/LWD Equipment Requirements

- 7.4.1 CONTRACTOR may be required to provide MWD and LWD Equipment and Sensors. The exact specifications, types of sensors and tool configurations will be available for all hole sizes (not under-reamed holes).
- 7.4.2 CONTRACTOR will be required to provide additional services as and when required by COMPANY. The exact specifications, types of sensors and tool configurations will be available for any hole size. The additional sensor and tool configuration requirements will include but will not necessarily be limited to those identified in Table 2. Where CONTRACTOR is unable to provide a service CONTRACTOR should indicate how this requirement may be supported.
- 7.4.3 CONTRACTOR will provide all auxiliary MWD/LWD equipment that is normally required to perform the WORK even where not specifically identified herein.
- 7.4.4 The MWD and LWD subs shall be supplied with API connections. The use of cross over subs must be minimized and will be furnished by CONTRACTOR at no charge to COMPANY.
- 7.4.5 CONTRACTOR shall provide:
- (a) All necessary equipment and personnel to acquire raw MWD directional surveys, temperature data and provide tool face orientation information in all hole sizes, and
 - (b) Full technical information on the equipment and specialized equipment deemed useful to the operations which CONTRACTOR might wish to propose to be deployed under the Scope of Work.
- 7.4.6 Subject to CONTRACTOR having undertaken an engineered analysis of the drilling programs, CONTRACTOR may wish to propose to COMPANY that MWD/LWD tools are not used under certain conditions. COMPANY shall consider the potential benefits of any such proposal on each application and advise CONTRACTOR of its approval or otherwise.

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7.4.7 All MWD/LWD and DD tools must have the capability to transmit high speed (memory quality) data through Grant-Prideco IntelliServ (IS) drill pipe and adequate surface software to intelligently display at surface. The requirements for the LWD/MWD tools are:

(a) Basic Requirements:

- (i) System is compatible with IS and allows two way data flow.
- (ii) The LWD provider will specify the data rate that they can supply the IS network with (IS network provides 1 MEG bps bandwidth, LWD tools do not yet feed data at that rate) IS data stream to be compatible with Mud Pulse data stream (to enable back-up/redundancy).
- (iii) Data to be made available on a WITSML server.
- (iv) Rate at which WITSML data is provided from the LWD surface system to be specified (to ensure there is no bottle neck here).

(b) Expectation of Wired Pipe enabled applications:

- (i) Memory quality logs in real-time.
- (ii) Repeat logs (measurements made while tripping or reaming) available in real-time.
- (iii) High data density MWD (downhole PWD, Torque, WOB, Shock, Vibrations etc.) in real-time while drilling and tripping.
- (iv) Surface control of steerable BHA: On the fly downlinking to rotary steerables.
- (v) Surface Control of MWD/LWD: Ability to diagnose, reprogram/configure MWD/LWD tools from surface.

(c) Data Processing/Analysis:

- (i) WORKSITE or Office based drilling performance engineer(s) to analyze the MWD data
- (ii) Real-time pore pressure/well-bore stability analysis services.

7.5 MWD/LWD Equipment Specifications

7.5.1 The MWD and LWD systems must meet the technical specifications detailed in the Technical and Functional Specs, Appendix 6.

7.5.2 As a minimum when operating in "Recorded Mode, sufficient down hole power shall be provided for 100 hours of operation with all petro-physical sensors functioning. Sufficient down-hole memory shall be available for 6000 feet of logged interval with all logging sensors sampling data at an average of two (2) samples per foot.

8.0 SURVEYING SPECIFICATIONS

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(See also Services and Support - Drilling Engineering and Well Planning)

- 8.1 CONTRACTOR shall provide all necessary equipment and personnel to acquire directional surveys, and orientation information in all hole sizes.
- 8.2 All surveying tool and services specifications must conform to the operating ranges detailed in Technical and functional Specs, Appendix 6 and Well-Bore Information.
- 8.3 The WORK shall be conducted in accordance with the standard set of Joint Operating Procedures ("JORPs") which have been jointly developed and agreed by COMPANY and CONTRACTOR. In turn this shall be in compliance with the Directional Drilling and Surveying Group Practice GP10-05.
 - 8.3.1 The JORPs documents may require amending during the period of the CONTRACT due to a change in practices. In such event it shall be the responsibility of CONTRACTOR to propose such changes to ensure agreement on any amendments with COMPANY.
 - 8.3.2 Adherence to JORPs shall be clearly specified for every tool or service used.
 - 8.3.3 CONTRACTOR shall use JORPs automatically for all the WORK. CONTRACTOR's use of JORPs ensures that the Instrument Performance Models used at the planning stage are applicable, and that, as far as possible, a uniform standard of service and data quality is achieved world wide.
 - 8.3.4 In exceptional cases JORPs may not be available for a particular service. CONTRACTOR shall consult with COMPANY and CONTRACTOR shall demonstrate to COMPANY's satisfaction, which shall be evidenced by written agreement, that CONTRACTOR has adequate QA and QC procedures (e.g., pre-job tool calibration, quality of survey personnel) before any survey instrument can be used.
 - 8.3.5 Any breach of this condition by CONTRACTOR shall be considered negligence and COMPANY may terminate the WORK or any part thereof immediately. CONTRACTOR's QA and QC procedures are considered by COMPANY as equally important to the overall service as basic tool performance.
 - 8.3.6 JORPs are discussed in more detail in COMPANY's Directional Survey Handbook Document Number: BPA_D_004, a copy of which will be made available to CONTRACTOR prior to start of the CONTRACT.
- 8.4 Surveying Equipment
 - 8.4.1 CONTRACTOR shall provide equipment necessary to successfully execute surveying services which shall include but will not be limited to the Well Placement Survey Equipment listed.
 - 8.4.2 All tools are required to provide real time directional survey data comprising measurements of Azimuth, Inclination, and Tool Face as a minimum unless otherwise agreed by COMPANY. All DD and MWD tools are required to provide real time continuous directional service comprising measurements of Azimuth, Inclination, and Tool Face, together with continuous surveying capabilities where available.
 - 8.4.3 COMPANY's Drilling Policy refers to the requirement of running only qualified survey tools, that is, tools whose performance and reliability have been demonstrated to

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COMPANY through the process of validation. This process is covered in more detail in Directional Survey Handbook, document number: BPA_D_004.

- 8.4.4 CONTRACTOR shall provide all auxiliary surveying equipment that is normally required to perform the WORK even where not specifically identified herein.
- 8.4.5 CONTRACTOR shall be fully responsible for the equipment used which shall, as a prerequisite, be entirely consistent with competent practice and meet all relevant COMPANY and statutory standards:
- (a) CONTRACTOR shall manage the availability of the various equipment packages throughout each phase of the drilling operation. CONTRACTOR shall provide the relevant equipment package at the WORKSITE prior to the commencement of drilling operations on each relevant section of the well. COMPANY shall not specify an equipment list for the performance of the WORK, nor shall it prescribe the techniques that shall be used to construct, complete, manage, and intervene in the wells. It is the intention that techniques used shall be jointly developed and agreed by CONTRACTOR and COMPANY.
 - (b) CONTRACTOR shall mobilize and demobilize its equipment packages in accordance with the specific requirements of each well engineering activity, in such a manner so as to ensure an overall efficient operation. CONTRACTOR shall manage the movement of equipment by each designated section of the well.
 - (c) CONTRACTOR shall ensure that it has made appropriate provision for back up equipment, spare parts, tools etc. to ensure that the WORK is not disrupted due to equipment failures or other problems associated with CONTRACTOR's processes.
 - (d) CONTRACTOR shall continuously examine all steps of the Supply Chain to identify methods to reduce logistics, transportation, handling, storage, inspection, repair, inefficiencies, and costs. CONTRACTOR shall seek to continuously improve the utilization, manage out waste and other costs associated with rental equipment.
- 8.4.6 It shall be the responsibility of CONTRACTOR to provide COMPANY at the WORKSITE and at COMPANY's Onshore Operations centre with a load out list of all surveying components which are required for each operation and the efficient execution of this Scope of Work. This load out list shall indicate which items of equipment are from CONTRACTOR's own inventory and which are to be accessed from the third party equipment inventory.
- 8.4.7 CONTRACTOR shall provide Survey Engineer with a PC capable of downloading tool memory, performing survey Quality Control checks and preparing a final survey report at the WORKSITE.

9.0 SPECIALIST REAL-TIME DATA ACQUISITION SERVICES

- 9.1 CONTRACTOR may be required to provide specialist services as and when required by COMPANY. The exact specifications, types of sensors and tool configurations should be available for any hole size. The additional sensor and tool configuration requirements will include but will not necessarily be limited to those identified below.

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- High speed data transmission / systems for remote operations
 - Rig Site and Operations Center Displays , as well as web based displays viewable inside COMPANY
 - IT support for limited networking / data sharing between CONTRACTOR and COMPANY systems at the rig site
 - WITSML feed (with support) to Third Party units at rig site
 - Real Time and Recorded Rig Site Data Transmission (Time and Depth Based)
 - Real Time Down Hole Vibration Data Interpretation and Drilling Parameter Optimization
 - Rig Site Modeling Capabilities
 - Up Link and Down Link Capability
 - Geological Steering Capabilities
 - Forward geological modeling
 - Post logging modeling
 - Full range Data Processing Services
 - Full range of Data Management Services
 - Petrophysical Support and Analytical Services
- 9.2 CONTRACTOR shall ensure that its personnel are familiar with the requirements of COMPANY during the drilling phase of the well. Real time and memory data, both depth-based and time-based shall be easily accessible via WITSML for review. Output options and presentations must be flexible to meet COMPANY requirements. Hard and digital copies in various pre-agreed formats shall be required.
- 9.3 CONTRACTOR shall have the capability to provide a Real Time Downhole Vibration Data Analysis and Drilling Optimization service to be provided at the WORKSITE. Information will be required on the type of training undertaken by specialist personnel and their experience, the processing technique employed at the WORKSITE and the software used to interpret and display this information.
- 9.4 CONTRACTOR shall have the capability to provide a specialized Pore Pressure Analysis service that may be provided at the WORKSITE. Information will be required on the type of training undertaken by specialist personnel and their experience, pre-drill prediction material used for modeling, the type of information collated while drilling, the processing technique employed at the WORKSITE, and the software used to interpret and display this information. The use of Third Party software may augment CONTRACTOR's own system but is not a replacement.
- 9.5 The interface between MWD/LWD log data and Mud Logging CONTRACTOR's computer must be possible utilizing the WITSML format and according to COMPANY's specified updating frequency.
- 9.6 Data readout will be required on the rig floor and in COMPANY's office(s) on the rig.
- 9.7 Real-time transfer of MWD/LWD/FEWD data between CONTRACTOR's well site unit and COMPANY's offices onshore/worldwide will be required. CONTRACTOR will transmit their own data from the rig site to CONTRACTOR's or COMPANY's office using COMPANY's bandwidth but using their own systems to facilitate their value added services. In addition COMPANY shall manage an 'aggregated' flow of data between rig site and COMPANY offices to facilitate a standard platform for COMPANY's own or other Third Party value add services on top of a known capable architecture.

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- 9.8 Transmitted information shall be provided in accordance with the Well Site Information Transfer Standardized Mark-up Language (WITSML) standard (see www.witsml.org). WITSML shall also be used as a medium for the exchange of static and real-time data.
- 9.9 COMPANY requires testing of the interoperability of rig site and offsite information systems prior to mobilization to the field. CONTRACTOR should make allowance for the provision of equipment and services to perform integration testing of information systems, including those which will be installed at the WORKSITE, and those supplied by other contractors, prior to field mobilization, in order to ensure the overall system works as planned.
- 9.10 CONTRACTOR providing services to COMPANY in the Drilling and Completions domain, that include the supply of digital data, will increasingly be required to supply that data in the XML formats, and with interfaces conforming to the Applications Program Interface defined by the Drilling and Completions community through collaborative effort in the WITSML Special Interest Group (SIG). Questions and required technical solutions to interoperability between contractors, service suppliers and software application vendors, should see the SIG as the preferred approach to resolving technical issues around interoperability.
- 9.11 COMPANY expects its contractors and service providers to provide software to support the use of WITSML as a medium for both Real Time and static exchange of data, both between COMPANY and the supplier, and between COMPANY's suppliers in the offshore environment, where such exchange is approved by COMPANY. Within one year of a new revision of the standard being issued, COMPANY expects its suppliers and application vendors to be ready to deploy the new version, but to do so in a manner that does not require a synchronous upgrade of all systems sharing the data objects.
- 9.12 WITSML service agreement
- 9.12.1 Whenever a WITSML service is setup between a WITSML service provider (PROVIDER) and a WITSML service consumer (CONSUMER) there are several aspects of the service that needs to be further specified and agreed upon.
- 9.12.2 The WITSML standard only contains specifications about the data transport media, format, protocol, data objects, and their elements, and so the issues below are not part of the standard itself.
- 9.12.3 Prior to the finalization of a WITSML service agreement the following issues will be agreed between the PROVIDER and CONSUMER:
- (a) The WITSML interfaces which the PROVIDER will supply.
 - (b) The version of the PROVIDER'S WITSML server.
 - (c) The data objects and data elements the PROVIDER will supply (not all WITSML data elements are mandatory).
 - (d) Completion of the mapping between PROVIDER and CONSUMER such as names on curves etc.
 - (e) The default unit of measures to be used for the various data elements
 - (f) Security:
 - (i) HTTPS shall be used.

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- (ii) After guidance from COMPANY's DCT group, PROVIDERS will confirm what network the service be run on: Internet or VPN. PROVIDERS should validate and test their authentication model within that network framework.
- (iii) If firewalls need to be opened for the service to run the IP addresses and ports of the participating machines as well as the direction of connection initiation between them will be specified.
- (iv) CONTRACTOR shall ensure that the Work is performed in accordance with the BP Group Digital Security Standard, Digital Security Operating Practices, and COMPANY's Security of Information Standard and Instructions, copies of which are available upon request.

9.12.4 CONTRACTOR may be requested to provide data from the following data objects, as defined in the WITSML Schema, or additional items as added to future versions of the schema, as they are added, that are relevant to the services being provided:

- BHA Run data object
- Cement Job data object
- Conventional Core data object
- Fluids Report data object
- Formation Marker data object
- Log data object
- Message data object
- Mud Log data object
- Operations Report data object
- Real-time data object
- Rig data object
- Risk data object
- Sidewall Core data object
- Survey Program data object
- Target data object
- Trajectory data object
- Trajectory Station data object
- Tubular data object
- Well-bore Geometry data object
- Well data object
- Well-bore data object
- Well Log data object

9.12.5 CONTRACTOR will have a schedule which clearly indicates costs associated with the provision of the above data items from the services they will be providing, and whether the data can be delivered as a real time feed from a WITSML server, or in the case of contextual data, such as for example a Fluids report, in the form of an XML document. Where data is provided as a static document, the document should include a call to a style sheet for that object to ensure that the document is available both as XML and as human readable documentation.

9.12.6 Primary list of real time data types to be transferred includes:

- (a) Surface Parameters:

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- Block position / height
- Trip / running speed
- Bit Depth
- Hole Depth
- Lag Depth
- Gas total (include chromatograph breakdown of C1 – C5+, if chromatograph used)
- Lithology Percentage (if mud logging services being used)
- Weight on bit
- Hook Load
- Choke Pressure
- Stand Pipe Pressure
- Surface Torque
- Surface Rotary
- Mud Motor RPMs
- Flow In and Flow Out
- Mud Weight
- Rate of Penetration
- Pump Rate (spms for each pump)
- Cumulative Stroke Count
- Active Mud System Total
- Active Mud System Change
- All Trip Tanks (including any mini trip tanks)
- Mud Temperature In / Out

(b) Calculated Parameters:

- In Slips / Connection time (for rig comparisons and best of class)
- Connection Drag
- Washout / Restriction ratio where available (looks at ratio of pump pressure to flow for quick washout or jet plugging detection)
- Total hours on bit
- Calculated Bottom Up Strokes
- Calculated In/Out Strokes
- Total Bit Revolutions
- Dxc
- Calculated Hydraulics, (ECD, system, annular pressure losses)

(c) Down hole (MWD / LWD) parameters:

- Data from ALL sensors down hole. This includes (where available):
- All FEMWD data (Gamma, Resistivity, Neutron Porosity, Bulk Density, Nuclear Magnetic Resonance While Drilling; Resistivity At Bit; Seismic Measurement While Drilling; Formation Pressure While Drilling. etc)
- Bit depth
- Hole depth
- PWD annular pressure
- PWD internal pressure
- PWD EMW
- PWD pumps off min, max and average
- Drill String Vibration /Axial Shock Sensors

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- Drilling dynamics (downhole torque, downhole wob, etc.)

(d) Cement / DCRI Unit Real Time Data:

- Pump rate,
- Pump pressure,
- Slurry Density
- Cumulative volume pumped
- Data from LOT / FIT tests

9.13 Data Storage and Manipulation at WORKSITE

9.13.1 CONTRACTOR shall provide a Real Time Data Store server in the DD/LWD unit. This unit will be run by MWD/LWD/DD cross trained personnel.

9.13.2 The information shall be provided in accordance with the Well Site Information Transfer Standardized Mark-up Language (WITSML) standard (see www.witsml.org). WITSML shall also be used as a medium for the exchange of static data. The offshore Data Store shall gather data, including but not limited to data generated by:

- (a) Directional Drilling / LWD / MWD
- (b) Mud Logging
- (c) Surveying
- (d) Drilling Contractor information

9.13.3 If CONTRACTOR is chosen to supply Data Transmission Services, CONTRACTOR shall supply the communications links between the various data sources and the Data Store.

9.13.4 CONTRACTOR is responsible for such detailed interface specification and coordination with other rig site data suppliers as is necessary to ensure the continued efficient transfer of data, both dynamic and static.

9.13.5 CONTRACTOR is responsible for development and execution of a detailed integrated test procedure to ensure these data flows are accomplished successfully, including coordination of other rig site data sources, prior to spud on the first well from any new rig installation.

9.13.6 The offshore Data Transmission Data Store shall be able to monitor real time activity at any time, with multiple displays of the various data feeds. Print outs of any data shall be available.

9.13.7 System must be able to lift ASCII data and make plots from the supplied visual data so that it can be used by the operations team in real time.

9.13.8 CONTRACTOR shall identify any areas where other industry standard data formats are preferred for the rig site data interface – e.g., WITSML or OPC.

9.14 Data Transmission Services – WORKSITE to Office

9.14.1 Data Transmission system from the WORKSITE to COMPANY's defined offices shall be through COMPANY's high capacity communications package on the WORKSITE.

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The bandwidth available from this shall meet the requirements of any Real Time Data Transmission system.

9.14.2 Data will be transmitted in WITSML format or COMPANY approved proprietary format for purposes of data compression

9.14.3 COMPANY requires testing of the inter-operability of WORKSITE and offsite information systems as soon as possible after mobilization to the field. CONTRACTOR shall make allowance for the provision of equipment and services to perform integration testing of information systems, including those which will be installed on the rig, and those supplied by other contractors, in order to ensure the overall system works as planned.

9.15 OFFICE Data Store

9.15.1 COMPANY OFFICE shall potentially be equipped with a central room for data gathering and decision-making, to be known as the Advanced Collaborative Centre (A.C.E.). The OFFICE Data Store supplied by CONTRACTOR will be situated in the A.C.E.

9.15.2 The onshore WITSML data shall mirror the rig site Data Store. This then provides a WITSML feed (using Openwire) into COMPANY's onshore data stores, principally Landmark EDM and Openwells. COMPANY's design basis is for this onshore server to be within COMPANY domain, in the Advanced Collaborative Center (ACE). Access by COMPANY Third Parties, such as CONTRACTOR, would be using iLink. For this onshore WITSML data store, COMPANY will specify Operating System requirements, network and security rules, as it forms part of COMPANY Domain.

10.0 MUDLOGGING SERVICES

10.1 COMPANY expectations – this scope defines the minimum level of service that COMPANY requires from any Mud Logging Unit.

CONTRACTOR is deemed to have an expert knowledge and capability and COMPANY expects:

- (a) The efficient execution of the mud logging service and timely reporting with CONTRACTOR providing personnel that are trained in unit operation and have extensive local geological experience;
- (b) The maintenance and calibration of all sensors to ensure that they are always providing accurate data to assist real time decision making, and for processing to aid post-well analysis, and
- (c) A safe, clean, and comfortable working environment to be provided by CONTRACTOR which meets COMPANY standards.

10.2 Principal objectives of the mud logging service

- (a) Monitor the drilling operation parameters including providing Geological control, Formation evaluation, understand their significance to the downhole conditions, and advise COMPANY and Drilling Contractor personnel of any situation developing with safety or efficiency implications. Where the situation is judged to

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be of a serious potential impact, logging personnel should contact the rig floor directly if COMPANY Representative cannot immediately be contacted.

- (b) Efficiently record the parameters, and provide the data that is required to support post well analysis, via COMPANY defined format, to the correct personnel, and in a timely manner.
 - (c) Recommend solutions for improvement of performance based on monitoring of the well conditions. The Mud Logging Service, if required shall be fully computerized to provide an on and off-line system in constant operational readiness. Unit systems shall be latest technology. In event of future systems upgrades of software and hardware CONTRACTOR shall offer COMPANY the opportunity for such upgrades.
- 10.3 CONTRACTOR shall provide all units and equipment, necessary to successfully perform the required WORK, fully serviced and in a good state of operational readiness. The Mudlogging Unit shall be a skid mounted oilfield module of sufficient size to accommodate COMPANY's geologist in addition to the service crew. As a minimum the Unit shall feature:
- (a) Unit power provided by COMPANY with necessary transformer interfaces and regulators supplied by CONTRACTOR.
 - (b) Safety barrier system to prevent stray electrical surges from outside the unit.
 - (c) Explosion proof safety pressurized system to ensure safe unit interior by fresh air purge, with control to maintain stable environment within unit. Preferably, the unit should automatically shut down if loss of pressurization occurs.
 - (d) Air conditioning system able to provide environmental control under pressurization with minimal noise.
 - (e) All electrical systems shall meet requirements of local regulatory agencies. All unit personnel shall be trained in wiring and grounding techniques and lightening protection.
 - (f) Unit shall contain sheathing or similar system to minimize effects of radio interference on the equipment.
 - (g) Quiet working environment.
 - (h) Emergency exit in addition to the main entrance/exit.
 - (i) Drafting space and light.
 - (j) Software to include an acceptable Word processor and Spreadsheet package.
 - (k) Workspace for COMPANY Well Site Geologist.
 - (l) Unit to be ergonomically designed and use a minimum number of monitors, printers, etc. In order to reduce noise and distraction but allow an acceptable level of service.

In addition, all electrical equipment and sensors shall be intrinsically safe and all unit operators shall be trained in wiring and grounding techniques.

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10.4 Geological Parameters and Sampling –the following requirements shall be provided:

(a) Geological Parameters

- Description and recording of lithologies, recording of total and Chromatographic Gases, monitoring for Hydrogen Sulphide and Carbon Dioxide, fluoroscopic examination of drilled cuttings and other 'show' evaluation procedures, calcimetry, mud 'resistivity in' and mud resistivity out.

(b) Clay hydration

- The CEC (MBT) test should be performed in all clay sections drilled with water-based mud. Oil-based mud cuttings should be cleaned by washing in acetone or a similar solvent, and carefully dried.

(c) Pressure detection and analysis service:

- Providing pore pressure prediction, overburden, and estimated fracture pressure.
- Provide general assistance to COMPANY Well Site Geologist as and when required.

(d) Sampling

- Washed and dried samples, Unwashed bulk samples, geochemical samples, treated with bactericide, stored in either SEET foil bags or suitable tins, drilling mud samples, stored in nalgene bottles.
- Throughout the well, maintain a collection of samples of all mud chemicals and additives (liquids and solids) and rig equipment lubricants and greases that may affect the hydrocarbon evaluation of the well.
- Any other sampling (mud, formation fluids/gases) as requested during the well.

The actual required number of sets and the intervals etc., for each well will be provided prior to the commencement of the well by COMPANY Well Site Geologist.

10.5 Basic Applications

10.5.1 Drilling Monitor Program

A program capable of monitoring observed trends is required. While drilling, it shall be possible to display and monitor the following parameters in graphical and textual form:

- Time of day
- Date
- Drilled depth
- Bit depth
- True vertical depth
- Bit size

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- Stand number
- Instantaneous ROP
- Averaged ROP (for the bit run and user defined intervals, e.g., every 10 feet)
- Weight on bit (minimum, maximum, average, standard deviation)
- Rotational speed of bit (calculated from motor/turbine characteristics including nozzled motors)
- Rotational speed of string (minimum, maximum, average, standard deviation)
- Mud flow rate in
- Mud flow rate out
- Pump strokes per minute
- Min, max, average, and standard deviation of torque
- Block / Kelly height
- Standpipe pressure (minimum, maximum, average, standard deviation)
- Hookload.
- String weight
- Rig heave (if applicable)
- Current cost per foot
- Total gas and chromatography

10.5.2 Pit Volume Totalization and Monitor Program

It shall also be possible to display and monitor trends of the total and individual pit volumes, and trends in the active circulating volume. The system should allow for totalizing in any combination to give resultant active and reserve volumes such as:

- Total active circulating volume.
- Individual pit volumes.
- Reserve volume.
- Total volume.
- Temperature In/Out.
- PVT change.

10.5.3 Trip Monitor Program

It is also considered essential to provide a Trip-Monitor program capable of monitoring observed and predicted parameter trends. The Trip-Monitor program shall be capable of calculating and displaying the following parameters in graphical and textual form, and in the form of a paper log:

- Time of day.
- Depth of bit.
- Bit size.
- Stands tripped / stands to go.
- Average, minimum, and maximum hookload.
- Expected hookload.
- Pit volume – actual.
- Pit volume – expected.
- Trip tank volume.
- Average time per stand.
- Instantaneous and average pipe velocity based on the traveling block sensor measurement.

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- Reaming data (pump operation, torque, flow in/out, pressure) In the event of reaming having occurred, these variable values should be stored at regular depth and time increments, with a higher resolution than one value of each per stand (e.g., every ten feet or every one minute).

10.5.4 Kick and Kill Monitor Program

When the well is shut-in, or whilst killing the well, the following parameters should be made accessible on printers and rig site monitors:

- Time of day
- Casing pressure
- Standpipe pressure
- Total pit volume
- Mud weight in/out
- Mud flow in
- Total barrels displaced
- Total strokes pumped
- Depth to kill mud
- Strokes to bit
- Strokes to bottoms up
- Plot of casing pressure, standpipe pressure and pit volume
- Total gas.

10.6 Engineering Programs

10.6.1 COMPANY standard is to use DEAP. However, in the event that a hydraulics program for slip velocities and calculated cuttings lag time should be run (Power law, Modified Power Law and Bingham) then the following conditions apply:

- (a) At the beginning of each hole interval;
- (b) Whenever there are significant changes in pump rate/rheology then undertake:
- (c) Swab and surge analysis;
- (d) Cost/unit depth analysis;
- (e) The resultant data being provided on-line and off-line.

10.6.2 CONTRACTOR's Well Control programs shall not be used to direct COMPANY operations during a well control incident.

10.7 Data Acquisition, Storage and Display

A continuous computerized monitoring, display, and interpretation service is required for all selected drilling parameters.

10.7.1 Computational Hardware

Computational equipment shall be interfaced with the monitoring systems to provide automatic collection, transfer processing and recording. All processing equipment shall be redundant.

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10.7.2 The computer system used to run engineering assistance programs should be:

- (a) Compatible with telecommunications equipment to enable the data transmission service to be used if required
- (b) Able to be reconfigured as an acquisition computer if the acquisition equipment fails. All the processes shall be redundant. The system shall be configurable within ten minutes to account for failure and a back up system has to work at all times.

10.7.3 Data Sampling, Processing, and Storage Specifications

This section defines the recording specifications to ensure that accurate, pertinent data is obtained in a reliable manner to aid the real time decision making process and for post well analysis.

- (a) Dynamic drilling parameter measurements (including block/kelly position, rig heave, hookload, torque, rotary speed, stand-pipe pressure) shall be filtered to minimize the effects of data aliasing;
- (b) Parameters shall all be sampled at a consistent frequency. A minimum sampling frequency of 10Hz is required;
- (c) Each of the critical variables shall be allocated low and high level alarms and the setting of these discussed with COMPANY Drilling Representative/Engineer at the start of the well;
- (d) Placement of mud logging sensors shall allow all measurements to be made independently of other CONTRACTOR equipment;
- (e) All of the critical measured parameters should also be recorded on chart recorders of the continuous multi-track type;
- (f) All parameters shall be stored digitally against depth and time and if requested provided post well in an agreed upon format.
- (g) Comprehensive time based data while not making hole should be stored on paper and in databases (real time charts) for subsequent analysis. This should include data collected while drilling out cement/casing shoe, reaming, and during open hole tripping.

10.8 DISPLAYS

10.8.1 CRT and Remote Displays

- (a) In addition to the display terminals normally present within the logging unit COMPANY requires additional VDU's in COMPANY Drilling Representative/Engineer office and an intrinsically safe VDU on the drill floor. An additional monitor should be available;
- (b) Each of these VDU's shall be capable of various graphic/numeric displays, to the format defined by COMPANY Drilling Representative/Drilling Engineer. The screens should be interactive (ability to alter scales or format), and one-touch changeover should be provided between displays for different rig operations, together with simple data recall facilities, and

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- (c) The numeric and graphical display shall be capable of showing trends in the measured drilling parameters. Color graphics and large screen sizes (i.e., minimum 11" diagonally corner to corner) are preferred. Both raw and computed parameters should be available.

10.8.2 Chart Recorders

- (a) Any paper chart recorders provided for use in COMPANY office or mud logging unit should be of a type using paper of width 9" or greater (e.g., Siemens or Yokinawa type), rather than 4 3/4" wide paper as in the Chessel type. This shall allow greater resolution and longer display of historical data. Multiple pen colors are required;
- (b) All critical measured parameters shall be recorded on a chart recorder;
- (c) Chart recorder data shall obey the following rules;
- Consistent format between units in one area (including pen colors and layout);
 - Regular scaling and annotation of the traces (time, date, observations);
 - A reasonable number of pens per track (i.e., <6);
 - Logical grouping of traces e.g., torque and rpm, standpipe pressure and flow rate, WOB and hookload. A continuous computerized monitoring, display, and interpretation service is required.

10.9 CALIBRATION and QA/QC

10.9.1 Sensor Type, Accuracy, and Calibration

- (a) Sensors with minimum accuracy of 0.2 bbls are the preferred type for pit level measurement on land operations. Sensors on all pits (including sand traps) may be required. The standard is eight sensors per rig;
- (b) In-sensor compensation for temperature variations shall be provided for all sensors, especially those measuring WOB and hookload. Accuracy of sensors for the base service should be better than 5%. Better specification of sensor accuracy is required if Optional Services Clause 10.11 of Appendix 5 is requested;
- (c) Calibration shall take place in accordance with a defined program (specified in the bid) which is acceptable to COMPANY. If calibration check readings are outside the allowed tolerances, the sensor shall be investigated by CONTRACTOR and all instrumentation/sensors shall be recalibrated or replaced as necessary. The Drilling Engineer/Representative, or Well Site Geologist shall ensure that the program is adhered to and that checks/recalibration are properly carried out, and
- (d) Any discrepancies between measurements made by Mud Logging and Drilling equipment shall be reported to COMPANY Representative, who shall then request a calibration check of the equipment concerned. At no time is one measurement to be deliberately manipulated to mimic another sensor value without an investigation of the cause of the discrepancy having taken place. If

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the discrepancy persists after a calibration check, the matter shall be reported through to COMPANY Representative.

10.9.2 QUALITY CONTROL OF DATA

Data quality control is considered to be of supreme importance and a demonstrable ability by CONTRACTOR personnel to implement the rules as specified in this document shall be required. This Clause 10.9.2 defines the responsibilities of CONTRACTOR personnel with regard to data validation during all phases of operation.

CONTRACTOR shall:

- (a) Obtain the signed approval of COMPANY Representative for sensor placement and hookup;
- (b) Maintain and calibrate all equipment in a state of operational readiness at all times. Calibrations should be recorded in a log which can be made available to company during, or post well for purposes of correlation with post well data;
- (c) Notify all failures or inconsistent readings immediately to the relevant company representative. All data logged from the last known date of correct operation to be reported to company representative as suspect;
- (d) Maintain an adequate level of spares to preclude/minimize the effects of any faults or breakdowns;
- (e) Take prompt action to rectify any breakdowns or suspected problems with the measurement or derived parameters;
- (f) Present the data required for post well analysis in the defined format (see Clause 10.22 herein) where requested. Ownership of the data shall be the responsibility of CONTRACTOR until COMPANY office receives the data, and
- (g) Ensure that all data presented on disc or hard copy highlights erroneous data by the use of standard error codes (-999.25). Similar data on logs shall be accompanied by a notation defining the failed sensor and interval affected.

10.10 MONITORING PRIORITIES

This section defines the Mud Logging activities which are to take precedence during each type of operational activity. This is to avoid ancillary functions acting to the detriment of the prime responsibility of the Mud Logging service, that being well monitoring and safety.

10.10.1 Primary responsibilities during Drilling/Circulating

- (a) Well monitoring, including total gas levels, circulating system volumes, mud flow, mud weight/temperature, mud losses;
- (b) Monitoring for indications of drilling problems, e.g., poor hole cleaning, pipe sticking, bit balling, excessive cavings;
- (c) Monitoring and display of all logged parameters.

10.10.2 Primary Responsibilities during Tripping/Running Casing

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- (a) Observed versus expected trends in mud volumes and string weight;
- (b) Monitoring of mud flow;
- (c) Monitoring of gas levels from circulations;
- (d) Comparison with previous trips e.g., tight spots.

10.10.3 Primary Responsibilities during Cementing

- (a) Progress of the circulation(s), returns and reconciliation of volumes during and after the job;
- (b) Cement unit/mud pump rate, pressure.

10.10.4 Primary Responsibilities during Open hole Logging

- (a) Mud system volumes, flow.

10.10.5 Primary Responsibilities during testing

- (a) Hydrocarbon analysis of retrieved samples;
- (b) Monitoring annulus pressures;
- (c) Monitoring well kill pressures, volumes.

10.11 COMPETENCY/ENGINEERING STANDARDS

This Clause 10.11 applies to all of the basic requirements and optional services specified in this Scope of Work.

CONTRACTOR shall show the following basic engineering standards and competency:

- (a) Documentation of mud logging engineering practices including, transfer of intermediate section and end of well data to COMPANY (where requested), engineering research ongoing, accuracy and reliability of current monitoring systems and adherence to standard engineering practices for well site services to ensure that the operations optimization process is formalized and then applied routinely (the latter should be available in the form of a manual for COMPANY to review if required). To include full accounting for mud losses while drilling (especially in the reservoir), swab/surge calculation in compliance with HSSE requirements;
- (b) Staff trained and assessed as competent in the WORK, including ongoing training program and succession plan in place. This shall include the personnel in the office and on the rig site as their ability to interpret and act upon the data from the well is particularly important. (The training and development of local staff is also an important criteria to COMPANY);
- (c) Mud logging management system in place, including logging program design, instrument selection procedures, process for validating new measurements, process in place for screening results and guaranteeing integrity of data. As the

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logging data is important to a number of COMPANY departments, the speed with which it is processed and issued is a consideration;

- (d) Implementation of a management and control system to ensure that there is a mechanism in place to handle and document new requirements of service. This could be due to a new measurement, alterations in the accuracy of monitoring;
- (e) Implementation of mud logging engineering procedures to a sufficiently high level of competency to ensure the achievement of a basic performance as defined in the performance criteria;
- (f) Accreditation of the Mud Logging services to a recognized Quality Standard e.g., ISO9000, and
- (g) General management and supervision of the whole service including office support, logistical organization and well site supervision. It is anticipated that CONTRACTOR shall manage all equipment provided for their operations in accordance with a CONTRACTOR owned standard minimum technical specification. This specification may initially be based upon current COMPANY specifications.
- (h) It is anticipated that COMPANY and CONTRACTOR shall jointly agree on the attainment of these competencies. In addition to CONTRACTOR having the documentation and audit mechanisms in place, COMPANY shall be looking for CONTRACTOR to demonstrate his understanding of COMPANY's policies and working practices.

10.12 ADDITIONAL MUDLOGGING SERVICES

These services are seen as key contributors to an optimal Mudlogging system and may be requested by COMPANY on a well by well basis and are detailed below.

- Pressure detection Services
- Enhanced Pit Level Sensor Package for floating rigs
- High Resolution Flow Monitoring
- Drilling Data Analysis Package
- Data transmission services
- Vibration Detection Service
- Enhanced Hole Condition Monitoring
- Casing Wear Monitoring
- Drill Off Test Monitoring
- Torque and Drag Monitoring
- Real Time Data Transmission
- Pore Pressure Analysis
- Advanced Gas Detection/Chromatography/Analysis

10.13 PRESSURE DETECTION SERVICE

10.13.1 Primary Methods

CONTRACTOR shall provide the following analysis, at a frequency suited to regional conditions:

- (a) Corrected drilling exponent;

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- (b) Flow line mud temperature and differential temperature;
- (c) Gas trends, particularly trip/connection gas including chromatograph analysis, and
- (d) Cuttings and cavings analysis.

Shale density may be required, the method for which shall be at the discretion of CONTRACTOR, but shall under no circumstances contravene relevant health, safety, security, or environmental regulations. The bulk density method using water balance is unacceptable.

10.13.2 Secondary Methods

At regular defined intervals, or at the discretion of the Well Site Geologist, the following additional work may be required:

- (a) Calcimetry;
- (b) Pore pressure from electric log data stored in a digital medium, uploaded at the WORKSITE;
- (c) Software package to analyze drilling data, MWD or LWD measurement of resistivity and gamma ray to produce estimation of pore pressure, fracture gradient;
- (d) Evaluation of d exponent corrected for bit wear, and
- (e) Temperature trend,

10.13.3 Additional Competencies

For this service the mud logging CONTRACTOR shall be required to provide personnel with:

- (a) The ability to recognize and predict trends in pressure from measurements;
- (b) The ability to recognize deviations from predicted trends, and the implications for drilling and safety;
- (c) Use of d exponent and other predictive tools for the determination of pore pressure, fracture pressure, and overburden evolution;
- (d) Safe working practices, particularly where shale density is requested, and
- (e) Previous experience of providing a pressure detection service

10.14 ENHANCED PIT LEVEL SENSOR PACKAGE FOR FLOATING RIGS

- (a) The method of heave compensation for pit level monitoring is at the discretion of CONTRACTOR but shall be technically acceptable to COMPANY. CONTRACTOR should indicate additional sensor requirements with the bid, and any additional costs incurred, if any, by providing heave compensation.

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- (b) The preferred method of measurement shall be to install two sensors per pit at opposite corners, and to use software averaging to determine the true pit level.

10.15 DRILLING DATA ANALYSIS PACKAGE

10.15.1 Introduction

A package of software analytical facilities may be required to assist in the processing and manipulation of large amounts of drilling parameters or other types of data.

10.15.2 Availability and General Functionality

When requested, the package as defined below shall be available both at the WORKSITE and at the onshore support base, and be able to operate both on-line (i.e., to act on data as it is acquired) and off-line. The package shall support the extension of existing tools, or addition of extra tools if required by COMPANY.

10.15.3 Data

The package shall be capable of acting on data of various types. This shall normally include any measured or derived depth-based and time-based data.

10.15.4 Package Content

As a minimum, drilling or additional data shall be able to be operated on using the following tools:

- (a) Mathematical manipulation of measured or derived drilling parameters, to allow operator-defined equations to be performed and the resulting variables to be stored, processed, and displayed. An example of such a function would be the calculation of mechanical horsepower consumed per unit volume of rock drilled;
- (b) X-y cross plotting, with up to three parameters available as discriminants on the plotted data. Curve fitting to be available for the plotted data, using an operator-accessible library of linear, exponential and logarithmic methods, and
- (c) Statistical analysis of measured or derived drilling parameter data, or additional data, using various techniques e.g., standard deviation, coefficient of variation, analysis of variance, frequency histograms.

Plotting of both raw and derived variables should be possible.

10.15.5 Additional Competencies

For this service CONTRACTOR shall be required to provide personnel with:

- (a) Statistical analysis methods training (to meet an agreed upon and understood level);
- (b) Working experience of the data analysis package.

10.16 DATA TRANSMISSION FACILITIES

10.16.1 Hardware

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CONTRACTOR shall provide:

- (a) A minimum of one office workstation in direct communication with the rig site database. This station should be of a high enough specification to allow detailed logs to be drawn on the screen quickly and legibly, and
- (b) An office plotter capable of producing logs and reports with the same specifications as the rig site plotter.

10.16.2 Software

CONTRACTOR shall install a network connecting the rig site and office (TCP/IP). The minimum specification for the network shall be a serial line or phone link using Point to Point Protocol. The ability to perform batch updates shall be required. If requested, CONTRACTOR shall install a full network connection with a router at each site and provide a digital fax capability allowing the on-line computer system on the rig to send reports and logs directly to the office fax. Logs for office based personnel & partners shall be used as a primary source. Where an office workstation facility is provided the system shall be used only for investigation of measured parameters, and production of "one-off" logs which are needed at short notice in the office.

10.17 HIGH RESOLUTION FLOW MONITORING

An enhanced method of flow monitoring may be required. If requested, the method of flow monitoring shall be at the discretion of CONTRACTOR but shall be technically acceptable to COMPANY.

10.17.1 Requirements

The flow monitoring system:

- (a) Shall be able to compensate for rig heave, pitch/roll, and riser boosters on floating rigs;
- (b) Shall be able to compensate for pipe movement, and starting/stopping/altering of pumps;
- (c) Shall be able to work with either water based or oil based mud;
- (d) Shall be unaffected by temperature and density changes in the mud system;
- (e) Shall make alarms in response to influx rate, influx volume, loss rate and loss volume; the alarm system should include the ability to preset the levels for each alarm at any time, and
- (f) Sensitivity should be sufficient to allow detection of 1-2bbls losses/kicks on semi-submersible rigs, and 1/2bbl on fixed rigs.

10.17.2 Sensors

Several types of sensor are available:

- (a) Acoustic: detects a phase shift in the return time of mud pump noise due to gas or liquid entry;

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- (b) Electromagnetic: works only in wbm;
- (c) Coriolis force: works in obm or wbm;
- (d) J-meter: works in obm or wbm.

10.17.3 Display

The following parameters shall be available for display or for plotting against time once the Early Kick Detection system has processed the measured parameters:

- (a) Total SPM: strokes per minute of the circulating pumps;
- (b) Total flow: flow measured in gpm and calculated from the pump strokes and pump efficiency;
- (c) Instantaneous flow: flow out along the return line in gpm, sampled at high frequency, corrected for variation in return line slope, and for the thickness of any cuttings deposited on the bottom of the pipe;
- (d) Flow out: the instantaneous flow values averaged over one or more heave periods;
- (e) AVG DFLO: average Delta Flow (gain +ive, loss -ive) in gpm. This is the difference between Total Flow and Flow Out;
- (f) TRD DFLO: trend Delta Flow (gain +ive, loss -ive) in gpm. A less smoothed average delta flow, used to detect trends in flow rate;
- (g) CUM DFLO: cumulative Delta Flow (gain +ive, loss -ive) in gpm. Cumulative difference in flow in and flow out since last reset;

10.18 MUD LOGGING VIBRATION DETECTION SERVICE

10.18.1 General Requirement

The principal objective is to distinguish periods of excessive variance in torque, surface rotary speed, hookload or standpipe pressure, and to alarm these to the mud logging crew and other rig personnel. Periods of excessive variation in these variables often indicate the presence of vibration. In particular, a signal analysis method should be employed to detect and discriminate the cyclic torque that is characteristic of torsional resonance (slip-stick). Displays and alarms are required on the rig to initiate responses to observed vibration (suppression).

10.18.2 Specific Requirements

- (a) To read the surface torque, rotary speed, hookload and standpipe pressure sensors;
- (b) From the high speed data, to calculate the standard deviation of each of the four parameters per time increment;
- (c) From the high speed torque data, to employ a detection method to identify the regular cyclic torque pattern that is characteristic of slip-stick vibration. The

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minimum slip-stick period that shall be detectable shall be in the region of one (1) torque cycle per second. The detection method shall be able to discriminate between genuine slip-stick (regular torque cycling), and other, less regular torque variation which is not indicative of slip-stick vibration. This detection method shall not be dependent upon variance in surface rotary speed;

- (d) To employ manually selectable set points and alarm thresholds to govern the sensitivity of the detection capability (set points for standard deviation alarm thresholds, minimum period of slip-stick, minimum amplitude(%) and number of torque cycles for slip-stick to be valid etc.);
- (e) To trigger visible alarms in the mud logging unit and on the drill floor when the alarm thresholds are exceeded, or slip-stick detected (an audible drill floor alarm is not recommended). A "traffic light" type of visible alarm on the drill floor is suggested;
- (f) To provide an on-line display of the high-speed torque, rotary speed, hookload and pump pressure data in the mud logging unit and company office, and to provide on the drill floor an ability to display the high speed data during periods of vibration. COMPANY office display shall be able to be left running at all times necessitating a devoted display;
- (g) Whenever vibration is detected, to trigger an automatic printout of the four variables (raw high speed data), together with time/depth, and alarm status. These shall be used to provide a record of detection efficiency, and explanation material when vibration is being discussed at the rig. A lag time before and after the detected period of vibration should also be retained;
- (h) Whenever vibration is detected, to store the raw high speed data to file, for later playback and analysis. A lag time before and after the detected period of vibration should also be retained, and
- (i) To write values of the standard deviation of each variable to the standard depth database (i.e., averaged per depth increment), together with a flag indicating slip-stick status (i.e., Present or absent). Each of these variables shall be made available to depth-based logs and subsequent ASCII data on cd-rom (if optional Service 11.0 is requested).

10.18.3 Additional Competencies

CONTRACTOR shall be able to provide personnel trained in:

- (a) Use of the vibration detection service;
- (b) Maintenance of the detection hardware and software;
- (c) Calibration of the equipment;
- (d) Ability to recognize and be able to calibrate the equipment to recognize the difference between slip-stick and erratic torque.

CONTRACTOR shall provide monitors and /or "Traffic Lights" for the Rig Floor and COMPANY Man Office.

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10.19 ENHANCED HOLE CONDITION MONITORING

Where enhanced hole condition monitoring is requested it is expected that severe hole problems shall arise due to tectonic stresses, overpressure, faults. The objective of this service is to provide equipment and procedures for the continuous monitoring of hole conditions, especially the volume of cuttings and cavings returned to surface. This latter measurement is used to produce a trend of the returns and early indication of a deterioration in hole condition.

The design of the monitoring system is at the discretion of CONTRACTOR but shall be technically acceptable to COMPANY.

10.19.1 Measurement of Cavings and Data Storage

The measurement:

- (a) System shall be able to provide an automatic, continuous measurement of the total weight/volume of cuttings/cavings being received at the shakers. This measurement shall be made not only while drilling, but also while tripping or reaming to provide the parameters referenced herein;
- (b) Shall be recorded on the mud logging time database at the normal sampling frequency for the base service, and also in depth based format. Drilling information should be stored on the depth database as per normal requirements. The storage location of the tripping/reaming information is at the discretion of CONTRACTOR but it shall be possible to interrogate the system for the information so that the parameters referenced herein can be computed, and
- (c) Device shall be regularly cleaned and calibrated to ensure that the correct weight of cuttings is being recorded.

10.19.2 Data Required

If the service 10.22 – Provision of Digital Data for Post Well Analysis has been requested the following parameters shall be provided for each lag depth as defined in Clause 10.22:

- (a) Total time reaming: until the section is cased;
- (b) Total caving volume per foot: until the section is cased;
- (c) Total caving volume per section: until the section is cased;
- (d) Total exposure time per foot: from time drilled to time cased;

The parameters are the cumulative value of time or volume derived from drilling, tripping, and reaming at each lag depth).

Where the Provision of Digital Data for Post Well Analysis service has not been requested the information shall be extracted from the mud logging databases separately, and presented in depth based ASCII format on CD-ROM.

10.19.3 Tripping Data

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- (a) When saving the cuttings returns rate to the database COMPANY may request that a trip number index is saved which identifies which trip the rate was recorded on. This data shall be used to obtain the maximum rate recorded at each lag depth, and the trip upon which it occurred (including drilling) where requested. This shall assist in determining the duration over which particular formations produce cavings.
- (b) Where the Provision of Digital Data for Post Well Analysis service has been requested this information shall not be provided with that data. A separate ASCII format disc shall be required. If the Post Well Analysis service has not been requested, this information may be included on the extra cavings analysis disc mentioned above.

10.19.4 Sampling Requirement

The shape and size distribution of the cuttings/cavings (percentage of each type) returned from a well may give an indication of the problem which is causing the cavings, e.g., high pressure & fractures and the formation which is producing the cavings. Accordingly:

- (a) The cavings identification (procedure 10.19.5) shall be performed upon request from COMPANY Representative, and
- (b) Three samples from each formation drilled shall be taken for comparison and stored for post well analysis. Comparison of these samples with real time cuttings/cavings returned to surface may indicate which formation is producing the cavings, especially when made at cavings return "peaks".

10.19.5 Cavings Identification Procedure

This procedure shall outline a method for determining the percentage size and type of cavings produced whilst drilling. This information shall be recorded on COMPANY's Pore Pressure and Hole Condition Log if requested. The procedure shall be required only if stipulated by COMPANY Well Site Geologist, or in the Drilling Program for the well.

The Procedure:

- (a) To catch approximately a one kilogram sample at normal sample intervals;
- (b) To pass the sample through three sieves whilst washing with water or base oil as appropriate:
 - 5mm sieve - to catch obvious cavings to be sorted by shape.
 - 2mm sieve - to ensure only cuttings pass through to the sample inspection sieve.
 - 68-90 micron sieve - to wash sample for inspection of cuttings whilst retaining particles down to a fine sand grade.
- (c) To weigh each fraction of the sample (to an accuracy of no less than 10 grams):
 - 5mm sieve = W1.
 - 2mm sieve = W2.
 - 68-90 micron sieve = W3.

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- (d) To prepare 68-90 micron sample for inspection by the geologist;
- (e) To sort the contents of the 5mm sieve into four categories of caving as defined by the pictures below; Tectonic (square/blocky), splintery (long and thin pressure cavings), flat angular plates and eroded cavings (damaged cavings not fitting any of the previous categories);
- (f) To weigh each of the four samples (to an accuracy of no less than ten grams):
 - Tectonic = W_t Angular = W_a .
 - Splintery = W_p Eroded = W_e .
- (g) To record the total percentage of cavings: $(W_1/(W_1 + W_2 + W_3)) * 100 =$ total percentage of cavings;
- (h) To record the total percentage of each of the four categories of caving with respect to the total sample: $(W_i / (W_1 + W_2 + W_3)) * 100 =$ total percentage of tectonic cavings (similarly for W_p , W_a and W_e), and
- (i) To record each of the total percentages on COMPANY Pore Pressure and Hole Condition Log if these have been requested in the reporting requirements.

10.19.6 Parameter Trend Monitoring

The hole condition should be inferred by monitoring trends in the following parameters:

- Pump pressure (corrected for flow rate variations);
- Torque (corrected for rpm, wob);
- Drag;
- Reaming time;

Indications of divergence from the expected trend for each parameter may signify loading of the annulus with cuttings/cavings or breakouts.

Where this service is requested it is essential that logging personnel provide continuous monitoring of well-bore stability indicators, and that response to perceived problems is rapid.

10.19.7 Alarms

If requested by COMPANY, an automatic alarm system monitoring one or more well-bore stability indicators (compensated for changes in the drilling parameters) shall be required. The system should be able to respond automatically to deviations of the monitored parameters from trend, and raise an audible alarm to the mud logging personnel.

10.19.8 Additional Competencies

CONTRACTOR shall provide personnel trained in:

- Use of the database for storage of time and depth based data while tripping and reaming;
- Cavings identification procedure as stated in 10.19.5;

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- Recognition, and understanding of hole condition deterioration;
- Maintenance and calibration of the cuttings measurement device installed at the shakers.

10.20 CASING WEAR MONITORING

This service shall provide an estimate of the amount of casing wear which is occurring in the well and to identify the wear mechanism. Casing wear has three mechanisms:

- (a) Abrasive wear: this mechanism is characterized by small particles of metal. It occurs when solids contained in the mud system are ground against the casing wall by the drill string, causing a gradual wearing away of the metal.
- (b) Adhesive wear: this mechanism is caused when the tool joint is pressed against the casing under rotation with enough force to form a friction weld with the metal. As the tool joint continues to rotate a "lump" of metal is pulled away
- (c) Cutting wear: this mechanism is caused when the hard banding of the tool joint is not flush ground. As the tool joint rotates the exposed hard banding cuts long shavings of metal away from the casing.

CONTRACTOR shall, on a daily basis, measure the total weight of metal fragments recovered. The weight of fragments measured should be notified daily to COMPANY Representative on the rig and the ops drilling engineer.

10.21 GEOLOGICAL SERVICES

10.21.1 Equipment

The unit shall be furnished with the following equipment:

- Shale factor kit
- Shale density kit
- Cuttings gas equipment
- Calcimetry kit
- Two high quality binocular zoom microscopes with variable power light system, one for the sole use of company geologist
- Ultra-violet light box
- Sample drying ovens
- Chemicals and equipment for geological examination of drilling returns for hydrocarbon detection and analysis
- Equipment for reproducing log copies at the WORKSITE (including plotter with geological symbols).

10.21.2 Sample Collection

CONTRACTOR shall be responsible for the proper collection, washing, and packaging of the cutting samples. The sampling program shall be defined in the well program or amended by COMPANY Well Site Geologist on site. CONTRACTOR shall supply all the WORKSITE consumables i.e., wet sample packaging, dry sample envelopes and boxes, and official transport boxes. Color coded boxes to identify recipients may be preferred. If requested, CONTRACTOR shall also supply foil bags for geochemical samples, plastic lined bags for Paleo samples and 1 liter polypropylene containers for mud samples. This does not include coring operations.

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10.21.3 Sample Description

Meticulous cuttings sample descriptions are required and shall include:

- (a) Lithologies present, and their percentages, as determined by microscopic analysis of cuttings. Percentage cavings shall also be noted. Descriptions are to follow the standard company format. If a procedures manual is provided to the unit, the document shall be in both English and the local language (if different) and shall be read, understood and adhered to (where differences of interpretation exist, the English manual should take precedence). All data and descriptions shall be recorded in the cuttings register provided by company. The cuttings register should also be available on the mud logging system in digital format;
- (b) Petroleum content as determined by chromatographic analysis of mud gases, cuttings gas, and white light/fluorescopic analysis of the cuttings and associated mud samples. The effect of solvent extraction shall be recorded. Where a procedures manual is provided, the effect shall be recorded according to the method outlined. If a show is present, it shall be recorded in the show report format, and
- (c) Carbonate analysis using calcimetry may be required every 50 ft, or at an interval specified by COMPANY Well Site Geologist, or in the Drilling Program for the well.

10.21.4 Test for Clay Hydratability

The CEC (MBT) test should be performed in all clay sections drilled with water-based mud, if requested by the Geologist. Oil-based mud cuttings should be cleaned by washing in acetone or a similar solvent, and carefully dried.

10.21.5 Assistance To COMPANY Geologist

CONTRACTOR shall provide general assistance to COMPANY designated Well Site Geologist as and when required.

10.21.6 Additional Competencies

CONTRACTOR shall provide personnel trained in:-

- Sample description and conversant with COMPANY format for geological symbols and descriptions
- Analysis of cuttings as described above
- Correct procedures for storing and logging samples
- Safe working practices
- Ability to make formation top picks based on cuttings sample information.

10.22 PROVISION OF DIGITAL DATA FOR POST-WELL ANALYSIS

Digital data shall be provided to COMPANY, for use in post-well studies of drilling performance and drilling problems. It is imperative that these data are of prime quality, since they shall be used both qualitatively in studies of drilling phenomena and bit response. Any algorithms used to screen data shall be reported to COMPANY.

10.22.1 Format of the Data

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- (a) Data shall be provided in ASCII format on CD-ROM at the end of each hole section and at the end of the well;
- (b) Data shall be stored every 1 foot or 0.5 meter. If the depth increment is 1 foot, integer values of depth only shall be used;
- (c) No depths should be repeated and all depths should continuously increase by the chosen depth increment;
- (d) No depths should be missing. If any data is missing for a particular depth the variable values should be null (-999.25);
- (e) All variables should carry either a valid or null value at every depth;
- (f) All variable values should be averages over the chosen depth increment, unless specified otherwise;
- (g) Each variable value should be in the format nnnnnnnn.nn;
- (h) Each ASCII file should contain a maximum of 10 variables, meaning that more than one CD-ROM shall be required to carry the data set from one hole section;
- (i) Each ASCII file should carry the measured depth variable (DMEA);
- (j) The column for each variable should be separated by 1 space from adjacent variable columns;
- (k) ASCII data shall be backed up weekly

10.22.2 Data Set Required

The variables described here are required:

Variable	Units	Mnemonic
Measured depth	Feet	DMEA
Date	YY:MM:DD	DATE
Time	HH:MM:SS	TIME
COMPANY Bit number		BITN
Time on bottom	Minutes	TON
Time off bottom	Minutes	TOFF
Penetration rate	Ft/hr	ROI
Weight on bit	Klbs	WOBA
Hookload	Klbs	HKLD
Rotary speed (String+bit)	RPM	RPMA
Measured depth	Feet	DMEA
Corrected D-exponent	-	DXC

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Variable	Units	Mnemonic
Average torque	Kft.lbs	TQA
Maximum torque	Kft.lbs	TQMX
Minimum torque	Kft.lbs	TQMN
Sigma torque (st. dev)**	Kft.lbs**	SITQ**
Slip-stick flag**	-**	VIBR**
Cumulative bit hours	Hours	BDTI
Estimated pore pressure	PPG	PORE
Flow rate in	GPM	MFIA
Measured depth	Feet	DMEA
Standpipe pressure	Psi	SPPA
Mud density in	PPG	MDIA
Mud density out	PPG	MDOA
Mud temperature in	Deg.F	MTIA
Mud temperature out	Deg.F	MTOA
Spare 1	-	SPR1
Spare 2	-	SPR2
Spare 3	-	SPR3
Spare 4	-	SPR4
Measured depth	Feet	DMEA
Interpreted lithology	-	LTYP
Total gas	%	TGAS
Chromatograph C1	PPM	C1
Chromatograph C2	PPM	C2
Chromatograph C3	PPM	C3
Chromatograph iC4	PPM	iC4
Chromatograph nC4	PPM	nC4
Chromatograph C5	PPM	C5
Chromatograph C6	PPM	C6
Gas Wetness Ratio	%	$(C2+C3+C4+C5) / *100$ $(C1+C2+C3+C4+C5)$
Light to Heavy Ratio	PPM	$(C1+C2) /$ $(C3+C4+C5)$
Gas Wetness Ratio	PPM	$(C4+C5) / C3$
Measured depth++	Feet++	DMEA++

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Variable	Units	Mnemonic
Total time reaming++	Hours++	TREA++
Total cavings per foot++	Bbls++	CVFT++
Total cavings per section++	Bbls++	CSEC++
Total exposure per foot++	Time++	TEXP++

==These parameters shall only be required where the Vibration Detection service (Section 10.18) has been requested.

++=These parameters shall only be required where the Enhanced Hole Condition Monitoring service (Section 10.19) has been requested.

10.23 Definitions

10.23.1 General

This section defines the meaning of certain terms used in the context of this Scope of Work:

- **Derived Parameter** – The result of combining two or more measurements with or without external data.
- **Measurement** – The output signal of a sensor after processing by the computer.
- **Sensor Calibration** – A method of verifying the satisfactory operation of a sensor. This is achieved by (a) ensuring a suitable sensor signal response to changes in the parameter of interest, and (b) calibrating the sensor output signal so that the displayed measurement accurately reflects the parameter's current properties.
- **Sensor Signal** – The output signal of the sensor prior to filtering, processing, or conversion to measurement units.

10.23.2 Applicable to the variables listed in Clause 10.2.2:

Hookload	Measure weight of the drill string and hoisting equipment while drilling (average per depth increment).
Maximum Torque	Highest torque value recorded during the depth increment.
Minimum torque	Lowest torque value recorded during the depth increment.
Sigma Torque	Standard deviation of high frequency torque data recorded during the depth increment.
Slip-stick Flag	See "Specification for Optional Mud Logging Services", "Vibration Detection Service" (Clause 10.18).
Bit Number	The bit number (not the BHA run number), taken from COMPANY bit record.
Time on Bottom	The time spent on bottom drilling the depth increment (reset every depth increment)
Time off Bottom	The time spent off bottom while hole depth is within the depth increment (reset every depth increment).
Cum. Bit Time	Cumulative on-bottom time for the current bit run.

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Interpreted Lithology	Single integer value indicating the lithology present at that depth. The tail end of the ASCII file should contain details of integer values for each rock type. This should be standardized on all CONTRACTOR Mud Logging Operations.
Total time reaming	Total time spent reaming past each depth interval including back-reaming by the time the section is cased off.
Total cavings per foot	Total volume of cavings generated from each lag depth by the time the section is cased off.
Total cavings per section	Total volume of cavings generated for the whole section.
Total exposure per foot	Total exposure time for each foot of the section from time depth first drilled to time cased.
Spare 1 - 4	To be used to convey other data, e.g., compliance-corrected ROP, formation evaluation or drilling mechanics MWD measurements etc.

10.23.3 Delivery of Data

CONTRACTOR shall, if requested by COMPANY, supply a partial data set during hole sections on CD-ROM.

10.24 Drill Off Test Monitoring

COMPANY uses two types of drill-off test. The Mud Logging service is required to collect data during these two types of test, and treat the data to the point where the relationships between penetration rate, and weight on bit and RPM, can be clearly deduced and presented in cross plot form.

This section describes the steps involved in these tests, COMPANY's expectations of data processing requirements and instructions for Mud Logging Data Acquisition and Calculations.

10.24.1 Drill-Off Test Method 1

(a) COMPANY

- Choose appropriate drilling parameters for the test i.e., maximum WOB to drill-off from; minimum WOB to drill-off to; the three rotary speeds to be used for the test.
- These parameters should be chosen according to the type of bit in use (e.g., from a bit catalogue), and any BHA constraints (e.g., weight below the jars). They should explore as wide a range of parameters as possible.

(b) Driller

- Notify the Mud Logging unit that a drill-off test is about to be performed then start their time database and chart recorder.
- At the mid-range RPM, lock the brake at the maximum WOB. Allow the WOB to drill-off to the chosen minimum, without touching the brake.
- Repeat step 3 at the highest RPM.
- Repeat step 3 at the lowest RPM.
- Repeat step 3 at the first (mid-range) RPM.
- Go back to normal drilling (the test is now complete).

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(c) Mud Logger

- Get a printout of the time database data for the test interval, and the chart record.
- Perform the calculations as described overleaf.
- Deliver the ROP/WOB cross plot and chart record to COMPANY Drilling Representative.

(d) COMPANY

- From the chart record, check for smoothness of torque during each drill-off interval.
- From the ROP/WOB cross plot and chart record, choose the lowest WOB/RPM combination that gives best ROP and smoothest torque (thus balancing ROP versus bit and drill string life).

(e) Data Acquisition

- For the drill-off tests, the mud loggers should run a time database for the following variables, storing data every 30 seconds: time, block position, hookload, instantaneous weight on bit, average weight on bit, rotary speed, average torque, sigma torque, flow rate in, pump pressure. Also, the mud loggers should run a chart recorder at a minimum speed of 1.5 meters/minute with the following variables; block position, hookload, weight on bit, rotary speed, torque, sigma torque (if possible), flow rate in, and pump pressure.

(f) Data Processing

The following data processing is required from the mud loggers, and relates to the intervals of drill-off only (i.e., when the brake is locked and the string is drilling-off)

- Calculation of drill string compliance (drill pipe only) from,

$$C = \frac{MD}{E} \frac{Fdp1}{Adp1} + \frac{Fdp2}{Adp2}$$

in which:

C	=	compliance (m/kN)
MD	=	length of drill pipe (m)
E	=	Young's modulus for steel (GPa)
Fdp1	=	fraction of drill pipe of type 1 (e.g., 1")
Fdp2	=	fraction of drill pipe of type 2 (e.g., 6.5/8")
Adp1	=	cross-sectional area of pipe 1 (sq. mm)
Adp2	=	cross-sectional area of pipe 2 (sq. mm)

Typical values are:

E	=	206 GPa for drill pipe
Adp1	=	3403 sq. mm for 5" drill pipe
Adp2	=	4211 sq. mm for 6.5/8" drill pipe

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Fdp1 = 0.6, if 6000 ft of 5" pipe in 10,000 ft of total drill pipe
Fdp2 = 0.4, if the rest of the 10,000 ft is 6.5/8" drill pipe
MD = 3048, for the example quoted here (10,000 ft of pipe)

The value for C is converted to FT/KLB before further use.

- Calculation of the amount of depth advance per WOB increment, and ROP per depth increment, from the time database data for the drill-off intervals only, as follows:

WOB change (klbs) = Inst. WOB - Previous Inst. WOB
Depth advance (ft) = WOB change (klbs) * Compliance (FT/KLBS)
Calc. ROP (ft/hr) = Depth advance (ft) * (60/delta time) (mins)

These calculations are necessary because with the brake locked, the mud logging depth sensor is static, thus the system shall see no depth advance and hence calculate no ROP data. ROP is therefore calculated by hand from the WOB decay during the drill-off, and the estimated bit advance as the string extends.

- (g) Plotting of calculated ROP (from step 2), versus average WOB (from the time database printout), for each RPM.

If, at this stage, the ROP/WOB relationships are not clear, instantaneous WOB data, and the resultant calculated ROPs should be calculated over longer time intervals, by grouping the raw time database data (this has the effect of smoothing out some of the errors in ROP and WOB). Alternatively, data can be grouped by WOB increment, which shall guarantee a minimum amount of data at higher WOB, where drill-off may be rapid. The new averages of ROP and WOB for each RPM should then be re-plotted.

- (h) Deliver the raw data, ROP/WOB cross plot, and chart record to COMPANY Drilling Representative.

10.24.2 Drill-Off test Method 2

- (a) COMPANY

- Choose appropriate drilling parameter "pairs" for the test (three pairs of WOB/RPM). These parameters should be selected according to the type of test in use (e.g., from a bit catalogue), and any BHA constraints (e.g., weight below the jars). They should explore as wide a range of WOB and RPM as possible.

- (b) Driller

- Notify the mud logging unit that a drill-off test shall be performed. They should start their time database and chart recorder, recording the data as stipulated overleaf.
- Set the WOB to the mid-range value.
- Drill a minimum of 5 feet with each of the three chosen RPMs, beginning with the mid-range RPM and ending with the low RPM.
- Set the WOB to the high value.
- Drill 5 feet with each of the three RPMs beginning with the same RPM as used at the end of the mid-range WOB interval.

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- Set the WOB to the low value.
- Drill 5 feet with each of the three RPMs, beginning with the same RPM as used at the end of the high WOB interval.
- Revert to the mid-range WOB and RPM, and drill at least 5 feet.
- Revert to chosen parameters (the test is now over).

(c) Mud Logger

- Take the data from the drilling test interval from the time and depth databases, and process the data as described overleaf.
- Deliver the ROP/WOB crossplot and the chart record to COMPANY Drilling Representative.

(d) COMPANY

- From the chart record, check for smoothness of torque during each drilling test interval.
- From the ROP/WOB cross plot and chart record, choose the lowest WOB/RPM combination that gives best ROP and smoothest torque (thus balancing ROP versus bit and drill string life).

(e) Data Acquisition

- For the drilling test, the mud loggers should run a time database, storing the following variables every 30 seconds: time, depth, block position, hookload, instantaneous and average weight on bit, rotary speed, average torque, sigma torque, flow rate in, pump pressure, rate of penetration. A chart recorder should also be run, at a minimum speed of 1.5 meters/minute, with the following variables: block position, hookload, weight on bit, rotary speed, torque, sigma torque, flow rate in, and rate of penetration. These requirements are in addition to the normal storage of data on the depth database.

(f) Data Processing

The following data processing is required from the mud logging system, for the data collected during the drilling test interval:

- Averaging of the ROP, WOB and RPM data over each of the intervals of constant WOB/RPM during the drilling test (i.e., averaging of these three variables for each pair of WOB/RPM values). The interval for this averaging should be user-selectable, either in terms of depth increments (e.g., 1 foot, 5 feet), or time steps. This shall require some automated recognition of each WOB/RPM pair.
- User-defined discrimination of data from the drilling test interval, e.g., to exclude bad ROP data from one or more of the WOB/RPM intervals, or to exclude WOB and/or RPM data that is not constant during an interval. This functionality may best be incorporated into the cross plotting in step 3.
- From the time or depth database data, cross plotting of average ROP versus average WOB data, with one or more data points per pair of WOB/RPM values, for each of the test rotary speeds. Curve fitting should be employed to give an equation for the relationship of ROP to WOB and RPM, either separately or combined.

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- Deliver the raw data, ROP/WOB cross plot, and chart record to COMPANY Drilling Representative.

(g) Additional Competencies

CONTRACTOR shall provide personnel who are:-

- Fully conversant with COMPANY procedure for drill off test monitoring;
- Able to understand the meaning of the measured data, and know how to perform cross-correlation of the information to deduce the relationship between WOB, RPM, and ROP.

11.0 ONSHORE FACILITIES

11.1 Repair and Maintenance (R & M) Facilities

11.1.1 The services to be provided by CONTRACTOR shall include as a minimum:

- (a) Coordination of all equipment, logistics and transportation requirements.
- (b) Storage and handling of equipment and spare parts.
- (c) Equipment preparation.
- (d) Equipment inspection and testing.
- (e) Repair and Maintenance (R&M).

11.1.2 CONTRACTOR is responsible for determining the most cost effective balance between back-up equipment requirements and the level of R&M and calibration facilities required in each SPU. As a minimum, CONTRACTOR's R&M facilities must be capable of performing mechanical and all board level servicing for all equipment likely to be used in the performance of the WORK including but not limited to the following:

(a) Rotary Steerable

- Inspection, testing and repair of sub-assemblies.
- Flow loop and bench testing facilities for command confirmation and systems testing prior to shipping.

(b) Positive Displacement Motors

- Checking of bearing gap clearance.
- Checking of rotor/stator fit.
- Complete assembly and disassembly of motor.
- Inspection, testing and repair of sub-assemblies, i.e., stator, rotor, bearing, smaller subs.

(c) Mechanical

- Assembly and disassembly of outer collars (i.e., complete MWD subs/assemblies).

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- Assembly/disassembly, inspection and testing of sub-assemblies (i.e., basic pulser replacement).
- Complete disassembly and disassembly of entire MWD and LWD tool.
- Inspection, testing and repair of sub-assemblies, i.e., advanced MWD pulser repairs.

(d) Electrical

- Basic functional and verification testing of LWD subs and probe strings.
- Advanced LWD subs and probe testing.
- Exchange of broken/damaged harnesses and connectors.
- Testing at temperature.
- PCB (Board) replacement.
- Opening of probes and LWD subs to board level.
- Testing of boards and exchange of boards.

(e) Calibration

- Routine calibration of nuclear tools including GR and Neutron-Density tools.
- Routine calibration of resistivity tools.
- Routine calibration of pressure measurement tools including FPWD and PWD tools.

11.1.3 Prior to the EFFECTIVE DATE of the CONTRACT, CONTRACTOR shall have developed a detailed management plan to ensure that sufficient equipment and personnel resources are available at all times to service COMPANY's operations.

The management plan will address the following as a minimum:

- (a) Repair and Maintenance (R&M) facilities to be located in the SPU.
- (b) Repair and Maintenance (R&M) facilities to be utilized at CONTRACTOR's bases located elsewhere.
- (c) Tool calibration and testing requirements.
- (d) Back-up equipment requirements.
- (e) Spare parts, tools etc.
- (f) Turn around times where equipment R&M and calibration activities are to be completed in locations other than the SPU.
- (g) Transportation routes to be utilized for moving equipment to/from the Point(s) Of Mobilization and Demobilization.
- (h) Personnel requirements at the WORKSITE, within the SPU and any other location(s) where R&M and/or calibration activities may be required.

11.2 Storage and Transportation of Radio Active Sources

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11.2.1 CONTRACTOR shall be responsible for the following with respect to Radio Active source materials:

- (a) Transportation of Radio Active sources between CONTRACTOR's base of operation and COMPANY's Points of Mobilization and De-mobilization.
- (b) Provision of suitable shipping containers for the shipping of Radio Active sources between CONTRACTOR's base of operations and COMPANY's supply base.
- (c) Provision of suitable storage containers for the storage of Radio Active sources within COMPANY's supply base for the duration of the CONTRACT.
- (d) Provision of suitable shipping containers for the transportation of Radio Active sources between COMPANY's supply base and the WORKSITE(s) on supply vessels.
- (e) Provision of suitable containers for the storage and transportation of Radio Active sources at the WORKSITE(s).
- (f) Handling of all Radio Active sources at the Points of Mobilization and De-mobilization, COMPANY's supply base and WORKSITE(s) until all Radio Active material has been demobilized from COMPANY's supply base and WORKSITE(s) and returned to CONTRACTOR's base of operations.
- (g) Application and approval of all permits and licenses required by the local Government for the transportation, storage and use of Radio Active materials.
- (h) Provision of Radio Active Survey Meter to detect radiation around Radio Active storage container(s) and other necessary locations at the WORKSITE(s).
- (i) CONTRACTOR shall provide all required permits/licenses/approval from relevant institution/government authorities to perform this WORK with no additional charge or expenses to COMPANY. **CONTRACTOR shall indemnify and hold COMPANY harmless from and against all liability, demands, levies, fines and expenses in the event CONTRACTOR fails to acquire such permits/licenses/approval.**

11.2.2 COMPANY shall be responsible for the following with respect to Radio Active source materials:

- (a) Transportation of Radio Active sources, stored in CONTRACTOR's shipping container, between COMPANY's Points of Mobilization and De-mobilization and COMPANY's supply base.
- (b) Transportation of Radio Active sources, stored in CONTRACTOR's shipping container, between COMPANY's supply base and the WORKSITE(s).
- (c) Provision of a secure designated area for the storage of CONTRACTOR's Radio Active storage container. The secure area shall include fencing and secure access.
- (d) Provision of security personnel, if required, at the designated Radio Active source storage area.

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- (e) Provision of assistance to CONTRACTOR for the application and approval of permits and licenses for the transportation, storage and use of Radio Active materials where requested by CONTRACTOR.

11.3 CONTRACTOR shall provide a tool make-up and testing service (pre-made BHAs). Drilling tool modules shall be made up as agreed with COMPANY. Scope shall include, but not be limited to make-up and break-out, function testing, hydraulic/gas testing, pressure testing, inspection, storage and preparation for shipment. Modules shall be clearly identified by stenciling unique ID and component serial numbers. Modules shall be loaded into shipping baskets which, together with lifting slings and shackles, shall be fit for purpose and certified

11.4 Materials

CONTRACTOR shall store all drilling tools, equipment, spares, etc (with the exception of drilling modules due for shipment), under cover. Perishable items shall be stored according to manufacturer's recommendations. All completion tools and equipment shall be provided with appropriate protection.

11.5 Schedule

CONTRACTOR shall provide materials, equipment and services in order to take account of COMPANY's drilling schedule and as amended and issued to CONTRACTOR from time to time by COMPANY.

11.6 SERVICE LEVELS.

11.6.1 It shall be CONTRACTOR's responsibility to establish a level of servicing that shall be conducted within each specified SPU, for each technology, in order to support the levels of WORK detailed herein; whilst considering reliability of CONTRACTOR's different systems, R&M capabilities, and required competencies to ensure all tools operate to publicized specifications. All additional costs incurred to cater for remote servicing (transportation, customs, R&M costs etc.) shall be included in the pricing of each tool or service.

11.6.2 Prior to the EFFECTIVE DATE of the CONTRACT, service levels shall be mutually agreed between COMPANY and CONTRACTOR.

12.0 REPORTING AND RECORD KEEPING

12.1 CONTRACTOR will be responsible for the reporting of directional drilling and survey data, ensuring BHA records are current etc. on COMPANY's "EDM/COMPASS" or other system to be determined by COMPANY, in addition to fulfilling CONTRACTOR's own internal reporting requirements.

12.2 CONTRACTOR should ensure that its personnel are familiar with the data requirements of COMPANY during the WORK. Real time and memory data, both depth-based and time-based shall be easily accessible for review. Output options and presentations must be flexible to COMPANY requirements. Hard and digital copies in various formats shall be required.

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- 12.3 CONTRACTOR is required to provide COMPANY with timely information on request. Running the tools successfully should not be the only CONTRACTOR focus on the WORKSITE. This alone does not meet COMPANY requirements.
- 12.4 CONTRACTOR personnel at the well site shall maintain a daily diary in digital form. This shall capture not only a summary of the day's activity but any problems, recommendations, and critical comments covering any and all aspects of the drilling activity and its management. The intention is to capture this information as it happens and use it in hole section reviews and lessons learned sessions, post well. CONTRACTOR personnel shall contribute to this as often as practicable but as a minimum it shall be updated every day. Subjectivity is encouraged and will be treated in a positive manner.
- 12.5 On completion of well operations, CONTRACTOR will prepare an End of Well Report (EOWR) in line with the requirements of COMPANY REPRESENTATIVE. This shall be completed within 30 days of reaching TD of each well or hole section. The end of well report shall contain:
- (a) Run by run detailed synopsis by service.
 - (b) BHA description and operational variables.
 - (c) Details of lessons learned and recommendations for continuous performance improvement.
 - (d) A complete reconciled cost close out on the well
 - (e) Tracking, reporting and benchmarking of COMPANY's Directional Drilling Performance Measures.
- 12.6 Any additional engineering service provided by CONTRACTOR (such as Drilling Optimization, Pore Pressure Management, NDS) shall be summarized in an additional or integrated End of Well report, with supporting logs where appropriate.
- 12.7 The format of the end of well report shall be approved by COMPANY Representative.
- 12.8 All digital data from the well shall be stored securely by CONTRACTOR for a one (1) year period after termination of the CONTRACT. COMPANY shall be notified prior to its destruction after the end of this period.
- 12.9 On completion of well operations, CONTRACTOR shall operate a post-analysis review of well performance so that lessons learned are fed back into the plans for the next well. The details of this review will be jointly agreed upon with COMPANY. The data to be reviewed will include but not be limited to:
- Mud logging and associated reports
 - COMPANY "EDM/COMPASS" or other system to be determined by COMPANY - compatible directional drilling report

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- Special Note: For long term archival purposes, the survey data and QA/QC sheets for the constituent parts of the definitive survey will be employed as the data to be reviewed

12.10 CONTRACTOR is required to submit the following reports

CONTRACTOR Reporting Requirements

	FREQUENCY
Invoice of WORK	Monthly/By Well
Daily Digital Diary (maintain and submit as requested)	Update Daily
Itemized Cost for WORK by Product Line	Per well
Safety Reports	Monthly
Performance Standards	Quarterly
Performance Measures	Quarterly
Performance Score Cards, if required	Per Well or Batch
Summary of Inspection Reports and findings	Monthly
Failure Analysis / problem	as required
End of Well Reports Directional	Per well
End of Well Tool Utilization	Per well/month
Definite Survey	Per well
Project / Study reports	as required

The content, style and structure of the above reports shall be agreed between COMPANY REPRESENTATIVE and CONTRACTOR REPRESENTATIVE.

12.11 For the Performance Standards and Measures reports, they will be for CONTRACTOR's operation as a whole and not on well by well basis. The report shall include both the month's performance and a cumulative aggregated performance.

12.12 Inspection and Failure/Problem analysis reports shall be discussed and agreed on an individual basis by COMPANY and CONTRACTOR. CONTRACTOR must provide full details on problems and issues in order to ensure capture of lessons learned and continuous improvement.

12.13 Project / Study Reports shall be undertaken as necessary following identification of the issues from the above reports. Such projects/studies shall have an agreed Scope of Work, objective and deliverable prior to commencement. This type of work shall be part of CONTRACTOR's commitment to improve performance and will be undertaken at no cost to COMPANY.

12.14 In addition to job reports CONTRACTOR is requested to supply to COMPANY on a monthly basis a summary of jobs performed. The summary is to be delivered to COMPANY's REPRESENTATIVE by the third working day of the following month. The format is to be agreed with COMPANY's REPRESENTATIVE but shall include the following information for each job performed within the month.

- Well name/Slot number
- AFE number
- Hole section/Casing / Liner - size
- Service provided

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- Itemized Cost (excluding tax)

12.15 CONTRACTOR will produce as part of the End Of Well Dataset five (5) hardcopies of final logs and reports (scales and TVD/MD requirements to be dictated by sub-surface requirements) , and two (2) ASCII /LAS and EOWR Datasets (including yet not limited to all Reporting Requirements items listed in Table Rep.1) on DVD.

12.16 Each SPU reserves the right to reduce the amount of reports or logs as required. Any additional logs will be as per Appendix 3 and/or Appendix 4.

12.17 All End of Well logs must be fully environmentally corrected with tool calibration files attached. The entire well must be spliced on a composite log including spliced repeat sections and include details of the splice points when logs from subsequent runs are joined, on the header. Separate / individual runs printed on one log scroll are not acceptable. These logs will follow the formats specified in the BOD document.

12.18 Should any post well processing be required (for example sonic, SMWD etc) this will be conducted prior to the splicing of the final composite logs or EOWR data sets.

12.19 All End of Well Logs will be approved by COMPANY Geophysicist prior to submission as the final data set.

12.20 CONTRACTOR shall be responsible to ensure that all logs are depth matched to the reference log. GR and Resistivity from the MWD/LWD will be the depth reference log.

12.21 Mud Logging Reporting

All reporting should be in electronic format where possible.

- (a) Daily copy of FEL at 1:500 scale and PEL at 1:2000 scale, correct to 06:00 hrs and covering a minimum of the previous 24 hour period. The log scales and symbols used shall conform to COMPANY standard 'Formation Evaluation Log'.
- (b) Preparation of a Daily Geological Report (in the absence of COMPANY Well Site Geologist) to COMPANY standard format.
- (c) Preparation and posting of Daily Drilling Data files containing the last 24 hrs drilling data and gas data.
- (d) The 'Mudlogging End of Well Report' shall be issued in ring binders with stiff cover. Diagrams and plots should be in color and letter size. Two unbound draft copies of the report complete with logs and data on CD are to be sent to COMPANY Operations Geologist, within two weeks of the end of well.

12.22 Meetings

12.22.1 There will be a formal Quarterly Performance Review (QPR) meeting, with minutes produced, which will take place quarterly. The purpose of the meeting will principally

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be to discuss general performance, contractual issues and areas for improvement, and any other issues raised as may be agreed between the PARTIES. The meeting will be recorded with minutes and actions to be agreed and signed off by both PARTIES. This meeting will discuss, as a minimum:

- Safety update and issues
- Operational Issues
- Technical / Engineering issues
- Performance issues
- Address any action arising from previous meetings or reports
- AOB

12.22.2 CONTRACTOR's personnel shall be required to attend a variety of meetings both in COMPANY office and at the WORKSITE. COMPANY encourages full, effective, open, honest, proactive participation in all meetings and encourages CONTRACTOR personnel to share this goal.

12.22.3 CONTRACTOR personnel shall lead briefings ahead of well and hole sections to introduce new technology tools/equipment to all rig site personnel. They shall ensure that literature is available to familiarize involved rig floor personnel with any handling issues or hazards associated with the tools/equipment. CONTRACTOR personnel are also encouraged to lead safety meetings on the rig site as well.

13.0 SUPPLIER PERFORMANCE MANAGEMENT

13.1 The intent of the CONTRACT is for CONTRACTOR to deliver upper quartile performance and continuous improvement throughout the CONTRACT term.

13.2 On a quarterly basis CONTRACTOR shall present QPR data mutually agreed upon, detailing overall performance using Drilling and Completions SPM metrics.

13.3 CONTRACTOR will be requested to participate in regionally or globally held Performance Reviews at regular intervals to be defined by COMPANY.

13.4 CONTRACTOR will track the Key Performance Indicators detailed below, which have been collated in the D&C SPM system as outlined in Appendix 1 Supplier Performance Management, unless COMPANY proposes an alternative system or rationalized data set:

General Details	NUMBER OF SCORE CARDS
HSE	TRIF PER 200K MANHRS
HSE	PROACTIVE SAFETY INPUT PER 200K MANHRS
Cost	ACTUAL VS PLANNED COST (W/ SCOPE CHANGE)
Cost	ACTUAL COST PER 10K FT
Cost	NPC COST PER 10K FT
Cost	LIH COST PER 10K FT
Cost	TOTAL ACTUAL COST OF SERVICE

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General Details	NUMBER OF SCORE CARDS
Efficiency	TRIPS FOR FAILURE PER 10K FT
Efficiency	% DRILLING TIME PER CIRCULATING HOURS
Efficiency	NPT VS BELOW ROTARY TIME
Efficiency	REAL TIME LOGGING EFFICIENCY
Efficiency	RECORDED TIME LOGGING EFFICIENCY
Efficiency	FOOTAGE PER DRILLING HOUR (ROP)
Efficiency	% SUCCESSFUL RUN RATE (FAILURE FREE)
Quality	WELL SPECIFIC OBJECTIVE MET / SET RATIO
Quality	GLOBAL OBJECTIVES MET / SET RATIO
Incremental Benefit Delivered	IBD PER ACTUAL INVOICE COST

- 13.5 The performance criteria shall be monitored whether CONTRACTOR has WORKSITE representation or is providing engineering support from elsewhere. CONTRACTOR shall provide a plan on the EFFECTIVE DATE of the CONTRACT or initial mobilization, which ever is the earliest date, to monitor the achievement of these objectives.
- 13.6 CONTRACTOR shall document operations in the Well Placement Score Card detailed below, unless an SPU defines an alternative card or condensed system:

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Drilling and Completions

* Denotes Compulsory

Global D&C SCORECARD: Well Placement (Dir. Drig, Rot Steerables, and/or MWD-LWD)	
Region	
Business Unit	
Country	
Service Company	
Field	
* Well Name	
Unique Well Number	
* Start Date of Operation	
* End Date of Operation	
* Mobilisation Date	
* De-mobilisation Date	
Platform	
* Rotary or CTD Well?	
Degree of difficulty (Alaska only)	

- Number of HSE related management rig visits
- Number of dropped objects incidents

* Calculation of Number of HSE Proactive Inputs (Leading Indicators)

Number Completed

**Recorded Safety Observations e.g. STOP Cards
Safety Observations and Conversations (SOC's) / Safety Tours**

- Total Manhours
- Days Away From Work Injuries
- Recordable Injuries and Illnesses
- First Aid Cases
- Number of accidental, uncontained oil spills or discharge

• Planned Cost of Services (Directional Drilling)	US Dollar Sterling Canadian Dollar
• Planned Cost of Services (MWD/LWD)	US Dollar Sterling Canadian Dollar
• Planned Cost of Services (RSS)	US Dollar Sterling Canadian Dollar
• Actual Cost of Services (Directional Drilling)	US Dollar Sterling Canadian Dollar
• Actual Cost of Services (MWD/LWD)	US Dollar Sterling Canadian Dollar
• Actual Cost of Services (RSS)	US Dollar Sterling Canadian Dollar
• Lost or Left in Hole Costs (Directional Drilling)	US Dollar Sterling Canadian Dollar
• Lost or Left in Hole Costs (MWD/LWD)	US Dollar Sterling Canadian Dollar
• Lost or Left in Hole Costs (RSS)	US Dollar Sterling Canadian Dollar

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Failed Runs	Directional Drilling	MWD/LWD	RSS
Trips for Failure of this Product	Directional Drilling	MWD/LWD	RSS
Out of Spec Trips for Failure	Directional Drilling	MWD/LWD	RSS
Number of 0-25 hr (BRT Hrs) Failures of this product	Directional Drilling	MWD/LWD	RSS
Number of Total Other Failures	Directional Drilling	MWD/LWD	RSS
<ul style="list-style-type: none"> No. of Memory Measurements (MWD/LWD) No. of Real Time Measurements (MWD/LWD) No. of psi tests attempted (MWD/LWD) No. of psi tests obtained (MWD/LWD) 			

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Well Specific Objectives		
Objectives Defined	Objective Successfully Delivered?	Explanation for non-delivery of Objective
1	No	
	Yes	
2	No	
	Yes	
3	No	
	Yes	
4	No	
	Yes	
5	No	
	Yes	
6	No	
	Yes	

*** Global Well Placement Sector Objectives**

	Objective Compulsory	Objective Successfully Delivered?	Explanation for non-delivery of Objective
Personnel meet BP competency requirements, and are proactive both onshore and offshore	Yes	No	
	No	Yes	
No Unplanned Shut Ins or Close Approach Violations for equipment or service reasons	Yes	No	
	No	Yes	
No Unplanned Side-tracks for equipment or service reasons (as a result of equipment, product line or service).	Yes	No	
	No	Yes	
No Stuck Pipe Incidents (as a result of equipment, product line or service).	Yes	No	
	No	Yes	
No back offs, twist offs or fatigue related failures in supplier equipment.	Yes	No	
	No	Yes	
No lost BHA's or components (as a result of equipment, product line or service)	Yes	No	
	No	Yes	
No Trips as a result of Surface or subsurface BHA system failures.	Yes	No	
	No	Yes	
No surface equipment or BHA component or system failures (regardless of cause), which interrupted the service (i.e. redundancy was inadequate).	Yes	No	
	No	Yes	
At least one complete set of functional backup equipment at the rig site for each BHA component in the hole and required for next run. (See clarifications.)	Yes	No	
	No	Yes	
Intersected all Targets as planned within agreed tolerances (inclusive of csg points, fluid or gas contacts, zones of interest, geological markers etc). Did not exceed DLS limits, Tortuosity limits	Yes	No	
	No	Yes	
Did not exceed operating limits of tools (intentionally or unintentionally).	Yes	No	
	No	Yes	
Logged & Drilled shoe to shoe without service interruption, delay, or failure.	Yes	No	
	No	Yes	
Reported 100% of all failures, service interruptions, delays & equipment non conformances regardless of severity level i.e. catastrophic, severe, critical, major, minor.	Yes	No	
	No	Yes	

*** Global Well Placement Sector Objectives (MWD/LWD) (MWD/LWD)**

	Objective Compulsory	Objective Successfully Delivered?	Explanation for non-delivery of Objective
Delivered 100% of all data within agreed time frame. (Specify data distribution requirements & timings)	Yes	No	
	No	Yes	
100% of all Data Fully Tracable (Environmental Corrections, Tool Numbers, Software ID, Key Constants, Variables & Filtering Identified)	Yes	No	
	No	Yes	

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100% Match between Real Time and Recorded Data
 No repeat logging runs required to acquire poor, lost, or missing data.

Yes	No
No	Yes
Yes	No
No	Yes

* Global Well Placement Sector Objectives (DD/RSS) (Directional Drilling)

	Objective Compulsory	Objective Successfully Delivered?	Explanation for non-delivery of Objective
Achieved planned (P50- Average) Drilling hours for well and each hole section. (Specify P50 hours for each hole section)	Yes No	No Yes	
Reached planned TVD, departure and measured depth for each BHA run and each hole section.(Specify Dep, TVD, MD & Tolerances +/-)	Yes No	No Yes	
STRETCH: Optimum target (P10) drilling curve achieved.	Yes No	No Yes	

* Global Well Placement Sector Objectives (DD/RSS) (RSS)

	Objective Compulsory	Objective Successfully Delivered?	Explanation for non-delivery of Objective
Achieved planned (P50- Average) Drilling hours for well and each hole section. (Specify P50 hours for each hole section)	Yes No	No Yes	
Reached planned TVD, departure and measured depth for each BHA run and each hole section.(Specify Dep, TVD, MD & Tolerances +/-)	Yes No	No Yes	
STRETCH: Optimum target (P10) drilling curve achieved.	Yes No	No Yes	

Incremental Benefit Delivered

Approximate value of incremental benefit delivered	Incremental Benefit Details of Cost Savings of successfully implemented incremental benefit ideas submitted
1	

D. Wireline Services

1.0 GENERAL SERVICE REQUIREMENTS

- 1.1 CONTRACTOR shall provide twenty-four (24) hour Wireline services (Open Hole, Cased Hole, and Perforating) in accordance with the terms and conditions detailed within this Appendix 5 and the Statement of Requirements found in Section 4, Appendix 3, and in a safe and cost effective manner as detailed herein comprising, but not limited to, the provision of all necessary rig site management, support and engineering expertise, office and rig site personnel, equipment, tools, spare parts, consumables and other items necessary or required for the satisfactory performance of the WORK described herein during COMPANY's exploration and development drilling and production operations.
- 1.2 In the event COMPANY elects under the provisions of Section 4 (Remuneration), to pay a monthly minimum guaranteed rate per surface equipment spread (logging unit and associated equipment), all tools, services, consumables, and expendables contribute to the monthly minimum rate with no exclusions. Operations by these units in excess of the guaranteed monthly minimum will be charged in accordance with the Schedule of Rates and Charges.
- 1.3 It is agreed and understood by the PARTIES that COMPANY may adjust the total fleet of WIRELINE exclusive equipment and associated personnel provided to perform the WORK by providing CONTRACTOR thirty (30) days written notice, in the form of a Change Order hereunder. CONTRACTOR shall adjust its fleet of equipment provided to COMPANY within thirty (30) days from the issuance date of the Change Order or such later date specified by COMPANY.
- 1.4 The provision, utilization and management of the services shall be the sole responsibility of CONTRACTOR always accepting that CONTRACTOR must meet the requirements of this CONTRACT. Each service shall be provided in accordance with the service specific statement of technical requirements stated hereunder.
- 1.5 CONTRACTOR shall work together with COMPANY, and with other contractors from the first stages of well planning through finalization of well reports and performance evaluation. COMPANY's operations are conducted utilizing Beyond the Best principles, and a strongly process-focused approach to well planning, design, execution, evaluation, and re-design. CONTRACTOR is expected to work with COMPANY and other contractors performing well services for COMPANY within this framework.
- 1.6 CONTRACTOR performance with respect to total cost, project cycle time, and well rates are critical to achieving COMPANY objectives. Performance of CONTRACTOR will be measured, and intervened upon as necessary, utilizing score cards developed mutually between COMPANY and CONTRACTOR.
- 1.7 CONTRACTOR may be required to co-operate and work closely with other service providers during provision of the WORK. In particular this may include working with the providers of Logging-While-Drilling and Mudlogging services.

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2.0 PERSONNEL

- 2.1 CONTRACTOR shall provide fully trained, competent personnel to perform the services in accordance with the Scope of Work. The number and location of personnel required will be determined by operational and engineering need as agreed by COMPANY and CONTRACTOR. To ensure continuity and operational learning(s), personnel assigned to a drilling unit shall not be replaced without COMPANY's written agreement.
- 2.2 Personnel are required to be capable of operating, testing, troubleshooting and repairing all CONTRACTOR equipment as required.
- 2.3 In support of this role, the Account Manager, referenced in Section 3, Clause 3.3 shall be responsible for setting up an engineering planning process for COMPANY that is compatible with COMPANY's system. This shall include documents to be produced for the WORK and individual wells, information required to prepare the documentation and a 'Responsible, Accountable, Consult and Inform' (RACI) chart for the process.
- 2.4 The Account Manager shall also ensure that all produced documentation pertaining to COMPANY comes under a document control system where signatory authorities shall be described through the RACI process. Electronic copies of all documentation shall be required, copies of which must be logged within COMPANY system.
- 2.5 CONTRACTOR, as directed by COMPANY to meet operational requirements, will make available a suitable number of Wireline Office Engineers, including In-house Engineers, who will become familiar with COMPANY operations so as to provide effective support and coordination for the WORK, ensure efficiency and consistency in process, and if so directed by COMPANY serve as a single point of contact for the Asset Team, Rotary Teams, Coiled Tubing Drilling Team, as well as Workover and Wells Teams. Their minimum responsibilities will be performing or participating in providing:
 - Planning and generation of well-specific and project logging programs with COMPANY's subsurface representative to ensure COMPANY's WORK objectives are realized, efficiently and safely
 - Technology resources for advanced logging and perforating applications
 - Operational co-ordination between COMPANY's local offices and well site
 - Project planning and scheduling meetings
 - Process re-engineering, technical limits evaluations, beyond best technical practices, knowledge management, risk assessments, and cost and efficiency benefit analysis, etc.
 - Project / well evaluations and reporting
 - Support for CONTRACTOR invoice and field service report reconciliation issues as may be required by COMPANY
 - Real-time transmission applications in COMPANY's office
 - Support and training material for COMPANY staff as required
 - Technology leadership for advanced wireline logging and perforating applications
 - Cost and time estimates for the WORK as required by COMPANY
 - Assurance that the cost estimates are not exceeded during performance of the WORK
 - Other logging and Perforating support as required

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- 2.6 Data and Data Transmission Requirements will unless otherwise advised by COMPANY provide:
- Preliminary hard copy plots at well site
 - Multiple final hard copy plots
 - Well site CD / DVD / floppy log presentation curves (LAS / DLIS)
 - Preliminary and final Log Plots in digital format (PDS / CGM) to data servers or Intranet / secure internet
 - Final Log Plots in digital format (PDS / CGM) to data servers
 - Provide real time data.
 - At the end of all Jobs, Wells, and individual hole sections CONTRACTOR shall provide COMPANY DVDs / CDs and other acceptable formats as agreed by the PARTIES, including all data files (repeats, main logs) in appropriate format (XTF / LAS / DLIS) and all digital log plots (PDS / CGM)
- 2.7 CONTRACTOR may provide Wireline and / or petrophysical analytical services to support COMPANY operations which shall include, but not be limited to:
- Processing of digital wireline log data
 - Data re-processing
 - Specialist log analysis
 - Interpretative studies
 - Recommendations for special data acquisition
 - Access to new or developing technology
- 2.8 Drilling Unit and / or Well Site wireline personnel will be required to provide the following services, including but not limited to:
- Participation in STOP program and / or other safety behavior programs
 - Early involvement in planning meetings and interaction with rig crew to ensure sheave points and rig up details have been discussed and risk assessed prior to jobs.
 - Caliper / gauge all equipment that goes in the well
 - Supply COMPANY on-site representative with tool string diagrams prior to running in the well and caliper fishing neck / tool body.
 - Fishing procedure and logging while fishing program
 - Table of Risks and Mitigations
 - Applying industry Best Practices, lessons learned, knowledge and experience, and be responsible for pushing back and questioning rig / well procedures as appropriate.
- 2.9 As required, CONTRACTOR shall ensure all boom truck / crane / mast crews have a minimum of two fully trained and experienced ABC ticketed / certified crane operators on the WORKSITE at all times during the execution of the WORK.
- 2.10 As required, CONTRACTOR shall ensure all crews have valid advanced heavy equipment driver training certificate, and current D.O.T. license type, CDL suitable for the vehicles. This requirement also includes, as a prerequisite for ALL crews, a full array of light vehicle training courses including but not limited to journey management, Arctic driving familiarization and coaching, defensive driver training, skid pan and simulator training etc. All driver training

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records are subject to systematic refresher courses and may be audited by COMPANY from time to time.

- 2.11 Individual Asset Teams may require that the Wireline Office Engineer be co-located with the Performance Unit. Depending on the amount of WORK awarded to CONTRACTOR, and the number of Engineers co-located with COMPANY, COMPANY may require the appointment of a CONTRACTOR Coordinator.
- 2.12 COMPANY requires that Wireline Office Engineers serve tours of duty with COMPANY of no less than two years duration. COMPANY will review the qualifications of and approve the placement of such individuals. COMPANY reserves the right to demand replacement of any such engineer or analyst based on inadequate performance, capabilities, or compliance with COMPANY policies and procedures.
- 2.13 CONTRACTOR shall provide units capable of performing services that cover the following work activities, including but not limited to:
- Open Hole logging (real time Wireline and / or memory)
 - Cased Hole logging (real time Wireline and / or memory)
 - Perforating and mechanical services (real time Wireline and or memory / E-fire)
 - Wireline hoisting services
 - Logging data services (Pre job, real time and Post job support)
- 2.14 From time to time, CONTRACTOR will be required to provide technically competent and experienced technical personnel and research support for CONTRACTOR awarded WORK on COMPANY projects.

3.0 EQUIPMENT

- 3.1 CONTRACTOR shall provide all equipment required to perform the WORK, as required by COMPANY's programs and ensure that safety, efficiency and quality is not compromised.
- 3.2 Equipment and services provided by CONTRACTOR to meet COMPANY's statements of requirements shall be fit for purpose, and will include all equipment necessary for providing the following services which shall include, but is not limited to:
- Open Hole logging of newly drilled wells to determine formation properties
 - Cased Hole logging of wells to determine formation properties
 - Cased Hole gamma ray correlation logs
 - Pressure and fluid sampling in Open Hole and Cased Hole
 - Cement bond / quality logs
 - Casing inspection logs
 - Casing and pipe recovery services
 - Production logs
 - Perforating casing, drill pipe, or work strings
 - Setting plugs, packers, inflatable tools, whipstocks, and bridge plugs
 - Pressure and temperature recording
 - Hoisting services

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- Tractor conveyance
 - All of the above work in slim hole, HPHT and Memory environments when necessary
- 3.3 Individual Performance Unit assets may have specific equipment requirements to service the CONTRACT.
- 3.4 COMPANY shall have the right to inspect and audit CONTRACTOR's equipment, materials and supplies at any time to observe their condition and to ensure that no deficiencies exist therein. Such inspection by COMPANY shall not imply any acceptance of the condition of the said equipment, materials and supplies by COMPANY and CONTRACTOR shall not be relieved of its obligations under this CONTRACT by any such inspection.
- 3.5 In concert with Appendix 1, Clause 2.2 and Clause 5.3 herein below this Appendix 5, prior to running logs, mutually approved evaluation objectives between COMPANY and CONTRACTOR will be completed for each hole section or Cased Hole log / perforating run which identifies log suite quality, depth for logs, targeted evaluation zone, agreed footage for perforating intervals.
- 3.6 CONTRACTOR shall be required to identify and communicate in writing fishing contingencies for all down-hole equipment used to perform the WORK prior to running in hole. CONTRACTOR shall maintain knowledge and availability of appropriate fishing tools and techniques for CONTRACTOR's equipment. A complete record of down-hole equipment with calliper dimensions is required for each run in hole. COMPANY may require appropriate fishing tools onsite for remote operations. For normal operations, fishing tools will be provided from CONTRACTOR's base as required. CONTRACTOR shall provide onsite support and supervision for all fishing operations that involve higher risk tools, such as by non-limiting example, tools that may contain one or more radioactive sources, explosives and other dangerous goods.
- 3.7 CONTRACT tools and contingency equipment shall be available for all WORK at COMPANY's Well Site, except as otherwise specified by COMPANY.
- 3.8 COMPANY reserves the right, in its reasonable discretion, to specify the electric line cable size, type and manufacturer, and any other enabling technologies as may be required from time to time. By mutual agreement with COMPANY, CONTRACTOR will use and maintain said equipment and or enabling technologies for the WORK.

4.0 QUALITY ASSURANCE

- 4.1 CONTRACTOR may be required to submit a QA/QC plan for the equipment/services furnished to COMPANY for review and approval. This QA/QC plan shall be tailored after a recognized quality standard such as API-Q1, ISO 9001, MIL-Q9858A or equivalent. Upon approval by COMPANY, this QA / QC plan shall be made a part of this CONTRACT and shall apply not only to CONTRACTOR's activities, but also to those of any SUBCONTRACTORS. The QA / QC plan shall, at a minimum, include:
- 4.1.1 Detailed description of the stages of performance of a service, or manufacture of

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equipment components and final product.

- 4.1.2 Location of service to be provided, sources of materials and equipment, and manufacture, inspection, assembly, testing and storage of any purchased equipment.
- 4.1.3 A matrix that shall list the full description of the individual services, products, and equipment utilized in conducting required services, or of individual components and assembly of purchased equipment, along with the documentation, traceability, testing, inspection and process that shall be performed by CONTRACTOR or his agents. This matrix shall be utilized by COMPANY to list any COMPANY required inspections, standards and testing in addition to COMPANY's witness, review, traceability and documentation requirements.
- 4.1.4 Provisions for COMPANY to review and approve CONTRACTOR's and SUBCONTRACTOR's QA/QC plans, processes, procedures, documentation, drawings, materials, parts lists and non-conformance deviation reports.
- 4.1.5 The accepted QA/QC plan shall contain certain inspections and manufacturing processes which COMPANY may or may not witness, verify or review. This does not absolve CONTRACTOR from performing any and all tests, inspections, equipment calibrations or dimensional measurements that are required in CONTRACTOR's approved QA / QC plan.
- 4.1.6 COMPANY reserves the right to conduct any and all tests and any other inspection deemed necessary by COMPANY at COMPANY's sole expense.
- 4.1.7 CONTRACTOR shall afford COMPANY reasonable access to:
 - (a) Perform audits
 - (b) Perform relevant inspections
 - (c) Review all QA/QC records and documents
- 4.2 These QA/QC plans will be agreed to by COMPANY and CONTRACTOR at a later date. Any commercial issues arising out of any additional testing, inspections, traceability, documentation or dimensional requirements that COMPANY may require will be agreed to at that time between COMPANY and CONTRACTOR and the CONTRACT will be amended to include that agreement.

5.0 ENGINEERING SERVICES

- 5.1 CONTRACTOR shall pro-actively monitor, evaluate and promote the use of new technology to improve cost effectiveness and add value through the application of technology. COMPANY is committed to making its knowledge of best practice available to CONTRACTOR. It is expected that CONTRACTOR will avail itself of the opportunity to use COMPANY's data and knowledge in the course of its work. Likewise, it is expected that CONTRACTOR will provide to COMPANY its knowledge of industry best practices and technology.
- 5.2 CONTRACTOR shall commit to utilizing the necessary quality and performance improvement systems to provide full traceability of its engineering work, provide assurance that engineering designs were accurate and were followed, and improve performance of all

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aspects of CONTRACTOR services.

- 5.3 In concert with Appendix 1, Clause 2.2 and Clause 3.5 herein above this Appendix 5, prior to performing each operation, CONTRACTOR shall provide, at the request of COMPANY, a complete well specific engineering proposal for requested services, complete with cost estimate. This proposal should include:
- 5.3.1 Consideration that COMPANY reserves the right to conduct any and all tests and any other inspection deemed necessary by COMPANY at COMPANY's sole expense.
 - 5.3.2 Wireline logging tools to be run
 - 5.3.3 Stacked tool combinations
 - 5.3.4 Depth intervals to be logged
 - 5.3.5 Conveyance methods (i.e., capstan, appropriate strength cable, weak-point)
 - 5.3.6 Tension analysis for each run
 - 5.3.7 Load out sheet containing item description, weight, size and safety issues, most recent inspection date, and responsible party with telephone numbers for each item, with all Third Party items clearly marked.
 - 5.3.8 Detailed job cost estimate, and if applicable data service charges.
- 5.4 After well operations are completed, CONTRACTOR, at request of COMPANY, shall conduct a formal post-analysis review of operational performance so that lessons learned are fed back into the plans for the next well. The format of the report will be determined by COMPANY and CONTRACTOR. Where applicable, all relevant COMPANY specialists, technologies and facilities shall be made available to CONTRACTOR to facilitate this process. Such assistance shall be provided at the sole discretion of COMPANY but shall not be unreasonably withheld.
- 5.5 CONTRACTOR shall contribute to the process of daily reporting on COMPANY's information system installed at the WORKSITE or field office location.
- 5.6 CONTRACTOR will be required to conduct pre-studies to evaluate acquisition parameters for the NMR, seismic and other advanced / non-standard tools as required including but not limited to slim hole and HPHT environments.
- 5.7 CONTRACTOR shall store all original logging data for five (5) years.
- 5.8 All Open Hole and Cased Hole unit charges include presentation, interpretation and deliverables in accordance with COMPANY's requirements.
- 5.9 Wireline Open Hole and Cased Hole unit rates for WORK as set forth in Appendix 3 and/or

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Appendix 4 include all standard data services and post processing required for the generation and shipping of final prints, films, tapes and disks as listed below, or in accordance with COMPANY's procedures and / or requirements. The WORKSITE and final product deliverables will be specified by each SPU.

- Digital disks (CD, DVD or other) will be made available immediately after the Job (or run in hole) for field deliverables.
- If applicable, LDWG logs, which shall include depth shifting, clipping, compositing, as required for AOGCC compliance
- Tapes / Disks
- Electronic data transfers
- Black and white prints
- Film and sepia if applicable
- Color prints and associated field playbacks will be provided for all services.

5.10 All Well Site logging units shall have real time data transmission and remote witnessing capability as required by COMPANY, which shall be for CONTRACTOR's account. Finalized logging products shall be delivered on a timetable that meets or exceeds the SPU internal and partner requirements, which is expected to vary depending on job complexity and well site location, etc.

6.0 MANAGEMENT SYSTEMS AND OTHER REQUIREMENTS

6.1 CONTRACTOR must have in place or implement and demonstrate compliance in all of the systems noted below:

- BP Environmental Management System (EMS)
- Preventative Maintenance Systems for all mechanical equipment
- Staff Development and Deployment System for COMPANY Operations
- Personnel Competency Assessment System for COMPANY Operations
- Organizational Learning System

6.2 CONTRACTOR shall manage its operations in accordance with the principles outlined in COMPANY "Getting HSE Right" document and comply with various Performance Unit and COMPANY defined Safe Practices Guidelines and Safety Policies.

6.3 COMPANY also requires CONTRACTOR to maintain up-to-date training records for their employees and make the records available for review at COMPANY's request. All CONTRACTOR personnel should be trained to the standards required by law as a minimum or to some other standard as may be required by COMPANY.

6.4 Should CONTRACTOR fail to achieve the required competencies within the agreed timescale, CONTRACTOR shall be deemed to be in default of the CONTRACT, and COMPANY shall have the right to terminate the CONTRACT at its sole discretion under the terms and conditions of Section 2 (General Conditions of Contract), Clause 23.1(b).

SPECIAL REQUIREMENTS FOR ANY WORK PERFORMED IN THE GULF OF MEXICO

1.0 EQUIPMENT

- 1.1 Cable working strength of up to 18,000 pounds is required on most wells in the deeper hole sections.
- 1.2 Further to Section 3, Appendix 5, Clause 3.2, a CONTRACT cable of similar specification to the primary cable is required at the WORKSITE. Cost should be included in the Base Service Unit Rate.
- 1.3 A redundant surface acquisition system / electronics cab is required on location, with umbilical capability to the primary logging / winch unit. Cost should be included in the Base Service Unit Rate.

E. Completions

1.0 GENERAL

- 1.1 As required by COMPANY, CONTRACTOR shall provide completion equipment and services as detailed herein comprising but not limited to, the provision of all management, support base, engineering expertise, office and rig personnel, equipment, tools, spare parts, and consumables, necessary for the satisfactory performance of the WORK.
- 1.2 CONTRACTOR shall provide design, engineering, qualification, computer modeling, supply, and installation of the equipment and services for COMPANY's operations, as detailed herein. The equipment and services shall comprise, but not necessarily be limited to:
 - 1.2.1 Provision and installation of completions equipment and services; see Section 3, Appendix 6 – Functional and Technical Specifications.
 - 1.2.2 Provision of Completions Products, spare inventory, services, personnel and rental equipment; see Section 3, Appendix 6 – Functional and Technical Specifications.
 - 1.2.3 Provision of Multi-Lateral Systems, Fishing, Whipstock, and Machine Shop services, personnel and rental equipment; see Section 3, Appendix 6 – Functional and Technical Specifications.
 - 1.2.4 Provision of personnel and rental equipment, including installation and deployment of the lower completion equipment, sand screens, upper completion equipment, intelligent well equipment; DST / TCP services, and sand control pumping services.
 - 1.2.5 Preparing completion programs and procedures, including cost estimates.
 - 1.2.6 Coordination / Integration of Third Party services and equipment (e.g., nipple profiles, rentals, etc.).
 - 1.2.7 Onshore facilities for storage, inspection, make-up, and testing of completion equipment.
 - 1.2.8 Onshore facilities for staging, storage, maintenance of service equipment.
 - 1.2.9 Tracking of all equipment through manufacture, transportation, delivery, storage, and installation in the well-bore.
 - 1.2.10 Participation in technical limit, right scoping exercise, risk mitigation, and complete well on paper (CWOP) sessions.
 - 1.2.11 Participation in integration and stack-up testing of CONTRACTOR equipment and Third Party completion equipment where required.
- 1.3 CONTRACTOR shall provide lower completion equipment and services to meet the requirements of the Lower Completion Functional and Technical Specifications; see Section 3, Appendix 6 – Functional and Technical Specifications.

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- 1.4 CONTRACTOR shall provide upper completion equipment and services to meet the requirements of the Upper Completion Functional and Technical Specifications; see Section 3, Appendix 6 – Functional and Technical Specifications.
- 1.5 CONTRACTOR shall provide sand control pumping equipment, consumables, and services to meet the requirements of the Sand Control Pumping Functional and Technical Specifications; see Section 3, Appendix 6 – Functional and Technical Specifications.
- 1.6 CONTRACTOR shall provide the TCP / DST equipment, consumables, and services to meet the requirements of the TCP / DST Functional and Technical Specifications; see Section 3, Appendix 6 – Functional and Technical Specifications.
- 1.7 CONTRACTOR shall provide the sand screen equipment and services to meet the requirements of the Sand Screens Functional and Technical Specifications; see Section 3, Appendix 6 – Functional and Technical Specifications.
- 1.8 CONTRACTOR shall provide the intelligent well (including downhole flow control (DHFC), permanent monitoring, pressure / temperature gauges) equipment and services to meet the requirements of the Intelligent Wells Functional and Technical Specifications; see Section 3, Appendix 6 – Functional and Technical Specifications.

2.0 PERSONNEL AND ENGINEERING SUPPORT

- 2.1 CONTRACTOR shall provide engineering or technical support, which shall include but not be limited to:
 - 2.1.1 Working with COMPANY to finalize equipment technical specifications and qualification programs including Equipment Statement of Requirements (eSOR).
 - 2.1.2 Selection of well specific completion equipment.
 - 2.1.3 Sand control design (including OHGP, gravel packing, water packing, frac packing, etc.).
 - 2.1.4 Analysis, assessment and documentation of critical well engineering parameters including, but not limited to: torque and drag; tubing movement; pump rates and pressures; packer performance envelopes, etc.
 - 2.1.5 Optimization of completion operations through application of processes such as technical limit, right scoping exercises, risk management, Complete Well on Paper (CWOP) and application of industry best practices.
 - 2.1.6 Verification of systems integration / compatibility of Third Party supplied equipment.
 - 2.1.7 Work with COMPANY to develop programs, procedures and cost estimates for completion designs, equipment and services including Third Party equipment and services.
 - 2.1.8 Coordination of CONTRACTOR personnel and equipment requirements for well completion operations.

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- 2.1.9 Produce post-well completion reports including job evaluation, time breakdowns, non-productive time analysis, recommendations for continual performance improvement; and "as-run" equipment tallies.
 - 2.1.10 Investigating and reporting to COMPANY of any equipment or service failures during installation. Working with COMPANY to diagnose any post-installation failures, resolving issues and providing assurance plans for future avoidance of the failures.
 - 2.1.11 Completion of COMPANY's Performance Management Score Card.
 - 2.1.12 Ensuring the transfer of lessons learned and best practices from CONTRACTOR's on-going operations.
 - 2.1.13 CONTRACTOR shall be responsible for ensuring that the technical interfaces between the upper completion and Third Party Contractors' equipment (e.g., DHFC, subsea, sand face completion, real time temperature profiling) and rig are coordinated and seamless.
- 2.2 CONTRACTOR shall provide technically competent and experienced personnel for the delivery of technical and engineering support. CONTRACTOR shall propose candidates to COMPANY by submission of a completed competency assessment model. (An example of a completed competency assessment model / framework is provided for your review in Attachment A). COMPANY will provide competency assessment model, if required. COMPANY may request evidence and verification of skills, experience, training, and competencies including an on-site interview of the candidate. An on-site interview shall be at CONTRACTOR's account. The competency assessment model will document, assess, and evaluate four areas:
- 2.2.1 Experience;
 - 2.2.2 Interpersonal;
 - 2.2.3 HSSE;
 - 2.2.4 Technical.
- 2.3 CONTRACTOR shall provide technically competent and experienced specialist personnel at the WORKSITE for the installation and service of the WORK.
- 2.3.1 COMPANY designates the following personnel as key positions. As required, COMPANY may designate other key positions.
 - (a) Account Manager
 - (b) Technical and Engineering Support personnel
 - (c) Upper Completion Specialist (including upper completion, DHFC, intelligent well, and permanent monitoring equipment)
 - (d) Sand Face Tool Specialist
 - (e) TCP / DST Tool Specialist

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- (f) Pumping Supervisor
- (g) Offshore Lab Technician (sand control services)
- (h) Coordinator (single trip gravel pack systems)
- (i) Project Coordinator

2.3.2 CONTRACTOR shall select personnel for key positions that are technically competent and highly experienced for the specific product line / service. This assessment shall be based primarily on the following:

- (a) Actual job experience as the senior or lead tool or service specialist; and,
- (b) Progression through CONTRACTOR's competency based training program.

2.3.3 COMPANY may request, on a per job basis, that CONTRACTOR submit a completed competency assessment (see example in Attachment A) that will verifiably demonstrate that the candidates proposed for key positions are technically competent and highly experienced.

2.4 CONTRACTOR personnel shall carry a documented record detailing the following items: technical / operational training; experience; safety and environmental training; and specific areas of competence (e.g., high pressure testing, operating down-hole tools).

3.0 POST CONTRACT AWARD

- 3.1 All proposed equipment may be subjected to a COMPANY specified design review process (e.g., Detailed Design Review).
- 3.2 If requested by COMPANY, CONTRACTOR and / or SUBCONTRACTORS shall demonstrate the functionality of the integrated completion string(s) in a land based stack-up test (e.g., gravel packing tool string with Fluid Loss Control Valve (FLCV) at expected pump rates and conditions).
- 3.3 If requested by COMPANY, CONTRACTOR shall subject all proposed breaker systems, stimulation, treating fluids, and gravel carrier fluids to a rigorous core flood formation damage / mud cake removal study.
- 3.4 If requested by COMPANY, CONTRACTOR shall generate a risk matrix for all aspects of the completion operations and shall identify contingency measures for each (i.e., contingency on losing a pump, excessive fluid loss to the formation, early screen out, incorrect fluid viscosity, sand bridge in workstring / cross-over tool, etc.).
- 3.5 In response to COMPANY equipment statement of requirements (eSOR), CONTRACTOR shall provide a Certificate of Performance (COP) documentation package which shall address and include, but not be limited to, the following elements:

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- (a) Engineering narrative.
- (b) Technical specification sheet.
- (c) Bill of Material.
- (d) Standard Operating Procedure / Installation Procedure.
- (e) Equipment diagrams and drawings.
- (f) State of Stress Table (see example – Attachment B).
- (g) Rated Performance Envelope.
- (h) Equipment Performance Validation (see example – Attachment C).
- (i) Run history and reliability data.

4.0 RENTAL EQUIPMENT

- 4.1 CONTRACTOR shall provide all necessary tools and equipment to install and test the equipment specified in Section 3, Appendix 6 – Functional and Technical Specifications.
- 4.2 COMPANY may designate the use of Third Party suppliers for the provision of equipment and services specified herein, including but not limited to, pumping / treating iron, high pressure hoses, wash pipe and associated handling tools, etc.

5.0 CONSUMABLE MATERIALS

- 5.1 CONTRACTOR shall provide or procure all necessary consumable materials to install and test the equipment specified in Section 3, Appendix 6 – Functional and Technical Specifications.
- 5.2 CONTRACTOR shall ensure that all consumable materials are individually labeled or identified so as to ensure verification of material content, shelf life, expiration date and traceability to job lot or batch number.
- 5.3 CONTRACTOR shall be responsible for segregating and proper disposal of consumable materials that have exceeded their shelf life or expiration date.

6.0 BACK-UP MATERIALS AND EQUIPMENT

- 6.1 CONTRACTOR shall make appropriate provision for back-up materials, equipment, spare parts and tools to ensure the WORK is not disrupted due to equipment failures or other problems associated with CONTRACTOR's equipment or service.
- 6.2 Back-up equipment shall include, but not be limited to, permanently installed equipment, service tools, spares, and re-dress kits.

7.0 TECHNICAL INTEGRITY

- 7.1 COMPANY's technical integrity assurance requirements for the WORK inclusive of quality assurance, quality control, and design verification requirements are given in Section 3, Appendix 7 – Technical Integrity. Quality control plans (QCPs) and / or Inspection and Test Plans (ITPs) shall include, but not be limited to:

- 7.1.1 Manufacturing;
- 7.1.2 Service support facilities (shop or base) to include:
 - (a) Rental equipment.
 - (b) The inspection, preparation, assembly, test (function / pressure) and packaging for shipment of completion assemblies, service tools, and rental equipment.
 - (c) Pre-job inspection and performance testing of powered and non-powered equipment (e.g., pumps).
- 7.1.3 On-site installation and service quality plans and procedures.
- 7.1.4 Post-job and end of well report.

8.0 FACILITIES, LOGISTICS, LABORATORY, AND TESTING

- 8.1 Onshore Base, Materials, and Logistics
- 8.1.1 CONTRACTOR shall maintain an onshore warehousing and service support facility. The services to be provided by CONTRACTOR shall include, but not be limited to, the preservation, storage, handling, preparation, and restocking of equipment and consumables.
 - 8.1.2 CONTRACTOR shall be responsible for ensuring that competent CONTRACTOR supervision as well as technically competent and experienced personnel are present:
 - (a) When shipping or taking receipt of COMPANY materials and equipment at CONTRACTOR premises.
 - (b) For the inspection, assembly / disassembly of equipment, make-up of assemblies, functional testing, etc.
 - (c) For the development of shop quality control plans and / or inspection and test plans.
 - (d) For the development of WORKSITE quality control plans for equipment, services, and rental equipment.
 - (e) For the inventory management, preservation, handling, and storage of critical equipment and consumables.

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- 8.1.3 CONTRACTOR shall provide to COMPANY prior to shipment, manifests quoting volumes, weights, descriptions, and serial / identification numbers on all equipment and material delivered to COMPANY's nominated supply base or heliport.
- 8.1.4 CONTRACTOR shall continuously examine all steps of the supply chain to identify methods to reduce costs relating to logistics, transportation, handling, storage, inspection, and repair.
- 8.1.5 CONTRACTOR shall be responsible for the disposal cost of all drums, bags, and any other waste types generated by CONTRACTOR activities required in performance of the WORK whether inside or outside CONTRACTOR's facilities. COMPANY shall return all CONTRACTOR's drums, bags, and other waste types generated at the WORKSITE to CONTRACTOR for disposal.
- 8.1.6 CONTRACTOR shall ensure that all equipment and material deliveries identify the CONTRACT, Purchase Order, or Call-Off reference numbers as applicable on 100% of packing lists and on material and equipment where practical.
- 8.1.7 CONTRACTOR shall provide Materials Safety Data Sheet (MSDS) for all applicable materials offered for shipment to the WORKSITE. Laminated copies shall be provided for use at WORKSITE. CONTRACTOR shall ensure that a hard copy of the MSDS accompanies shipments to WORKSITE. CONTRACTOR shall ensure the MSDS is provided to COMPANY.
- 8.1.8 CONTRACTOR shall be responsible for obtaining necessary regulatory approval for fluids, chemicals, and materials used at the WORKSITE.
- 8.1.9 MSDS must be retained by CONTRACTOR at WORKSITE.
- 8.2 Make-up and Testing
 - 8.2.1 Equipment shall be made-up in accordance with CONTRACTOR's procedures and quality plans (see Appendix 7 – Technical Integrity). CONTRACTOR shall provide procedures and quality plans for review and acceptance by COMPANY.
 - 8.2.2 Upon completion of all testing, equipment shall be clearly identified (stenciled) with a designation of "Primary" or "Back-up" as necessary or use of an alternative tagging system such as "green tag".
- 8.3 Laboratory Testing and Reporting
 - 8.3.1 CONTRACTOR shall have an onshore facility to perform laboratory tests in accordance with the latest API / ISO Specifications (as referenced in Section 3, Appendix 6 – Functional and Technical Specifications) or CONTRACTOR standard operating procedures or COMPANY specific procedures.
 - 8.3.2 CONTRACTOR shall provide an offshore WORKSITE lab to perform laboratory tests in accordance with the latest API / ISO Specifications (as referenced in Section 3, Appendix 6 – Functional and Technical Specifications) or CONTRACTOR standard operating procedures or COMPANY specific procedures.

9.0 STORAGE

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- 9.1 Where CONTRACTOR is responsible for storing COMPANY's goods and materials, these goods and materials shall be adequately protected against corrosion, degradation, handling, transportation, or storage damage through the use of suitable protection and measures.
- 9.2 Upon acceptance by COMPANY, where acceptance is agreed upon when the COMPANY signs the CONTRACTOR's service ticket for invoicing purchased items, COMPANY acknowledges the passage of title and assumes the risk of loss on all purchased items from CONTRACTOR to COMPANY regardless if the goods remain at CONTRACTOR's facilities subject to the next paragraph below. Payment for purchased items is not contingent to any future services which, if provided, will be subject of a separate agreement.

COMPANY acknowledges that CONTRACTOR will hold the requested, purchased items as a bailee for COMPANY and that CONTRACTOR shall exercise custodial care and control in accordance with good industry practice. CONTRACTOR assumes no liability with respect to purchased items unless damage or loss is due to negligence of CONTRACTOR, willful misconduct of CONTRACTOR, or failure of CONTRACTOR to adhere to industry standard storage and preservation practices. CONTRACTOR assumes no liability to insure COMPANY owned equipment. CONTRACTOR liability shall be limited to replacement of COMPANY's equipment, repair of COMPANY's equipment, or reimbursement of the replacement cost of the equipment, whichever COMPANY elects.

At the time of title transfer, CONTRACTOR shall provide to COMPANY a recommended storage procedure, a recommended maintenance plan and schedule, and an estimated cost for storage and maintenance (Storage and Maintenance Plan) for the goods stored at CONTRACTOR's facilities and / or at COMPANY's PMF facility in Houma, Louisiana, all subject to COMPANY's approval.

If the CONTRACTOR is requested to store and / or maintain COMPANY's goods, CONTRACTOR shall provide COMPANY with documented evidence that the Storage and Maintenance Plan recommended by CONTRACTOR and approved by COMPANY has been performed.

COMPANY will have sixty (60) days, from the time the Storage and Maintenance Plan is submitted by CONTRACTOR to review and make recommendations and / or comments. Until such time as COMPANY makes a decision as to where the material will be stored and who will maintain it, CONTRACTOR shall store and maintain this material at no cost to COMPANY.

- 9.3 CONTRACTOR shall be responsible for the timely written notification to COMPANY of any damage to COMPANY owned equipment and materials. The notification will include a descriptive listing of the equipment and materials and the estimated value of the equipment in an undamaged state. The notification will also include a copy of CONTRACTOR's non-conformance report inclusive of root cause analysis and corrective actions.
- 9.4 CONTRACTOR shall be responsible for effective management and storage of materials (fluids, materials, chemicals, consumables, spare parts, re-dress kits, elastomers, etc.) and ensure that aforementioned materials that have exceeded their shelf life or expiration date and / or have been subject to a recall notice or engineering change order that such material is not used by COMPANY.

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10.0 INVENTORY

10.1 CONTRACTOR shall provide to COMPANY a monthly inventory update (electronic spreadsheet or equivalent) identifying the following:

10.1.1 CONTRACTOR owned equipment.

10.1.2 COMPANY owned equipment inclusive of Purchase Order value.

A monthly inventory update shall also be created and be able to record the quantity and name of the materials that are reserved / allocated (i.e., items required for a completion would be recorded and reserved).

10.2 COMPANY owned equipment returned from WORKSITE shall be properly cleaned, protected from corrosion, protected from storage / handling damage, and stored by CONTRACTOR in accordance with CONTRACTOR procedures.

11.0 PREVENTIVE MAINTENANCE (PM) / SERVICE SPECIFIC QUALITY PLAN

11.1 CONTRACTOR shall have a documented preventive maintenance plan for all equipment (both powered equipment and non-powered equipment).

11.2 COMPANY or designated COMPANY Representative shall review CONTRACTOR's PM plan and schedule. The review shall verify compliance to contractual requirements.

11.3 The Preventive Maintenance Program shall include, but not be limited to:

11.3.1 Regularly scheduled inspection and maintenance procedures.

11.3.2 Pre-Job equipment check.

11.3.3 Post-Job equipment check.

11.3.4 Regular hydrostatic pressure test of field iron (any fluid conveying conduit including rubber hoses).

11.3.5 Procedure for recording and tracking equipment problems.

11.3.6 Method of positive identification of equipment not meeting CONTRACTOR performance standards.

12.0 PRE-JOB MODEL

12.1 Prior to initiating WORK, CONTRACTOR shall generate a Job Model which includes but is not limited to:

12.1.1 Detailed running and installation procedures, including but not limited to, drawings, calculations, rig-up diagrams, equipment layouts, technical manuals, and specification sheets, etc. Procedures will reference CONTRACTOR Standard Operating Procedures (SOP). CONTRACTOR shall produce SOP for the installation

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and service of completion equipment and services. SOPs will be approved by CONTRACTOR's Technical Authority.

- 12.1.2 Torque and drag profiles.
- 12.1.3 Tubing stress analysis and movement calculations.
- 12.1.4 Treating and pumping design and plans.
- 12.1.5 Procedure for recording and tracking equipment problems.
- 12.1.6 Operating parameters for all equipment.

13.0 JOB EVALUATION AND JOB PERFORMANCE

13.1 Job Evaluation

- 13.1.1 A report on job execution shall be completed by CONTRACTOR within two (2) working days using COMPANY preferred reporting system and CONTRACTOR preferred execution report (format to be agreed with COMPANY). In addition, for each job, a Service Quality Assessment shall be provided. The contents of this assessment shall be agreed to by COMPANY.
- 13.1.2 At the end of each job, CONTRACTOR shall provide COMPANY with an end of well report. This report is to be presented within thirty (30) days of the completion of the WORK.
- 13.1.3 For each job executed, CONTRACTOR shall complete COMPANY's Drilling and Completions SPM Score Card. The completed card shall be submitted to COMPANY's representative within thirty (30) days of the completion of WORK.
- 13.1.4 Any incident investigation requested by COMPANY shall require a fully agreed terms of reference (TOR) prior to the commencement of the investigation.
- 13.1.5 All completion NPT incidents in DIMS shall be investigated by CONTRACTOR and written recommendations made to COMPANY to prevent recurrence.

13.2 Job Performance

- 13.2.1 The intent of the CONTRACT is for CONTRACTOR to deliver upper quartile performance and continuous improvement throughout the CONTRACT term.
- 13.2.2 On a quarterly basis CONTRACTOR shall present QPR data detailing overall performance using Drilling and Completions SPM metrics.
- 13.2.3 CONTRACTOR and COMPANY shall agree on annual performance assessment. Key performance criteria are listed in Attachment D – Global Completion Score Card.

14.0 STIMULATION VESSEL

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- 14.1 CONTRACTOR shall provide a suitable vessel to carry out the stimulation services in connection with the WORK (hereinafter referred to as the "Vessel"). Responsibility for and the expense of management, maintenance and operation of the Vessel shall remain at all times with CONTRACTOR. CONTRACTOR shall carry out its services with the utmost dispatch during the day and night as required by COMPANY and shall render all customary assistance to COMPANY in the conduct of its operations with the Vessel's crew and equipment. The Master of the Vessel shall be in full and complete control thereof. CONTRACTOR and not COMPANY shall employ all members of the crew of the Vessel. Subject to foregoing and CONTRACTOR's decision that an operation is likely to cause loss or damage to property, or loss of life or injury, all work requested by COMPANY shall be undertaken and accomplished with reasonable dispatch.
- 14.2 CONTRACTOR shall man the Vessel with Master, Officers, and crew as required for the Vessel to perform its normal services. In addition to the Vessel's Master, Officers, and crew, CONTRACTOR shall provide all necessary personnel, pumps and ancillary plant and equipment required to carry out the WORK.
- 14.3 Vessel shall be maintained, crewed, and operated in accordance with the applicable legislation in the country of its operation. In addition to these legislative requirements, the Vessel shall be operated in accordance with best industry practice and procedures.
- 14.4 CONTRACTOR shall ensure that the Vessel has all necessary safety and seaworthiness certificates permitting it to be employed on the WORK. CONTRACTOR shall ensure that no modifications of any kind to the Vessel have been or are made which could invalidate the said documents and certificates. CONTRACTOR shall, upon the execution of the CONTRACT, provide COMPANY with such copies of the said safety and seaworthiness certificates, as COMPANY shall request. CONTRACTOR shall also permit COMPANY to examine the originals of any such certificate.
- 14.5 CONTRACTOR shall carry out on its own initiative and at its own cost all inspection, maintenance and repair of the Vessel necessary to maintain the same safe, fully certified and operational status at all times. COMPANY shall be entitled to audit and reject any Vessel, which does not conform to the CONTRACT. CONTRACTOR shall immediately rectify the defect or deficiency, at no additional cost to COMPANY.
- 14.6 CONTRACTOR shall assume full responsibility for the safety of the Vessel and marine operations performed in connection with the WORK. In particular, CONTRACTOR shall ensure that the Vessel employed or chartered by CONTRACTOR shall at all times be in safe working condition, suitable for WORK and free from any legal, contractual or other restriction preventing it from operating in those areas and conditions required by the terms of the CONTRACT.
- 14.7 CONTRACTOR shall inform COMPANY of the anticipated Vessel workload, location and alternative commitments at a minimum of two-week intervals, commencing upon a date to be agreed between COMPANY and CONTRACTOR.
- 14.8 CONTRACTOR's dynamically-positioned Vessels shall comply with COMPANY's dynamic positioning requirements, a copy of which will be provided by COMPANY upon request by

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CONTRACTOR. COMPANY number for this document is "MAR – 57 – MA – PR – 0006, Revision 0" and dated 13 December 2007

15.0 MANAGEMENT OF SERVICE

15.1 Technical Support

- 15.1.1 CONTRACTOR shall provide to COMPANY well-qualified personnel, best technology, processes, and equipment on a global basis.
- 15.1.2 CONTRACTOR shall have a system in place for prioritizing technical service work, internal costing of that work and resource allocation. When a piece of work is required by COMPANY, the scope shall be agreed between COMPANY and CONTRACTOR in writing.

15.2 Management Systems

- 15.2.1 CONTRACTOR shall have in place and demonstrate compliance with all of the systems specified as follows: HSSE Management System; Preventive Maintenance Systems; Personnel Development and Deployment System for COMPANY; and Quality Assurance and Quality Control plan for tools, bulks, equipment, and laboratory.
- 15.2.2 CONTRACTOR shall as required by COMPANY, perform a capability audit of the services provided to ensure strict adherence to the CONTRACT specifications, CONTRACTOR's policies and operating procedures performed in a manner so as to provide a professional and cost effective service.
- 15.2.3 Prior to the introduction of a new chemical or hazardous material to the WORKSITE, MSDS shall be reviewed by CONTRACTOR who shall ensure that the potential human health risk is assessed and provided to COMPANY. The chemical or material shall not be used or shipped to the WORKSITE until this process is completed satisfactorily.

15.3 Third Party Services

- 15.3.1 CONTRACTOR may be required to subcontract and manage non-core services. This requirement shall be at COMPANY's discretion, and COMPANY assesses that CONTRACTOR is able to effectively manage such services in COMPANY's best interests. In such case CONTRACTOR shall demonstrate to COMPANY's satisfaction that CONTRACTOR
 - (a) Employed competent people by the SUBCONTRACTOR,
 - (b) Has HSSE management plans in place,
 - (c) Has managed the training of its personnel in, and
 - (d) Has demonstrated good audit practices and control of the service.
- 15.3.2 COMPANY shall produce a scope of work for any service which it wishes CONTRACTOR to perform or to subcontract.

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15.3.3 Detailed scopes of work for the provision of Third Party services referred to above shall be mutually agreed between COMPANY and CONTRACTOR.

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Attachment A – Competency Assessment Model
Engineering and Technical Support

Experience

Name: DESC Engineer			Self Assessed Skill Level		Go to Summary	
1. Experience			0 is has no experience in this area. 1 is basic only in the assessed area 2 is competent in the assessed area 3 is highly competent in the assessed area.			
Area	Skill Definition	Desired Skill (0 - 3)	Skill (0 - 3)	Supporting Information	Forward Action	Agreed Skill Level
	8 years oilfield experience with 4 years in a completions/ sand control environment.	3				
	Has been involved in a minimum of 15 completion operations for wells of each type (horizontal OHGP, Allpack, CHGP, FDP)	3				
	Has been involved in the execution of > 15 TCP jobs, and at least five orientated TCP jobs.	3				
	Has been the lead engineer/ Field Service Coordinator for at least 10 sand control jobs.	3				
	Fully understands company SOP's for each sand control technique and has written >15 completion programs requiring sand control and 5 completion programs requiring TCP.	3				
	Capable of using company software to: 1, Perform T&D analysis 2, Conduct tool movement and tubing stress analysis 3, Predict fluid rheology versus temperature, and frictional pressure loss during pumping operations 4, Design sand control operational schedule 5, Produce all engineering calculations & procedures related to pressure testing operations, maintaining final screen out pressure below minimum rated collapse pressure etc. 6, Calculate charge pressure for FIV and cycle pressure required to open same.	3				
	Totally familiar with the procedures, operation and limitations of contractor's service tools and packers and capable of troubleshooting & servicing same. Must have taken part in: 1. Failure investigation of critical equipment items. 2, Input to operating procedures for same. Documented evidence required.	3				
	Totally familiar with the design of SSSV and fluid loss control devices. Capable of producing all engineering calculations & procedures related to maximum setting depth, pressure required to open SSSV.	3				
	Familiar with formation damage laboratory testing procedures. Capable of producing a formation damage work program.	3				
	Must have previous experience of pumping with linear and cross-linked gels, thime and Oil-pac fluid systems.	3				
	Has been involved in execution of loss circulation pills and understands risks to sandface completion. Familiar with screen plugging tests to mitigate against same.	3				
	Must have experience of Quality Plans/ QA/QC processes and input to same for FIV, packers, screens etc. documented evidence of experience required.	3				
	Must be rated within the top quartile of the completion engineers. Evidence is required.	3				
	Familiar with bp IT procedures for ordering, receiving, shipping and documenting. Ideally will have worked within bp. Experience with DMS and GWSI.	3				
Total		42	9	0%	0%	0

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Interpersonal

DESC Engineer		Self Assessed Skill Level		Go to Summary	
		0 is has no experience in this area 1 is basic only in the assessed area 2 is competent in the assessed area 3 is highly competent in the assessed area.			
Skill Definition	Desired Skill (0 - 3)	Skill (0 - 3)	Supporting Information	Forward Action	Agreed Skill Level
Must clearly demonstrate the ability to communicate easily at all levels with BPTT engineers, service company field personnel, workshop technicians and technical / R&D facilities.	3				
Must be effective & motivated team player intent on striving for continued performance improvement.	3				
Must be fluent in English.	3				
Total		9	0	0%	0

HSSE

DESC Engineer		Self Assessed Skill Level		Go to Summary	
		0 is has no experience in this area 1 is basic only in the assessed area 2 is competent in the assessed area 3 is highly competent in the assessed area.			
Skill Definition	Desired Skill (0 - 3)	Skill (0 - 3)	Supporting Information	Forward Action	Agreed Skill Level
Must have complete awareness of occupational hygiene issues. Understands the implications of MSDS sheets & recommends procedures & PPE.	3				
Must be familiar with relevant regulations & controls, GHSER & offshore Trinidad.	3				
Has been trained in GHSER, ASA, JSA. Provide evidence.	3				
STOP trained. If so, date of last STOP course required. Must be capable of performing ASA on contractor's equipment at the rig site.	3				
Total		12	0	0%	0%

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Technical

Section 3 – Scope of Work
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Name: DESC Engineer			Self Assessed Skill Level		Go to Summary	
4. Technical			U is has no experience in this area. 1 is basic only in the assessed area 2 is competent in the assessed area 3 is highly competent in the assessed area.			
Area	Skill Definition	Desired Skill (# - 3)	Skill (# - 3)	Supporting Information	Forward Action	Agreed Skill Level
	Must have successfully completed all contractor training courses commensurate with grade level & experience. Formal training as a sand control engineer is a must. Evidence is required.	3				
	Must have good understanding of well construction process. Evidence of how experience gained is required.	3				
	Must have good working knowledge of drilling fluids & influence on formation damage.	3				
	Familiar with slurry design & understands function & limitations of carrier additives & influence of downhole conditions on slurry behavior.	3				
	Capable of using company software to: 1. Perform T&D analysis. 2. Conduct tool movement and tubing stress analysis. 3. Predict fluid rheology versus temperature, and frictional pressure loss during pumping operations. 4. Design sand control operational schedule. 5. Produce all engineering calculations & procedures related to pressure testing operations, maintaining final screen out pressure below minimum rated collapse procedure etc. 6. Calculate charge pressure for FIV and cycle pressure required to open same.	3				
	Capable of making all engineering calculations related to surface & downhole pressure testing operations & safely conducting testing.	3				
	Must be capable of performing space out calculations for washpipe - GP tool, and prevention of connections across BOPs	3				
	Must be capable of interpreting temperature/ pressure data from GP/ FP jobs and capable of producing timely and of well reports	3				
	Must have a full working knowledge of pumping system, blenders and mixing systems (additives/ gravel)	3				
	Must understand criticality of fluid QA/QC testing and have a working knowledge of onsite testing requirements.	3				
	Has been trained in Well Control. Attended formal training.	3				
Total		33	0	0%		0

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Attachment B – State of Stress Table

STATE OF STRESS TABLE				
Assembly Number: <u>A123-45-6789</u>				
PART NO.	DESCRIPTION	CRITICAL (Y/N)	FAILURE MODE	FACTOR OF SAFETY / RATING
P000-01-0001	ScSSV Bottom Sub	Y	200,000 lbs Tensile	2.5
			15,000 psi int. Press	1.8
			Torsion	20,000 ft-lbs
P000-01-0002	1/4" set screw	N		

Verification Test Number: _____ Date of Test: _____

Maximum Tension Applied: _____ Maximum Internal Pressure Applied: _____

Actual Material Yield Tested: _____ Minimum Material Yield Specified: _____

Design Criteria: _____

Attachment C – Equipment Performance Validation Table

EQUIPMENT PERFORMANCE VALIDATION TABLE			
ASSEMBLY	PERFORMANCE VALIDATION METHOD*		
	TESTING	HISTORICAL USE	ANALYTICAL**
7" TRSV f/12,000 psi WP inside project specified casing	Y/N	Y/N	Y/N

* Provide summary of validation obtained for 'Yes' responses or a plan and schedule to obtain validation for 'No' responses through testing or analytical methods.

** Include States of Stress Table.

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Attachment D – Global Completions Score Card



Drilling and Completions

* Dependent Compulsory

Global D&C SCORECARD: New Global Completions Scorecard
Region
Business Unit
Country
Service Company
Field
* Well Name
* End Date of Operation
Unique Well Number
* Start Date of Operation

- * Days Away From Work Injuries
- * Recordable Injuries and Illnesses
- * First Aid Cases
- * Number of accidental, uncontained oil spills or discharge
- * Total Manhours

* Calculation of Number of HSE Proactive Inputs (Leading Indicators)

Recorded Safety Observations e.g. STOP Cards Safety Observations and Conversations (SOC's) / Safety Tours	Number Completed
--	------------------

- * Number of HSE related management rig visits
- * Number of dropped objects incidents

* Actual Cost of all relevant Products & Services

Unit Dollar
Starting
Completion Date

* Overall Rig Cost / Day

Unit Dollars
Starting
Completion Date

- * Service Company accountable Total Non-Productive Time: NPT, (days)
- * Total NPT Incidents accountable to (Packer/ Valve (PV, BVM, BV, PS-I, etc))
- * Total NPT Incidents accountable to (Accessories)
- * Total NPT Incidents accountable to (Production Packer Assembly)
- * Total NPT Incidents accountable to (Sand Control Pumping)
- * Total NPT Incidents accountable to (Sand Control Tools (Screen and Retainer))
- * Total NPT Incidents accountable to (Performance: Wells and Down Hole Flow Control)
- * Total NPT Incidents accountable to (Tubing Corrosion Prevention)
- * Total NPT Incidents accountable to (Producer & Annular seal/face safety systems)
- * Total NPT Incidents accountable to (Other services: supplies, GLWs, etc)

* Operational Efficiency Table

	If unsuccessful, what success was the related Service?	Explanation of inefficiency and improvement opportunity
Was the completion performed without Service Company accountable NPT	<div style="border: 1px solid black; padding: 5px;"> Packer/ Valve (PV, BVM, BV, PS-I, etc) Accessories Production Packer Assembly Sand Control Pumping Sand Control Tools (Screen and Retainer) Tubing Corrosion Prevention Producers Safety Systems (Flowing and Retainer) Performance: Wells and Down Hole Flow Control Tubing Corrosion Prevention </div>	

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EXPANDABLE SCREENS		PRODUCTION PACKER ASSEMBLY		SAND CONTROL PUMPING		SAND CONTROL TOOLS (SCREENS AND REMEDIAL EQUIPMENT)		SURVEILLANCE, WELLS AND DOWN HOLE FLOW CONTROL	
Was the completion performed without any known or likely well productivity impairment attributable to the service company	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was all equipment, including backup, in country and available at the shore base by the agreed upon date	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was all equipment provided in accordance with existing contract pricing so that no items were "outside of the contract" with price on request or special pricing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the completion performed without any unplanned logistical or operational incident (e.g. invisible NPT, offline NPT, operational near miss, etc) NOTE: Add row below to record for more than one service	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Barrier Valve (FIV, AFIV, SV, FS-1, etc) Objectives (Barrier Valve (FIV, AFIV, SV, FS-1, etc))		Successful?
Was the valve fully functional and in correct position (during and upon installation) as intended, at all times	Yes	Yes
Was the valve fully open or fully closed as intended at all times (without any milling required)	Yes	Yes

* Production Packer Assembly Objectives (Production Packer Assembly)		Successful?
All packers(s) fully set at the correct depth, on first attempt	Yes	Yes
There were no issues with the setting process (i.e. ball seat blow prematurely, etc.)	Yes	Yes

* Sand Control Pumping Objectives (Sand Control Pumping)		Successful?
Was a complete gravel pack achieved - usually accepted to be >50% packed (This criteria should be agreed prior to the job)	Yes	Yes
Did the pumping equipment perform without failure for the duration of the job (example: a pump failed, but a backup was brought online and rate was maintained)?	Yes	Yes
Were the critical pumping parameters (pressure, rate and density) properly displayed and recorded without failure or incident during the job	Yes	Yes
Were the proppant concentrations, fluid rheology and additives all pumped according to design?	Yes	Yes

* Sand Control Tools (Screen and Remedial Equipment, Not expandables) Objectives (Sand Control Tools (Screens and Remedial Equipment))		Successful?
Did the crossover tool pull free without sticking or significant over pull following the pumping treatment?	Yes	Yes
Was the excess slurry reversed out of the hole without difficulty immediately after the gravel pack?	Yes	Yes
Was the service company able to accurately model the hook loads and hydraulics during this job?	Yes	Yes
No backup setting mechanism was required in order to set the packer, and the crossover tool did not release prematurely?	Yes	Yes

* Surveillance, Wells and Down Hole Flow Control Objectives (Surveillance, Wells and Down Hole Flow Control)		Successful?
Was the cable was run without a splice?	Yes	Yes
Was the down hole gauge data provided at the point in time specified by the well design (i.e. no delay)?	Yes	Yes

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* Tubing Conveyed Perforating Objectives (Tubing Conveyed Perforating)

Successful?
NO
Yes
No
Yes

All shots fired with primary detonation method and without incident

Did the guns and tools perform without mechanical gun failure or other service company related incident that could cause sticking, or significant additional drag while tripping out or hole (e.g. almost stuck)

* Tubular and Annular subsurface safety systems objectives (Tubular & Annular subsurface safety systems)

Successful?
NO
Yes

Was the tubular and annular subsurface safety systems installed correctly, and fully functional the first time without incident

* Expandable objectives (Expandable)

Successful?
No
Yes

Was the expandable fully expanded for the entire length

* Other (slaves, nipples, GLMs, etc) Objectives (Other (slaves, nipples, GLMs, etc))

Successful?
NO
Yes
No
Yes
No
Yes

Did all items perform as intended?

Were all items available at the shorebase and rig on time?

Were all items torqued and tested as required by the well plan?

Well Specific Objectives Objective Defined Objectives Successfully Delivered? Explanation for non-delivery of Objective

1	No
2	No
3	No
	Yes



Summarize Benefits and Savings Summarize Benefit/Rig Time savings (hours) Productivity increase (MBOE/D) Reserve increase (MMBOE)

- 1
- 2
- 3

Appendix 6 – Functional and Technical Specifications

A. Cementing Services

1.0 RELEVANT CEMENTING SPECIFICATIONS APPLICABLE TO THIS CONTRACT

All relevant API / ISO specifications shall apply to the Scope of Work unless agreed otherwise by COMPANY. (The current lists of relevant specifications are listed in Attachment C entitled: "API/ISO SPECIFICATIONS")

API Specification Number	Title	Synopsis
API RP 65	Cementing Shallow Water Flow Zones in Deep water wells	Covers design processes for cementing where the risk of shallow water flows are high. Includes test procedures and checklist for design of cement slurries to prevent shallow water flow.
API 10TR1	Cement Sheath Evaluation	Provides the current principles and practices regarding the evaluation and repair of primary cementations. Cement bond logs, compensated logging tools and borehole compensated logging tools and ultrasonic logs.
API 10TR3	Temperatures for API Cement Operations Thickening Time tests – 1993 Report from the API Task Group on Cementing Temperature Schedules.	Work by the API task group on cementing temperatures. The task group reviewed a large industry database and recommend significant changes to determine well stimulation temperatures.
API 10B	Addendum 1 – Specification for Cements and Materials for well Cementing	Provides guidance for the testing of cement slurries and related materials under simulated well conditions.
API 41	Presenting Performance Data on Cementing and Hydraulic Fracturing Equipment	
API RP 10F	Recommended Practice for Performance Testing of Cementing Float Equipment.	Describes the testing and practices to evaluate the performance of cementing float equipment. The Specification only covers equipment used with WBM.
API Spec 10A	Specification for Cements and Materials for well Cementing.	Specifies requirements and gives recommendations for eight classes of well cement including their chemical and physical requirements and procedures for physical testing.
API G04400 – Obsolete	Worldwide Cementing Practices	Covers cements and well cementing. Intended as a practical text by both the beginning and practicing engineer.
API Spec 10D	Specification for Bow Spring Casing Centralizers	Provides minimum performance requirements test procedures and marking requirements for bow spring casing centralizers. Specification does not cover rigid centralizers.

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Appendix 6 – Functional and Technical Specifications

2.0 THE MINIMUM TESTING FOR CEMENTING OPERATIONS

2.1 All testing is required on rig samples and to be submitted to COMPANY Wells Team 24 hours prior to cementing operations commence, unless otherwise agreed with Wells Team.

2.2 General Requirements (all slurries all job types)

All slurries incorporating a Fluids Loss aid must have API fluid loss determined

Slurries placed for control of Shallow Flows (conductor or surface pipe) or where gas migration risk is high (predicted flow potential is high and/or static cement overbalance < 200psi against a permeable gas bearing formations) must have static gel strength transition time and zero gel time determined. In addition COMPANY settlement test must be run in these situations

2.3 Specific Requirements

Job Type	Slurry	Pump Time	Compressive Strength	Operating Free Water	API Fluid Loss	Rheology	COMPANY Settlement Test
Conductor	Neat	Note 1	No	No	No	No	No
	Extended	Yes	Yes	Yes	No	Yes	No
Surface	Lead	Yes	Note 2	Yes	No	No	No
	Tail	Yes	Yes	Yes	No	No	No
Intermediate	Lead	Yes	No	Yes	No	Yes	No
	Tail	Yes	Yes	Yes	No	Yes	No
Production Casing and Drilling liners	Lead and Tail	Yes	Yes	Yes	No	Yes	Note 3
Production Liner		Yes	Yes	Yes	Yes	Yes	Yes
Plugs		Yes	Yes	Yes	No	Yes	Note 3

Note 1: Extended testing regime applies if temperature > 40 degrees C or slurry not Class G/H + accelerator

Note 2: Where structural support or zonal isolation is required, and when a filler slurry is unnecessary, compressive strength must be determined.

Note 3: When the hole angle exceeds 70 degrees, a COMPANY settlement test is required.

2.4 Compatibility Testing

2.4.1 Water Based Mud and Oil Based Mud

For liner jobs and where cement is pumped directly in contact with the drilling fluid a contaminated thickening time test is required using a 95 / 5 cement to mud contaminant.

For every well API mud /spacer compatibility test should be performed on intervals isolating hydrocarbon bearing formations and permeable overpressured brine or

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Appendix 6 – Functional and Technical Specifications

water bearing formations for each section (mud spacer combinations only need to be tested once per well).

Where a cement evaluation log is to be run compressive strength should be determined for a 95/5 cement/spacer combination.

2.4.2 Oil Based Mud

Water wetting characteristics of the spacer to be confirmed on a metal coupon test with sample of field mud for once each well.

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Appendix 6 – Functional and Technical Specifications
B. Fluids Services

B. Fluids Services

NO FUNCTIONAL AND TECHNICAL SPECIFICATIONS ARE INCLUDED IN SECTION 3 – SCOPE OF WORK, APPENDIX 6 – FUNCTIONAL AND TECHNICAL SPECIFICATIONS

C. Well Placement

1.0 MWD

- 1.1 MWD, Tool Collar Mounted (≤ 1.5 bps) and MWD, Tool Probe Based (≤ 1.5 bps) shall be 3 1/4" - 11 1/4" Collar size (All hole sizes) and include the following in the standard offering:
 - 1.1.1 Lost Circulation Tolerant Pulsar / Modulator (to 50 ppbl for uniform, non-coarse, and homogeneously-mixed materials)
 - 1.1.2 Price includes all additional subs for telemetry, tool bus termination, and batteries etc.
 - 1.1.3 Max Operating Temperature up to 302°F BHST (150 deg C)
 - 1.1.4 Max Hydrostatic Pressure up to 25,000 psi
 - 1.1.5 Continuous wave positive or negative pulse.
 - 1.1.6 STANDARD - Transmitting at up to 1.5bps
 - 1.1.7 RT Communications to uphole and downhole tools
 - 1.1.8 Power provided for all LWD tools and configurations
 - 1.1.9 Downlink option active and inclusive
 - 1.1.10 Rotary Speed: Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.
 - 1.1.11 Flow range optional : 200-400, 300-600, 400-800, 900-1200 gpm
 - 1.1.12 Drilling Fluid Sand Content : 1% (maximum)
 - 1.1.13 LCM max size and concentration : 40lb/bbl medium grade.
 - 1.1.14 CO₂ and H₂S Contents : 10% and 10 ppm
 - 1.1.15 Drilling Dynamics survivability 30 minutes at design specification limit
 - 1.1.16 INCLINATION Measurement
 - 1.1.16.1 Range : 0°-180°
 - 1.1.16.2 Accuracy : $\pm 0.1^\circ$
 - 1.1.16.3 Resolution : 0.05°
 - 1.1.17 AZIMUTH Measurement
 - 1.1.17.1 Range : 0°-360°
 - 1.1.17.2 Accuracy : $\pm 1.0^\circ$
 - 1.1.17.3 Resolution : 1.0°

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Appendix 6 – Functional and Technical Specifications
C. Well Placement

- 1.1.18 MAGNETIC TFO Measurement
 - 1.1.18.1 Range :0°-360°
 - 1.1.18.2 Accuracy :± 1° (Update frequency 15 seconds or less)
 - 1.1.18.3 Resolution :1.0°
- 1.1.19 GRAVITY TFO Measurement
 - 1.1.19.1 Range :0°-360°
 - 1.1.19.2 Accuracy :± 3.0°
 - 1.1.19.3 Resolution :1.0°
- 1.1.20 TEMPERATURE Measurement
 - 1.1.20.1 Range :0-150°C (175°)
 - 1.1.20.2 Accuracy :+/- 0.5°C
 - 1.1.20.3 Resolution :0.1°C
- 1.1.21 FIELD STRENGTH :Magnetic Field Strength (Interference)
- 1.1.22 6 AXIS SURVEY :6 Axis measurements for accelerometers and magnetometers.
- 1.1.23 5 AXIS SURVEY (axial correction):5 Axis measurements for accelerometers and magnetometers.
- 1.1.24 Magnetic interference corrected survey
- 1.1.25 WASHOUT DETECTION: :Turbine RPM transmitted where available in MWD/LWD
- 1.1.26 When operating in "Recorded Mode", as a minimum there must be sufficient down hole power shall be provided for 100 hours of operation with all petro-physical sensors functioning. Sufficient downhole memory shall be available for 10000 feet of logged interval with all logging sensors sampling data at an average of two (2) samples per foot.
- 1.1.27 Modular or Collar mounted MWD inclusive of Control Electronics, Memory & Power Source, Processing and telemetry modules. Real time and memory (if available) update of Directional inclination, Azimuth, Toolface, Magnetic Highside, Gravity Highside, Flow On or off (Turbine RPM), Tool face orientation, Circulating Temperature, Static temperature, 1.5 bps telemetry, advanced or enhanced memory & data compression.
- 1.2 MWD Unit will meet the following specification, with listed ancillaries:
 - 1.2.1 An intrinsically safe MWD/LWD surface unit if situated within the hazardous zone
 - 1.2.2 Surface decoding equipment and software for differential, multiple standpipe sensor signal detection, filtering and signal strength boosting.
 - 1.2.3 Surface computing equipment
 - 1.2.4 Surface plotting equipment
 - 1.2.5 Offshore remote display screens
 - 1.2.6 Depth tracking sensors including heave compensation

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Appendix 6 – Functional and Technical Specifications
C. Well Placement

- 1.2.7 Hook load sensors
 - 1.2.8 RPM sensor
 - 1.2.9 Surface torque sensor
 - 1.2.10 Pump stroke flow sensor
 - 1.2.11 Signal pressure transducers
 - 1.2.12 Rig floor display
 - 1.2.13 Real time data transmission equipment and software.
 - 1.2.14 Rig floor Real Time down-hole vibration "Traffic Light" warning unit
 - 1.2.15 Cables
 - 1.2.16 Equipment baskets and containers / workshops
- 1.3 Should CONTRACTOR be requested to operate within an alternative unit or office, or the supplier have a rationalized offering for surface data acquisition and service support the following should be provided as a minimum:
- 1.3.1 Surface decoding equipment and software for differential, multiple standpipe sensor signal detection, filtering and signal strength boosting.
 - 1.3.2 Surface computing equipment
 - 1.3.3 Surface plotting equipment.
 - 1.3.4 Depth tracking sensors
 - 1.3.5 Hook load sensors
 - 1.3.6 Pressure transducers
 - 1.3.7 Cables
- 1.4 Optional extras that can be added to the standard MWD service include but will not be limited to:
- 1.4.1 TELEMETRY:
 - 1.4.1.1 Transmitting at greater than 1.5bps and up to 3 bps (inclusive)
 - 1.4.1.2 Transmitting at greater than 3bps and up to 6 bps (inclusive)
 - 1.4.1.3 Transmitting at greater than 6bps and up to 12 bps (inclusive)
 - 1.4.1.4 Transmitting at greater than 12bps

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1.4.2 MWD HPHT

1.4.2.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)

1.4.2.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi

1.4.2.3 Both HP and HT options at the same time

1.4.3 CONTINUOUS SURVEY - inc and azi in RT

1.4.4 Wired pipe cross over sub option available for GOM, Trinidad and Alaskan operations.

1.4.5 High Density Data / High Downhole Power Generation addition to the standard MWD pricing should extra power be required to run high tier LWD services

1.5 MWD, Tool Electromagnetic (≤12 bps) specifications will be AS MWD ABOVE WITH DIFFERENCES BELOW

1.5.1 4 3/4" - 6 3/4" collar

1.5.2 Up to and inclusive of 12 bps telemetry

1.5.3 125 deg C, 12,000 psi rated tools

1.5.4 Flow range : 0-400, 0-600 gpm

1.5.5 Data compression

1.5.6 MWD, Tool Electromagnetic, Retrievable (≤12 bps) shall be fully retrievable

2.0 DRILLING DYNAMICS

All Drilling Dynamics shall be available from all MWD and LWD tools and be inclusive of the following:

2.1 Drilling Dynamics in separate collar, in MWD or LWD tools for 3 1/8" - 11 1/4" Collar size (Any hole size)

2.2 Max Operating Temperature up to 302°F BHST (150 deg C)

2.3 Max Hydrostatic Pressure up to 25,000 psi

2.4 Rotary Speed: Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.

2.5 Flow range optional : 200-400, 300-600, 400-800, 900-1200 gpm

2.6 Drilling Fluid Sand Content : 1% (maximum)

2.7 LCM max size and concentration : 40lb/bbl medium grade.

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- 2.8 CO₂ and H₂S Contents :10% and 10 ppm
- 2.9 Drilling Dynamics survivability 30 minutes at design specification limit
- 2.10 Includes all batteries and disposal
- 2.11 For standard Drilling Dynamics services the following measurements will be taken and transmitted in RT
 - 2.11.1 Lateral Vibration
 - 2.11.2 Axial Vibration
 - 2.11.3 Torsional Vibration
 - 2.11.4 Peak Shock / Shock Risk / Shocks per second / RMS per second
 - 2.11.5 Drilling Dynamics in Memory when achievable
- 2.12 Stick-Slip in RT Stick-Slip (delta RPM) in RT
 - 2.12.1 Peak RPM in RT
 - 2.12.2 stick-slip in Memory when achievable
- 2.13 Downhole Weight and Torque will be transmitted in real-time and includes:
 - 2.13.1 Weight, torque and bending force in separate collar or in MWD 6 3/4" - 8" Collar size (Any hole size)
 - 2.13.2 Downhole Weight on Bit
 - 2.13.3 Downhole Torque in RT
 - 2.13.4 DWOB and DTORQ in Memory when achievable.
- 2.14 Borehole Annular Pressure in Real Time & Memory (APWD) can be in separate collar or in MWD, will be in 4 3/4" - 9 1/2" Collar size (Any hole size) and include:
 - 2.14.1 Range :1 - 25,000 psi (1,725 bar)
 - 2.14.2 Resolution :5 psi
 - 2.14.3 Accuracy: :+/- 12psi / 0.25% of full scale.
 - 2.14.4 Total Error: :<0.25 % F.S.
 - 2.14.5 Borehole Annular Pressure in Real Time & Memory
- 2.15 Options that COMPANY may procure during operation of the WORK include:
 - 2.15.1 Annular PWD (Pumps on + off for LOT) in Real Time & Memory (provides only a minimum pressure reading, a maximum pressure reading, and a mean pressure reading)

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- 2.15.2 Bending Force in Real Time & Memory
- 2.15.3 Azimuthal Bending in Real Time & Memory
- 2.15.4 High speed sample option (1000Hz) for Drilling Dynamics
- 2.15.5 Downhole tare feature in Real Time & Memory
- 2.15.6 DYNAMICS HPHT
 - 2.15.6.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)
 - 2.15.6.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi
 - 2.15.6.3 Both HP and HT options at the same time

3 GAMMA RAY

The following specifications are standard whilst running a Gamma Ray service:

- 3.1 Max Operating Temperature up to 302°F BHST (150 deg C)
- 3.2 Max Hydrostatic Pressure up to 25,000 psi
- 3.3 Rotary Speed : Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.
- 3.4 CO2 and H2S Contents :10% and 10 ppm
- 3.5 Drilling Dynamics survivability 30 minutes at design specification limit
- 3.6 GR in separate collar or in MWD 3 1/8" - 9 1/2" Collar size (Any hole size)
- 3.7 Pricing includes all batteries and disposal
- 3.8 Gamma Ray - Plateau/Total, non-azimuthal in Memory,
 - 3.8.1 Real-Time add-on
 - 3.8.2 Range: 0-250 API
 - 3.8.3 Accuracy: +/- 2.5 API at 100ft/hr
 - 3.8.4 Vertical resolution:6"
- 3.9 Gamma Ray - Spectral in Memory
 - 3.9.1 Real-Time add-on
 - 3.9.2 Range: 0-250 API

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- 3.9.3 Accuracy: +/- 2.5 API at 100ft/hr
- 3.9.4 Vertical resolution: 6"
- 3.9.5 Potassium, thorium, and uranium measurements (K, Th, and U).
- 3.10 Gamma Ray - Azimuthal in Real Time & Memory
 - 3.10.1 Range: 0-250 API
 - 3.10.2 Accuracy: +/- 2.5 API at 100ft/hr
 - 3.10.3 Vertical resolution: 6"
 - 3.10.4 Azimuthal (Up/Down)
 - 3.10.5 Azimuthal GR (all sectors transmitted) in Memory as standard
- 3.11 Gamma Ray, N. Bit (modular sub) in Real Time (incorporated into the MTR (excluding RSS))
 - 3.11.1 N. Bit (modular sub)
 - 3.11.2 Less than 5 ft from bit
- 3.12 Optional extras that are associated to MWd OR lwd Gamma Ray include:
 - 3.12.1 Azimuthal Measurements
 - 3.12.1.1 Azimuthal (4 sector)
 - 3.12.1.2 Azimuthal (8 sector)
 - 3.12.1.3 Azimuthal (16 sectors or greater)
 - 3.12.2 GR HPHT
 - 3.12.2.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)
 - 3.12.2.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi
 - 3.12.2.3 Both HP and HT options at the same time
 - 3.12.3 Total GR in Memory only option or as an add-on to a real-time service.

4 RESISTIVITY

The following technical specifications are required from any resistivity offering:

- 4.1 Resistivity in separate collar or in MWD 3 1/8" - 9" Collar size (Any hole size)
- 4.2 Max Operating Temperature up to 302°F BHST (150 deg C)

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- 4.3 Max Hydrostatic Pressure up to 25,000 psi
- 4.4 Rotary Speed: Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.
- 4.5 Flow range - no limits
- 4.6 CO2 and H2S Contents :10% and 10 ppm
- 4.7 Drilling Dynamics survivability 30 minutes at design specification limit
- 4.8 All Drilling Dynamics provided where available in standard data set
- 4.9 Includes all batteries and disposal

The following information dictates the required deliverables and specifications for each resistivity service tier:

4.10 Basic Resistivity Service in Memory

- 4.10.1 Compensated Correlation Resistivity Single Freq (either 500KHz, 1MHz or 2MHz) (as selected by COMPANY)
- 4.10.2 2 x phase shift and 2 x attenuation curves
- 4.10.3 Phase
 - 4.10.3.1 Depths of investigation: To be defined by COMPANY
 - 4.10.3.2 Range : 0-3000 ohm.m
 - 4.10.3.3 Accuracy : +/- 3%
 - 4.10.3.4 Vertical Resolution: 1ft
- 4.10.4 Attenuation
 - 4.10.4.1 Depths of investigation: To be defined by COMPANY
 - 4.10.4.2 Range : 0-500ohm.m
 - 4.10.4.3 Accuracy : +/- 4%
 - 4.10.4.4 Vert Resolution : 6ft
- 4.10.5 Real-time and memory data for time lapsed logging.
- 4.10.6 SOBM environment
- 4.10.7 In Real-Time add-on

4.11 Intermediate Resistivity Service in Memory

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- 4.11.1 Compensated Correlation Resistivity Single Freq - Any two (defined by COMPANY) of 500 KHz, 1 MHz or 2MHz Resistivity frequency. (as selected by COMPANY)
- 4.11.2 4 x phase shift and 4 x attenuation (8 curves)
- 4.11.3 Phase
 - 4.11.3.1 Depths of investigation: To be defined by COMPANY
 - 4.11.3.2 Range : 0-3000 ohm.m
 - 4.11.3.3 Accuracy : +/- 3%
 - 4.11.3.4 Vert Resolution : 1ft
- 4.11.4 Attenuation
 - 4.11.4.1 Depths of investigation: To be defined by COMPANY
 - 4.11.4.2 Range : 0-500ohm.m
 - 4.11.4.3 Accuracy : +/- 4%
 - 4.11.4.4 Vert Resolution : 6ft
- 4.11.5 Real-time and memory data for time lapsed logging.
- 4.11.6 SOBM environment
- 4.11.7 In Real-Time add-on

4.12 Advanced Resistivity Service in Memory

- 4.12.1 Compensated Correlation Resistivity Single Freq - Any two (defined by COMPANY) of 125 KHz, 250 KHz, 500 KHz, or 2MHz Resistivity frequency. (as selected by COMPANY)
- 4.12.2 All available phase shift and attenuation curves from the tool. (20 curves +)
- 4.12.3 Phase
 - 4.12.3.1 Depths of investigation: All Available
 - 4.12.3.2 Range : 0-3000 ohm.m
 - 4.12.3.3 Accuracy : +/- 3%
 - 4.12.3.4 Vert Resolution : 1ft
- 4.12.4 Attenuation
 - 4.12.4.1 Depths of investigation: All Available

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- 4.12.4.2 Range : 0-500ohm.m
- 4.12.4.3 Accuracy : +/- 4%
- 4.12.4.4 Vert Resolution : 6ft
- 4.12.5 Real-time and memory data for time lapsed logging.
- 4.12.6 SOBM environment
- 4.12.7 In Real-Time add-on
- 4.13 Multi-Depth, Dual frequency Resistivity Service in Memory
 - 4.13.1 Real-time and memory data for time lapsed logging.
 - 4.13.2 Multi Frequency
 - 4.13.3 5 7/8 - 14 1/2" hole size
 - 4.13.4 In Real-Time add-on
- 4.14 At-Bit / Near Bit Resistivity for Geo-Stopping in Real Time & Memory
 - 4.14.1 Bit - sensor or reading offset: <3ft
 - 4.14.2 Electrically-Conductive Drilling Fluids with resistivity ranging from 0.01 to 10 ohm-meters
 - 4.14.3 Vertical resolution: 12-24in
 - 4.14.4 Depth of Investigation: 12 in
 - 4.14.5 Range 0-20000 ohm-m
- 4.15 Ring Laterolog resistivity in Real Time & Memory
 - 4.15.1 Up and Down Resistivity Boundary Mapping (Azimuthal Deep Res) – SERVICE NOT PROVIDED BY HALLIBURTON
 - 4.15.2 Optional Extras – add-ons
 - 4.15.2.1 Azimuthal Measurements of Propagation resistivity Device
 - 4.15.2.2 Azimuthal (4 sector) Propagation
 - 4.15.2.3 Azimuthal (16 sector) Propagation
 - 4.15.2.4 Resistivity HPHT
 - 4.15.2.4.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)
 - 4.15.2.4.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi

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4.15.2.4.3 Both HP and HT options at the same time

4.16 Azimuthal Resistivity (4 sector) in Real Time & Memory

4.16.1 STANDARD Azimuthal (4 sector) Laterolog

4.16.2 Range 0.2 to 1,000 ohm-m

4.16.3 Accuracy below 2,000 ohm-m \pm 5%

4.16.4 Accuracy above 2,000 ohm-m \pm 20%

4.16.5 DOI: 1-7"

4.16.6 Vertical Res: 2-3"

4.16.7 Real-time and memory data for time lapsed logging.

4.16.8 WBM environment

4.16.9 Includes imaging sleeves – NOT PROVIDED BY HALLIBURTON

4.16.10 Azimuthal Measurements additional resolutions include:

4.16.10.1 Resistivity, Azimuthal (8 sector) Laterolog, Add-on in Real Time & Memory

4.16.10.2 Resistivity, Azimuthal (16 sector) Laterolog, Add-on in Real Time & Memory

4.16.10.3 Resistivity, Azimuthal (32 sector) Laterolog, Add-on in Real Time & Memory

4.16.10.4 Resistivity, Azimuthal (64 sector) Laterolog, Add-on Memory

4.16.10.5 Resistivity, Azimuthal (128 sector) Laterolog, Add-on Memory

4.17 Ultra Deep Resistivity in Real Time in Real Time & Memory

4.17.1 Up and Down Resistivity Boundary Mapping

4.17.2 Real-time and memory data for time lapsed logging.

4.17.3 Range 0.2 to 1,000 ohm-m

4.17.4 Accuracy below 2,000 ohm-m \pm 5%

4.17.5 Accuracy above 2,000 ohm-m \pm 20%

4.17.6 DOI: 1-15'

5 ACOUSTICS

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- 5.1 Standard operating specifications for acoustic services (Sonic tools or Ultra-Sonic Caliper tools) are detailed below:
- 5.1.1 Max Operating Temperature up to 302°F BHST (150 deg C)
 - 5.1.2 Max Hydrostatic Pressure up to 25,000 psi
 - 5.1.3 Rotary Speed : Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.
 - 5.1.4 Flow range optional -
 - 5.1.5 CO2 and H2S Contents :10% and 10 ppm
 - 5.1.6 Drilling Dynamics survivability 30 minutes at design specification limit
 - 5.1.7 All Drilling Dynamics provided where available in standard data set
 - 5.1.8 Includes all batteries and disposal
- 5.2 Acoustic Caliper (Average) in Memory
- 5.2.1 Ultra-sonic Caliper in separate collar or in Nuclear or Sonic Tool 6 3/4" - 8" Collar size (Any hole size)
 - 5.2.2 Real Time add-on
 - 5.2.3 Range: 0 -2" over-gauge - Standoff range
 - 5.2.4 Accuracy +/- 10% or +/- 0.1" (which ever is greater)
 - 5.2.5 MW up to 13ppg
 - 5.2.6 Azimuthal additional measurements include:
 - 5.2.6.1 Azimuthal Acoustic Caliper (Quadrant) in Real Time & Memory
 - 5.2.6.2 Azimuthal Acoustic Caliper (16 Sector) in Real Time & Memory:
- 5.3 Sonic in Real Time & Memory
- 5.3.1 4 3/4" - 9 1/2" Collar size (Any hole size)
 - 5.3.2 Compressional Slowness Delta-T (40 - 220µs/ft)
 - 5.3.3 Measure/transmit shear vel. slowness with range: 60 - 550s/ft
 - 5.3.4 Accuracy: ±2µ sec/ft Δt compressional
 - 5.3.5 Vertical Resolution: 2ft
 - 5.3.6 All memory included
 - 5.3.7 Correlation (Coherence) curve value in real time

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- 5.3.8 Multiple mode (STC) peaks streamed in real time
- 5.3.9 Full raw waveform recorded in Mem.
- 5.4 Optional extras include:
 - 5.4.1 Pore pressure trend plot from sonic (in memory only)
 - 5.4.2 Synthetic Sysmogram (service as specified requires compressional sonic log data as well as density log data over the same run intervals and are generated on a run by run basis)
 - 5.4.3 Slowness time curve processing
 - 5.4.4 Top of Cement detection
 - 5.4.5 Shear
 - 5.4.5.1 DiPole Shear + processing
 - 5.4.5.2 Quadrapole Shear + processing
 - 5.4.6 ACOUSTIC HPHT
 - 5.4.6.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)
 - 5.4.6.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi
 - 5.4.6.3 Both HP and HT options at the same time

6 NUCLEAR SERVICES

All nuclear services will be subject to the following specifications:

- 6.1 Max Operating Temperature up to 302°F BHST (150 deg C)
- 6.2 Max Hydrostatic Pressure up to 25,000 psi
- 6.3 Rotary Speed :Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.
- 6.4 Flow range optional
- 6.5 CO2 and H2S Contents :10% and 10 ppm
- 6.6 Drilling Dynamics survivability 30 minutes at design specification limit
- 6.7 Collar stabilized or slick
- 6.8 4 3/4" - 8 1/4" Collar size (Any hole size)

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- 6.9 All Drilling Dynamics provided where available in standard data set
- 6.10 When providing density image services (memory or real time image logs as standard deliverable and included in rates up to requirements specified in the Scope of Work)
- 6.11 Pricing includes all sample rate configurations
- 6.12 Includes all batteries and disposal
- 6.13 Compensated Formation Density in Memory
 - 6.13.1 Real-time add-on
 - 6.13.2 Density (1.6 - 3.1 g/cc) compensated
 - 6.13.3 Range: 1.6 - 3.1 g/cc
 - 6.13.4 Accuracy: +/-0.025 g/cc
 - 6.13.5 All acquisition rates included in rates
 - 6.13.6 Vert Resolution: 6"
 - 6.13.7 Azimuthal Measurements
 - 6.13.7.1 Azimuthal Density (Quadrant) compensated
 - 6.13.7.2 Azimuthal Density (16 sector) compensated
- 6.14 Photo-electric Factor (PEF) compensated in Memory
 - 6.14.1 Real-time add-on
 - 6.14.2 Pe factor operating range 1 - 20 B/e-
 - 6.14.3 Pe factor measurement accuracy 3 ± 0.25 B/e- (1 - 5 B/e-)
 - 6.14.4 Vert Resolution: 6"
 - 6.14.5 Sample rate: 5 seconds or less
 - 6.14.6 Azimuthal options to PEF include:
 - 6.14.6.1 Azimuthal PeF (Quadrant) compensated
 - 6.14.6.2 Azimuthal PEF (16 sector and image) compensated
 - 6.14.6.3 PEF Caliper (16 sector and image)
- 6.15 Fully Compensated Neutron Porosity in Memory
 - 6.15.1 Real-time add-on
 - 6.15.2 Porosity (0 - 100 pu) thermally compensated

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- 6.15.3 Range: 0 - 100 pu
- 6.15.4 Accuracy: 0.5 pu from 0-10 pu and 5% from 10-50 pu
- 6.15.5 Vert Resolution: 12"
- 6.15.6 All porosity sampling rates / configurations included in operating rates
- 6.16 Density Caliper Average in Memory
 - 6.16.1 Real-time add-on
 - 6.16.2 Image derived density
 - 6.16.3 Azimuthal Measurements
 - 6.16.3.1 Up/Down
 - 6.16.3.2 4 sector
 - 6.16.3.3 16 sector
- 6.17 Neutron-Gamma Density in Real time and memory
 - 6.17.1 Caliper corrected
 - 6.17.2 Capture Spectroscopy (Elements, minerals, matrix properties)
 - 6.17.3 Sigma
- 6.18 NUCLEAR ADDITIONAL ITEMS
 - 6.18.1 RT or Post-well dip
 - 6.18.2 Post-well structural zone, structural interpretation
 - 6.18.3 Wireline retrievability of nuclear source – THIS SERVICE IS NOT PROVIDED BY HALLIBURTON
 - 6.18.4 Orientating Sub
 - 6.18.5 Nuclear HPHT
 - 6.18.5.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)
 - 6.18.5.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi
 - 6.18.5.3 Both HP and HT options at the same time

7 SPECIALIST LWD

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- 7.1 All specialist LWD tools need to meet the following specifications:
- 7.2 Max Operating Temperature up to 302°F BHST (150 deg C)
- 7.3 Max Hydrostatic Pressure up to 20,000 psi
- 7.4 Rotary Speed : Rated to 250 RPM; however, due to excessive wear and tear any damage caused above 220 RPM will be for COMPANY account.
- 7.5 Flow range optional -
- 7.6 CO2 and H2S Contents :10% and 10 ppm
- 7.7 Drilling Dynamics survivability 30 minutes at design specification limit
- 7.8 Drilling Fluid Sand Content : 1% (maximum)
- 7.9 All Drilling Dynamics provided where available in standard data set
- 7.10 Tool cost includes all Basic Pressure test charges independent of number
- 7.11 Tool costs inclusive of preplanning job
- 7.12 Includes all batteries and disposal
- 7.13 Formation Pressure While Drilling in Real Time & Memory (FPWD)
 - 7.13.1 6 3/4" - 8 1/4" Collar size
 - 7.13.2 No orientation required in hole sizes up to 15" diameter.
 - 7.13.3 Pressure accuracy +/- 0.2% Full Scale
 - 7.13.4 Tests up to 150 in RT and Memory
 - 7.13.5 Drawdown pressure range 0-6000psi, variable.
 - 7.13.6 Drawdown volume up to 25cc variable
 - 7.13.7 Drawdown rate up to 10cc/s variable
 - 7.13.8 Mobility Range: 0.1 mD/cP - 10 D/cP (field experience)
 - 7.13.9 Mobility Accuracy: ±5%
 - 7.13.10 Available from 8 1/2" to 17 1/2" hole sizes
 - 7.13.11 10 minutes maximum disruption to drilling process per pressure test.
 - 7.13.12 Basic Test: Single Draw Down, Preset Volume & Rate
 - 7.13.13 Five (5) points transmitted in RT
 - 7.13.14 Real-time pressure data sent within 0.1psi resolution directly after test

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7.13.15 Quality assurance status transmitted as standard.

7.14 FPWD additional items

7.14.1 Optimized Test: Two (2) point variable Draw Down, Smart Mode

7.14.2 Annular pressure measurement before, during and after testing

7.14.3 Pumps-off measurements

7.14.4 FPWD HPHT

7.14.4.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)

7.14.4.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi

7.14.4.3 Both HP and HT options at the same time

7.15 Seismic Measurements While Drilling in Real Time & Memory (Downhole sensors for acquisition and first order processing)

7.15.1 6 3/4" - 9" Collar size

7.15.2 30 hrs of memory available (14,000 waveforms)

7.15.3 Real-time waveforms for QC and look ahead

7.15.4 Real-time check-shot data

7.15.5 Recorded waveforms for look-ahead vertical seismic profiles (VSPs)

7.15.6 Real-time placement of well trajectory on surface seismic map, following SMWD check shot.

7.15.7 Resolution: 2mS

7.15.8 Waveform sampling interval: 2mS

7.15.9 SMWD HPHT

7.15.9.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)

7.15.9.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi

7.15.9.3 Both HP and HT options at the same time

7.16 Nuclear Magnetic Resonance Imaging in Real Time & Memory

7.16.1 8-1/2 to 10-5/8 inch hole tool (14 inch sensitive volume)

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- 7.16.2 operate for up to 200 hours
- 7.16.3 Real-time identification of free- and bound-fluid volumes
- 7.16.4 Total porosity, free fluid, bound fluid, permeability, T2LM (RT)
- 7.16.5 Mineralogy-independent porosity measurement in RT
- 7.16.6 Identification of free-fluid type: gas, oil or water
- 7.16.7 Dual wait time acquisition for hydrocarbon identification (RM)
- 7.16.8 T1 or T2 acquisition modes (fully programmable)
- 7.16.9 Real Time T2 distribution
- 7.16.10 Shell diameter 14 in. [356 mm]
- 7.16.11 Static vertical resolution 6 in. [152 mm]
- 7.16.12 Vertical resolution 3.9 ft at 100 ft/hr [1.2 m at 30 m/hr] with vertical stacking to achieve
- 7.16.13 Porosity accuracy ± 1 pu or $\pm 5\%$, whichever is greater
- 7.16.14 Max number of echoes 2000
- 7.16.15 NMR HPHT
 - 7.16.15.1 Max Operating Temperature (High Temp Option) greater than 300°F BHST (150 deg C) to 347 Deg F (175 deg C)
 - 7.16.15.2 Max Hydrostatic Pressure (High Press Option) Greater than 25,000 psi up to 30,000 psi
 - 7.16.15.3 Both HP and HT options at the same time

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8 SURVEYING

Full listing of COMPANY approved IPMs listed within the "A Guide to BP Tool Error Models" revision 4, page 5, Appendix A. Find below a list of survey services and the minimum expectation of those services:

Directional MWD	Magnetic source reference model			Azimuthal processing	Multi-Station	Special Service / Tool	
	BGGM	IFR (CA)*	IFR (IIFR)**	Axial Correction		SAG	
MWD	√						
MWD+SCC	√			√			
MWD+CRUST		√				√	
MWD+CA+SC		√		√		√	
MWD+IFR ^{1 & 3}			√			√	
MWD+IFR+MS		√	√		√	√	
GYRO+MWD+SS ⁷	n/a	n/a	n/a	n/a			√
EMS	√						
EMS+SAG	√					√	
EMS+IFR ^{1 & 6}			√				
EMS+CRUST		√					
North Seeking Rate Gyro services							
	Instrument delivery & environment				Gyro Mode	Gyro Continuous	Special
	Drop / DP	W/L in DP	W/L in Csg	W/L in LID Csg	Gyro Compass		Floater
GYD-GC-MS ⁴			√		√		
GYD-CT-CMS ⁴			√			√	
GYD-CT-DMS ⁴		√				√	
GYD-LID-MS ^{2 & 4}				√		√	
GYD-BM-MS ⁵	√				√		
KPR-CSG-MS ⁴			√			√	
KPR-DP-MS ⁴		√				√	
KPR-LID-MS ⁴				√		√	
Other Gyro							
	Instrument delivery & environment				Gyro Mode	Optical/Surface Ref	Special
	Drop / DP	W/L in DP	W/L in Csg	W/L in LID Csg	Gyro Compass		Floater
NS Gyro single Shot ^{3 & 5}	√	√	√		√		√
KPR-SR-SS ⁵		√	√			√	
GYD-SS ⁵		√			√		
KPR-SS ⁵		√			√		

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Other Survey	Instrument Delivery					
	Drop / DP	W/L in DP	in drilling BHA			
Inc (Totco style)	√	√				
Inc (Teledrift style)			√			

- * Static crustal anomaly, to BGS standard with Down continuation
- ** Time dependant IFR (IIFR) to BGS standard w/ Downward Continuation
- 1 Time dependant IFR (IIFR) to BGS standard w/ Downward Continuation
- 2 18" ID or larger (Large Internal Dimension - LID)
- 3 North Seek gyro in floater environment
- 4 Survey Depth Reference is W/L
- 5 Survey Depth Reference is Drill Pipe
- 6 Some Locations may have location dependant version IPM
- 7 IPM reference is only for the GYRO surveys, not the included MWD in the same BHA.

8.1 The MWD system specifications for surveying are detailed in this Appendix 6, Clause 1. (This service does not include acquisition of aeromagnetic data or BGS transformation.)

8.2 The GMWD, Gyro Tool (≤ 1.5 bps) system must provide the following data:

- 8.2.1 Gravity Tool Face
- 8.2.2 Gyro Tool Face
- 8.2.3 Magnetic Tool Face
- 8.2.4 Hole Inclination, accuracy $\pm 0.1^\circ$
- 8.2.5 Hole Direction, accuracy $\pm 0.5^\circ$
- 8.2.6 Tool Face, accuracy $\pm 1.5^\circ$ (Update frequency 15 seconds or less)
- 8.2.7 The Gyro MWD system shall be a high speed North Seeking Continuous Gyro system.
- 8.2.8 Optically referenced Gyro tools are not acceptable.

8.3 NORTH SEEKING OR RATE GYROS Equipment Specifications (as contingency to MWD when experiencing magnetic interference from adjacent well bores) are outlined below:

- 8.3.1 CONTRACTOR shall supply a high accuracy North Seeking Gyro tool. The high accuracy gyroscopic tool shall be able to give continuous reading over the whole well-bore, consisting of complete in and out run data sets. At lower angles it may not be possible to operate in continuous mode with certain tools, the merits of this shall be considered by COMPANY in order to evaluate the use or limitations.
- 8.3.2 Tool memory shall be capable of storing a minimum of 500 Survey Stations.

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8.3.3 Tool shall be supplied complete with the following equipment as a minimum:

- 8.3.3.1 Sinker Bar Roller
- 8.3.3.2 Centrollers
- 8.3.3.3 Side entry sub
- 8.3.3.4 Shock absorbers
- 8.3.3.5 Running equipment including rope socket, spear point and retrieval overshot

8.3.4 Add-ons include:

- 8.3.4.1 Additional report charge per job (5 original + 3 IBM ANSCI II data discs) in addition to standard report requirements listed in the Scope of Work
- 8.3.4.2 Temperature sub
- 8.3.4.3 Gamma Ray sub
- 8.3.4.4 Casing Collar Locator (CCL)
- 8.3.4.5 Orienting sub
- 8.3.4.6 Elevated bushing
- 8.3.4.7 Template, Manifold, wellhead orienting sub and stinger
- 8.3.4.8 Circulating head and pack off, cable inserts and rubbers
- 8.3.4.9 Survey tool pup down sub (all applications)
- 8.3.4.10 Wireline Unit Daily Rental - Diesel/Electrical driven, skid mounted, non pressurized Zone II unit with electric single mono 5/16" conductor line (BP 200).
- 8.3.4.11 Heat shield

8.4 Inclination tools Capable of drop, wireline operations (Totco style)

- 8.4.1 Capable to be run in drilling BHA (Teledrift style)
- 8.4.2 Provided with all operational and/or consumable equipment to perform survey operations
- 8.4.3 Measurement intervals (Inclination) no greater than 0.5 degree increments

9 ROTARY STEERABLE SYSTEMS

Standard Specs include:

9.1 Max Operating Temperature up to 302°F BHST (150 deg C)

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- 9.2 Max Hydrostatic Pressure up to 20,000 psi
- 9.3 CO₂ and H₂S Contents :10% and 10 ppm
- 9.4 Drilling Dynamics survivability 30 minutes at design specification limit
- 9.5 Drilling Fluid Sand Content : 1% (maximum)
- 9.6 Modular In-line RSS Stabilizer Flex or Standard inclusive
- 9.7 Downlink and RT Confirmation capability inclusive in all systems.
- 9.8 All Drilling Dynamics provided where available in standard data set
- 9.9 Operate from vertical
- 9.10 Mud: WBM, OBM, SOBM
- 9.11 Basic Directional Toolface, Magnetic Highside, Gravity Highside,
- 9.12 Excludes MWD in specs.
- 9.13 Standard Hybrid / Push / Point the bit
- 9.14 Includes all batteries and disposal
- 9.15 4 3/4 - 5 1/4" RSS (Excluding MWD)
 - 9.15.1 5 3/4" - 6 3/4" Hole Size
 - 9.15.2 Flow range: 220-400 gpm
 - 9.15.3 DLS: 8 deg/30m build rate
 - 9.15.4 Rotary Speed: up to 250 RPM
- 9.16 6 3/4" RSS (Excluding MWD)
 - 9.16.1 8 3/8" - 9 7/8" Hole Size
 - 9.16.2 Flow range: 320-650 gpm
 - 9.16.3 DLS: 6.5 deg/30m build rate
 - 9.16.4 Rotary Speed: up to 250 RPM
- 9.17 8 1/4" RSS (Excluding MWD)
 - 9.17.1 10 5/8" Hole Size
 - 9.17.2 Flow range: 480-1500 gpm
 - 9.17.3 DLS: 6.5 deg/30m build rate
 - 9.17.4 Rotary Speed: up to 250 RPM

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- 9.18 9 1/2" RSS (Excluding MWD)
 - 9.18.1 12 1/4 - 18 1/4" Hole Size
 - 9.18.2 Flow range: 480-1900 gpm
 - 9.18.3 DLS: 5 deg/30m build rate
 - 9.18.4 Rotary Speed: up to 250 RPM
- 9.19 11.25" RSS (Excluding MWD)
 - 9.19.1 16 - 26" Hole Size
 - 9.19.2 Flow range: 480-1900 gpm
 - 9.19.3 DLS: 3 deg/30m build rate
 - 9.19.4 Rotary Speed: up to 200 RPM
- 9.20 Vertical ROTARY Steerable devices can be a reconfiguration of the tools above to drill in vertical mode or additional tools detailed below:
 - 9.20.1 6 3/4" RSS (Excluding MWD) 8 3/8" - 9 7/8" Hole Size
 - 9.20.2 9 1/2" RSS (Excluding MWD) 12 1/4 - 14 3/4" Hole Size
 - 9.20.3 9 1/2" RSS (Excluding MWD) 16 - 28" Hole Size
 - 9.20.4 Tool must be able to retain verticality to within 1.0 degrees of vertical.
- 9.21 Performance MTR + RSS
 - 9.21.1 4 3/4 - 11 1/4" RSS (Excluding MWD configuration or pricing)
 - 9.21.2 Performance Rotary Steerable devices are tools with an additional modumar motor. As such the specifications for the Rotary Steerable tools are as above:
 - 9.21.3 Full bi-directional communication through the MTR (hard wired)is an additional service that may be utilized.
- 9.22 Low Cost/Limited Service RSS
 - 9.22.1 Restricted service, limited functionality rotary steerable tool for cost effective 3-Dimensional directional drilling.
 - 9.22.2 6 3/4" RSS (Excluding MWD) - 8 3/8" - 9 7/8" Hole Size
 - 9.22.3 8" RSS (Excluding MWD) - 12" - 14 3/4" Hole Size
- 9.23 Hostile Environment RSS
 - 9.23.1 Higher dog-leg, harsher drilling environment rotary steerable system
 - 9.23.2 Abrasive, hot and high-shock locations

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9.23.3 Openhole sidetracking in over-gauge hole and soft formations with the reduced dependence of the steering principle on well-bore contact.

9.23.4 Bi-center bits functionality for directional drilling with minimal well-bore dependence.

9.24 Rotary Steerable additional options include:

9.24.1 HP - 30000 psi

9.24.2 Automatic Inclination Hold Mode

9.24.3 Near Bit Inclination continuous RT (3Ft)

9.24.4 Azimuthal Near Bit Gamma (4Ft)

9.24.5 Near Bit Gamma (4Ft)

9.24.6 Computer controlled Non-intrusive Down-link (no interruption to drill at all)

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10 MOTORS

10.1 Directional motor specifications will be compiled in CONTRACTOR's response in the Schedule of Rates and Charges. As a guide some specifications have been detailed below so technical offerings can be compared across Proposing Parties:

Nominal Hole Size	Tool Size (OD)	Description	Flow Range (gpm)		Dr. Speed (rpm)		Max Operating Torque (ft. lb.)	HP
			From	To	From	To		
3 1/2 - 4 1/4	3 1/8	Standard Short Radius	60	120	230	460	280	10
3 1/2 - 4 1/4	3 1/8	Articulated Short Radius	60	120	230	460	280	10
4 1/2 - 4 3/4	3 3/4	Standard Short Radius	130	190	240	355	600-1050	16-35
4 1/2 - 4 3/4	3 3/4	Articulated Short Radius	130	190	240	355	600-1050	16-35
5 7/8 - 7	4 3/4	Standard Short Radius	100	250	100	245	1100	24
5 7/8 - 7	4 3/4	Articulated Short Radius	100	250	100	245	1100	24
2 7/8 - 3 1/2	2 3/8	STANDARD POWER Medium Speed	20	50	160	395	195	7
3 5/8 - 4 3/4	2 7/8	STANDARD POWER Medium Speed	30	90	125	375	465-580	15
3 1/2 - 4 1/4	3 1/8	STANDARD POWER Low Speed	80	160	65	125	1135	17
3 1/2 - 4 1/4	3 1/8	STANDARD POWER high speed	80	160	175	350	565-700	36-54
3 1/2 - 4 1/4	3 1/8	STANDARD POWER Medium speed	80	160	115	244	695	32
4 1/4 - 6	3 1/2 - 3 3/8	STANDARD POWER Medium Speed	30	110	45	200	575	18
4 1/4 - 6	3 1/2	STANDARD POWER high speed	30	110	95	350	980	33
5 7/8 - 7	4 3/4	STANDARD POWER Medium Speed	100	250	55	135	2590-3750	34-54
5 7/8 - 7	4 3/4	STANDARD POWER high speed	160	265	180	600	1365-2550	165-174
5 7/8 - 7	4 3/4	STANDARD POWER low speed	105	315	50	155	2350-4120	62-97
7 7/8 - 8 1/2	6 1/4	STANDARD POWER Medium Speed	150	400	50	135	440-2000	64-118
7 7/8 - 8 1/2	6 1/4	STANDARD POWER low speed	170	400	53	124	3400	80
8 3/8 - 9 7/8	6 1/2	STANDARD POWER Medium Speed	300	600	60	115	6800	100
8 3/8 - 9 7/8	6 1/2	STANDARD POWER high speed	265	530	235	470	4300	240
8 3/8 - 9 7/8	6 1/2	STANDARD POWER low speed	265	660	55	135	7790	160
8 3/8 - 9 7/8	6 3/4	STANDARD POWER Medium Speed	300	600	150	300	3360-5400	170-192
8 3/8 - 9 7/8	6 3/4	STANDARD POWER high speed	300	600	235	600	2600-5600	240-415
8 3/8 - 9 7/8	6 3/4	STANDARD POWER low speed	300	600	85	172	3300-5700	96-125
9 7/8 - 14 3/4	8 - 8 1/4	STANDARD POWER Medium Speed	300	900	45	225	5000-9900	132-217
9 7/8 - 14 3/4	8 - 8 1/4	STANDARD POWER high speed	300	600	210	500	1300-2200	138
12 1/4 - 26	9 1/2 - 9 5/8	STANDARD POWER Medium Speed	600	1200	135	265	6900-10500	354-435
12 1/4 - 26	9 1/2 - 9 5/8	STANDARD POWER high speed	600	1200	150	570	1200-4500	480-709
12 1/4 - 26	9 1/2 - 9 5/8	STANDARD POWER low speed	600	1200	40	135	9500-13500	110-250
17 1/2 - 26	11 1/4	STANDARD POWER Medium Speed	1000	1500	115	180	10200-14900	318-350
3 1/2 - 4 1/4	3 1/8	HIGH POWER medium Speed	80	160	180	380	600-1300	27-53
4 1/2 - 4 3/4	3 3/4	HIGH POWER medium Speed	80	210	150	410	2590	126
5 7/8 - 7	4 3/4	HIGH POWER medium Speed	100	250	105	350	2100-4600	84-161
5 7/8 - 7	5	HIGH POWER medium Speed	100	250	105	260	4500	132
8 3/8 - 9 7/8	6 1/2 - 6 3/4	HIGH POWER medium Speed	300	600	125	300	8080-10500	212-310
8 3/8 - 9 7/8	7	HIGH POWER medium Speed	300	600	85	175	12000	250
9 7/8 - 14 3/4	8 - 8 1/4	HIGH POWER medium Speed	300	900	75	340	12500	285-470

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Motor/Bit Hole Size	Tool Size (OD)	Description	Expected operating range					
			Flow Range (gpm)		Bit Speed (rpm)		Max Operating Torque (ft-lb)	HP
			From	To	From	To		
12 1/4 - 26	9 1/2 - 9 5/8	HIGH POWER medium Speed	600	1200	65	230	17230-24000	330-342
17 1/2 - 26	11 1/4	HIGH POWER medium Speed	600	1200	65	130	24000-28320	342-370
17 1/2 +	12 1/4	HIGH POWER medium Speed Thin Wall - Even Wall Thickness MOTORS	790	1270	70	110	28320	370
2 7/8 - 3 1/2	2 3/8	TWM-EWT MOTORS medium speed	25	80	145	435	365	24
3 5/8 - 4 3/4	2 7/8	TWM-EWT MOTORS medium speed	25	120	100	490	780	58
4 1/4 - 6	3 1/2	TWM-EWT MOTORS medium speed	80	180	160	360	2280	117
4 1/4 - 6	3 1/2	TWM-EWT MOTORS low speed	80	180	90	200	1455	44
4 1/4 - 6	3 1/2	TWM-EWT MOTORS high speed	60	180	400	1185	765	129
5 7/8 - 7	4 3/4	TWM-EWT MOTORS medium speed	105	315	110	325	3920-5960	194-276
5 7/8 - 7	4 3/4	TWM-EWT MOTORS low speed	105	315	55	155	4120	97
5 7/8 - 7	4 3/4	TWM-EWT MOTORS high speed	130	315	480	1150	1865	307
8 3/8 - 9 7/8	6 1/2	TWM-EWT MOTORS medium speed	265	660	90	220	7225	242
8 3/8 - 9 7/8	6 1/2	TWM-EWT MOTORS low speed	265	660	55	135	7790	160
8 3/8 - 9 7/8	6 3/4	TWM-EWT MOTORS medium speed	265	675	90	252	7225-11560	242-363
8 3/8 - 9 7/8	6 3/4	TWM-EWT MOTORS low speed	265	660	55	135	7790	160
8 3/8 - 9 7/8	6 3/4	TWM-EWT MOTORS high speed	265	530	450	900	3845	493
9 7/8 - 14 3/4	8 - 8 1/4	TWM-EWT MOTORS medium speed	395	900	85	195	14660	435
12 1/4 - 26	9 1/2 - 9 5/8	TWM-EWT MOTORS medium speed	530	1200	75	185	20565	575
12 1/4 - 26	9 1/2 - 9 5/8	TWM-EWT MOTORS low speed	530	1160	40	90	20600	280
12 1/4 - 26	9 1/2 - 9 5/8	TWM-EWT MOTORS high speed	395	1055	365	975	7375	1025
17 1/2 +	12 3/4	TWM-EWT MOTORS medium speed	790	1740	70	150	37050	845

10.2 Additional Items

10.2.1 Sleeves

10.2.2 Instrumented motors with :

10.2.2.1 Near-bit inclination (rotating and sliding)

10.2.2.2 Resistivity & Gamma Ray near bit

10.2.2.3 Resistivity measurements available in either oil-base or water-base muds

10.2.2.4 Azimuthal gamma ray, providing high-side and low-side measurements

10.2.2.5 Real-time and memory data acquisition

10.2.3 High durometer elastomer - Nitrile Butadiene Rubber. The durometer of the stator rubber is 90.

10.3 All Motor prices must include:

10.3.1 All Pricing to include Cargo Baskets, slings, and thread protectors

10.3.2 Bend housing independent of setting or range

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- 10.3.3 Normal Flow/High Flow Configurations
- 10.3.4 Rotor Catcher
- 10.3.5 No string or conventional near bit stabilizers
- 10.3.6 configured with Near bit, middle and top motor stabilizers
- 10.3.7 All tool pricing must include X/Overs to string connections
- 10.3.8 Open or sealed Bearings

- 11 CONTRACTOR's SERVICES COORDINATOR shall be considered competent in the following skills on all COMPANY facilities:
- 11.1 Evaluate pre-well planning to ensure safest well trajectory has been planned, and that all tools required to achieve trajectory are included in well plan.
 - 11.2 Are properly trained in HSE competencies, and are certified by COMPANY recognized authority to travel and to work at the WORKSITE.
 - 11.3 Are competent in the safe supervision of bottom hole assemblies, sub assemblies and drill string construction.
 - 11.4 Are trained in the use of all well planning, anti-collision, drilling engineering and survey management software utilized in the well-bore construction process.
 - 11.5 Are competent in the interpretation of all rig sensors and their implications on the drilling process.
 - 11.6 Are competent to recommend drilling parameters associated with the well construction process. These include WOB, pump pressure, RPM, allowable pickup and slack off loads with respect to buckling and surveying JORPs.
 - 11.7 Are competent in the assessment of well-bore design in order to recommend design features that shall enhance the safe, efficient delivery of the well construction process.
 - 11.8 Have enhanced competencies in the area of trajectory design, drill string design, bit selection, and specialty product applications.
 - 11.9 Are competent in the assessment of Directional Drillers and MWD/LWD Engineers in order to identify opportunities for personal and professional growth.
 - 11.10 Are competent in trouble shooting technical problems that may arise at the WORKSITE.
 - 11.11 Evaluate trajectories to ensure sufficient magnetic isolation is accounted for in BHA design.
 - 11.12 Are trained and tagged for work with nuclear sources, and promotion of safe handling practices at the WORKSITE.
 - 11.13 Are competent in the interpretation of all logs acquired and able to QC logs prior to dispatch to COMPANY.

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- 11.14 CONTRACTOR's Directional Drillers (Lead or otherwise) shall be competent to carry out the following on COMPANY designated WORKSITES:
- 11.14.1 Evaluate pre-well planning to ensure safest well trajectory has been planned, and that all tools required to achieve trajectory are included in well plan.
 - 11.14.2 Are properly trained in HSSE competencies, and are certified by COMPANY recognized authority to travel and to work offshore.
 - 11.14.3 Are competent in the safe supervision of bottom hole assembly, sub assembly and drill string construction.
 - 11.14.4 Are trained in the use of all well planning, anti-collision, drilling engineering and survey management software utilized in the well-bore construction process.
 - 11.14.5 Are competent in the calculation of well-bore position and its relevance to any adjacent wells.
 - 11.14.6 Are competent in the interpretation of all rig sensors and their implications on the drilling process.
 - 11.14.7 Are competent to design all bottom hole assemblies and recommend drilling parameters associated with the well construction process. These include WOB, pump pressure, RPM, allowable pickup and slack off loads with respect to buckling.
 - 11.14.8 Are competent to efficiently operate and maximize the operation all down hole drilling systems such as positive displacement motors, rotary steerable systems, third party adjustable gauge stabilizers and other such downhole drilling system.
 - 11.14.9 Are competent to select the correct drill bit for any specific application, BHA drive and drilling environment.
- 11.15 CONTRACTOR's DESC - Directional Drilling Engineer / Well Planner shall be considered competent in the following skills on all COMPANY facilities;
- 11.15.1 Are properly trained in HSSE competencies
 - 11.15.2 Are competent to conduct the following engineering analyses:
 - 11.15.2.1 Well planning and trajectory design
 - 11.15.2.2 BHA design and optimization
 - 11.15.2.3 Torque and Drag modeling of BHAs, Drill Stings and Casing Strings
 - 11.15.2.4 Hydraulics for hole cleaning, pressure prediction and bit optimization
 - 11.15.2.5 Drillstring vibration mitigation and management
 - 11.15.2.6 Well-bore anti-collision and conductor slot utilization
 - 11.15.2.7 Well-bore survey procedures & JORPs
 - 11.15.2.8 Maintenance of directional drilling and survey data on COMPANY database

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- 11.16 CONTRACTOR's LWD/MWD Supervisors shall be considered competent in the following skills on all COMPANY facilities:
- 11.16.1 Are properly trained in HSE competencies and are certified by COMPANY recognized authority to travel and to work offshore.
 - 11.16.2 Evaluate trajectories to ensure sufficient magnetic isolation is accounted for in BHA design.
 - 11.16.3 Are trained and tagged for work with nuclear sources, and promotion of safe handling practices at the WORKSITE.
 - 11.16.4 Are competent in the interpretation of all logs acquired and able to QC logs prior to dispatch to COMPANY.
 - 11.16.5 Are competent in trouble shooting technical problems that may arise at the WORKSITE.
 - 11.16.6 Are competent to use the First Alert reporting process to close out failures in a timely manner.

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D. Wireline Services

D. Wireline Services

**ALL FUNCTIONAL AND TECHNICAL SPECIFICATIONS, AS WELL AS THE
STATEMENT OF REQUIREMENTS ARE FOUND IN THE SCHEDULE OF RATES
AND CHARGES**

E. Completions

Part 1 – Tubing Conveyed Perforation (TCP) / Drillstem Testing (DST)

1.0 INTRODUCTION

These are the functional and technical specifications for TCP / DST for Gulf of Mexico (GoM). For TCP, CONTRACTOR shall provide the equipment capable of performing perforating services that cover both offshore and land work using any conveyance – tubing conveyed, wireline, and / or coiled tubing systems for the following rig operations:

- Rotary Rig Operations
- Workover and Pulling Unit Rig Operations
- Coiled Tubing Drilling Operations
- Well Services Coiled Tubing Operations

1.1 System Description

CONTRACTOR shall provide TCP services as detailed herein comprising, but not limited to, the provision of all necessary well site management, support, and engineering expertise, office and rig site personnel, equipment, tools, spare parts, consumables, and other items necessary for the performance of the WORK described herein during COMPANY's drilling and well operations. DST type services shall amount to brief flow periods and bottom hole pressure measurements, associated with underbalanced perforating, or "perforate-and-surge" TCP operations. The equipment and services will likely comprise, but are not necessarily be limited to:

- 1.1.1 Tubing conveyed perforating guns (Various gun sizes, charge type, and shot densities).
- 1.1.2 Safe and secure transportation and handling of all explosive material and TCP related equipment, tools and accessories.
- 1.1.3 All necessary tools and handling equipment for the safe arming and disarming of all explosive material at COMPANY'S designated WORKSITE.
- 1.1.4 All necessary tools and handling equipment for the make-up of TCP guns, perforating packer and downhole test valve(s) assemblies at COMPANY's designated WORKSITE.
- 1.1.5 Downhole test assemblies (e.g., packers, test valves, BHP gauge carriers, bundle carriers, and other downhole components).
- 1.1.6 Drop bar, absolute pressure, differential pressure, and redundant firing heads.
- 1.1.7 Surface production equipment, flowheads, manifolds, tanks, etc.

In addition the following extra services may be required and shall include all equipment necessary for providing the following services:

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1.1.8 Surging of the perforations. This may be on the same trip as perforating or may be a separate (subsequent) trip.

1.1.9 Perforating and sand control pumping on the same trip.

1.2 Typical Core Job Requirements

Production wells will be completed with Cased Hole Frac Packs (CHFP) / Gravel Packs (CHGP) or Open Hole Gravel Packs (OHGP). Well productivity requirements for the cased hole completions often dictate high shot densities. To facilitate effective well bore connectivity, COMPANY prefers to perforate underbalanced where the risk of sticking guns is manageable. In high risk circumstances, wells are often perforated slightly over / on balance, the guns retrieved above the perforated interval, and the well surged via circulating in a predetermined underbalance (typically 20 to 50 bbls at approximately 2 bpm).

TCP operations must prioritize safety and environmental performance during all phases from initial preparation through to equipment demobilization. The objective is to achieve:

1.2.1 Safe and efficient operation to maximize well productivity without any environmental incidents or spills.

1.2.2 Obtain effective well bore to reservoir communication.

1.2.3 Collect all necessary data to control and optimize reservoir performance and completion quality.

2.0 TCP EQUIPMENT AND SUPPORT REQUIREMENTS

Equipment, services, and personnel required for TCP services shall comprise, but not necessarily be limited to:

2.1 Provide and maintain a legally compliant storage magazine and gun loading facility that meets or exceeds all applicable regulations.

2.2 Safe and secure transportation and handling of all explosive material and TCP related equipment, tools, and accessories.

2.3 All necessary tools, auxiliary equipment, and handling equipment for the safe arming and disarming of all explosive material at COMPANY's WORKSITE.

2.4 Knowledge of appropriate fishing tools and fishing safety procedures for explosives shall be required on-site at all times.

2.5 All necessary tools and handling equipment for the make-up of TCP gun, perforating packer, and downhole test valve(s) assemblies at COMPANY's WORKSITE.

2.6 Transport and disposal of all explosive materials, including but not limited to, misfired, flooded, fished, old stock, damaged, unloaded charges, remnants, and excess stock.

2.7 Downhole test assemblies (e.g., packers, test valves, BHP gauge carriers, bundle carriers, and other downhole components).

2.8 Drop bar, absolute pressure, differential pressure, and redundant firing heads.

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2.9 Surface production equipment, flowheads, manifolds, etc.

In addition, the following extra services may be required and shall include all equipment necessary for providing the following services:

2.10 Surging of the perforations. This may be on the same trip as perforating or may be a separate (subsequent) trip.

2.11 Perforating and sand control pumping on the same trip.

3.0 TCP EQUIPMENT AND SERVICES SPECIFICATIONS

The following table details the surface testing equipment for the planned well testing and clean-up services.

TCP / DST Surface Equipment		COMPANY Requirements
1	Tubing Conveyed Perforating Head	Appropriately sized bore 15,000 psi working pressure, nominal 1.2 million lbs tensile rating at full working pressure, wing valve(s) with a minimum 15,000 psi working pressure, 1502 unions, integral swivel rated for rotation at working pressure, remote controlled valves which fail safe closed before wing outlets, remote controlled master valve upstream of swivel.
2	Tubing Conveyed Perforating Head Crossover to Workstring	15,000 psi working pressure, nominal 1.2 million lbs tensile rating at full working pressure, crossover to be made-up to TCP head at CONTRACTOR's facility and tested to COMPANY required pressure rating prior to mobilization to WORKSITE.
3	Surface Iron	Appropriate diameter for required service (typically 2"), 15,000 psi working pressure, 1502 connections, adequate length, chiksans to provide required flexibility for workstring movement, connect to TCP manifold and rig systems.
4	Choke Manifold	2" minimum nominal bore, 15,000 psi working pressure upstream, H ₂ S rating if required by COMPANY, one (1) adjustable choke up to 2" orifice, one (1) fixed choke with a complete set of tungsten carbide and ceramic inserts, provisions to use fixed chokes in both wings (where appropriate), upstream and downstream pressure gauges, including a minimum of two, ½" NPT connections.
5	Open Top Catch Tank	200 bbl capacity.

Note:

All equipment must comply with the relevant lifting requirements specified by COMPANY.
CONTRACTOR shall provide appropriate crossovers to COMPANY workstring.

TCP / DST Downhole Equipment		COMPANY Requirements
1	Retrievable Packers	Nominal casing sizes ranging from 5" to 13 3/8", complete with hydraulic by-pass, hydraulic hold-down slips, crossovers to workstring.

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	TCP / DST Downhole Equipment	COMPANY Requirements
2	Upper and Lower Packer Safety Joint	Complete with crossovers.
3	Packer Bypass or Circulating Joint	If not already covered as an integral part of retrievable packer and upper and lower packer safety joint.
4	Hydraulic Jars	Complete with crossovers.
5	Radioactive Marker Subs	Full bore subs.
6	Multiple Operating Reversing and Circulation Valve	Complete with hydraulic reversing / pressure testing reference assembly and valve pressure testing subs, drain valves for all potential trapped pressure shall be provided.
7	Slip Joints	Complete with crossovers.
8	Single Shot Reverse Circulating Valve Or Reverse Circulating Valve with Ball Valve Isolation	Complete with crossovers, shear pins and / or shear discs, pressure test subs, and control mandrel(s).
9	Perforated Anchor for Single Trip Perforate and Pack	Complete with crossovers.
10	Self-fill Tubing Tester Valve	Single shot valve that allows self-filling and string pressure testing.
11	Shear Open Pipe Tester Valve	Single shot valve for pressure testing string, shear operation opens valve.
12	Bottom Hole Pressure and Temperature Gauges	15,000 psi minimum working pressure, 275 degrees Fahrenheit working temperature, quartz gauges, minimum memory capacity of 1 million data sets.
13	Fast Gauges (Bottom Hole Pressure and Temperature)	15,000 psi minimum working pressure, 275 degrees Fahrenheit working temperature, quartz gauges, minimum sample rate of 1,000 points per second.
14	Gauge Carriers	15,000 psi minimum working pressure, H ₂ S rating, complete with crossovers and pressure testing subs.
15	Batteries	Adequate gauge operating power for a minimum period of fifteen (15) days and up to 275 degrees Fahrenheit working temperature, full back-up is required.

	TCP Gun Systems	COMPANY Requirements
1	TCP Guns	Various sizes and types, 15,000 psi minimum working pressure to meet field specific requirements.
2	Firing Heads (Mechanical, Annulus Pressure, Tubing Pressure Activated, Wireline)	15,000 psi minimum working pressure to meet field specific requirements, vendor shall be able to run any combination of firing heads as primary and back-up.

4.0 PERSONNEL

Fully trained, certified personnel shall be provided to perform the WORK in accordance with the TCP / DST scope. Personnel are required to be capable of operating, testing, troubleshooting, and repairing their equipment. CONTRACTOR shall provide COMPANY with a single point contact for all TCP / DST operations. CONTRACTOR responsibilities shall be performing or participating in:

- 4.1 planning and generation of well specific and project specific TCP and DST programs including computer simulated perforating performance.

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- 4.2 on-site personnel adequate for 24 hour operations.
- 4.3 operational coordination between COMPANY's local offices and WORKSITE.
- 4.4 project planning.
- 4.5 process re-engineering, technical limits evaluations, and risk assessments.
- 4.6 generation of cost estimates for required TCP and DST services.
- 4.7 typical core job requirements.

CONTRACTOR on-site personnel must have an in-depth knowledge of the surface equipment, downhole tools, firing systems and guns. COMPANY reserves the right to request Curriculum Vitae for CONTRACTOR personnel.

5.0 DATA ACQUISITION AND REPORTING SERVICES

The following table details the data acquisition and reporting services for the planned TCP and DST services.

	Downhole Data Acquisition Services	COMPANY Requirements
1	Downhole Data Collection, Recording, and Processing	Record all bottom hole gauge data and deliver to COMPANY in a timely manner.
2	Data Reports	A full report covering equipment and operations, including data collection, hard and electronic copies (MS Word, Excel and Adobe Acrobat), CD-R media, suitable format to enable WORKSITE transmission via the data transmission services provider.

6.0 REFERENCES

ISO 11960 (API Spec 5CT): Petroleum and natural gas industries – Steel pipes for use as casing or tubing for wells.

ISO 14310 (API Spec 11D1): Petroleum and natural gas industries – Downhole equipment – packers and bridge plugs.

NACE MR-01-75: Sulfide stress cracking resistant materials for oilfield equipment.

API Specification 6A718: Specification of Nickel Base Alloy 718 (UNS N07718) for Oil and Gas Drilling and Production Equipment. 1st Edition March 2004*.

* - Note In addition to the requirements of API Spec 6A718, COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1 as per Section 4.1.3.1 of API6A718.

BP References:

GIS 02-201: Specification for OCTG Seamless Casing & Tubing (Standard Grades).

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GIS-02-203:	Specification for OCTG Crossover Connectors.
GIS-02-204:	Specification for OCTG Sour Resistant Grade C110 Low Alloy Steel OCTG Seamless Casing.
GIS-02-205:	Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
GIS-02-206:	Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
BP-EPT-IAS-01:	Integrity Assurance Specification – For the Procurement of Critical equipment for Drilling and Completions.

For undated references, the latest edition of the normative document referred to applies.

7.0 DEFINITIONS AND ABBREVIATIONS

For the purposes of this Part 1 – Tubing Conveyed Perforation (TCP) / Drillstem Testing (DST), the following definitions and abbreviations will apply:

bbl:	Barrel
BHP:	Bottom Hole Pressure
bpm:	Barrels Per Minute
CHFP:	Cased Hole Frac Pack
CHGP:	Cased Hole Gravel Pack
DST:	Drillstem Testing
FLCV:	Fluid Loss Control Valve
GoM:	Gulf of Mexico
GP:	Gravel Pack
lb:	Pounds
OHGP:	Open Hole Gravel Pack
psi:	Pounds per Square Inch
QA:	Quality Assurance
QC:	Quality Control
TCP:	Tubing Conveyed Perforation

Part 2 – Offshore Sand Face Pumping

1.0 INTRODUCTION

These are the functional and technical specifications for Offshore Sand Face Pumping Services.

1.1 System Description

The development wells will require a range of different lower completion types. Further details can be found in Part 6 - Well-Bore Information for representative well types.

1.2 Lower Completion Description

The list below is a summary of the potential lower completion types.

1.2.1 Producers:

- (a) Cased Hole Frac Pack (CHFP)
- (b) Cased Hole Gravel Pack (CHGP)
- (c) Dual zone Gravel Packs (Lower Zone Open Hole and Upper Zone Cased)
- (d) Cased Hole High Rate Gravel Pack
- (e) Cased Hole High Rate Water Pack
- (f) Cased and Perforated (C&P)
- (g) Open Hole Gravel Pack (OHGP)
- (h) Expandable Completion (EC)

1.2.2 Injectors (water / gas):

- (a) Cased Hole Frac Pack (CHFP)
- (b) Stand Alone Screens (SAS)
- (c) Expandable Completion (EC)
- (d) Cased Hole Gravel Packs (CHGP)

The majority of lower completions are expected to be CHFP. There may be some CHGP applications. Both SAS and ECs shall have the capability to accommodate Open Hole Zonal Isolation (OHZI) and Downhole Flow Control (DHFC).

2.0 PUMPING EQUIPMENT AND SUPPORT REQUIREMENTS

2.1 General

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The equipment, materials, and support services described below are intended to cover OHGP, CHGP, CHFP, and SAS completion types. Further requirements for each of these lower completion types are detailed herein.

2.2 Pumping Equipment

Pumping equipment, and associated auxiliary equipment, required for gravel placement in open hole gravel packs (OHGP), cased hole gravel packs (CHGP) and cased hole frac packs (CHFP) shall be either skid or vessel based. Skid based pumping equipment shall be optimized to reduce foot print requirements on the rig. Vessel based pumping operations shall be independent of the rig with the exception of the treating hose interface. Equipment required consists of, but is not limited to the following:

	Loose Equipment	Minimum Requirements
1	Treating Iron	15,000 psi working pressure, 1502 unions, appropriately sized for pump rate.
2	Coflexip Hose	All coflexip hoses compatible with 1502 iron unions and 15,000 psi working pressure, with quick disconnect capability.
3	Fluid Storage Tanks*	200 – 400 bbl volume, 4.0" and 8.0" suction capability, circulating line, fluid level indicator system, fluid sump to minimize tank bottoms.
4	Sand Silo with unmanned bag cutter	100,000 lb capacity, low profile, safe loading option (preference for system that does not require working at height).
5	Suction and Discharge Hose	With transportation basket.
6	Slurry Return Tank	100 bbl volume minimum, gravel separation facility, graduated for volume measurement, flushing facilities for residual gravel.
7	Liquid Additive Storage Tanks	Stainless steel tank or tank lined with inert material, adequate for the job size.
8	Pump-in Sub	15,000 psi working pressure, 1502 unions with integral swivel.
9	Frac Head	10,000 psi or 15,000 psi working pressure, 1502 unions with integral swivel, minimum of 1.2 million lbs tensile load rating, minimum of one (1) hydraulic actuated master valve, minimum of two, 3" side entry connections.
10	Ball Catcher (where necessary for reversing packer setting ball)	15,000 psi working pressure, 1502 unions.
11	Gravel pack / Frac pack Manifold	Appropriately sized for expected pump / flow rate, 15,000 psi working pressure, 1502 unions.
12	Ball Dropping Sub (packer setting ball)	15,000 psi working pressure, 1502 unions.
13	Polymer Shearing Device	Minimum throughput 8 bpm.
14	Acid Transport Tanks	Appropriately sized tanks, lined, integral unions.

Note: All equipment must comply with the relevant lifting rules specified by COMPANY. All preventive maintenance certifications shall be up to date at time of service. All items except for Items 2, 4, 7, and 12 shall be provided by a Third Party.

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* Tanks shall to be fit for purpose and may need to be Polyurethane, Steel, or Stainless Steel.

2.3 On-Site Monitoring and Data Acquisition

	Treatment Monitoring	Requirements
1	Monitoring Cabin	100% redundant data acquisition systems.
2	High Pressure Flow Meters	15,000 psi, 1502 unions, Mag or Turbine, appropriately sized for pump rate.
3	Low Pressure Return Line Flow Meter	1502 unions, Mag or turbine, appropriately sized for flow / pump rate.
4	High Pressure Densitometer (Main Treating Line)	15,000 psi, 1502 unions, 100% redundancy, calibrated prior to operations.
5	Low Pressure Densitometers	Blender density line, return line density, calibrated prior to operations.
6	Communication Systems	Radios for vessel and rig personnel, with backup radios, batteries, chargers, to maintain adequate communication.
7	Fluid QA / QC Lab	Viscosity measurement, pH, specific gravity, acid titration (see Note 1 below).
8	Equipment for Remote Data Transfer Capability	Adequate to allow real-time interaction with operation (see Note 2 below).
9	In-Line Viscosity Meter	Adequate to determine base gel loading.

Note 1: The on-site fluid QA / QC Lab minimum equipment requirements are as follows:

- Fann-50 or equivalent, (i.e., Brookfield, Chandler) pressurized viscosity meter(500 – 1,000 psi), Temperature to 250 degrees Fahrenheit
- Fann 35 (Ambient viscosity) viscosity meter
- Water Analysis Kit (Ca, Fe, pH, Specific Gravity)
- Heated Water Bath
- Sand Settling Testing at Temperature
- Sand Sieve Analysis Equipment
- Break Time Analysis Equipment
- Sand Screen Mud Flow Through Tester – 1 liter capacity (i.e., Baroid HP / HT cell)
- Qualified Lab Technician

Note 2: The data acquisition system shall be capable of recording and displaying typical operating parameters required in gravel / frac packing operations. These include, but are not limited to, the following:

- Workstring or tubing and annulus pressures, pump-in / flow back rates, fluid / slurry density
- Liquid add rates, volumes, in-line pH
- Surface viscosity, temperature.

2.3.1 Additional measurements, include but are not limited to;

- Weight loss in sand silo as a function of time
- Liquid additive volumes as a function of time

2.3.2 Additional requirements of CONTRACTOR are to:

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- Provide timely merged surface and downhole gauge data (pressure and temperature) to COMPANY engineers.
- Perform Remote Data Transfer onto COMPANY intranet.
- Adequate redundancy (i.e., 100% of critical systems).
- Real-time maximum allowable surface treating (workstring) pressure calculation based on integrated density measurement (calculation of workstring hydrostatic in real-time) and workstring and annulus pressure measurements.
- Real-time net pressure as a function of treating time (i.e., Nolte-Smith plot) display in control cabin.
- Display of data shall be available on rig floor, at WORKSITE Leader's office, and in COMPANY's onshore office.

2.4 Blending Equipment

	Blending Equipment	Minimum Requirements
1	Fracturing Blender(s)	50 bpm, 12 ppa, dry additive functionality, appropriate hoses / fittings to perform operations.
2	Gravel Pack Blender	Blending rates of 2 – 15 bpm, 0.5 – 15 ppa, appropriate hoses / fittings to perform operations with either viscous or non-viscous fluids.
3	Batch Blender*	Stainless steel, capacity of 50 bbls or more, appropriate hoses / fittings to perform operations.
4	Chemical Additive System	Individually metered, low rate and high rate additive pumps, 100% backup of critical additives (i.e., crosslinker, breaker, buffer, etc).
5	Centrifugal Pump Skid	Capable of 20 bpm clean rate fluid transfer, appropriate hoses / fittings to perform operations.

* CONTRACTOR's vessels are equipped with a 50 bpm fracturing blender rather than a batch blender.

2.5 Skid Based Pumps

	High Pressure Pumps	Requirements
1	OHGP Pumps	Minimum 500 HHP, 1502 treating iron.
2	Fracturing Pumps	HHP rating based on treatment design, 1502 treating iron.

2.6 Pumping Vessel

	High Pressure Pumps	Requirements
1	GP Pumps	Minimum 500 HHP, 1502 treating iron.
2	Fracturing Pumps	HHP rating based on treatment design, 1502 treating iron.

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- 2.6.1 The dynamically positioned stimulation pumping vessel shall be capable of providing a stand alone service independent from the rig. Vessel shall be capable of providing miscellaneous pumping services in addition to the operations discussed herein.
- 2.6.2 CONTRACTOR shall provide the rig based hose hanger and associated equipment to ensure simple, efficient rig-up to the hanger and to the workstring. Coflexip quick disconnect system is required.
- 2.6.3 Pumps shall be remote operated from the monitoring cabin and have an over-pressure shut down system integral to pump control system.

2.7 Fluids and Gravel

It is anticipated that the following fluids may be used for any job. The list is not exhaustive but covers the majority of fluids that are likely to be used. The sand face completion fluids employed will be field and well specific.

Acid & Clean-Up Systems	Requirements
Acid Systems and Additives	Acids may include HCl, HF, Acetic Acid, and Citric Acid with necessary inhibitors, non-emulsifiers, and anti-sludge agents, as required. The acid systems may be used for, but not limited to, mud cake removal during well clean-up and CaCO ₃ scale removal. HCl concentrations up to 15% may be used.
Pickle Systems	HCl, pipe dope dissolver.
Wax Dissolution	Aromatic solvent(s).
Methanol	May be used for hydrate removal in the upper completion and the christmas tree.
Glycol	Used for hydrate inhibition.
OHGP Carrier Fluids*	Requirements
Brine Based	Clay inhibited.
Viscous Water-Based	HEC, Xanthan, VES, or alternative fluid systems.
Viscous Oil-Based	Based on RDF base oil.
Breakers	To break reversed gel with no delay (i.e., surfactant-based micellar fluids).
Fracturing Fluids	Requirements
Guar-Based and Additives	Legally dischargeable overboard.
Crosslinked Fluid System for Above 300 degrees Fahrenheit (150 degrees Celsius)	Legally dischargeable overboard.
Crosslinker	Legally dischargeable overboard.
Breakers	Legally dischargeable overboard.
Breaker Acids	Legally dischargeable overboard.
Filter Cake Clean-Up Fluids	Requirements
Calcium Carbonate Removal System	Typically acidic, minimum environmental risk.
Polymer Breaker System	Typically acidic or oxidizer, minimum environmental risk.
Proppants And Gravels**	Requirements

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	Mesh Distribution as determined by Produced Sand Particle Size Distribution	Typical API meshes to include, but not limited to 12-18/20, 16-20/30, 20-40, 30-50/60, 40-60/70, 50-70. Ceramic, resieved gravel, sintered bauxite, and resin coated versions of the above typical sizes.
	Loss Control Pills	Requirements
	Solids Free Gels	Adjustable break time by use of internal breaker, consistent loss control behavior with reproducible regained permeability following acid remediation.
	Solids Laden Pills (Calcium Carbonate, Salt, etc.)	Sized to bridge on inside of screens with reasonable lift-off pressures. Proof of testing required.

* Carrier fluid must be compatible with either water-based or oil-based drill in fluid – supported through lab testing.

**All proppant will meet the requirements of API 58 and API RP 60 specifications, unless COMPANY specifies retention of a particular particle size distribution. A full range of proppant types and sizes are required for potential program use. Proppant type and size selection will be based on application and lab retention testing. CONTRACTOR shall have at least 30% excess of proppant on location, based on final job design.

3.0 OPEN HOLE / CASED HOLE GRAVEL PACK COMPLETIONS

3.1 General

COMPANY may use oil-based mud or water-based mud. COMPANY may employ gravel placement via viscous gel with alternate flow path equipment or circulating OHGP placement via the alpha-beta technique; however, both gel packing and water packing provisions for gravel pack services shall be available to optimize performance based on the well bore construction and the reservoir conditions.

The gravel pack service tool shall maintain hydrostatic pressure on the formation in all tool positions, have wash down functionality, and have the ability to spot fluids via the wash pipe after gravel packing is completed. The gravel pack tool string shall close the fluid loss control valve and the gravel circulation port isolation sleeve while pulling out the wash pipe.

3.2 Technical Requirements

3.2.1 OHGP / CHGP – General

The objective of the gravel pack is to place a low skin sand face completion, annular pack for a reliable life-of-well sand control.

3.2.2 Pumping / Blending Equipment

Equipment used for pumping gravel packs can be either skid based or on a pumping vessel. The minimum requirements for this equipment are as follows:

- (a) Equipment shall be capable of pumping rates required by the completion design. OHGPs typically do not exceed 8 bpm at 5,000 psi but CHGP may

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require pump rates in excess of 30 bpm with surface pressures up to 10,000 psi.

- (b) Blending equipment shall be capable of adding gravel at concentrations ranging from 0.5 – 15 ppa, with an accuracy +/- 0.25 ppa.
- (c) In the event liquid additives are required to be pumped 'on the fly,' add pumps shall be capable of metering rates of 2 to 60 US gpm and shall have 100% redundancy.
- (d) All equipment shall meet or exceed COMPANY's and rig operator's safety regulations.

3.2.3 Gravel Carrier Fluids

Water-based carrier fluids are the preferred carrier. However considerations for oil-based carriers will be considered when conditions warrant. Circulating brine packs, water-based viscous packs, and oil-based carrier fluids may be used.

OHGP carrier fluids shall be formulated to inhibit shales, be non-damaging to the formation, and be compatible with all other well bore and formation fluids. CONTRACTOR shall perform compatibility testing to ensure no adverse fluid / fluid interactions exist. CONTRACTOR shall provide documented test results to COMPANY. CONTRACTOR shall supply samples as required to COMPANY (or designated laboratory) for fluid / mineralogical testing to ensure that the carrier fluid is compatible with the formation and provides a high level of retained permeability.

The proposed fluid systems shall be evaluated on the following characteristics:

- (a) Proppant transport capacity adequate for the completion technique and reservoir conditions.
- (b) Non-damaging characteristics (supported by appropriate lab results and case histories) with high retained permeability.
- (c) Proven, simple, reliable, and quick mixing capability.
- (d) Capability of chemicals for filter cake clean-up.
- (e) Minimal environmental risk / impact.

3.2.4 Post Gravel Pack Treatment Fluids

COMPANY may require an optimized post-placement clean-up fluid for productivity reasons. The clean-up fluid shall be required to provide the following characteristics in either an oil-based or water-based environment:

- (a) Ability to breakdown polymer at different times (mud filter cake & linear gel).
- (b) Ability to dissolve calcium carbonate.
- (c) Corrosion inhibited at bottom hole static temperature.
- (d) Emulsion / Sludge prevention.

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3.2.5 Gravel Placement Design

CONTRACTOR shall be able to model, through computer simulation, the placement of gravel in the open hole and casing in order to optimize the design prior to and during operations. Required outputs from the simulation model shall include:

- (a) Pump rates (maximum / minimum) for proppant suspension.
- (b) Proppant addition rates.
- (c) Volume of proppant required (open hole and blank coverage).
- (d) Predicted surface and bottom hole treating pressures at all points of interest in the well.
- (e) Durations of phases of gravel placement.
- (f) Estimated fluid velocities at all points of interest in the well.
- (g) Dune height predictions (when applicable).

3.2.6 Fluid Loss Control Pill

COMPANY may require fluid loss control pills for:

- (a) Losses while running in hole with lower completion assembly.
- (b) Excessive losses during circulation tests or prior to pumping slurry.
- (c) Failure or leakage of mechanical fluid loss control device.

Loss control pills shall be either non-particulate or properly sized bridging material (i.e., sized Calcium Carbonate, Salt, etc.). Non-particulate pills may include crosslinked or linear HEC or Xanthan gels, as required to cure formation losses.

On flow back, loss control pills shall not leave lasting damage to formation or plugged sections of screen. Residual loss control pill material shall be capable of being removed with a simple breaker or solvent.

Open hole loss control pills shall be sized to easily pass through the sand screens.

3.2.7 Fluid System Requirements

The table below outlines the functional and technical requirements for a typical fluid system. The fluid system below ranges in gel loadings from 60-85 pptg HEC.

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Description		Critical Well Factors		QA Requirements Y/N	
Fluid Type	Viscous	Well Type	Gas or Oil	Lab Tested Formulation	
Base Fluid	Water Based	Reservoir Temp	150–240 °F (Max Expected)	Min Sensitivity O/S	
		Completion brine	9.7–10.5 ppq CaCl ₂	Sand Settling Tests Performed	
				Gravel Pack Testing	
Performance Standard		Reservoir Pressure	5000–7500 psig	External Break, Pore Fracture Tests	
Sand Settling Criteria	20% Settling in 30 mins (at BHFT)	Fracture Pressure	Variable		
Minimum Viscosity	100 cP @ 170s ⁻¹ (at BHFT)	DIF type	WBM	Estimated Gravel Pack Sand Control Completion	
Final Viscosity	Required to have viscosity < 10 cP	Expected OH to GP	800 to 1500 ft	Gravel Pack Flow Test	
Fluid Break Time	24–72hrs @ BHST	Open Hole Size	7.5" & 9.5"	Screening Test	
Shear Effect Requirements	Fluid must sustain presence above the reference curve for the calculated pump time	Max H ₂ S	0 ppm	Pre-Gravel Pack Flow Test	
Other Additives	Filter cake cleanup chemicals e.g. chelants, enzyme or oxidiser types	Workstring size	4" XT39 & 5 7/8" XT 57	Working Procedures	
Recovery Time	N/A	Max CO ₂	0.05 Mol %	Gravel Screen Required for Location	
Fluid Heat Ramp	<ul style="list-style-type: none"> Fluid Tested at BHFT for calculated pumping time Subsequently Tested at BHST for remaining test time 	Screen size/ Type	5 1/2" 20ppt Alternate Path	Field Tested Completion	
			4" 11.6ppt Alternate Path		
Environmental Effects	Must be able to be dumped overboard in GOM and TF	Gravel Size	40/60 Econoprop	Field Gravel Screen Calibration	
Post Treatment	No external breakers	Perforation size/ density (for CH)	N/A	Gravel Screen Calibration	
		Deviation	Max 60 degrees	Gravel Screen Calibration	
		OH or MZ packer	None	Gravel Screen Calibration	

4.0 CASED HOLE FRAC PACK (CHFP) COMPLETIONS

4.1 General

The main objective of a CHFP is to provide highly productive, reliable sand control completions.

A typical frac pack includes:

- 4.1.1 Workstring pickle
- 4.1.2 Circulation tests (circulate and reverse)
- 4.1.3 Fluid loss pill breaker treatment (i.e., pre-fracturing acid clean-up)
- 4.1.4 Mini-frac (fluid calibration test)
- 4.1.5 Step-rate test
- 4.1.6 Step-down test (could be required by injection pressures – infrequent)
- 4.1.7 Main frac treatment
- 4.1.8 Reverse out excess slurry / re-stress

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4.2 Technical Requirements

4.2.1 Pumping Equipment

Equipment used for pumping frac packs can be either skid based or on a pumping vessel. The minimum requirements for this equipment are as follows:

- (a) Capable of pumping at rates up to 50 bpm at pressures up to 14,000 psi.
- (b) Capable of blending gravel and additives at rates up to 50 bpm and concentrations up to 15 ppa with accuracy within +/- 0.5 ppa, and 2% additive variance.
- (c) Sufficient redundancy of required equipment to execute the design in the event of equipment failure.
- (d) 100% redundancy of critical components (i.e., densitometer, critical additive pumps, etc.).

4.2.2 Frac Pack Fluids

Fracturing fluids shall be designed with COMPANY engineer. Typical fluids are guar-based (or any of its derivatives), borate crosslinked brines designed for high early viscosity development with rapid break when exposed to reservoir temperature. In general, fluid viscosities shall be greater than 100 – 200 centipoises at 170 sec⁻¹ for the planned duration of injection time. This requires on-site testing of fluids, mixed with on-site additives, to confirm required fluid properties. Fluid system shall be compatible with resin coated proppant in the event that this media is utilized. Third Party quality assurance personnel may be utilized to document fluid performance. CONTRACTORS shall provide berth space to accommodate these personnel on Stimulation Vessels.

4.2.3 Fluid Loss Control / Kill Pills

COMPANY may require fluid loss control pills for:

- (a) Post perforating losses
- (b) Failure or leakage of mechanical fluid loss control device

Loss control pills shall be either non-particulate or properly sized bridging material (i.e., sized Calcium Carbonate, Salt, etc.). Non-particulate pills may include crosslinked or linear HEC or Xanthan gels, as required to cure formation losses.

On flow back, loss control pills shall not leave lasting damage to the annular pack or plug the screens. Residual loss control pill material shall be capable of being removed with a simple breaker or solvent.

4.2.4 Fracture Placement Design

CONTRACTOR shall be able to model, through computer simulation, the placement of gravel in the fracture in order to optimize the design prior to and during operations. Required outputs from the simulation model shall include:

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- (a) Predicted surface and bottom hole treating pressures
- (b) Stage front prediction of gravel placement
- (c) Frac width, height, and length
- (d) Proppant placed in fracture
- (e) Proppant distribution within fracture
- (f) Estimate fluid efficiency and predicted time to Tip Screenout (TSO)
- (g) Fluid loss rate through fracture placement duration
- (h) Predicted net pressure gain
- (i) Closure time estimate

4.2.5 Other Completion Output Data

- (a) Workstring hydrostatic pressure during proppant placement
- (b) Real-time net pressure during proppant placement
- (c) Real-time maximum allowable surface treating pressure
- (d) Real-time surface pressure, rate, and density of proppant
- (e) Amount of proppant placed:
 - (i) In the fracture
 - (ii) Around screens
 - (iii) Around blank (including blank height)
 - (iv) In workstring above crossover (needing to be reversed out)

5.0 QUALITY ASSURANCE

5.1 General

CONTRACTOR shall provide QA / QC of the pumping equipment and fluids.

5.2 General Requirements

Quality assurance measures shall be implemented for all aspects of the WORK. CONTRACTOR shall provide the following for review by COMPANY:

- 5.2.1** Verification of CONTRACTOR's checklist and maintenance programs for gravel pack equipment.

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5.2.2 Traceability of all chemicals.

- (a) Lot numbers
- (b) Shelf Life

5.2.3 Certification records of treating iron.

5.2.4 QA / QC Fluids Onshore

In preparation for each job, a fluids statement of requirements (SOR) will be given to CONTRACTOR by COMPANY such that CONTRACTOR has sufficient time to blend a fluid formulation that meets the requirements for the sand face completion.

5.2.5 QA / QC Job Design

In preparation for each job, CONTRACTOR shall supply design data prior to the execution of the job. The job preparation packet shall include the following:

- (a) Laboratory fluid design data with break data of fluid in increments of 0, 15, 30, 60, 90, 120, 240, and 1,440 minutes.
- (b) Verification that fluid can be pumped at surface conditions without losing pump prime.
- (c) Sand settling rates.
- (d) Calculations of estimated volumes of fluid required for job including excess.
- (e) Calculation of Maximum Allowable Surface Pressure (MASP) based on tool string given by COMPANY.
- (f) Table of displacement volume as a function of MASP.
- (g) Table of displacement volume as a function of reversing pressure.
- (h) Prediction of circulation rates and pressures.
- (i) Prediction of OHGP / CHPG.

5.2.6 QA / QC Equipment Preparation

CONTRACTOR shall test the major components of the equipment which will be used in the lower completion in a yard test prior to the completion load out. Equipment shall be quarantined prior to shipping to WORKSITE. A yard test will be accepted and the equipment ready for the job when the following parameters are met:

- (a) Hydraulic Horsepower test (meets 100% HHP of pumps).
- (b) Densitometer calibration (+/- 0.5%).
- (c) Liquid Additive pump testing (+/- 2%).
- (d) Flow meter calibration (+/- 2%).

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- (e) Communications to monitoring station are functional.
- (f) All licenses to proprietary software are verified to be up to date.

5.2.7 WORKSITE Fluid QA / QC

Quality control of all fluids to be pumped on WORKSITE is required. This includes the following:

- (a) Detail field mixing procedures.
- (b) QA / QC lab with capabilities noted above.

5.2.8 Proppants

A sample of the proppant shipped to the WORKSITE shall be measured and comply with the requirements of API 58 and API RP 60.

6.0 REFERENCES

ISO 11960 (API Spec 5CT):	Petroleum and natural gas industries – Steel pipes for use as casing or tubing for wells.
ISO 14310 (API Spec 11D1):	Petroleum and natural gas industries – Downhole equipment – packers and bridge plugs.
NACE MR-01-75:	Sulfide stress cracking resistant materials for oilfield equipment.
API Specification 6A718:	Specification of Nickel Base Alloy 718 (UNS N07718) for Oil and Gas Drilling and Production Equipment. 1st Edition March 2004*

* - Note In addition to the requirements of API Spec 6A718, COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1 as per Section 4.1.3.1 of API6A718.

BP References:

GIS 02-201:	Specification for OCTG Seamless Casing & Tubing (Standard Grades).
GIS-02-203:	Specification for OCTG Crossover Connectors.
GIS-02-204:	Specification for OCTG Sour Resistant Grade C110 Low Alloy Steel OCTG Seamless Casing.
GIS-02-205:	Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
GIS-02-206:	Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
BP-EPT-IAS-01:	Integrity Assurance Specification – For the Procurement of Critical equipment for Drilling and Completions.

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For undated references, the latest edition of the normative document referred to applies.

7.0 DEFINITIONS AND ABBREVIATIONS

For the purposes of this Part 2 – Offshore Sand Face Pumping, the following definitions and abbreviations will apply:

API:	American Petroleum Institute
bbl:	Barrel
BHP:	Bottom Hole Pressure
bpm:	Barrels Per Minute
CHFP:	Cased Hole Frac Pack
CHGP:	Cased Hole Gravel Pack
C&P:	Cased and Perforated
DHFC:	Downhole Flow Control
EC:	Expandable Completions
FLCV:	Fluid Loss Control Valve
GoM:	Gulf of Mexico
GP:	Gravel Pack
gpm:	Gallons per Minute
HEC:	Hydroxyethyl Cellulose
HHP:	Hydraulic Horsepower
ID:	Internal Diameter
lb:	Pounds
mbd:	Thousand Barrels Per Day
OD:	Outside Diameter
OHGP:	Open Hole Gravel Pack
OHZI:	Open Hole Zonal Isolation
pptg:	Pounds Per Thousand Gallons
ppa:	Pounds Proppant Added Per US Gallon
psi:	Pounds per Square Inch
QA:	Quality Assurance
QC:	Quality Control
RDF:	Reservoir Drilling Fluid
RIH:	Run In Hole
SAS:	Stand Alone Screens
SOBM:	Synthetic Oil-Based Mud
TSO:	Tip Screenout
VES:	Visco-elastic Surfactant

Part 3 – Lower Completions

1.0 INTRODUCTION

These are the functional and technical specifications for Lower Completions.

1.1 General

The development wells programs will require a range of different lower completion types. Further details can be found in Part 6 - Well-Bore Information for representative well types.

1.2 Lower Completion Description

The list below is a summary of the potential lower completion types.

1.2.1 Producers:

- (a) Cased Hole Frac Pack (CHFP)
- (b) Cased Hole Gravel Pack (CHGP)
- (c) Dual Zone Gravel Packs (Lower Zone Open Hole and Upper Zone Cased)
- (d) Cased Hole High Rate Gravel Pack
- (e) Cased Hole High Rate Water Pack
- (f) Cased and Perforated (C&P)
- (g) Open Hole Gravel Pack (OHGP)
- (h) Expandable Completion (EC)

1.2.2 Injectors (water / gas):

- (a) Cased Hole Frac Pack (CHFP)
- (b) Stand Alone Screens (SAS)
- (c) Expandable Completion (EC)
- (d) Cased Hole Gravel Packs (CGFP)

The majority of lower completions are expected to be CHFP. There may be some CHGP applications. Both SAS and ECs shall have the capability to accommodate Open Hole Zonal Isolation (OHZI) and Downhole Flow Control (DHFC).

2.0 GENERAL REQUIREMENTS

2.1 Production Casing and Tubing Summary

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Casing sizes for the typical wells can be found in Part 6 - Well-Bore Information for representative well types. Tubing sizes for the individual projects can be found in Appendix 3 and/or Appendix 4.

2.2 Connections

Unless specified otherwise herein, connections shall be a VAM-type premium connection.

2.3 Metallurgy

All completion component metallurgy shall be an equivalent or superior grade to the tubing unless otherwise specified by COMPANY. All selection of materials shall be subject to COMPANY approval.

The producers shall have a minimum grade of ISO 11960 (API 5CT) L80 13Cr, AISI 410 or AISI 420 modified. COMPANY may specify Super 13Cr or 25Cr. If a high strength alternative is required, it shall be Alloy 718 or equivalent. Injectors shall have a minimum grade of 25Cr, with nickel alloy 718 or equivalent as approved by COMPANY. COMPANY may require high strength alternatives to meet project requirements.

All components made from L80 13Cr, AISI 410 or AISI 420 modified shall conform to ISO 11960 (API 5CT), BP GIS-02-201 and BP GIS-02-203. All Super Duplex stainless steel shall conform to ISO 11960, BP GIS-02-206, and BP GIS-02-204.

All components made from Alloy 718 shall conform to API Specification API 6A718. COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1, as per Section 4.1.3.1 of API 6A718. All equipment material selection shall be subject to a metallurgy review to ensure acceptability regarding corrosion / erosion performance, material specifications and supplier qualification.

All components shall meet the requirements of NACE MR-01-75 unless otherwise stated by COMPANY on WORK ORDER.

2.4 Elastomers

Examples of production, completion, and intervention fluids that will be seen by the wells throughout field-life are Sodium Chloride / Bromide, Calcium Chloride / Bromide brines, natural gas, condensates, and gravel / frac packing fluids. Recommendations shall be made for elastomers that are suitable for project conditions. Elastomer recommendations shall be subject to COMPANY approval but suggested elastomers are as follows:

Typical Elastomer Seals

Seal Type	Elastomer
Packer elements	HNBR, Nitrile, CHEMRAZ, AFLAS, Viton
Chevron sets	HNBR, FKM, Viton, plus PTFE, plus PEEK
O-rings, T-seals etc	HNBR, FKM, Viton, plus PEEK back-ups
Safety valve	Non-elastomer

Final elastomer specification shall be made by COMPANY on WORK ORDER. Compatibility testing shall be required for all production and completion fluids.

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2.5 Pressure Ratings / Tests

The bodies of the completion equipment shall be rated to at least the maximum anticipated well pressures, although a higher rating may be required for individual components, (e.g., TR-SCSSV control system, hydraulic actuation, absolute pressure components, etc.). The completions will be tested to the maximum anticipated pressures.

Pressure ratings and differential pressure requirements for the typical projects can be found on in Section 3, Appendix 6, Part 6 – Well-Bore Information. In general maximum anticipated pressures are 10,000 psi – 20,000 psi.

2.6 Temperature Rating

Equipment shall be rated for the temperature range 40 degrees Fahrenheit to 275 degrees Fahrenheit with HT range to include 300 degrees Fahrenheit.

Material strengths shall be de-rated as appropriate for the temperatures.

2.7 Well Profile

Wells will range from non-deviated (straight hole) to highly deviated (70-90 degrees). The completion intervals will range from non-deviated sections to highly deviated sections including horizontal for some OHGPs. Average build rate for planned well paths typically will not exceed an average of 4.5 degrees per 100 ft on any well. Dog leg severity at discrete points may be up to 10.0 degrees per 100 ft. For more details about typical well profiles, see Section 3, Appendix 6, Part 6 – Well-Bore Information.

2.8 Mud / Fluid System

The reservoir section will be drilled with synthetic oil-based mud. The mud will be conditioned to a level between 175 and 325 US mesh using shaker screens prior to running casing. The sand control screens will be run in clear completion brines consisting of Calcium Bromide (CaBr₂), Calcium Chloride (CaCl₂), and / or Zinc Bromide (ZnBr).

2.9 Intervention Fluids and Treatment Chemicals

It is anticipated that the following fluids may be used for well intervention purposes and for treatment of produced and injected fluids over the life of the well. The list is not exhaustive but covers the majority of fluids that are likely to be used. Detailed fluid selection will be specified in Section 3, Appendix 6, Part 6 – Well-Bore Information.

2.9.1 Hydrochloric Acid (HCl): May be used for mud cake removal during well clean-up and for CaCO₃ scale removal. It is anticipated that HCl acid concentrations up to 15% may be used.

2.9.2 Scale Dissolvers / EDTA: May be used for mud cake removal during well clean-up and for removal of both BaSO₄ and CaCO₃ scales.

2.9.3 Mutual Solvents: May be pumped as part of chemical stimulation or scale inhibition treatments.

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- 2.9.4 Surfactants: May be pumped as part of chemical stimulation or scale inhibition treatments.
- 2.9.5 Organic Solvents: May be used for stimulation treatments.
- 2.9.6 Scale Inhibitors: May be used to prevent both BaSO₄ and CaCO₃ scales. Scale inhibitors will be pumped in the tubing via the chemical injection mandrel above the production packer in producers. Scale inhibitors may also be required to be pumped into the formation in squeeze treatments.
- 2.9.7 Methanol: May be used for hydrate removal in the upper completion and the christmas tree.
- 2.9.8 Glycol: May be used for hydrate inhibition.
- 2.9.9 Relative Permeability Modifiers: May be used for water shut-off treatments.
- 2.9.10 Water Shut-off Gels: May be pumped into the formation as water shut-off treatments.
- 2.9.11 Oxygen Scavengers: May be used in injected seawater during steady state water injection and during initial injectivity tests.
- 2.9.12 Corrosion Inhibitor: May be used in the injected produced water.
- 2.9.13 Biocide: May be used in the injected water.
- 2.9.14 Xylene: May be used for asphaltene remediation.

2.10 Testing and Qualification

Testing and qualification of equipment shall be performed in accordance with the standards (API, ISO etc.) that have been identified herein. Regardless as to whether or not a standard has been identified for the equipment, CONTRACTOR shall test and qualify all equipment in accordance with documented plans and procedures (see Clause 2.11 – Technical Integrity Assurance). These tests shall include analysis for all installation, tie-back, production load cases, contingency tools, and interventions. Welding, mechanical testing, and non-destructive testing shall be performed in accordance with recognized COMPANY and international standards.

Additional testing and qualification may be required for non-standard (new or modified) equipment. Testing programs and procedures are subject to review and approval by COMPANY. CONTRACTOR shall perform Failure Mode Effect and Criticality Assessment (FMECA) for any downhole equipment that is of a new or modified design. COMPANY shall be given the option of taking part in FMECA programs.

All design assumptions and calculations shall be made available for audit or verification. All proposed equipment may be subjected to a COMPANY specified design review process (e.g., Detailed Design Review).

Gravel pack packers, when used as production packers, shall be qualified in accordance with API Specification 11D1 / ISO 14310 and to a design validation grade V3 for oil service and V0 for gas service. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.) The API monogram shall be required.

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2.11 Technical Integrity Assurance

Technical integrity assurance requirements inclusive of quality assurance, quality control, and design verification requirements are given in the following documents:

- BP-EPT-IAS-01: Integrity Assurance Specification (IAS) for the Procurement of Critical equipment for Drilling & Completions (excluding Tubular Products).
- BP-EPT-IAS-02: Integrity Assurance Specification (IAS) for the Procurement of Critical equipment for Drilling & Completions (excluding Tubular Products).
- BP-DC-EIA-DRP-01: Design Review Process for Drilling, Completion and Subsea Equipment.

In cases where a BP Global QCP exists, this shall be used for critical equipment.

2.12 Marking and Traceability

Where traceability is a requirement for compliance with the respective API or other standard, CONTRACTOR shall control and record the unique identification of equipment. The components shall be marked as follows:

- 2.12.1 Supplier's name.
- 2.12.2 COMPANY Purchase Order number.
- 2.12.3 Supplier part number.
- 2.12.4 Assembly number.
- 2.12.5 Serial number.
- 2.12.6 Size and rated working pressure.
- 2.12.7 Date of manufacture.
- 2.12.8 API Monogram (as appropriate).

2.13 Storage Requirements

CONTRACTOR is responsible for the storage and protection of all goods and materials being supplied. Goods and materials shall be adequately protected against corrosion, handling, and transportation damage through the use of suitable protection and measures which shall include, but not be limited to, the following:

- 2.13.1 All non-metallic completion items with the exception of fully assembled modules shall be stored in a temperature-controlled atmosphere to prevent deterioration.

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- 2.13.2 Elastomers, including packers and seal elements, shall be stored inside an environmentally controlled atmosphere in closed lightproof packets (complete with cure date and expiration date details) and protected against mechanical damage.
- 2.13.3 All metallic completion equipment shall be handled, transported, and stored in accordance with BP GIS-02-207, Guidance Document for the Handling, Transportation and Storage of Casing & Tubing (OCTG) or CONTRACTOR's procedures whichever is the more stringent. Although BP GIS-02-207 is for OCTG, the same requirements shall be applied to completion equipment as appropriate.
- 2.13.4 All CRA materials (see BP GIS-02-207, Section 3 for definition of CRA) shall be stored away from harmful environments such as chloride-laden atmosphere (salt air).
- 2.13.5 All completion items including all fully assembled modules shall be properly stored (vertical and / or horizontal) under cover to prevent corrosion, contamination, and damage. Ports and bores shall be protected to prevent ingress of debris, insects (and their remains) and / or animals (and their remains).
- 2.13.6 All completion items including fully assembled modules shall have the appropriate preservation / protection applied as advised by the original equipment manufacturer.
- 2.13.7 All temporary corrosion protection fluids and greases shall be of a low sulfur type, compatible with the intended hydrocarbon service and non-damaging to the completion.
- 2.13.8 Thread protectors shall be used for all threaded connections (composite plastic, breathable type for premium connections, steel style for API type connections).
- 2.13.9 CONTRACTOR shall ensure that all sealing surfaces shall be adequately protected against corrosion, impact, and abrasion damage.
- 2.13.10 Shear pins shall be closely controlled to avoid the risk of improper use in assembly and preparation. Procedures shall be in place to ensure segregation of new and used shear stock and other consumable items.
- 2.13.11 All equipment exposed to salt / brine atmosphere / fluids and returned to CONTRACTOR for storage shall be rinsed in potable water to ensure that no salt deposit remains and that the residual chloride ion concentration of the waste water is negligible (<100 milligrams per liter or the level of atmospheric chloride concentration, whichever is greater) after the equipment has been allowed to soak for 30 minutes.

3.0 OPEN HOLE GRAVEL PACK (OHGP) COMPLETIONS

3.1 General

The main objective is to achieve a complete gravel pack with a low skin.

- 3.1.1 Typical project sand face conditions can be found in Part 6 – Well Bore Information for representative well types.

3.2 Technical Requirements

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3.2.1 General

All equipment shall have a temperature rating, burst / collapse pressure rating, as identified in Clause 2.0 of this PART 3, unless otherwise specified by COMPANY.

All equipment shall be capable of being run and set inside the production casing as identified in Clause 2.0 of this PART 3, unless otherwise specified by COMPANY.

All equipment shall be of the appropriate metallurgy for the service required as given in Clause 2.0 of this PART 3, unless otherwise specified by COMPANY. All components to meet requirements of NACE MR-01-75 unless otherwise stated.

3.2.2 Gravel Pack Packer

The gravel pack packer is intended to provide the primary tubing to casing barrier during sand control operations. The packer is set and tested by means of the GP service tool.

- (a) Service life shall be 20 years, unless stated otherwise by COMPANY.
- (b) Packer shall have a 5,000 psi differential pressure rating (plugged and unplugged). A higher rating of 6,500 psi may be needed for some over-pressured reservoirs.
- (c) Minimum packer seal bore shall be 6.00".
- (d) Packer shall be capable of setting in solids laden synthetic oil-based mud.
- (e) The bottom connection shall be compatible with extensions and approved by COMPANY.
- (f) The tensile / compressive rating shall be compatible with the rating of screen base pipe.
- (g) Packer shall have bi-directional circumferential slips.
- (h) Packer shall be hydraulically set with GP service tool.
- (i) Packer shall be retrievable (cut or shifting tool) without having to mill.
- (j) Run in hole rate shall be 0.8 ft per second. Packer shall be capable of circulating while running in hole without risk of pre-set or swabbing of the element with the following circulating conditions: rate greater than 8 bpm in synthetic oil-based mud, plastic viscosity of 20, yield point of 24 at 120 degrees Fahrenheit.
- (k) Packer shall be capable of an over pull of 100,000 lbs and set down weight of 200,000 lbs without movement or compromise of seal element.
- (l) Packer shall be capable of pressure and compression / tension (+/- 40,000 lbs) testing following set without compromise to fluids or tools.
- (m) Packer shall allow for easy entry of wireline tools, coiled tubing tools, and tractors at high well bore deviations.

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- (n) Gravel pack packers, when used as production packers, shall be qualified in accordance with API Specification 11D1 / ISO 14310 and to a design validation grade V3 for oil service and V0 for gas service. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.) The API monogram shall be required.

3.2.3 Gravel Pack Extensions (including Gravel Circulation Port)

- (a) GP extensions shall be compatible with GP packer and Fluid Loss Control Valve.
- (b) The connections shall be COMPANY approved.
- (c) The gravel circulation port isolation sleeve shall be capable of mechanically being shifted closed when the GP service tool / wash pipe is pulled through the assembly.
- (d) The gravel circulation port isolation sleeve requires a positive means of position retention when open and closed (seal friction is not considered positive means of retention).
- (e) Tensile / Compressive rating shall be compatible with rating of screen base pipe.
- (f) Minimum differential pressure rating for isolation sleeve shall be 5,000 psi when closed. A rating of 6,500 psi is preferred.

3.2.4 GP Service Tool (Rental)

- (a) The service tool shall be capable of operations in solids laden reservoir drill in fluid.
- (b) The service tool shall be a one trip system.
- (c) The GP Packer Hydraulic Setting Tool shall have to follow requirements:
 - (i) A feature to allow circulation without applying a load to the packer setting mechanism.
 - (ii) Capable of setting the GP Packer with applied tubing pressure.
 - (iii) Allow for hydraulic release of service tool from packer, with a mechanical back-up release.
 - (iv) Allow gravel circulation port isolation sleeve to be locked in place once shifted open, and ball / flapper secured for reverse circulation.
- (d) The service tool shall have a differential pressure rating of 5,000 psi.
- (e) The service tool shall be designed to maintain hydrostatic overbalance to the open hole during all steps of the operation and prevent pressure surge and swabbing to the formation during setting of the packer and positioning of the tool prior to pumping gravel pack.
- (f) The service tool shall have a positive indication of position when performing all functions of the service tool (weight down in the gravel pack pumping position).

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- (g) The service tool shall be able to pump a slurry of 10 ppa at 10 bpm for a total of 100,000 lbs of gravel without performance degradation or erosion.
- (h) Service tool seals, collets, or other parts shall be compatible with 6.000" nominal seal bore.
- (i) The service tool shall be compatible with closing mechanism of gravel circulation port isolation sleeve assembly (capable of shifting mechanically with axial motion of the GP service tool).
- (j) The service tool shall be capable of carrying packer, screens and associated gravel pack extension assembly through well bore profile into open hole (packer remains inside casing). The tensile rating while carrying packer and screens shall be compatible with the screen coupling rating.
- (k) The service tool shall be capable of annulus pressure and push / pull test (+/- 40,000 lbs) of packer following setting without compromise to fluids or tools while maintaining communication with the formation.
- (l) The service tool shall be capable of redirecting the fluid flow path to the inside of the wash pipe string to facilitate post-gravel pack chemical treatment.
- (m) Tool shall provide a tell tale of final gravel port closing sleeve position.
- (n) The tool shall be compatible with shifting tools. The shifting tool for the Fluid Loss Control Valve shall not inadvertently open the port closure sleeve.

3.2.5 Quick Connect Sub

The quick connect sub negates the need for rotation of the GP assembly during the final make-up to the wash pipe / extensions / blanks.

- (a) The tensile / compressive rating shall be compatible with rating of screen base pipe.
- (b) Sub shall have an anti rotational lock capable of having limited (greater than 5,000 ft-lbs) torque put through it. Minimum collapse shall be equal to or greater than the gravel pack extension. Threads shall be compatible with the GP extension such that no crossovers are required.

3.2.6 Crossovers

Crossovers shall be manufactured in accordance with ISO 11960 (API 5CT) and BP GIS-02-203.

3.2.7 PBR

- (a) PBR in lower completion assembly shall accommodate a seal stinger on the wash pipe, to enable circulation down wash pipe and out through wash down shoe.
- (b) Pup joint

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If required, the PBR shall have a 5.5" pup joint (+/- 2 ft in length) for space out of the seal stinger inside the PBR.

- (c) The PBR shall have a device that provides a means of relieving the hydraulic lock between the wash pipe seals and wash down shoe check valves during movement of the wash pipe (if required).

3.2.8 Wash Down Shoe

- (a) A double check valve design shall be used to allow circulation (>8 bpm) and wash down while screen assemblies are being run in hole and to prevent returns when performing open hole gravel pack.
- (b) Check valve spring metallurgy shall be compatible with any fluid that may be circulated (e.g., acid).
- (c) GoM: If required, the wash down shoe shall have a 5.5" pup joint (+/- 2 ft in length) for space out of the seal stinger inside the PBR.

3.2.9 Wash Pipe (Rental)

- (a) The wash pipe shall be 4" OD, 11.6 ppf (or other appropriate size i.e., 2 7/8" OD, 6.5 ppf) and grade N80.
- (b) Connections shall be Hydril 511 connections or flush joint equivalent to be approved by COMPANY.
- (c) The wash pipe swivel (for connection of GP assembly to wash pipe string) shall be compatible with the Fluid Loss Control Valve ID.
- (d) The wash pipe shall have an internal corrosion resistant powder coating (TK34P).

3.2.10 Wash Pipe Tools (Rental)

- (a) A seal stack at the end of the wash pipe shall be required for isolation inside the PBR above the wash down shoe.
- (b) Gauge carriers shall be flush with the OD of the wash pipe.
- (c) Downhole electronic memory pressure and temperature gauges minimum requirements shall be: 0.5 second sample rate, 1MB memory, >14 days battery life, +/- 5 psi pressure accuracy, 0.05 psi pressure resolution, 0.5 degree Celsius temperature accuracy, and 0.001 degree Celsius temperature resolution.
- (d) Gauges shall be placed at locations in the wash pipe string specified by COMPANY.
- (e) In order to reduce differential pressure across the wash pipe, the wash pipe shall have valves to change flow path (reduce length of wash pipe).
- (f) Wash pipe tools shall have a logging tool to measure gravel density in the screen open hole annulus to assess degree of pack achieved.

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- (g) Wash pipe tools / carriers connections shall be compatible with wash pipe.
- (h) The same technician shall run both the gauges for wash pipe tools and downhole data acquisition.

3.2.11 Downhole Data Acquisition (Rental)

- (a) Gauge carriers shall be used to carry gauges for 100% redundancy.
- (b) At least two downhole electronic memory pressure and temperature gauges, measuring in both annulus and tubing, shall be provided and located above the GP service tool in the running string.
- (c) Downhole electronic memory pressure and temperature gauges minimum requirements shall be: 0.5 second sample rate, 1MB memory, >14 days battery life, +/- 5 psi pressure accuracy, 0.05 psi pressure resolution, 0.5 degree Celsius temperature accuracy, and 0.001 degree Celsius temperature resolution.
- (d) Data acquisition and reporting capabilities shall be COMPANY approved.

3.2.12 Upper Completion Interface

The upper completion interface for producers requires a latch seal extension and guide shoe to sting inside the lower completion.

- (a) Latch Mechanism
 - (i) Latch mechanism shall be compatible with gravel pack packer.
 - (ii) Latching mechanism shall be capable of verifying seal position with an over pull of 20,000 lbs (minimum 5% loss of snap force over 5 snap in / out cycles).
 - (iii) Latch shall be capable of taking 200,000 lbs set down weight when seals are fully landed in the packer to accommodate shearing upper contraction joint or PBR.
- (b) Seal Stack
 - (i) Seal extension and seal assembly shall seal inside GP extension PBR to isolate gravel circulating port.
 - (ii) Seal unit shall have a minimum ID of 4.6".
 - (iii) Bonded seals shall have elastomers as specified in Clause 2.0 of this PART 3 and be COMPANY approved.
- (c) Guide Shoe
 - (i) Guide shoe OD shall be compatible with GP packer and GP extension ID.

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- (ii) Guide shoe shall have self aligning functionality, and a spring covered by sleeve to isolate shoe from well bore fluid. CONTRACTOR does not provide a cover for sleeve to isolate shoe from well bore fluid.
- (iii) Guide shoe shall provide smooth continuity for intervention tools (CT or tractor).
- (iv) Guide shoe shall have a minimum ID of 4.6".

4.0 CASED HOLE FRAC PACK (CHFP) COMPLETIONS

4.1 General

- 4.1.1 Typical project sand face conditions can be found in Part 6 – Well Bore Information for representative well types.

4.2 Technical Requirements

4.2.1 General

All equipment shall have a temperature rating, burst / collapse pressure rating, as identified in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY.

All equipment shall be capable of being run and set inside the production casing as identified in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY.

All equipment shall be of the appropriate metallurgy for the service required as given in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY. All components to meet requirements of NACE MR-01-75 unless otherwise stated.

4.2.2 Gravel Pack Packer

The Gravel Pack packer is intended to provide the primary tubing to casing barrier during sand control operations. The packer is set and tested by means of the GP Service Tool.

- (a) Service life shall be 20 years, unless stated otherwise by COMPANY.
- (b) The differential pressure rating shall be 10,000 – 15,000 psi (plugged and unplugged, i.e., pressure test against FLCV). Further details can be found in Part 6 – Well Bore Information for representative well types.
- (c) Packer seal bores shall be 3.25 – 6.00". Further details can be found in Part 6 – Well Bore Information for representative well types.
- (d) Bottom connection shall be compatible with extensions and approved by COMPANY.
- (e) Tensile / compressive rating shall be compatible with rating of screen base pipe.
- (f) The packer shall have bi-directional circumferential slips.
- (g) Packer shall be hydraulically set with GP service tool.

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- (h) Packer shall be retrievable (cut or shifting tool) without having to mill.
- (i) Run in hole rate shall be 0.8 ft per second. Packer shall be capable of circulating while running in hole without risk of pre-set or swabbing of the element at rates greater than 8 bpm.
- (j) Packer shall have the ability to facilitate over pull of 100,000 lbs and set down weight of 160,000 lbs without movement or compromise of element seal. Further details can be found in Part 6 – Well Bore Information for representative well types.
- (k) Packer shall be capable of pressure test and compression / tension (+/- 40,000 lbs) test following packer set without compromise to fluids or tools.
- (l) Packer shall allow for easy entry of wireline tools, coiled tubing tools, and tractors at high deviations.
- (m) Packer shall be in accordance with API Specification 11D1 / ISO 14310 and to a design validation grade V3 for oil service and V0 for gas service unless otherwise specified by COMPANY. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.) The API monogram shall be required. Further details can be found in Part 6 – Well Bore Information for representative well types.

4.2.3 Gravel Pack Extensions (including Gravel Circulation Port)

- (a) Extensions shall be compatible with GP packer and Fluid Loss Control Valve.
- (b) Connections shall be COMPANY approved.
- (c) Gravel circulation port isolation sleeve shall be capable of mechanically being shifted closed when the GP service tool / wash pipe is pulled through the assembly.
- (d) Gravel circulation port isolation sleeve shall have a positive means of position retention when open and closed (seal friction is not considered positive means of retention).
- (e) The tensile / compressive rating shall be compatible with rating of screen base pipe.
- (f) The differential pressure rating shall have a minimum differential pressure rating for isolation sleeve shall be 10,000 psi when closed.

4.2.4 Gravel Pack Service Tool (Rental)

The GP Service Tool is a rental service tool used to set the Gravel Pack packer and provide a conduit for placing gravel pack slurry from the tubing ID to the annulus area outside the screens in the open hole.

- (a) The assembly shall be a one trip system.
- (b) The GP Packer Hydraulic Setting Tool shall meet the follow requirements:

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- (i) A feature to allow circulation without applying a load to the packer setting mechanism.
 - (ii) Capable of setting the GP Packer with applied tubing pressure.
 - (iii) Allow for hydraulic release of service tool from packer, with a mechanical back-up release.
 - (iv) Allow gravel circulation port isolation sleeve to be locked in place once shifted open, and ball secured for reverse circulation.
- (c) Differential pressure requirements can be found in Appendix – Well Bore Information for representative well types.
- (d) The service tool shall be designed to maintain hydrostatic overbalance to the open hole during all steps of operation and prevent pressure surge and swabbing to the formation during setting of the packer and positioning of the tool prior to pumping the gravel pack.
- (e) The service tool shall have positive indication of position when performing all functions of the service tool (weight-down in the gravel pack pumping position).
- (f) The service tool shall be compatible with closing mechanism of gravel circulation port isolation sleeve assembly (capable of shifting mechanically with axial motion of the GP service tool).
- (g) The service tool shall be capable of carrying packer, screens and associated gravel pack extension assembly through well bore. The tensile rating while carrying packer and screens shall be compatible with the screen coupling rating.
- (h) The service tool shall be capable of annulus pressure and push / pull test (+/- 40,000 lbs) of packer following setting without compromise to fluids or tools while maintaining communication with the formation
- (i) Service Tool seals, collets, or other parts shall be compatible with nominal seal bore.
- (j) The service tool shall be capable of pumping a slurry of up to 12 ppg at up to 45 bpm for a total of up to 300,000 lbs of gravel without performance degradation or erosion on larger systems. Further details can be found in Part 6 – Well Bore Information for representative well types.
- (k) The service tool shall have the ability to test gravel port closing sleeve after shifting closed.

4.2.5 Quick Connect Sub

The quick connect sub negates the need for rotation of the GP assembly during the final make-up to the wash pipe / extensions / blanks.

- (a) The tensile / compressive rating shall be compatible with rating of screen base pipe.

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- (b) Sub shall have an anti rotational lock capable of having limited (greater than 5,000 ft-lbs) torque put through it.
- (c) Body burst / collapse rating shall be compatible with gravel pack extension and further details can be found in Part 6 – Well Bore Information for representative well types.

4.2.6 Safety Shear Sub / Shear Safety Joint

- (a) The maximum tensile / compressive rating shall be compatible with rating of screen base pipe.
- (b) The body burst / collapse rating shall be compatible with gravel pack extension. Further details can be found in Part 6 – Well Bore Information for representative well types.
- (c) The shear rating shall be further details can be found in Part 6 – Well Bore Information for representative well types.

4.2.7 Crossovers

- (a) Crossovers shall be manufactured in accordance with ISO 11960 (API 5CT) and BP GIS-02-203.
- (b) Connections shall be compatible with blank pipe and extensions.

4.2.8 Sump Packer

- (a) Setting method shall be with drill pipe or electric line (if possible) for depth control.
- (b) Service life shall be 20 years, unless stated otherwise by COMPANY.
- (c) The minimum pressure rating shall be as per Part 6 – Well Bore Information for representative well types.
- (d) The minimum seal bore ID shall be as per Part 6 – Well Bore Information for representative well types.
- (e) The sump packer shall be in accordance with API Spec 11D1 / ISO 14310. Validation Grade V3 and Quality Grade Q1 shall be used. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.)

4.2.9 Wash Pipe (Rental)

- (a) Wash pipe size and grade shall be as per Part 6 – Well Bore Information for representative well types.
- (b) Connections shall be Hydril 511 connections or flush joint equivalent to be approved by COMPANY.
- (c) The wash pipe swivel (for connection of GP assembly to wash pipe string) shall be compatible with the Fluid Loss Control Valve ID.

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- (d) The wash pipe shall have an internal corrosion resistant powder coating (TK34P).

4.2.10 Wash Pipe Tools (Rental)

- (a) A seal stack at the end of the wash pipe shall be required for isolation inside the PBR above the wash down shoe.
- (b) Gauge carriers shall have a full bore equivalent to the ID of the pipe.
- (c) Gauge carriers to carry gauges for 100% redundancy.
- (d) Downhole electronic memory pressure and temperature gauges minimum requirements shall be: 0.5 second sample rate, 1MB memory, >14 days battery life, +/- 5 psi pressure accuracy, 0.05 psi pressure resolution, 0.5 degree Celsius temperature accuracy, and 0.001 degree Celsius temperature resolution.
- (e) Gauges shall be placed at locations in the wash pipe string specified by COMPANY.
- (f) In order to reduce differential pressure across the wash pipe, the wash pipe shall have valves to change flow path (reduce length of wash pipe).
- (g) Wash pipe tools shall have a logging tool to measure gravel density in the screen annulus to assess degree of pack achieved.
- (h) Wash pipe tools / carriers connections shall be compatible with wash pipe.
- (i) A seal stack at the end of the wash pipe shall be required for isolation inside the PBR above the wash down shoe.

4.2.11 Downhole Data Acquisition (Rental)

- (a) Gauge carriers shall be used to carry gauges for 100% redundancy.
- (b) At least two downhole electronic memory pressure and temperature gauges, measuring in both annulus and tubing, shall be provided and located above the GP service tool in the running string.
- (c) Downhole electronic memory pressure and temperature gauges minimum requirements shall be: 0.5 second sample rate, 1MB memory, >14 days battery life, +/- 5 psi pressure accuracy, 0.05 psi pressure resolution, 0.5 degree Celsius temperature accuracy, and 0.001 degree Celsius temperature resolution.
- (d) Data acquisition and reporting capabilities shall be COMPANY approved.

4.2.12 Upper Completion Interface and Locator Seal Assembly

The upper completion interface for producers requires a latch seal extension and guide shoe to sting inside the lower completion.

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- (a) Latch Mechanism
 - (i) Latch mechanism shall be compatible with gravel pack packer.
 - (ii) Latching mechanism shall be capable of verifying seal position with an over pull of 20,000 lbs (minimum 5% loss of snap force over 5 snap in / out cycles).
 - (iii) Latch shall be capable of taking 200,000 lbs set down weight when seals are fully landed in the packer to accommodate shearing upper contraction joint or PBR.
- (b) Seal Stack
 - (i) Seal extension and seal assembly shall seal inside extension PBR to isolate gravel circulating port.
 - (ii) See Part 6 – Well Bore Information for seal unit minimum ID for representative well types.
 - (iii) Bonded seals shall have elastomers as specified in Clause 2.0 of this Part 3 and be COMPANY approved.
- (c) Guide Shoe
 - (i) Guide shoe OD shall be compatible with GP packer and GP extension ID.
 - (ii) Guide shoe shall have self aligning functionality, and a spring covered by sleeve to isolate shoe from well bore fluid. CONTRACTOR does not provide a cover for sleeve to isolate shoe from well bore fluid.
 - (iii) Guide shoe shall allow for easy entry of wireline tools, coiled tubing tools, and tractors at high deviations.
 - (iv) See Part 6 – Well Bore Information for guide shoe minimum ID for representative well types.

5.0 FLUID LOSS CONTROL VALVES (FLCV)

5.1 General

All completion types will include the use of a mechanical fluid loss control valve.

A fluid loss control valve will be used in all completion types to isolate the reservoir from the upper completion and facilitate displacing the casing to completion brines. The device must seal in both directions and pass a pressure and underbalance test. The ability to open and close the valve several times during completion activities is required. Reliable remote actuation (opening) of the valve will be a critical factor for evaluation.

Both remote actuated or mechanical only type valves may be required for different applications.

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5.2 Technical Requirements

5.2.1 General

All equipment shall have a temperature rating, burst / collapse pressure rating, as identified in Clause 2.0 of this Part 3. Tool functionality shall be maintained at the low end of the temperature range (e.g., run in hole through mud line) although flow path sealing is not required.

All equipment shall be capable of being run and set inside the production casing as identified in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY.

All equipment shall be of the appropriate metallurgy for the service required as given in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY. All components to meet requirements of NACE MR-01-75 unless otherwise stated.

5.2.2 FLCV

- (a) OD shall have an allowance for an encapsulated line (11 mm x 11 mm) to be installed around valve.
- (b) OD shall be suitable for performing an OHGP or CHFP, i.e., circulating sand-laden slurry outside the valve body. Typical slurry conditions shall be to pump 200,000 lb of a 12 ppa slurry at 30 – 45 bpm.
- (c) ID shall be compatible with flush joint wash pipe, mechanical shifting tool, and GP logging tool.
- (d) The tensile / compressive rating shall be equal to or greater than rating of screen base pipe.
- (e) A pup joint (saver sub) shall be installed above and below. The length shall be specified by COMPANY.
- (f) The valve shall have the capability of mill-out of the ball / flapper as a contingency if it fails to open.
- (g) The valve shall be suitable for production rates of up to 50,000 barrels per day (1 pound per thousand barrels sand loading) and injection rates of 60,000 barrels per day (minimal solids). The valve shall not form a choke to the flow rate. Further details can be found in Appendix – Well Bore Information for representative well types.

5.2.3 Remote Opening Capability

- (a) The FLCV shall have the ability to open by remote actuation with the completion string in place and tubing hanger landed, without intervention.
- (b) Pressure required to open valve shall be compatible with other pressure limitations.

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- (c) The FLCV shall be able to be subjected to multiple (greater than 10) pressure cycles (e.g., packer setting, casing cleaning) without opening, i.e., having a unique opening pressure, signature, or signal.
- (d) The FLCV shall have the ability to open and close under fluid loss conditions greater than 20 bpm.
- (e) Mechanism shall be tolerant to debris (e.g., Ceramic 40 / 60 proppant, mud solids, perforating debris, pipe scale, rust, as well as formation sand and silt), particularly during hydraulic operation. Tolerant implies that the valve is capable of operations with a reasonable amount of debris inside and on top of the ball during both mechanical and hydraulic operations.
- (f) The FLCV shall have an optional ability to lock open (or not) once remotely actuated.

5.2.4 Mechanical Shifting Tools

- (a) A mechanical shifting tool shall have the capability to shift the valve closed by withdrawal of the wash pipe and open / close during subsequent intervention prior to remote actuation (open only, close only and open / close functionality required).
- (b) The tool shall be capable of passing through screen base pipe ID. Further details can be found in Appendix – Well Bore Information for representative well types.
- (c) The tool shall not interfere with the packer release mechanism or the gravel circulation port isolation sleeve mechanism in order to prevent inadvertent shifting of the sleeve during FLCV activities.

5.2.5 Mechanical Override Tools

- (a) A mechanical override tool shall have the capability to shift the valve open and closed.
- (b) The tool shall have the capability of being conveyed on either coiled tubing or an electric line tractor with low open / close force in horizontal sections.
- (c) The tool shall be capable of passing through well bore restrictions. Further details can be found in Appendix – Well Bore Information for representative well types.
- (d) The tool shall not interfere with the packer release mechanism or the gravel circulation port isolation sleeve mechanism in order to prevent inadvertent shifting of the sleeve during FLCV activities.

6.0 ANNULAR FLUID LOSS CONTROL VALVE FOR DHFC COMPLETIONS

6.1 General

In order to accommodate the DHFC upper completion, an intermediate fluid loss module containing a tubing valve and annulus valve is required. The fluid loss control devices interface with the downhole flow control completion components.

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6.2 Technical Requirements

6.2.1 General

All equipment shall have a temperature rating, burst / collapse pressure rating, as identified in Clause 2.0 of this Part 3. Tool functionality shall be maintained at the low end of the temperature range (e.g., run in hole through mud line) although flow path sealing is not required.

All equipment shall be capable of being run and set inside the production casing as identified in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY.

All equipment shall be of the appropriate metallurgy for the service required as given in Clause 2.0 of this Part 3, unless otherwise specified by COMPANY. All components to meet requirements of NACE MR-01-75 unless otherwise stated.

6.2.2 FLCV

- (a) Same functional requirements as stated in Clause 5.2.2 – FLCV, with the following exception: Mechanical shifting tool and / or override tool must be able to run through a concentric restriction. Further details can be found in Part 6 – Well Bore Information for representative well types.

6.2.3 PBR between Fluid Loss Control Valves

The PBR provides the sealing interface for the DHFC dip tube (upper completion) seal stack.

- (a) ID shall be compatible with DHFC dip tube seal stack OD.
- (b) The PBR shall accommodate +/- 15 ft stroke length of seals.

6.2.4 PBR between Fluid Loss Control Valves

- (a) The tensile / compressive rating shall be compatible with rating of dip tube pipe.
- (b) A pup joint (saver sub) shall be installed above and below. The length shall be specified by COMPANY.
- (c) Flow area for each injection stream shall be at least as large as that of the dip tube. It shall not form a choke to the flow rate. Components shall be designed to avoid erosion damage for injector rates of 60,000 barrels per day with 0.1 pounds per thousand barrels particles less 50 microns and for production rates of 50,000 barrels per day with 1 pound per thousand barrels sand loading.
- (d) The PBR shall be able to pass through dog leg severity of 4.5 degrees per 100 ft.

6.2.5 Remote Opening Capability

- (a) The annular FLCV shall have the ability to open by remote actuation with the completion string in place and tubing hanger landed, without intervention.

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- (b) Pressure required to open valve shall be compatible with system pressure limitations.
- (c) The annular FLCV shall have the ability to open and close under fluid loss conditions greater than 20 bpm.
- (d) Mechanism shall be tolerant to debris (e.g., Ceramic 40 / 60 proppant, mud solids, perforating debris, pipe scale, rust, as well as formation sand and silt), particularly during hydraulic operation. Tolerant implies that the valve is capable of operations with a reasonable amount of debris inside and on top of the ball during both mechanical and hydraulic operations.
- (e) The annular FLCV shall have an optional ability to lock open (or closed) once remotely actuated.

6.2.6 Mechanical Shifting Tools

- (a) The tool shall not interfere with the packer release mechanism or the tubing FLCV mechanism to prevent inadvertent shifting of the tubing FLCV during annular FLCV functioning.

6.2.7 Mechanical Override Tools

- (a) A mechanical override tool shall have the capability to shift the valve open.
- (b) The tool shall have the capability of being conveyed on either coiled tubing or an electric line tractor with low open / close force in horizontal sections.
- (c) The tool shall be capable of passing through well bore restrictions. Further details can be found in Part 6 – Well Bore Information for representative well types.
- (d) The tool shall not interfere with the packer release mechanism to prevent inadvertent shifting of the tubing FLCV during annular FLCV functioning.

6.2.8 Intermediate FLCV Module Dip Tube

- (a) Connections shall be Hunting SLF or equivalent to be approved by COMPANY.
- (b) The tube shall have a no go locator for lower completion PBR seal bore.
- (c) The tube shall have a seal stack and spacers with bonded elastomeric seals to fit ID of lower completion PBR seal bore.
- (d) The tube shall have a guide shoe with self aligning functionality, and a spring covered by sleeve to isolate from well bore fluid.

7.0 REFERENCES

- ISO 11960 (API Spec 5CT): Petroleum and natural gas industries – Steel pipes for use as casing or tubing for wells.

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ISO 14310 (API Spec 11D1): Petroleum and natural gas industries – Downhole equipment – packers and bridge plugs.

NACE MR-01-75: Sulfide stress cracking resistant materials for oilfield equipment.

API Specification 6A718: Specification of Nickel Base Alloy 718 (UNS N07718) for Oil and Gas Drilling and Production Equipment. 1st Edition March 2004*

* - Note In addition to the requirements of API Spec 6A718, COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1 as per Section 4.1.3.1 of API6A718.

BP References:

GIS 02-201: Specification for OCTG Seamless Casing & Tubing (Standard Grades).

GIS-02-203: Specification for OCTG Crossover Connectors.

GIS-02-204: Specification for OCTG Sour Resistant Grade C110 Low Alloy Steel OCTG Seamless Casing.

GIS-02-205: Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.

GIS-02-206: Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.

BP-EPT-IAS-01: Integrity Assurance Specification – For the Procurement of Critical equipment for Drilling and Completions.

For undated references, the latest edition of the normative document referred to applies.

8.0 DEFINITIONS AND ABBREVIATIONS

For the purposes of this Part 3 – Lower Completions, the following definitions and abbreviations will apply:

AISI:	American Iron and Steel Institute
API:	American Petroleum Institute
BHA:	Bottom Hole Assembly
bpm:	Barrels per minute
CHFP:	Cased Hole Frac Pack
CRA:	Corrosion-Resistant Alloy
DHFC:	Downhole Flow Control
EDTA:	Ethylenediamine Tetraacetic Acid
FLCV:	Fluid Loss Control Valve
FMECA:	Failure Mode Effect and Criticality
GoM:	Gulf of Mexico
GP:	Gravel Pack
HT:	High Temperature
IAS:	Integrity Assurance Specification
ID:	Internal Diameter
ISO:	International Organization for Standardization

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MB:	Megabyte
NACE:	National Association of Corrosion Engineers
NAS:	National Aerospace Standard
OD:	Outside Diameter
OEM:	Original Equipment Manufacturer
OHGP:	Open Hole Gravel Pack
ppa:	Proppant added per US gallon
psi:	Pounds Per Square Inch
QA:	Quality Assurance
QC:	Quality Control
QCP:	Quality Control Plan
RIH:	Run in Hole
SOBM:	Synthetic Oil-Based Mud
SOR:	Statement of Requirements
TEC:	Twisted Encapsulated Conductor
TR-SCSSV:	Tubing Retrieved Surface Controlled Subsurface Safety Valve
WBM:	Water-Based Mud
WEG:	Wireline Entry Guide

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Part 4 – Intelligent Wells

1.0 INTRODUCTION

These are the functional and technical specifications for Intelligent Wells.

2.0 GENERAL REQUIREMENTS

2.1 Production Casing and Tubing Summary

Casing sizes for the typical wells can be found in Part 6 – Well Bore Information for representative well types. Tubing sizes for the individual projects can be found in Appendix 3 and/or Appendix 4.

2.2 Connections

Unless specified otherwise herein, connections shall be a VAM-type premium connection.

2.3 Metallurgy

All completion component metallurgy shall be an equivalent or superior grade to the tubing unless otherwise specified by COMPANY. All selection of materials shall be subject to COMPANY approval.

The producers shall have a minimum grade of ISO 11960 (API 5CT) L80 13Cr, AISI 410 or AISI 420 modified. COMPANY may specify Super 13Cr or 25Cr. If a high strength alternative is required, it shall be Alloy 718 or equivalent. Injectors shall have a minimum grade of 25Cr, with nickel alloy 718 or equivalent as approved by COMPANY. COMPANY may require high strength alternatives to meet project requirements.

All components made from L80 13Cr, AISI 410 or AISI 420 modified shall conform to ISO 11960 (API 5CT), BP GIS-02-201 and BP GIS-02-203. All Super Duplex stainless steel shall conform to ISO 11960, BP GIS-02-206, and BP GIS-02-204.

All components made from Alloy 718 shall conform to API Specification API 6A718. COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1, as per Section 4.1.3.1 of API 6A718. All equipment material selection shall be subject to a metallurgy review to ensure acceptability regarding corrosion / erosion performance, material specifications and supplier qualification.

All components shall meet the requirements of NACE MR-01-75 unless otherwise stated by COMPANY on WORK ORDER.

2.4 Elastomers

Examples of production, completion, and intervention fluids that will be seen by the wells throughout field-life are Sodium Chloride / Bromide, Calcium Chloride / Bromide brines, natural gas, condensates, and gravel / frac packing fluids. Recommendations shall be made

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for elastomers that are suitable for project conditions. Elastomer recommendations shall be subject to COMPANY approval but suggested elastomers are as follows:

Typical Elastomer Seals

Seal Type	Elastomer
Packer elements	HNBR, Nitrile, CHEMRAZ, AFLAS, Viton
Chevron sets	HNBR, FKM, Viton, plus PTFE, plus PEEK
O-rings, T-seals etc	HNBR, FKM, Viton, plus PEEK back-ups
Safety valve	Non-elastomer

Final elastomer specification shall be made by COMPANY on WORK ORDER. Compatibility testing shall be required for all production and completion fluids.

2.5 Pressure Ratings / Tests

The bodies of the completion equipment shall be rated to at least the maximum anticipated well pressures, although a higher rating may be required for individual components, (e.g., TR-SCSSV control system, hydraulic actuation, absolute pressure components, etc.). The completions will be tested to the maximum anticipated pressures.

Pressure ratings and differential pressure requirements for the typical projects can be found on in Appendix – Well Bore Information. In general maximum anticipated pressures are 10,000 psi – 20,000 psi.

2.6 Temperature Rating

Equipment shall be rated for the temperature range 40 degrees Fahrenheit to 275 degrees Fahrenheit with HT range to include 300 degrees Fahrenheit.

Material strengths shall be de-rated as appropriate for the temperatures.

2.7 Well Profile

Wells will range from non-deviated (straight hole) to highly deviated (70-90 degrees). The completion intervals will range from non-deviated sections to highly deviated sections including horizontal for some OHGPs. Average build rate for planned well paths typically will not exceed an average of 4.5 degrees per 100 ft on any well. Dog leg severity at discrete points may be up to 10.0 degrees per 100 ft. For more details about typical well profiles, see Part 6 – Well Bore Information.

2.8 Mud / Fluid System

The reservoir section will be drilled with synthetic oil-based mud. The mud will be conditioned to a level between 175 and 325 US mesh using shaker screens prior to running casing. The sand control screens will be run in clear completion brines consisting of Calcium Bromide (CaBr₂), Calcium Chloride (CaCl₂), and / or Zinc Bromide (ZnBr).

2.9 Intervention Fluids and Treatment Chemicals

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It is anticipated that the following fluids may be used for well intervention purposes and for treatment of produced and injected fluids over the life of the well. The list is not exhaustive but covers the majority of fluids that are likely to be used. Detailed fluid selection will be specified in Part 6 – Well Bore Information.

- 2.9.1 Hydrochloric Acid (HCl): May be used for mud cake removal during well clean-up and for CaCO_3 scale removal. It is anticipated that HCl acid concentrations up to 15% may be used.
- 2.9.2 Scale Dissolvers / EDTA: May be used for mud cake removal during well clean-up and for removal of both BaSO_4 and CaCO_3 scales.
- 2.9.3 Mutual Solvents: May be pumped as part of chemical stimulation or scale inhibition treatments.
- 2.9.4 Surfactants: May be pumped as part of chemical stimulation or scale inhibition treatments.
- 2.9.5 Organic Solvents: May be used for stimulation treatments.
- 2.9.6 Scale Inhibitors: May be used to prevent both BaSO_4 and CaCO_3 scales. Scale inhibitors will be pumped in the tubing via the chemical injection mandrel above the production packer in producers. Scale inhibitors may also be required to be pumped into the formation in squeeze treatments.
- 2.9.7 Methanol: May be used for hydrate removal in the upper completion and the christmas tree.
- 2.9.8 Glycol: May be used for hydrate inhibition.
- 2.9.9 Relative Permeability Modifiers: May be used for water shut-off treatments.
- 2.9.10 Water Shut-off Gels: May be pumped into the formation as water shut-off treatments.
- 2.9.11 Oxygen Scavengers: May be used in injected seawater during steady state water injection and during initial injectivity tests.
- 2.9.12 Corrosion Inhibitor: May be used in the injected produced water.
- 2.9.13 Biocide: May be used in the injected water.
- 2.9.14 Xylene: May be used for asphaltene remediation.

2.10 Testing and Qualification

Testing and qualification of equipment shall be performed in accordance with the standards (API, ISO etc.) that have been identified herein. Regardless as to whether or not a standard has been identified for the equipment, CONTRACTOR shall test and qualify all equipment in accordance with documented plans and procedures (see Clause 2.11 – Technical Integrity Assurance). These tests shall include analysis for all installation, tie-back, production load cases, contingency tools, and interventions. Welding, mechanical testing, and non-destructive testing shall be performed in accordance with recognized COMPANY and international standards.

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Additional testing and qualification may be required for non-standard (new or modified) equipment. Testing programs and procedures are subject to review and approval by COMPANY. CONTRACTOR shall perform Failure Mode Effect and Criticality Assessment (FMECA) for any downhole equipment that is of a new or modified design. COMPANY shall be given the option of taking part in FMECA programs.

All design assumptions and calculations shall be made available for audit or verification. All proposed equipment may be subjected to a COMPANY specified design review process (e.g., Detailed Design Review).

Gravel pack packers, when used as production packers, shall be qualified in accordance with API Specification 11D1 / ISO 14310 and to a design validation grade V3 for oil service and V0 for gas service. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.) The API monogram shall be required.

2.11 Technical Integrity Assurance

Technical integrity assurance requirements inclusive of quality assurance, quality control, and design verification requirements are given in the following documents:

- BP-EPT-IAS-01: Integrity Assurance Specification (IAS) for the Procurement of Critical equipment for Drilling & Completions (excluding Tubular Products).
- BP-EPT-IAS-02: Integrity Assurance Specification (IAS) for the Procurement of Critical equipment for Drilling & Completions (excluding Tubular Products).
- BP-DC-EIA-DRP-01: Design Review Process for Drilling, Completion and Subsea Equipment.

In cases where a BP Global QCP exists, this shall be used for critical equipment.

2.12 Marking and Traceability

Where traceability is a requirement for compliance with the respective API or other standard, CONTRACTOR shall control and record the unique identification of equipment. The components shall be marked as follows:

- 2.12.1 Supplier's name.
- 2.12.2 COMPANY Purchase Order number.
- 2.12.3 Supplier part number.
- 2.12.4 Assembly number.
- 2.12.5 Serial number.
- 2.12.6 Size and rated working pressure.
- 2.12.7 Date of manufacture.
- 2.12.8 API Monogram (as appropriate).

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2.13 Storage Requirements

CONTRACTOR is responsible for the storage and protection of all goods and materials being supplied. Goods and materials shall be adequately protected against corrosion, handling, and transportation damage through the use of suitable protection and measures which shall include, but not be limited to, the following:

- 2.13.1 All non-metallic completion items with the exception of fully assembled modules shall be stored in a temperature-controlled atmosphere to prevent deterioration.
- 2.13.2 Elastomers, including packers and seal elements, shall be stored inside an environmentally controlled atmosphere in closed lightproof packets (complete with cure date and expiration date details) and protected against mechanical damage.
- 2.13.3 All metallic completion equipment shall be handled, transported, and stored in accordance with BP GIS-02-207, Guidance Document for the Handling, Transportation and Storage of Casing & Tubing (OCTG) or CONTRACTOR's procedures whichever is the more stringent. Although BP GIS-02-207 is for OCTG, the same requirements shall be applied to completion equipment as appropriate.
- 2.13.4 All CRA materials (see BP GIS-02-207, Section 3 for definition of CRA) shall be stored away from harmful environments such as chloride-laden atmosphere (salt air).
- 2.13.5 All completion items including all fully assembled modules shall be properly stored (vertical and / or horizontal) under cover to prevent corrosion, contamination, and damage. Ports and bores shall be protected to prevent ingress of debris, insects (and their remains) and / or animals (and their remains).
- 2.13.6 All completion items including fully assembled modules shall have the appropriate preservation / protection applied as advised by the original equipment manufacturer.
- 2.13.7 All temporary corrosion protection fluids and greases shall be of a low sulfur type, compatible with the intended hydrocarbon service and non-damaging to the completion.
- 2.13.8 Thread protectors shall be used for all threaded connections (composite plastic, breathable type for premium connections, steel style for API type connections).
- 2.13.9 CONTRACTOR shall ensure that all sealing surfaces shall be adequately protected against corrosion, impact, and abrasion damage.
- 2.13.10 Shear pins shall be closely controlled to avoid the risk of improper use in assembly and preparation. Procedures shall be in place to ensure segregation of new and used shear stock and other consumable items.
- 2.13.11 All equipment exposed to salt / brine atmosphere / fluids and returned to CONTRACTOR for storage shall be rinsed in potable water to ensure that no salt deposit remains and that the residual chloride ion concentration of the waste water is negligible (<100 milligrams per liter or the level of atmospheric chloride concentration, whichever is greater) after the equipment has been allowed to soak for 30 minutes.

3.0 DHFC WELLS

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3.1 General

The DHFC BHA will consist of filter sub, splice sub, feed-through packer, triple gauges, DHFC unshrouded valve, DHFC shrouded valve, shroud, internal pup joints with landing nipples, plug or junk baskets, perforated pups, and quick connects. Control lines and components will consist of 1/4" TEC control lines, 1/4" hydraulic control lines, encapsulation, cross-coupling and special protector clamps, and control line fittings.

All equipment shall have a temperature rating, burst / collapse pressure rating, as identified in Clause 2.0 of this Part 4. Tool functionality shall be maintained at the low end of the temperature range (e.g., run in hole through mud line) although flow path sealing is not required.

All equipment shall be capable of being run and set inside the production casing as identified in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.

All equipment shall be of the appropriate metallurgy for the service required as given in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY. All components to meet requirements of NACE MR-01-75 unless otherwise stated.

3.2 Permanent Production Packer for DHFC Wells

3.2.1 General

Production packers and associated equipment shall include, but not be limited to:

- Permanent packers.
- Packer recovery tools.
- Spares inventory for equipment and tools.
- Interventionless packer setting devices.
- Retrievable or removable packers.

3.2.2 Technical Requirements

The feed-through production packer is intended to provide the primary tubing to casing barrier.

- (a) OD shall be suitable to run through and set in specified casing.
- (b) ID shall be at least as large as full bore tubing.
- (c) Packer shall have an anti-pre-set mechanism.
- (d) The slips shall be bi-directional slips with as maximum circumferential contact as practically possible.
- (e) It shall be possible to circulate through the packer while running the completion.
- (f) The packer shall be capable of being set in a hole angle of up to 85 degrees.
- (g) The packer shall have premium tubing connections as detailed in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.

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- (h) Metallurgy shall be equivalent or better than tubing.
- (i) Elastomers shall be as detailed in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.
- (j) Temperature range shall be as detailed in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.
- (k) Packer shall allow for a minimum of two thread re-cuts.
- (l) Packer shall be removable (i.e., primary removal shall be cut-to-release).
- (m) Qualified packer envelopes shall be in accordance with ISO 14310 Validation Grade with V0 for gas producers or V3 for oil producers, unless otherwise specified by COMPANY. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.)
- (n) The equipment shall conform to ISO 14310 with Quality Grade of Q1. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.)
- (o) The equipment shall conform to NACE MR-01-75.
- (p) Hydrostatic is preferred method of packer setting, if available.
- (q) There shall be no relative body movement during setting.
- (r) Packer shall have feed-through for six lines.
- (s) There shall be a nipple profile between the packer and the flow-control valves for secondary packer setting assistance.

3.3 DHFC Valves

3.3.1 General

Downhole flow control valves shall include, but not be limited to:

- (a) Flow control valve for upper zone.
- (b) Flow control valve for lower zone with shroud.
- (c) Plug to set beneath lower valve.

Each valve must be capable of being functioned hydraulically independent of the other valve with three hydraulic lines. Four lines may be specified as an option.

In addition to normal operating requirements, the valves will be used during the completion operations, i.e., to set the packer and test the tubing.

3.3.2 Technical Requirements

- (a) Upper Valve

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- (i) Valve shall be sized to fit inside and function in casing sizes specified in Appendix 3 and/or Appendix 4.
 - (ii) For choking systems, the valve shall have a fully open position, a fully closed position and at least six intermediate positions. COMPANY will customize trim at time of WORK ORDER.
 - (iii) Valve shall be suitable for 45,000 barrels per day of production or injection in the fully open position.
 - (iv) For injection service, upper valve shall be equipped with a tungsten-carbide deflector to prevent casing erosion.
 - (v) Control line fluid shall be water-based.
 - (vi) Valve shall be able to function with 1,500 psi differential pressure. This includes repeated opening from a closed position with 1,500 psi differential in either direction without seal degradation.
 - (vii) The valve shall have a fully closed position against which the upper completion can be pressure tested to 5,000 psi during the initial installation operations.
 - (viii) The valve minimum ID shall allow for normal retrieval of shroud plug.
 - (ix) Collapse, burst, tensile, and compressive ratings shall be equal to or greater than those of the adjacent tubing.
 - (x) Valve shall be able to go to fully closed on one hydraulic pressure cycle.
 - (xi) Valve shall be suitable for dog leg severity of up to 6.0 degrees per 100 feet.
- (b) Lower Valve
- (i) Maximum OD shall be 7.5" to allow sufficient flow by area to upper zone.
 - (ii) For choking systems, the valve shall have a fully open position, a fully closed position and at least six intermediate positions. COMPANY will customize trim at time of WORK ORDER.
 - (iii) Valve shall be suitable for 45,000 barrels per day of production or injection in the fully open position.
 - (iv) Control line fluid shall be water-based.
 - (v) Valve shall be able to function with 1,500 psi differential pressure. This includes repeated opening from a closed position with 1,500 psi differential in either direction without seal degradation.
 - (vi) The valve shall have a fully closed position against which the upper completion can be pressure tested to 5,000 psi during the initial installation operations.

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- (vii) For injection the design shall ensure that the water flow does not risk compromising the integrity of the shroud by a hydro jetting effect.
- (viii) The valve minimum ID shall be suitable for specified production and injection rates.
- (ix) The valve minimum ID shall allow for normal retrieval of plug.
- (x) Collapse, burst, tensile, and compressive ratings shall be equal to or greater than those of the adjacent tubing.
- (xi) Maximum valve closure time from any position 10 minutes to minimize cross flow.
- (xii) Valve shall be suitable for dog leg severity of up to 6.0 degrees per 100 feet

3.4 Flow Control Systems and Other Subsidiary Items

3.4.1 General

Flow Control systems and subsidiary items shall include, but not be limited to:

- Landing nipples.
- Wireline entry guides (WEGs).
- Crossovers.

3.4.2 Technical Requirements

(a) Landing Nipples

- (i) Landing nipples shall conform to ISO 16070. ISO 16070 Quality Grade Q1 and Validation Grade V2 shall apply.
- (ii) Material shall comply with API and NACE MR-01-75.
- (iii) A no go shoulder shall be required only for locating and setting flow control devices and shall not be a load bearing point; therefore, no go sizing shall be minimized.
- (iv) The landing nipple shall have a standard pressure rating as determined by the pressure rating of the tubing connection. Further details can be found in Appendix 3 and/or Appendix 4.
- (v) Ideally the nipple profile shall be designed in such a way as to allow for Original Equipment Manufacturer (OEM) locks to be utilized where necessary.
- (vi) Landing nipples shall have premium tubing connections as detailed in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.

(b) Locks

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- (i) The lock shall be retrievable at all times during the life of the well.
 - (ii) The lock shall be designed so that it may only be located and set in a proper nipple profile.
 - (iii) The lock shall have a standard pressure rating as determined by the pressure rating of the tubing connection. Further details can be found in Appendix 3 and/or Appendix 4.
 - (iv) Locks shall conform to ISO 16070, Quality Grade Q1 and Validation Grade V2 shall apply.
 - (v) The lock shall have a simple and rugged construction minimizing moving parts e.g., expander mandrel and lock dogs.
 - (vi) The lock shall have no springs behind lock dogs.
 - (vii) The lock shall be designed to withstand sand and small debris.
 - (viii) The locks shall have large area, pressure-bearing locking dogs for greater pressure capabilities from above and below. Lock dogs shall be the pressure / load bearing point and not the no go.
 - (ix) Lock dogs shall be designed to lift the no go off the locating point when in the set position. This will eliminate no go swaging.
 - (x) The lock shall have a positive locking mechanism that prevents vibration affects from un-seating the locks.
 - (xi) The lock shall have an external fishing neck for easy retrieval.
 - (xii) The lock shall have a smooth bore inside that inhibits corrosion or sticking by foreign elements.
 - (xiii) The lock shall have a positive locking indicator in the running tool to confirm that the lock is set as designed.
 - (xiv) The lock shall be compatible with standard wireline equipment, coiled tubing equipment, and electric line tractors.
 - (xv) A junk basket shall be required that has an ID that will fit inside the tubing so that debris will not fall down outside of basket.
- (c) Crossovers
- (i) The length shall allow for at least two re-cuts of each thread.
 - (ii) The length will allow a minimum of 5-7/8" space after re-cuts, plus 2" clearance plus marking area.
 - (iii) The maximum total length shall be 24".
 - (iv) Crossovers shall be manufactured in accordance with ISO 11960 (API 5CT) and BP GIS-02-203.

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- (v) Crossovers shall have premium tubing connections as detailed in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.

3.5 Quick Connect Sub

3.5.1 General

The quick connect sub is to negate the need for rotation of the DHFC assembly during the make up to the dip tube.

3.5.2 Technical Requirements

- (a) The tensile / compressive rating shall be greater than tubing thread.
- (b) The quick connect sub shall have an anti rotational lock capable of having limited (greater than 5,000 ft-lbs) torque put through it.
- (c) The quick connect sub shall be equipped with a premium seal stack good for production or injection loads (no o-rings).
- (d) The quick connect sub shall be externally testable.

3.6 Downhole Gauges for DHFC Wells

3.6.1 General

Downhole gauges and associated equipment shall include, but not be limited to:

- Downhole Pressure / Temperature gauge(s).
- Cable head.
- Gauge mandrel.
- Cable.
- Control line.
- Card for the Subsea Control Module.

Continuous data read-outs shall be required on the rig throughout the installation process. Continuous data collection shall be required after the well has been completed.

The gauge connectors at the hanger, tree, tubing hanger running tool, emergency disconnect package, etc., will be supplied by others. The gauge mandrel shall not form a choke to flow, i.e., its internal bore shall be at least as large as that of the tubing.

3.6.2 Technical Requirements

(a) Gauge Mandrels

- (i) Gauge mandrel shall be designed to the same tension, compression, burst and collapse ratings equal to or greater than those of the adjacent tubing.

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- (ii) Metallurgy shall be equivalent or better than tubing.
 - (iii) ID shall be at least as large as full bore tubing.
 - (iv) Gauge mandrel shall have a one-piece body.
 - (v) Gauge mandrel shall have premium tubing connections as detailed in Clause 2.0 of this Part 4, unless otherwise specified by COMPANY.
 - (vi) Three gauges shall be provided to give pressure and temperature readings in the following locations:
 - Inside tubing above upper valve (ported inwards – capable of reading tubing pressure and temperature above DHFC valves).
 - In the tubing-by-casing annulus at upper valve (Ported outwards – capable of reading pressure and temperature from upper zone when valve is closed).
 - Inside tubing below lower valve (Fitted with snorkel tube and ported to below the lower DHFC valve – capable of reading pressure and temperature from lower zone when valve is closed).
 - (vii) Gauge mandrel shall be below drift in casing including allowance for passage of the hydraulic lines for DHFC valves.
- (b) Pressure and Temperature Gauges
- (i) These requirements shall be met:

Pressure and Temperature Gauge Specifications

Type	Range	Max Drift	Accuracy	Resolution
Pressure	1,000 – 15,000 psi	3 psi per yr	+/- 43 psi	0.01 psi
Temperature	40 – 275 degrees Fahrenheit	+/- 0.09 degrees Fahrenheit per year	+/- 1.8 degrees Fahrenheit	0.002 degrees Fahrenheit

- (ii) Sampling rate shall be one data point per second.
- (iii) Quartz gauges shall be used.
- (iv) Gauges shall be protected from shocks by design, and the efficiency of protection shall be tested and documented. A shock tolerance of 11 g shall be required.
- (v) Gauges shall be tested to confirm resistance to vibration. Vibration resistance test procedures and results shall be fully documented.
- (vi) Gauges shall be isolated from well-bore fluids and shall be unaffected by pressure breathing.
- (vii) Isolation seals shall be metal-to-metal and back-up elastomeric seals shall be of a material specified in Clause 2.0 of this Part 4. Final seal choice shall be made by COMPANY on WORK ORDER.

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- (viii) Cable head shall be externally testable.
 - (ix) Cable head shall be of thread and ferrule type. Welded cable head connections shall not be accepted.
 - (x) One gauge shall be ported into tubing, one gauge shall be ported outward to the annulus, and one gauge shall be fitted with a snorkel tube and ported to the lower DHFC valve shroud.
- (c) SCM Card
- The card shall interface successfully with the subsea production system.
- (d) Cable and Accessories
- (i) Cable shall have an Incoloy 825 sheath.
 - (ii) Cable shall be encapsulated with Santoprene or Halor equivalent Polyimide thermoplastic, unless otherwise specified by COMPANY. Further details can be found in Part 6 – Well Bore Information for representative well types.
 - (iii) Size and flat pack configuration shall be indicated on specified in Appendix 3 and/or Appendix 4. Lengths shall be specified by COMPANY on WORK ORDER.

3.7 Control Lines and Accessories

3.7.1 General

The gauge lines and other control lines within the completion may be flat packed together if this is deemed to be the most efficient for installation by COMPANY.

3.7.2 Technical Requirements

(a) General

- (i) All lines shall be seamless or welded and floating plug drawn bright-annealed or welded lines in Incoloy 825. COMPANY shall specify requirement on WORK ORDER.
- (ii) CONTRACTOR shall supply Incoloy 825 twin ferrule compression fittings suitable for use at working pressure. Further details can be found in Appendix – Well Bore Information for representative well types.
- (iii) Fittings shall either be Autoclave brand or be another brand approved by COMPANY.
- (iv) The lines shall be encapsulated with thermoplastic material, which has a minimum thickness of 2 mm (Santoprene or Halor equivalent Polyimide thermoplastic). Further details can be found in Appendix 3 and/or Appendix 4 for representative well types.
- (v) Fluid cleanliness shall be to NAS-1638v Class 6 or cleaner.

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- (vi) Temperature rating shall be 40 to 275 degrees Fahrenheit.
- (b) Electrical Line
 - (i) Working pressure as specified in Appendix – Well Bore Information with adequate factors of safety to be provided.
 - (ii) Hardness of line shall meet or exceed NACE MR-01-75 specification for sour service, as appropriate.
 - (iii) Cable shall be copper mono-conductor (compatible with gauges).
 - (iv) Cable shall be suitably armored for deployment conditions.
- (c) DHFC Control Lines
 - (i) Working pressure as specified in Part 6 – Well Bore Information with adequate factors of safety to be provided.
 - (ii) Hardness of line shall meet or exceed NACE MR-01-75 specification for sour service, as appropriate.
- (d) Splice Subs
 - (i) Splice sub shall be quoted with and without an engineered communication between the three lines to allow for intervention valve movement. This communication pathway shall not hinder normal operation of the DHFC valves.
 - (ii) Splice sub shall provide ease of module make up and installation allowing for assemblies to be pre-made-up and tested onshore to minimize critical path rig time during installation.
 - (iii) Collapse, burst, tensile, and compressive ratings shall be equal to or greater than those of the adjacent tubing.
 - (iv) Metallurgy shall be equivalent or better than tubing.
 - (v) ID shall be at least as large as adjacent tubing.
 - (vi) Splice sub shall be below drift of casing.
 - (vii) Splice sub shall meet the requirements of NACE MR-01-75 specification for sour service, as appropriate.

3.8 Line Protectors

3.8.1 General

Protectors shall include cross coupling protectors and specialty protectors (e.g., TR-SCSSV and other BHAs).

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Details on the number of control lines and flat pack configurations shall be specified by COMPANY on WORK ORDER. Appendix 3 and/or Appendix 4 contains recommended configurations.

The protectors shall protect and support the various lines along the tubing at their most vulnerable positions. At the tubing couplings, it is necessary to clamp one cross coupling protector. At the completion components, it is recommended to use one protector at each end, which do not cover the lines but give a good curve and alignment to the lines.

Protectors shall protect the lines from potential damage caused by any part of the well completion process, especially caused by the dynamic motion of the tubing in the well bore. They shall support the lines with no slippage.

The protectors shall align the tubing in such a way that the protectors do not impede the completion, running smoothly into the production casing. In addition, they shall be retrievable and reusable if the completion is pulled.

3.8.2 Technical Requirements

- (a) Lines shall be supported with no slippage.
- (b) Line protectors shall have a flat pack grip capacity equivalent to at least 90 feet of flat pack weight.
- (c) Line protectors shall have chamfered edges to prevent hang up while running in or out of the well.

4.0 REFERENCES

- | | |
|----------------------------|--|
| ISO 11960 (API Spec 5CT): | Petroleum and natural gas industries – Steel pipes for use as casing or tubing for wells. |
| ISO 14310 (API Spec 11D1): | Petroleum and natural gas industries – Downhole equipment – packers and bridge plugs. |
| NACE MR-01-75: | Sulfide stress cracking resistant materials for oilfield equipment. |
| API Specification 6A718: | Specification of Nickel Base Alloy 718 (UNS N07718) for Oil and Gas Drilling and Production Equipment. 1st Edition March 2004* |

* - Note In addition to the requirements of API Spec 6A718, COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1 as per Section 4.1.3.1 of API6A718.

BP References:

- | | |
|-------------|--|
| GIS 02-201: | Specification for OCTG Seamless Casing & Tubing (Standard Grades). |
| GIS-02-203: | Specification for OCTG Crossover Connectors. |
| GIS-02-204: | Specification for OCTG Sour Resistant Grade C110 Low Alloy Steel OCTG Seamless Casing. |

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- GIS-02-205: Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
- GIS-02-206: Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
- BP-EPT-IAS-01: Integrity Assurance Specification – For the Procurement of Critical equipment for Drilling and Completions.

For undated references, the latest edition of the normative document referred to applies.

5.0 DEFINITIONS AND ABBREVIATIONS

For the purposes of this Part 4 – Intelligent Wells, the following definitions and abbreviations will apply:

AISI:	American Iron and Steel Institute
API:	American Petroleum Institute
BHA:	Bottom Hole Assembly
bpm:	Barrels per minute
CHFP:	Cased Hole Frac Pack
CRA:	Corrosion-Resistant Alloy
DHFC:	Downhole Flow Control
EDTA:	Ethylenediamine Tetraacetic Acid
FLCV:	Fluid Loss Control Valve
FMECA:	Failure Mode Effect and Criticality
GoM:	Gulf of Mexico
GP:	Gravel Pack
HT:	High Temperature
IAS:	Integrity Assurance Specification
ID:	Internal Diameter
ISO:	International Organization for Standardization
NACE:	National Association of Corrosion Engineers
NAS:	National Aerospace Standard
OD:	Outside Diameter
OEM:	Original Equipment Manufacturer
OHGP:	Open Hole Gravel Pack
psi:	Pounds Per Square Inch
QA:	Quality Assurance
QC:	Quality Control
QCP:	Quality Control Plan
RIH:	Run in Hole
SOBM:	Synthetic Oil-Based Mud
SOR:	Statement of Requirements
TEC:	Twisted Encapsulated Conductor
TR-SCSSV:	Tubing Retrieved Surface Controlled Subsurface Safety Valve
WBM:	Water-Based Mud
WEG:	Wireline Entry Guide

Part 5 – Upper Completions

1.0 INTRODUCTION

These are the functional and technical specifications for Upper Completions.

2.0 GENERAL REQUIREMENTS

2.1 Production Casing and Tubing Summary

Casing sizes for the typical wells can be found in Part 6 – Well Bore Information for representative well types. Tubing sizes for the individual projects can be found in Appendix 3 and/or Appendix 4.

2.2 Connections

Unless specified otherwise herein, connections shall be a VAM-type premium connection.

2.3 Metallurgy

All completion component metallurgy shall be an equivalent or superior grade to the tubing unless otherwise specified by COMPANY. All selection of materials shall be subject to COMPANY approval.

The producers shall have a minimum grade of ISO 11960 (API 5CT) L80 13Cr, AISI 410 or AISI 420 modified. COMPANY may specify Super 13Cr or 25Cr. If a high strength alternative is required, it shall be Alloy 718 or equivalent. Injectors shall have a minimum grade of 25Cr, with nickel alloy 718 or equivalent as approved by COMPANY. COMPANY may require high strength alternatives to meet project requirements.

All components made from L80 13Cr, AISI 410 or AISI 420 modified shall conform to ISO 11960 (API 5CT), BP GIS-02-201 and BP GIS-02-203. All Super Duplex stainless steel shall conform to ISO 11960, BP GIS-02-206, and BP GIS-02-204.

All components made from Alloy 718 shall conform to API Specification API 6A718. COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1, as per Section 4.1.3.1 of API 6A718. All equipment material selection shall be subject to a metallurgy review to ensure acceptability regarding corrosion / erosion performance, material specifications and supplier qualification.

All components shall meet the requirements of NACE MR-01-75 unless otherwise stated by COMPANY on WORK ORDER.

2.4 Elastomers

Examples of production, completion, and intervention fluids that will be seen by the wells throughout field-life are Sodium Chloride / Bromide, Calcium Chloride / Bromide brines, natural gas, condensates, and gravel / frac packing fluids. Recommendations shall be made

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for elastomers that are suitable for project conditions. Elastomer recommendations shall be subject to COMPANY approval but suggested elastomers are as follows:

Typical Elastomer Seals

Seal Type	Elastomer
Packer elements	HNBR, Nitrile, CHEMRAZ, AFLAS, Viton
Chevron sets	HNBR, FKM, Viton, plus PTFE, plus PEEK
O-rings, T-seals etc	HNBR, FKM, Viton, plus PEEK back-ups
Safety valve	Non-elastomer

Final elastomer specification shall be made by COMPANY on WORK ORDER. Compatibility testing shall be required for all production and completion fluids.

2.5 Pressure Ratings / Tests

The bodies of the completion equipment shall be rated to at least the maximum anticipated well pressures, although a higher rating may be required for individual components, (e.g., TR-SCSSV control system, hydraulic actuation, absolute pressure components, etc.). The completions will be tested to the maximum anticipated pressures.

Pressure ratings and differential pressure requirements for the typical projects can be found in Appendix – Well Bore Information. In general maximum anticipated pressures are 10,000 psi – 20,000 psi.

2.6 Temperature Rating

Equipment shall be rated for the temperature range 40 degrees Fahrenheit to 275 degrees Fahrenheit with HT range to include 300 degrees Fahrenheit.

Material strengths shall be de-rated as appropriate for the temperatures.

2.7 Well Profile

Wells will range from non-deviated (straight hole) to highly deviated (70-90 degrees). The completion intervals will range from non-deviated sections to highly deviated sections including horizontal for some OHGPs. Average build rate for planned well paths typically will not exceed an average of 4.5 degrees per 100 ft on any well. Dog leg severity at discrete points may be up to 10.0 degrees per 100 ft. For more details about typical well profiles, see Part 6 – Well Bore Information.

2.8 Mud / Fluid System

The reservoir section will be drilled with synthetic oil-based mud. The mud will be conditioned to a level between 175 and 325 US mesh using shaker screens prior to running casing. The sand control screens will be run in clear completion brines consisting of Calcium Bromide (CaBr₂), Calcium Chloride (CaCl₂), and / or Zinc Bromide (ZnBr).

2.9 Intervention Fluids and Treatment Chemicals

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It is anticipated that the following fluids may be used for well intervention purposes and for treatment of produced and injected fluids over the life of the well. The list is not exhaustive but covers the majority of fluids that are likely to be used. Detailed fluid selection will be specified in Part 6 – Well Bore Information.

- 2.9.1 Hydrochloric Acid (HCl): May be used for mud cake removal during well clean-up and for CaCO_3 scale removal. It is anticipated that HCl acid concentrations up to 15% may be used.
- 2.9.2 Scale Dissolvers / EDTA: May be used for mud cake removal during well clean-up and for removal of both BaSO_4 and CaCO_3 scales.
- 2.9.3 Mutual Solvents: May be pumped as part of chemical stimulation or scale inhibition treatments.
- 2.9.4 Surfactants: May be pumped as part of chemical stimulation or scale inhibition treatments.
- 2.9.5 Organic Solvents: May be used for stimulation treatments.
- 2.9.6 Scale Inhibitors: May be used to prevent both BaSO_4 and CaCO_3 scales. Scale inhibitors will be pumped in the tubing via the chemical injection mandrel above the production packer in producers. Scale inhibitors may also be required to be pumped into the formation in squeeze treatments.
- 2.9.7 Methanol: May be used for hydrate removal in the upper completion and the christmas tree.
- 2.9.8 Glycol: May be used for hydrate inhibition.
- 2.9.9 Relative Permeability Modifiers: May be used for water shut-off treatments.
- 2.9.10 Water Shut-off Gels: May be pumped into the formation as water shut-off treatments.
- 2.9.11 Oxygen Scavengers: May be used in injected seawater during steady state water injection and during initial injectivity tests.
- 2.9.12 Corrosion Inhibitor: May be used in the injected produced water.
- 2.9.13 Biocide: May be used in the injected water.
- 2.9.14 Xylene: May be used for asphaltene remediation.

2.10 Testing and Qualification

Testing and qualification of equipment shall be performed in accordance with the standards (API, ISO etc.) that have been identified herein. Regardless as to whether or not a standard has been identified for the equipment, CONTRACTOR shall test and qualify all equipment in accordance with documented plans and procedures (see Clause 2.11 – Technical Integrity Assurance). These tests shall include analysis for all installation, tie-back, production load cases, contingency tools, and interventions. Welding, mechanical testing, and non-destructive testing shall be performed in accordance with recognized COMPANY and international standards.

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Additional testing and qualification may be required for non-standard (new or modified) equipment. Testing programs and procedures are subject to review and approval by COMPANY. CONTRACTOR shall perform Failure Mode Effect and Criticality Assessment (FMECA) for any downhole equipment that is of a new or modified design. COMPANY shall be given the option of taking part in FMECA programs.

All design assumptions and calculations shall be made available for audit or verification. All proposed equipment may be subjected to a COMPANY specified design review process (e.g., Detailed Design Review).

Gravel pack packers, when used as production packers, shall be qualified in accordance with API Specification 11D1 / ISO 14310 and to a design validation grade V3 for oil service and V0 for gas service. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.) The API monogram shall be required.

2.11 Technical Integrity Assurance

Technical integrity assurance requirements inclusive of quality assurance, quality control, and design verification requirements are given in the following documents:

- BP-EPT-IAS-01: Integrity Assurance Specification (IAS) for the Procurement of Critical equipment for Drilling & Completions (excluding Tubular Products).
- BP-EPT-IAS-02: Integrity Assurance Specification (IAS) for the Procurement of Critical equipment for Drilling & Completions (excluding Tubular Products).
- BP-DC-EIA-DRP-01: Design Review Process for Drilling, Completion and Subsea Equipment.

In cases where a BP Global QCP exists, this shall be used for critical equipment.

2.12 Marking and Traceability

Where traceability is a requirement for compliance with the respective API or other standard, CONTRACTOR shall control and record the unique identification of equipment. The components shall be marked as follows:

- 2.12.1 Supplier's name.
- 2.12.2 COMPANY Purchase Order number.
- 2.12.3 Supplier part number.
- 2.12.4 Assembly number.
- 2.12.5 Serial number.
- 2.12.6 Size and rated working pressure.
- 2.12.7 Date of manufacture.
- 2.12.8 API Monogram (as appropriate).

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2.13 Storage Requirements

CONTRACTOR is responsible for the storage and protection of all goods and materials being supplied. Goods and materials shall be adequately protected against corrosion, handling, and transportation damage through the use of suitable protection and measures which shall include, but not be limited to, the following:

- 2.13.1 All non-metallic completion items with the exception of fully assembled modules shall be stored in a temperature-controlled atmosphere to prevent deterioration.
- 2.13.2 Elastomers, including packers and seal elements, shall be stored inside an environmentally controlled atmosphere in closed lightproof packets (complete with cure date and expiration date details) and protected against mechanical damage.
- 2.13.3 All metallic completion equipment shall be handled, transported, and stored in accordance with BP GIS-02-207, Guidance Document for the Handling, Transportation and Storage of Casing & Tubing (OCTG) or CONTRACTOR's procedures whichever is the more stringent. Although BP GIS-02-207 is for OCTG, the same requirements shall be applied to completion equipment as appropriate.
- 2.13.4 All CRA materials (see BP GIS-02-207, Section 3 for definition of CRA) shall be stored away from harmful environments such as chloride-laden atmosphere (salt air).
- 2.13.5 All completion items including all fully assembled modules shall be properly stored (vertical and / or horizontal) under cover to prevent corrosion, contamination, and damage. Ports and bores shall be protected to prevent ingress of debris, insects (and their remains) and / or animals (and their remains).
- 2.13.6 All completion items including fully assembled modules shall have the appropriate preservation / protection applied as advised by the original equipment manufacturer.
- 2.13.7 All temporary corrosion protection fluids and greases shall be of a low sulfur type, compatible with the intended hydrocarbon service and non-damaging to the completion.
- 2.13.8 Thread protectors shall be used for all threaded connections (composite plastic, breathable type for premium connections, steel style for API type connections).
- 2.13.9 CONTRACTOR shall ensure that all sealing surfaces shall be adequately protected against corrosion, impact, and abrasion damage.
- 2.13.10 Shear pins shall be closely controlled to avoid the risk of improper use in assembly and preparation. Procedures shall be in place to ensure segregation of new and used shear stock and other consumable items.
- 2.13.11 All equipment exposed to salt / brine atmosphere / fluids and returned to CONTRACTOR for storage shall be rinsed in potable water to ensure that no salt deposit remains and that the residual chloride ion concentration of the waste water is negligible (<100 milligrams per liter or the level of atmospheric chloride concentration, whichever is greater) after the equipment has been allowed to soak for 30 minutes.

3.0 UPPER COMPLETION EQUIPMENT

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3.1 General

The Upper Completion Equipment shall include the equipment that starts after the installation of the lower completion.

3.2 Production Packers and Associated Equipment

3.2.1 General

Production packers and associated equipment shall include, but not be limited to:

- (a) Permanent packers.
- (b) Packer recovery tools
- (c) Spares Inventory for equipment and tools.
- (d) Intervention-less packer setting devices.
- (e) Retrievable or removable packers.

COMPANY aims to install its completions in a single trip, i.e., with no wireline or coiled tubing (CT) operations. The completion shall include a device to set the packer remotely from surface without the requirement for any wireline work. A secondary setting mechanism shall be provided in the event that the primary mechanism fails.

The upper completion shall isolate any potential weak points in the lower completion (i.e., gravel pack closure sleeve).

3.2.2 Technical Requirements

- (a) Permanent Production Packer for Non-DHFC Wells
 - (i) OD shall be suitable to run through and set in specified casing.
 - (ii) ID shall be at least as large as full bore tubing.
 - (iii) Packer shall have a one piece body.
 - (iv) Packer shall have an anti-pre-set mechanism.
 - (v) The slips shall be bi-directional slips with as maximum circumferential contact as practically possible.
 - (vi) It shall be possible to circulate through the packer while running the completion.
 - (vii) The packer shall be capable of being set in a hole angle of up to 85 degrees.
 - (viii) The packer shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.

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- (ix) Metallurgy shall be equivalent or better than tubing.
 - (x) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (xi) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (xii) Differential pressure rating shall be range from 10,000 psi to 15,000 psi, as specified in Appendix 3 and/or Appendix 4.
 - (xiii) Packer shall allow for a minimum of two thread re-cuts.
 - (xiv) Packer shall be suitable for production fluids and completion / intervention fluids. Further details can be found in Appendix – Well Bore Information for representative well types.
 - (xv) Packer shall be removable (i.e., primary removal shall be cut-to-release).
 - (xvi) Qualified packer envelopes shall be in accordance with ISO 14310 Validation Grade with V0 for gas producers or V3 for oil producers, unless otherwise specified by COMPANY. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.)
 - (xvii) The equipment shall conform to ISO 14310 with Quality Grade of Q1. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.)
 - (xviii) The equipment shall conform to NACE MR-01-75.
 - (xix) Hydrostatic is preferred method of packer setting, if available.
- (b) Pressure Cycled Disappearing Plug

This shall be the setting module for internal testing of tubing while running in hole and setting production packer.

- (i) The plug shall be a one trip system.
- (ii) The plug shall have full bore access when the valve is open.
- (iii) The plug shall be a closed disc or ball valve.
- (iv) The plug shall hold pressure from above not below.
- (v) The valve shall be cycled open after a pre-determined number of pressure cycles to allow full bore access to the tail pipe.
- (vi) The plug shall allow for the tubing to fill up while running the completion string through a companion tool.
- (vii) The plug shall allow for pressure testing of the completion string while running.
- (viii) The plug OD shall suit maximum casing weight ID, but below the casing drift diameter.

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- (ix) The plug shall have an ultra slim OD design. Particular attention to slim line designs shall be within the scope of supply.
- (x) The plug shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.

3.3 Polished Bore Receptacle (PBR) and Dynamic Seals

3.3.1 General

The PBR and associated equipment shall include, but not be limited to:

- (a) PBR
- (b) Dynamic seal stack
- (c) Shearable release mechanism
- (d) Mule Shoe

The upper completion may be run with a lower most seal assembly and latch to engage the gravel pack / production packer. The seals will be spaced out so that they straddle the port closure sleeve.

3.3.2 Technical Requirements

- (a) OD shall be suitable to run through and set in specified casing.
- (b) The seal stack shall be of minimal cross section area to reduce piston forces, but not compromise performance.
- (c) ID shall be able to accommodate the seals.
- (d) Compressive strength when fully landed out shall be equivalent to tubing.
- (e) PBR shall be able to run through dog leg severity of up to 10 degrees per 100 ft (instantaneous) and extended dog leg severity of 4.5 degrees per 100 ft.
- (f) Bonded type seals shall be preferred, for reliability and easy stabbing in high deviations.
- (g) The PBR shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (h) The number of internal body connections shall be minimized. Internal body connections shall have metal-to-metal seals with backup resilient seal.
- (i) Metallurgy shall be equivalent or better than tubing.
- (j) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.

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- (k) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (l) Dynamic sealing capacity shall have 20 year design life. Demonstrated performance testing shall be required to confirm required performance with expected downhole pressure and temperature conditions. Seal testing shall be approved by COMPANY.
- (m) PBR shall allow for a minimum of two thread re-cuts.
- (n) PBR shall be suitable for production fluids and completion / intervention fluids. Further details can be found in Appendix – Well Bore Information for representative well types.
- (o) Seal assembly shall allow for 20 – 110 ft of movement plus length required to cover port closure sleeve. Further details can be found in Appendix 3 and/or Appendix 4 for representative well types.
- (p) A prepared bottom sub to provide easy entry into the polished bore receptacle shall be provided and shall be designed in such a way as to not impede access or retrieval of slick line, electric line or coiled tubing tools.
- (q) The equipment shall conform to ISO 14310 with Quality Grade of Q1. (CONTRACTOR equipment meets ISO 14310 quality grade Q2.)
- (r) The equipment shall conform to NACE MR-01-75.

3.4 Contraction (Space Out) Joint

3.4.1 General

A contraction joint (space out assembly) shall be included in the upper completion for space out. It will be used to accommodate potential tally error and to allow for picking up the upper completion to orient the tubing hanger. When a production packer is run, the pressure sealing capabilities of the space out device must take into account the packer setting mechanisms and accommodate as necessary. This includes taking account of any trapped annulus that may hinder setting of the packer or reduce packer load envelope.

3.4.2 Technical Requirements

- (a) Sealing (DHFC Wells)
 - (i) OD shall be suitable to run through and set in specified casing.
 - (ii) ID shall be at least as large as full bore tubing.
 - (iii) The space out joint shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (iv) Metallurgy shall be equivalent or better than tubing.
 - (v) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.

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- (vi) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (vii) The system shall not allow excessive pressure (greater than 3,000 psi) to develop in the annulus between the production packer and gravel pack packer.
 - (viii) The space out joint shall have a shear value of approx 80,000 lbs. The space out joint shall be capable re-setting without pulling the upper completion.
 - (ix) The space out joint shall have a stroke length of 110 feet, unless otherwise specified by COMPANY.
- (b) Non-Sealing
- (i) OD shall be suitable to run through and set in specified casing.
 - (ii) ID shall be at least as large as full bore tubing.
 - (iii) The space out joint shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (iv) Metallurgy shall be equivalent or better than tubing.
 - (v) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (vi) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (vii) The system shall not allow excessive pressure (greater than 3,000 psi) to develop in the annulus between the production packer and gravel pack packer.
 - (viii) The space out joint shall have a shear value of approx 30,000 – 50,000 lbs. The space out joint shall be capable re-setting without pulling the upper completion.
 - (ix) The space out joint shall have a stroke length of 110 feet, unless otherwise specified by COMPANY.

3.5 Downhole Chemical Injection System

3.5.1 General

Downhole chemical injection systems shall include, but not be limited to:

- (a) Chemical injection mandrel.
- (b) Chemical injection check valve.

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The system shall be equipped with a redundant dual check valve. The check valve shall require an initiation pressure to open, designed to avoid free flow by gravity. The system shall be equipped with a burst disk in addition to the check valves in order to allow the chemical injection line to be pressure tested. During installation it shall be possible to test the check valve integrity and to test the tubing without shearing the burst disk.

3.5.2 Technical Requirements

- (a) Collapse, burst, tensile, and compressive ratings shall be equal to or greater than those of the adjacent tubing.
- (b) Metallurgy shall be equivalent or better than tubing.
- (c) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (d) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (e) ID shall be at least as large as full bore tubing.
- (f) Mandrel shall have a one piece body.
- (g) The mandrel shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (h) The mandrel shall fit in specified production casing and allow for the passage of applicable control lines (downhole pressure and temperature, chemical injection, and / or DHFC).
- (i) The system shall have metal to metal seals for the valves and injection line connections.
- (j) The system shall have a chemical passage consistent with the injection line ID (1/4", 3/8", and 5/8", as specified by COMPANY), including the check valve.
- (k) The system shall interface successfully with tubing hanger and tree. Any potential interface issues shall be identified by CONTRACTOR and further work will be done post contract award.
- (l) CONTRACTOR shall demonstrate flow performance system testing (lines, valves, life-cycle, etc.).
- (m) The system shall have injection valve springs to prevent loss of chemical.
- (n) The equipment shall conform to the following standards:
 - (i) NACE MR-01-75.
 - (ii) ISO 11960 (API Spec 5CT)

3.6 Flow Control Systems and Other Subsidiary Items

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3.6.1 General

Flow control systems and subsidiary items shall include, but not be limited to:

- (a) Landing nipples.
- (b) Wireline Entry Guides (WEGs).
- (c) Crossovers

3.6.2 Technical Requirements

(a) Flow Control System

- (i) There shall be one profile in the TR-SCSSV.
- (ii) Contingency designs for open hole sand face completions shall include two further profiles, above and below the packer.
- (iii) Collapse, burst, tensile, and compressive ratings shall be equal to or greater than those of the adjacent tubing.
- (iv) Metallurgy shall be equivalent or better than tubing.
- (v) The flow control system shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (vi) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (vii) The flow control system shall allow for a minimum of two thread re-cuts.
- (viii) The flow control system shall conform to ISO 16070. ISO 16070 Quality Grade Q1 and Validation Grade V2 shall apply.

(b) Landing Nipples

- (i) Landing nipples shall conform to ISO 16070. ISO 16070 Quality Grade Q1 and Validation Grade V2 shall apply.
- (ii) Material shall comply with API and NACE MR-01-75.
- (iii) A no go shoulder shall be required only for locating and setting flow control devices and shall not be a load bearing point; therefore, no go sizing shall be minimized.
- (iv) The landing nipple shall have a standard pressure rating as determined by the pressure rating of the tubing connection. Further details can be found in Appendix 3 and/or Appendix 4.
- (v) Ideally the nipple profile shall be designed in such a way as to allow for Original Equipment Manufacturer (OEM) locks to be utilized where necessary.

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- (vi) Landing nipples shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (c) Locks
 - (i) The lock shall be retrievable at all times during the life of the well.
 - (ii) The lock shall be designed so that it may only be located and set in a proper nipple profile.
 - (iii) The lock shall have a standard pressure rating as determined by the pressure rating of the tubing connection. Further details can be found in Appendix 3 and/or Appendix 4.
 - (iv) Locks shall conform to ISO 16070, Quality Grade Q1 and Validation Grade V2 shall apply.
 - (v) The lock shall have a simple and rugged construction minimizing moving parts e.g., expander mandrel and lock dogs.
 - (vi) The lock shall have no springs behind lock dogs.
 - (vii) The lock shall be designed to withstand sand and small debris.
 - (viii) The locks shall have large area, pressure-bearing locking dogs for greater pressure capabilities from above and below. Lock dogs shall be the pressure / load bearing point and not the no go.
 - (ix) Lock dogs shall be designed to lift the no go off the locating point when in the set position. This will eliminate no go swaging.
 - (x) The lock shall have a positive locking mechanism that prevents vibration affects from un-seating the locks.
 - (xi) The lock shall have an external fishing neck for easy retrieval.
 - (xii) The lock shall have a smooth bore inside that inhibits corrosion or sticking by foreign elements.
 - (xiii) The lock shall have a positive locking indicator in the running tool to confirm that the lock is set as designed.
 - (xiv) The lock shall be compatible with standard wireline equipment, coiled tubing equipment, and electric line tractors.
- (d) Crossovers
 - (i) The length shall allow for at least two re-cuts of each thread.
 - (ii) The length will allow a minimum of 5-7/8" space after re-cuts, plus 2" clearance plus marking area.
 - (iii) The maximum total length shall be 24".
 - (iv) Crossovers shall be manufactured in accordance with ISO 11960 (API

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5CT) and BP GIS-02-203.

- (v) Crossovers shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.

3.7 TR-SCSSV

3.7.1 General

Tubing retrievable surface controlled subsurface safety valve (TR-SCSSV) and associated equipment shall include, but not be limited to:

- (a) TR-SCSSV.
- (b) Control line and fittings.
- (c) Lock open tools.
- (d) Communication tools.
- (e) Wireline retrievable surface controlled subsurface safety valves (WR-SCSSV) as a contingency (where applicable).
- (f) Running tools for WR-SCSSV (where applicable).

The TR-SCSSV shall be a fail-safe close design and, when closed, have a leakage rate below that specified in ISO 10432 (API 14A) for a newly manufactured valve and API RP 14B for 'in-situ'. It shall be possible to temporarily lock open the valve using a sleeve or other device. Where a heavy sprung SCSSV valve is applicable, it shall be possible to permanently lock it open and run a WR-SCSSV to be operated by the existing control line.

3.7.2 Technical Requirements

- (a) TR-SCSSV
 - (i) Collapse, burst, tensile, and compressive ratings shall be equal to or greater than those of the adjacent tubing.
 - (ii) Metallurgy shall be equivalent or better than tubing.
 - (iii) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (iv) The TR-SCSSV shall have an eccentric external system to guide and protect electrical lines.
 - (v) The TR-SCSSV shall have metal to metal seals on rod piston and on body valve threads. There shall be a back-up seal on end of stroke.
 - (vi) The TR-SCSSV shall have a metal to metal flapper seal with plastic resilient back-up.
 - (vii) Crossovers shall have premium tubing connections as detailed in Clause

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2.0 of this Part 5, unless otherwise specified by COMPANY.

- (viii) The TR-SCSSV shall have a nipple profile to receive a temporary plug or WR-SCSSV (where applicable).
- (ix) The equipment shall conform to the following standards:
 - API RP 14B.
 - API RP 14C.
 - ISO 10432 (API Spec 14A).
 - ISO 16070.
 - NACE MR-01-75.
- (x) The TR-SCSSV shall be qualified for ISO 10432 (API Spec 14A) Class 2 service.
- (xi) The TR-SCSSV shall be qualified for COMPANY specified, high-rate, gas slam closure testing.
- (xii) The TR-SCSSV shall be qualified for COMPANY specified endurance testing.
- (xiii) For landing nipples, ISO 16070 Quality Grade Q1 and Validation Grade V2 shall apply.
- (xiv) TR-SCSSVs shall be API Specification 14A monogrammed.
- (xv) The maximum outside diameter shall allow for all of the control lines that might be seen in a given well to bypass the TR-SCSSV in specified production casing (casing drift).
- (xvi) Both equalizing and non-equalizing valves will be considered.
- (b) WR-SCSSV (where applicable)
 - (i) Metallurgy shall be equivalent or better than tubing.
 - (ii) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (iii) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
 - (iv) The equipment shall conform to the following standards:
 - API RP 14B.
 - API RP 14C.
 - ISO 10432 (API Spec 14A), Class 2 service.
 - ISO 16070.
 - NACE MR-01-75.
 - (v) For locking mandrels, ISO 16070 Quality Grade Q1 and Validation Grade V1 shall apply.
 - (vi) WR-SCSSVs shall be API Spec 14A monogrammed.

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3.7.3 Operating Pressure Design

The general parameters to determine the actual operating pressures of both the TR-SCSSV and WR-SCSSV shall be finalized by COMPANY on WORK ORDER. The valve might see transient pressures higher, but it is not a requirement that the valve be held open by control line pressure during transient conditions. However, the valve shall be pump-through at these times. Ideally the same valve would be used in all fields to allow for total standardization, but due to the variations across fields and the additional engineering and cost issues of designing such a valve, this may not be readily achievable. In fields where it makes economic and technical sense, the same valve shall be proposed.

3.8 Downhole Gauges

3.8.1 General

Downhole gauges and associated equipment shall include, but not be limited to:

- (a) Downhole Pressure / Temperature gauge(s).
- (b) Cable head.
- (c) Gauge mandrel.
- (d) Cable.
- (e) Control Line.
- (f) Card for the Subsea Control Module.

Continuous data read-outs shall be required on the rig throughout the installation process. Continuous data collection shall be required after the well has been completed.

The gauge connectors at the hanger, tree, tubing hanger running tool, emergency disconnect package, etc., will be supplied by others. The gauge mandrel shall not form a choke to flow, i.e., its internal bore shall be at least as large as that of the tubing.

3.8.2 Technical Requirements

(a) Gauge Mandrels

- (i) Gauge mandrel shall be designed to the same tension, compression, burst and collapse ratings equal to or greater than those of the adjacent tubing.
- (ii) Metallurgy shall be equivalent or better than tubing.
- (iii) ID shall be at least as large as full bore tubing.
- (iv) Gauge mandrel shall have a one-piece body.

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- (v) Gauge mandrel shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.

(b) Pressure and Temperature Gauges

- (i) These requirements shall be met:

Pressure and Temperature Gauge Specifications

Type	Range	Max Drift	Accuracy	Resolution
Pressure	1,000 – 15,000 psi	3 psi per yr	+/- 43 psi	0.01 psi
Temperature	40 – 275 degrees Fahrenheit	+/- 0.09 degrees Fahrenheit per year	+/- 1.8 degrees Fahrenheit	0.002 degrees Fahrenheit

- (ii) Sampling rate shall be one data point per second.
- (iii) Quartz gauges shall be used.
- (iv) Gauges shall be protected from shocks by design, and the efficiency of protection shall be tested and documented. A shock tolerance of 11 g shall be required.
- (v) Gauges shall be tested to confirm resistance to vibration. Vibration resistance test procedures and results shall be fully documented.
- (vi) Gauges shall be isolated from well-bore fluids and shall be unaffected by pressure breathing.
- (vii) Isolation seals shall be metal-to-metal and back-up elastomeric seals shall be of a material specified in Clause 2.0 of this Part 5. Final seal choice shall be made by COMPANY on WORK ORDER.
- (viii) Cable head shall be externally testable.
- (ix) Cable head shall be of thread and ferrule type. Welded cable head connections shall not be accepted.
- (c) SCM Card

The card shall interface successfully with the subsea production system.

(d) Cable and Accessories

- (iv) Cable shall have an Incoloy 825 sheath.
- (v) Cable shall be encapsulated with Santoprene or Halor equivalent Polyimide thermoplastic, unless otherwise specified by COMPANY. Further details can be found in Appendix – Well Bore Information for representative well types.
- (vi) Size and flat pack configuration shall be indicated on specified in Appendix 3 and/or Appendix 4. Lengths shall be specified by COMPANY on WORK ORDER.

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3.9 Control Lines and Accessories

3.9.1 General

The gauge lines and other control lines within the completion may be flat packed together if this is deemed to be the most efficient for installation by COMPANY.

3.9.2 Technical Requirements

(a) General

- (i) All lines shall be seamless or welded and floating plug drawn bright-annealed lines in Incoloy 825. COMPANY shall specify preference on WORK ORDER.
- (ii) CONTRACTOR shall supply Incoloy 825 twin ferrule compression fittings suitable for use at working pressure. Further details can be found in Appendix – Well Bore Information for representative well types.
- (iii) Fittings shall either be Autoclave brand or be another brand approved by COMPANY.
- (iv) The lines shall be encapsulated with thermoplastic material, which has a minimum thickness of 2 mm (Santoprene or Halor equivalent Polyimide thermoplastic). Further details can be found in Appendix 3 and/or Appendix 4 for representative well types.
- (v) Fluid cleanliness shall be to NAS 1638v Class 6 or cleaner.
- (vi) Temperature rating shall be 40 to 275 degrees Fahrenheit.

(b) Electrical Line

- (i) Working pressure as specified in Appendix – Well Bore Information with adequate factors of safety to be provided.
- (ii) Hardness of line shall meet or exceed NACE MR-01-75 specification for sour service, as appropriate.
- (iii) Cable shall be copper mono-conductor (compatible with gauges).
- (iv) Cable shall be suitably armored for deployment conditions.

3.10 Line Protectors

3.10.1 General

- (a) Protectors shall include cross coupling protectors and specialty protectors (e.g., TR-SCSSV and other BHAs).
- (b) Details on the number of control lines and flat pack configurations shall be specified by COMPANY on WORK ORDER. Appendix 3 and/or Appendix 4 contains recommended configurations.

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- (c) The protectors shall protect and support the various lines along the tubing at their most vulnerable positions. At the tubing couplings, it is necessary to clamp one cross coupling protector. At the completion components, it is recommended to use one protector at each end, which do not cover the lines but give a good curve and alignment to the lines.
- (d) Protectors shall protect the lines from potential damage caused by any part of the well completion process, especially caused by the dynamic motion of the tubing in the well bore. They shall support the lines with no slippage.
- (e) The protectors shall align the tubing in such a way that the protectors do not impede the completion, running smoothly into the production casing. In addition, they shall be retrievable and reusable if the completion is pulled.

3.10.2 Technical Requirements

- (a) Lines shall be supported with no slippage.
- (b) Line protectors shall have a flat pack grip capacity equivalent to at least 90 feet of flat pack weight.
- (c) Line protectors shall have chamfered edges to prevent hang up while running in or out of the well.

3.11 Annular (Circulation) Vent Sub

3.11.1 General

Annular Vent Sub system shall include, but not be limited to:

- (a) Parting Piston.
- (b) Filter Screen.
- (c) End Subs
- (d) Control line and fittings
- (e) Control line clamps.

The system shall be equipped with a redundant dual check valve. The check valve shall require an initiation pressure to open, designed to avoid free flow by gravity. The system shall be equipped with a burst disk in addition to the check valves in order to allow the chemical line to be pressure tested. During installation it must be possible both to test the check valve integrity and to test the tubing to 5,000 psi without shearing the burst disk.

3.11.2 Technical Requirements

- (a) Annular Vent Sub System
 - (i) Design to COMPANY specified tension, compression, burst and collapse ratings.
 - (ii) Metallurgy to be equivalent or better than tubing, unless otherwise specified by COMPANY.
 - (iii) Elastomers shall be as detailed in Clause 2.0 of this Part 5, unless

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otherwise specified by COMPANY.

- (iv) Temperature range shall be as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (v) The system shall have 5/8" MP Autoclave female top connections.
- (vi) The system shall have a 6,000 psi parting piston rupture (+/- 5%).
- (vii) The system shall be 316L SS or higher alloy for screen, 0.030" spacing, 20 gauge, screen mechanically attached to COMPANY supplied pipe.
- (viii) The system shall have premium tubing connections as detailed in Clause 2.0 of this Part 5, unless otherwise specified by COMPANY.
- (ix) The system shall fit in specified production casing and to allow the passage of appropriate cables (pressure and temperature, chemical injection, Real Time Temperature Profiling, and DHFC).
- (x) The system shall have metal to metal seals.
- (xi) CONTRACTOR shall demonstrate flow performance system testing (lines, valves, life-cycle, etc.), as applicable.
- (xii) The system shall interface successfully with the SPS equipment. The equipment shall conform to the following standards:
 - NACE MR-01-75.
 - ISO 11960 (API Spec 5CT).
- (xiii) The system shall have COMPANY 25Cr Super Duplex or higher CRS Specification.

4.0 REFERENCES

ISO 11960 (API Spec 5CT):	Petroleum and natural gas industries – Steel pipes for use as casing or tubing for wells.
ISO 14310 (API Spec 11D1):	Petroleum and natural gas industries – Downhole equipment – packers and bridge plugs.
NACE MR-01-75:	Sulfide stress cracking resistant materials for oilfield equipment.
API Specification 6A718:	Specification of Nickel Base Alloy 718 (UNS N07718) for Oil and Gas Drilling and Production Equipment. 1st Edition March 2004*

* - Note In addition to the requirements of API Spec 6A718, COMPANY has a further requirement that the minimum total hot work reduction ratio shall be 4:1 and not 3.75:1 as per Section 4.1.3.1 of API6A718.

BP References:

GIS 02-201: Specification for OCTG Seamless Casing & Tubing (Standard Grades).

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GIS-02-203:	Specification for OCTG Crossover Connectors.
GIS-02-204:	Specification for OCTG Sour Resistant Grade C110 Low Alloy Steel OCTG Seamless Casing.
GIS-02-205:	Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
GIS-02-206:	Specification for Duplex and Super Duplex 25% Chrome Stainless Steel Seamless Pipe.
BP-EPT-IAS-01:	Integrity Assurance Specification – For the Procurement of Critical equipment for Drilling and Completions.

For undated references, the latest edition of the normative document referred to applies.

5.0 DEFINITIONS AND ABBREVIATIONS

For the purposes of this Part 5 – Upper Completions, the following definitions and abbreviations will apply:

AISI:	American Iron and Steel Institute
API:	American Petroleum Institute
BHA:	Bottom Hole Assembly
bpm:	Barrels per minute
CHFP:	Cased Hole Frac Pack
CI:	Chemical Injection
CRA:	Corrosion-Resistant Alloy
DHFC:	Downhole Flow Control
DHPT:	Downhole Pressure and Temperature
EDTA:	Ethylenediamine Tetraacetic Acid
FLCV:	Fluid Loss Control Valve
FMECA:	Failure Mode Effect and Criticality
GoM:	Gulf of Mexico
GP:	Gravel Pack
HT:	High Temperature
IAS:	Integrity Assurance Specification
ID:	Internal Diameter
ISO:	International Organization for Standardization
NACE:	National Association of Corrosion Engineers
NAS:	National Aerospace Standard
OD:	Outside Diameter
OEM:	Original Equipment Manufacturer
OHGP:	Open Hole Gravel Pack
PBR:	Polished Bore Receptacle
psi:	Pounds Per Square Inch
QA:	Quality Assurance
QC:	Quality Control
QCP:	Quality Control Plan
RIH:	Run in Hole
SOBM:	Synthetic Oil-Based Mud
SOR:	Statement of Requirements
TEC:	Twisted Encapsulated Conductor
TR-SCSSV:	Tubing Retrieved Surface Controlled Subsurface Safety Valve

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WBM: Water-Based Mud
WEG: Wireline Entry Guide
WR-SCSSV: Wireline Retrieved Surface Controlled Subsurface Safety Valve

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Part 6 – Well Bore Information

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STATEMENT OF REQUIREMENTS - Atlantis Type Producer					
Equipment Criteria					
Equipment Type	5.00" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) / 5-7/8" 52.5# Casing				
Description	Preliminary Frac Treatment Design Info		Critical Well Factors		
Casing Size Max ID Min ID Drift ID	5-7/8" 52.5# 5.625" 5.500" 5.450"	Design Spec.	NACE MR-0175, BP Approval of Material Specifications Required	Well Type: Producer and Injector Wells	
Working Size Grade Connections Tool Joint OD Tool Joint ID	5.75" 5.900" wall S-135T Int KT-M57 7.000" 4.250"	Service Conditions	Initially Sweet - May sour after water injection & started (see max H2S)	BHP @ SH1 7,500-8,400 psi / 150-165 F	
Service Tool Connections	5-7/8" XT-M57	Temp Range	40-180 F, 40F Min SH1	Absolute Pressure Range 4,000 psia (max flow) - 13,000 psi (see scenario)	
Frac Extension Connection Detail	7.50" 47.10# 3L/F / Pn 32w	Service Tool Position	Squeeze, Circulate, and Reverse position secured	Water Depth / Reservoir Depth 8,300' / 15,000-18,000' TVD-20,000' MD (M57 to M-54)	
Frac Assembly Materiality	13% Chrome (or equivalent) weldings for down-hole permanent equipment, P-1/0125 or 4130 Alloy acceptable for Service tools	Closing Sleeve Opening Force	Minimum 5,000 lbs	Max H ₂ S 0.10% H ₂ S - Max Potential H ₂ S 200 ppm after water injection is started	
Electronics / Seal Materials	4000 Packer Material NTRM on Service tools and bonded seal in Closing Sleeve. Chemical O-rings with Peak BU ring. Chemical/Torque Peak Seal and Wire	Frac Tool Pump Rate Prop Size Prop Type Max Loading Max Proppant	45 BPM 20/40 & 16/20 Carbide 12 psi 300,000 lbs	Max CO ₂ 0.40 - 1.2 Mol Percent	
Frac Assembly Max OD Min ID Min Tensile	8.45" OD on packer 5.625" on XT tool 400,000 lbs	Min Frac Assembly Burst / Collapse	19,000 psi Pac 19,000 psi production 19,000 psi (pressure-balanced) sections	Max H ₂ 0.4 - 0.7 Mol Percent	
Production Seal Min ID Differential Rating	4.875" 7,000 psi burst 5,000 psi collapse 300,000 lbs tensile	Min. Tension / Compression Rating	125,000 lbs Prod Ten / Comp	Fluid Density ("API / g/cc) GOR (scf/bbl)	34-36 API Oil 400-500 (single phase)
Fluid Loss Control Device Max OD Min ID Body Burst/Collapse Ball/Sleeve Differential Sleeve Safety Joint Max OD Min ID Differential Rating Sleeve Burst Frac Assembly Maximum Length	Ball Adapter Valve Sleeve 8.100" 7.930" 4.580" 2.910" 15W10k 15W10k 5,000 psi 10,000 psi 7.00" 4.58" 10,000 psi 30,000 lbs not to exceed 70 ft	Min Service Tool Tension Rating	200,000 lbs	Production Rates Max Production Solids Rate Injection Rates Max Injection Solids Rate	2 opdr/100 micron prod max rate/min 15,000 - 40,000 BWPD 1 opdr/50 micron in max rate/min
		Min Weight Down Rating	190,000 lbs (Live Annulus and Squeeze Positions)	Completion / Packer Fluid	3-11 spg Completion Fluid/ Packer Fluid 3-11 spg Calcium Chloride Comp Fluid
		Packer Qualification Test	150 / 1410 VS	Max Angle / Dogleg	50 Degrees 3 deg / 100 ft
Engineering Notes, Lessons Learned and Comments					
1 All tools with outside diameter larger than 5.98" must have a 15 degree taper on top to help deter sand bridging and erosion during frac operations.					
QUALIFICATION TEST REQUIREMENTS: Full Scale Erosion Test, Functional Testing, Seal Material Compatibility, and Tapered ball seal testing					

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STATEMENT OF REQUIREMENTS - Atlantis Type Contingency				
Equipment Criteria				
Equipment Type		3.25" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) fit 7" 38.0# Casing		
Description	Preliminary Frac Treatment Design Info		Critical Well Factors	
Casing Size Max ID 3.900" Min ID 3.798" O.D. 3.798"	Design Spec: NACE MR 0175, BP Approval of Material Specifications Required		Well Type:	Production and Injector Wells
Working Size Grade 3.1551 ksi Connections KT-M38 Tool Joint OD 4.750" Tool Joint ID 2.1416"	Service Conditions: BHP / BHT		7,500-8,400 psi / 150-165 F	
Service Tool Connections 4.500" AT-M38	Temp Range: 40-160 F / 40 F Min BHT		Absolute Pressure Range 4,500 psi (min flowing) - 13,000 psi (shutdown)	
First Extension Connection Down 5.125" 23 OWR SLF, Full Size	Service Tool Positions Squeeze, Circulate and Reverse positions required		Water Depth / Reservoir Depth 15,000-18,000' TWD-20,000' MD (MSL to MSH)	
First Assembly Metallurgy 1% Chrome (or equivalent) metallurgy for low-temp permanent equipment. P. 110125 or 4130 Alloy, acceptable for Service tools	Closing Sleeve Opening Force: Minimum 5,000 lbs		Max H.S. 6 initial H.S. Max Potential H.S. 200 psi after water injection is started	
Elastomers / Seal Materials 3167 packer material, 100% O-rings On Service tools and bonded seal in Closing Sleeve, Channal Couplings with PEEK B/U rings, Channal/Teflon PEEK Seals and Viton	Pac Job Pump Rate 30 BPM Prop Size 20/40 & 16/30 Pac Type Carbon-ite Max Loading 12 psi Max Pressure 250,000 lbs		Max CO ₂ 0.40 - 1.2 Mol Percent	
First Assembly Max OD 5.25" on XO tool Min ID 4.500" Max Tensile 950,000 lbs	Min Frac Assembly Burst / Collapse 10,000 psi frac 10,000 psi pre-tension 10,000 psi pressure-balanced fracture		Min AL 0.4 - 0.7 Mol Percent	
Production Seal Min ID 4.875" Differential Range 2,500 psi burst, 250,000 lbs tensile Fluid Loss Control Device Valve Max O.D. 5.500" Min ID 4.530" Body Burst/Collapse Burst 2,500 psi Collapse 15,000 psi Max OD 4.180" Min ID 2.972" Differential Range 10,000 psi Shut-In Pressure 20,000 psi First Assembly Maximum Length Not to exceed 170 ft	Min. Tension / Compressive Rating 125,000 lbs. Pack Tool / Comp		Fluid Density (API / slug) 14.00-14.50 (API) 140-150 (slug) Production Rates Max Production Solids Rate 15,000 - 30,000 BWPD Injection Rates 1 inch / 50 micron or finer Max Angle / Dogleg 50 Degrees 3 deg / 100 ft	
Engineering Notes, Lessons Learned and Comments				
1. All tools with outside diameters larger than 5.96" must have a 15 degree taper on top to help clear sand bridging and erosion during frac pac operations.				
QUALIFICATION TEST REQUIREMENTS: Full Scale Friction Test, Functional Testing, Seal Material Compatibility, and Tapered ball seal testing.				

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STATEMENT OF REQUIREMENTS - Atlantis Type Injector				
Equipment Criteria				
Equipment Type	8.00" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) w/ 8-7/8" 62.8# Casing			
Design Box	Preliminary Frac Treatment Design Info			Critical Well Factors
Casing Size Max ID 8.925" Min ID 8.563" DyW ID 8.483"	Design Spec	ISO 9001-2000, ISO 14310-1/2001, BP Approval of Material Specifications Required	Well Type	Producer and Injector Wells
Working Size 5-7/8" 6.500" nom Grade 8-1457 bar Connection XT-M57 Tool Joint OD 7.969" Tool Joint ID 4.259"	Service Conditions	Initially Squeeze - may occur after water injection or startup (see min H2S)	BHP / BHT	7,500-8,400 psi / 150-155 F
Service Tool Connections 8-7/8" XT-M57	Temp Range	40-160 F, 40-5 MH-BHT	Annular Pressure Range	4,000 psi (min flow) - 19,000 psi (maximum)
Frac Extension Connection Detail 7.58" 42.14WR SLF, Pin down	Service Tool Positions	Squeeze, Circulate and Reverse positions required	Water Depth / Reservoir Depth	8,000' / 15,000-18,000 TYD-20,000 MD (M57 to M-56)
Frac Assembly Notations 25% Chrome for sourwater inhibitors for low-wat permeant equipment (P-110125 to 4130 Alloy acceptable for service tools, 718 substituted in places for strength purposes) 9.125" seal-off element, RTSG	Closing Sleeve Operating Force	Minimum 5,000 lbs	Max H2S	0 initial MCS, Max Potential H2S 250 ppm after water injection is started
Extensions / Seal Materials on Service tools and bonded seal in Closing Sleeve, Chemraz C-4 plus w/PT Pack (60 rings), Chemraz/Tufcon/Pack Seal on Island Valve	Pump Rate Prop Size 2040 & 1825 Prop Type Carbide Max Loading 12 ops Max Pressure 900,000 lbs		Max CO2	0-40 - 1.2 Max Percent
Frac Assembly BHA 8.45" CD on packer Max OD 8.00" on 20' loc Min ID 400,000 lbs	Max Frac Assembly Burst / Collapse	15,000 psi frac 10,000 psi production 10,000 psi pressure-balanced sections	Max N2	0.4 - 0.7 Max Percent
Production Seal Min ID 4.375" Differential Rating 7,500 psi burst, 5,000 psi collapse	Min. Tension / Compression Rating	125,000 lbs Prod Ten / Comp	Fluid Density (API / SGG) DOE (wt/wb)	24-28 API Gr 490-500
Fluid Loss Control Device Valve Sleeve Max OD 8.163" 7.920" Min ID 4.583" 2.310"	Min Service Tool Tension Rating	200,000 lbs	Injection Rates Max Injection Solids Rates	40 CO2 BWPD (single stage) and 1 up to 150 mcm in area rate/lbs
Body Burst/Collapse Bolt/Sleeve Differential Shear Safety Joint Max OD 7.00" Min ID 4.58" Differential Rating Shear Rating 90,000 lbs Frac Assembly Maximum Length	Min Weight Down Rating	160,000 lbs 7.75m Annulus and Squeeze Position	Completion / Packer Fluid	0-1.1 ppg Completion Fluid Packer Fluid 8-11 ppg Cement Grout/Comp Fluid
	Packer Qualification Test	ISO 14312 V3	Max Angle / Dogleg	50 Degrees 5 deg / 100 ft
Engineering Notes, Lessons Learned and Comments				
1. All tools with outside diameter larger than 5.56" must have a 15 degree taper on top to help clear sand bridging and wearover during frac pack operations.				
QUALIFICATION TEST REQUIREMENTS: Full Scale Exercise Test, Functional Testing, Seal Material Compatibility, and Tapered Bar Seal Testing				

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STATEMENT OF REQUIREMENTS - Eastern GoM Producer					
Equipment Criteria					
Equipment Type		6.00" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions); 6 9-7/8" 82.8# Casing			
Description		Preliminary Frac. Treatment Design Info		Critical Well Factors	
Casing Size 5 1/2" x 27.0# Max ID 5.425" Min ID 5.500" Drill ID 5.460"		Design Spec:		NACE MR-0175, BP Approval of Material Specifications Required	Well Type:
Working String Grade 8-1351 ksi Construction ASTM A 270 Tool Joint 100 8-250" Tool Joint ID 5.840"		Service Conditions:		Sweet	SRP / SRP
Service Tool Connections		Taper Range		40-72° F - 40 F MS - RHT	Maximum Pressure Range
Frac Indicator Connections Down		7.50" 50Wt AB-HDL Pa. down		Squeeze, Set Down, Set-Arrival, Circulate, and Reverse positions required	Water Depth / Reservoir Depth
Frac Assembly Modularity		15% Chrome (or equivalent) metallurgy for flow-weld permeability improvement, P-110125 or 4130 Alloy acceptable for Service tools		Changing Sleeve Operating Force:	Min. H ₂ S
Electronics / Seal Materials		N/A on Service tools and bonded seal in Casing Sleeve. Chemical O-rings with PEEK O-rings. Chemical Teflon/Pack Seal sets and Vals		Fracture Job Pump Rate 100 BPM Fracture Size 2040, 1650, 4071 3058 Fracture Type Carbonate Max. Loading 12 psi Max. Pressure 300,000 lbs	Max. CO ₂
Frac Assembly Max. Casing Min. ID Service 400,000 lbs		3-45° CO on packer 5.00" on 20" tool Min. ID Service 400,000 lbs		Min Frac Assembly Burst Collapse	Max H ₂
Production Seal Max. ID Differential Rating 4,875"		10,000 psi burst, 1,250 psi collapse, 500,000 lbs tensile		Min. Tension / Compression Rating	Fluid Density (API / ppg) GOR (scf/stb)
Fluid Loss Control Device Valve 13112 13114 13116 Max. CO ₂ 0.50% 0.60% 7.70% Min. ID 4.500" 2.915" 2.815" Body Burst Collapse 11400N 11412N 11414N Gaskets/Seals 5,000 psi - 10,000 psi		Min. Service Tool Tension Rating		275,000 lbs after packer is set and tool is released	Production Rates Max Production Solids Rate Injection Rates Max Injection Solids Rate
Shovel Safety Joint Max. CO ₂ 7.40% Min. ID 4.50" Differential Rating 12,000 psi Shovel Rating 90k - 105K lbs		Min. Weight Down Rating GIP Packer Qualification Test		80,000 lbs (Live Analysis and Square Position) 80-14310 V3	Completion / Packer Fluid
Frac Assembly Minimum Well Length		Not to exceed 10 ft		Prod Per Qualification Test	Max Angle / Dogleg
Engineering Notes, Lessons Learned and Comments					
1. All tools with outside diameters larger than 5.50" must have a 15 degree taper on top to help with sand bridging and insertion during frac pac operations					
2. Need two differential Seal Valve Fluid Loss Device designs					
3. Service Tool Design with Blow Out Ball Seal (rather than reversing tool)					
QUALIFICATION TEST REQUIREMENTS: Full Scale Static Test, Functional Testing, Seal Material Compatibility, and Tapered Ball seal testing. Element Flow By testing					

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STATEMENT OF REQUIREMENTS - Holstein Type Producer				
Equipment Criteria				
Equipment Type	3.88" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) 6' 7-6/8" # Casing			
Description	Preliminary Frac Treatment Design Info		Critical Well Factors	
Casing Size Max ID 5.900" Min ID 5.500" Din ID 5.500"				
Working Size Grade Connection Tool Joint OD Tool Joint ID	5-1/2" & 5-1/8" S-135-40 X1-MS7 & XTM-40 7.000" & 5.250" 4.250" & 3.250"	Design Spec: NAACE MRQ-75, BP Approval of Material Specifications Required Initially Sweet - may sour after water injection is started (see frac H2S)	Well Type:	Producer
Service Tool Connections		Service Conditions:	Min / Max	4,000 psi (max flowing) - 13,000 psi (maximum)
Frac Extension Connection Down	5-13/32" 8-Stub Arms 1000'	Temp Range:	Absolute Pressure Range	4,344 /
Frac Assembly Materiality		Service Tool Positions	Water Depth / Production Depth	14,569 (1/2888) 1/2 new Tool
Closing Stroke Opening Force:				0 Initial H2S Max Potential H2S 500 ppm after water injection is started
Max H2S				
Max CO2				0.8 Mol Percent
Max H2				0.4 Mol Percent
Fluid Density (API) (g/g)				35 API Oil 500 - 1,200
Production Rates				15,000 BOPD (single phase zone) 2 ppm/100 million gpd max relative
Completion / Fracker Fluids				0.8 - 1.0 deg Completion Fluid / Fracker Fluid 9 C deg Glycol Co2
72 Degrees 9 deg / 100 ft				
Engineering Notes, Lessons Learned and Comments				
1. All tools with outside diameter larger than 5.90" must have a 15 degree taper on top to help deliver and bridge and insertion during frac pack operations.				
QUALIFICATION TEST REQUIREMENTS: Full Scale Extension Test, Functional Testing, Bone Material Competency, and Tension and seal testing.				

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STATEMENT OF REQUIREMENTS - Mad Dog Type 7.75"					
Equipment Criteria					
4.00" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling Extensions) 1 1/2" 3.4" 48.1# Casing					
Equipment Type	Description	Preliminary Frac Treatment Design Data		Critical Well Factors	
Casing Size	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175, BP Approval of Material Specifications Required	Well Type	Production Well
Working Size	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175	Well Type	Production Well
Service Tool Connections	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175	Well Type	Production Well
Fract. Extension Connections (MCS)	4.125" 16 Spd Vent Ann (1" ID)	Design Spec.	MACT 100-0175	Well Type	Production Well
Fract. Assembly Materiality	4140 Steel (NACE)	Design Spec.	MACT 100-0175	Well Type	Production Well
Extension (Steel Materiality)	4140 Steel (NACE)	Design Spec.	MACT 100-0175	Well Type	Production Well
Fract. Assembly Max OD	4.125" OD on casing	Design Spec.	MACT 100-0175	Well Type	Production Well
Production Size	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175	Well Type	Production Well
Fluid Loss Control Device Type	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175	Well Type	Production Well
Sheet Safety Valve	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175	Well Type	Production Well
Fract. Assembly Maximum Length	2.34" x 4.1# Max ID 2.550" Min ID 2.500" OD 4.125"	Design Spec.	MACT 100-0175	Well Type	Production Well

Engineering Notes, Lessons Learned and Comments:

- 1) Bell Valve Fluid loss device must be capable of stopping a 1000 psi fluid under 1000 psi differential, closed with pressure or mechanical. Safety must be through 2.75" H₂O. Must accept up to 9" of H₂O and still be pressure operated.
- 2) All equipment must still function at design rating when tested to 40 Deg F.
- 3) Design does not have Production testing tested into CP Packer. Instead a Pump Head with replaceable anchor to run with steel tubing through packer, isolate casing/frac well, and offer to perform it through circulating tubing.

QUALIFICATION TEST REQUIREMENTS: Full Scale Erosion Test Functional Testing, Seal Material Compatibility and Tapered Ball seal testing, Erosion Flow by testing

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STATEMENT OF REQUIREMENTS - Mad Dog Type 5.5"				
Equipment Criteria				
Equipment Type	3.25" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) fit 5-1/2" 23K Casing			
Description	Essential Frac Treatment Design Info		Critical Well Factors	
Casing Size Max OD 4.870" Min ID 4.545" Depth	Design Spec:	NACE MR-01-75 BP Approval of Material Spec. Posters Required	Well Type:	Production (OG)
Working Size Casing 4.100 to 4.750" Connector XFM43 x XFM67 Tool Joint OD 5.125" x 4.125"	Testing:	SD 14310 K3		WOB max 13,200 psi, 210 deg F MSE/MDS max 10,000 psi, 170 deg F
Service Tool Connections	Service Conditions:	Swells	Well ID / BHT	
First Retention Connection Depth	Temp Range:	40-120 F must achieve passing through 40 deg F Swells	Absolute Pressure Range	7,200 psi (min) to 10,000 psi (max)
Frac Assembly Materiality	Service Tool Positions:	Squeeze, Set Down Line Annulus, Circulate, and Reverse positions required	Water Depth / Reservoir Depth	4,400' Water Depth 18,000-28,200' MD 18,000-21,500' FVD
	Closing Sleeve Opening Force:	Maximum 5,000 lbs Closing Sleeve must not shut while passing at rates up to 40 BPM	Max H ₂ S	< 20 ppm
Electronics / Seal Materials	Max CO ₂ Fract Rate 15-65 BPM Fract Size 18-20 & 14-10 Prop Type Cartridge & Cartridge Max Loading 12 psi Max Pressure 200,000 psi		Max CO ₂	< 0.35 Mol Percent P 400 < 0.10 Mol Percent P 4500000
Max CO ₂ 4.50" OD on packer Min ID 3.25" Base Packer Min Torque 100,000 lbs	Min Frac Assembly Burst / Collapse	12,500 psi Burst/Collapse	Min H ₂	
Production Rate Min ID 2.441" Differential Rating 7,200 psi (min) 250,000 lbs (max)	Min Weight Down Rating	100,000 lbs (Live Annulus and Squeeze Positions)	Fluid Density (API / ppg) GOR (scf/stb) GOR (scf/stb)	25-30 API Oil MSE = 250 GOR, P=1500 psi MSE/MDS = 500 GOR, P=4500 psi
Fluid Loss Control Device (Set) Ball Packer Type 4.25" 4.25" 4.25" ecc Max CO ₂ 2.441" 2.441" 2.441" Min ID 2.56" 19.75" Body (MSE/MDS) 2,000 psi 3,000 psi	Min Service Tool Rating attached to Packer	100,000 lbs attached to Packer	Production Rates Min Production Solids Rate Injection Rates Max Injection Solids Rate	12,000 - 20,000 SCFD 10 psi (10000), 4000 psi None
Direct Safety Valve Max CO ₂ 4.25" Min ID 2.441" Differential Rating 12,500 psi Direct Rating 100,000 psi	Min Service Tool Tension Rating released from Packer	200,000 lbs after packer is set and tool is released	Completion / Packer Probe Completion Max Angle Dogleg Severity	WOB 11,2-12.0 deg Calc/Calc2 MSE/MDS 10-12.7 deg Calc/Calc2 25 Degrees with dog to 30 deg dog through dog 5 deg > 100 ft
Max Frac Assembly Maximum Length	Directly Anchored/Reop Direct	See note 80 100,000 lb anchor when set rating 25,000 lb when released from WOB rating 7,200 psi burst/1000 psi 4.25 max ecc 3.25 min ID approved for VLS recovery		
Engineering Notes, Lessons Learned and Comments				
1) Ball Valve Fluid Loss Device must be capable of stopping a 100000 lb annulus, opened under a 2000 psi differential, opened with pressure cycles at each started. Stuffer must fit through 2.441" (25K). Must accept up to 10000 psi and will be pressure opened. 2) All equipment must still function at desired rating when cycled to 40 deg F. 3) Design does not have Production tubing landed into CH Packer. Instead a Group Head with sleeve side anchor is run with seals set along through packer, isolate during flow sleeve, and after uniform to through circulating housing. QUALIFICATION TEST REQUIREMENTS: Full Scale Crown Test, Functional Testing, Seal Material Compatibility, and Reported test results. Element Flow by testing				

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STATEMENT OF REQUIREMENTS - Thunder Horse Type 9.875"				
Equipment Criteria				
Equipment Type	0.00" Frac Pac Tool System (including Service Tools, MCS, Indicator Coupling, Extensions) 9-7/8" 62.8# Casing			
Description	Preliminary Frac Treatment Design Info		Critical Well Factors	
Casing Sizes: 9-5/8" 43.5# & 53.5# Other: 7" 42.9# & 88.0# Max ID: n/a Min ID: 8.500" to 3.500" Drift ID: n/a	2	Design Spec:	APCE HRI-0175 BP Approval of Material Specifications Required	Well Type: Producer and Injector Wells
Working Size: 5-7/8" 0.500" well Grade: S-1257 hr Connector: JCT-M57 Tool Joint: COT-300" Tool Joint ID: 4.250"		Service Conditions:	Initial Sweet - may sour after water injection is started (see main HOS) NPS:	Production - 3,000-16,400 psi / 215-250°F Injection - 13,000-16,400psi / 40-100°F
Service Tool Connections: 4-7/8" JCT-M57		Temp Range:	-10°F to 325°F	Annular Pressure Range: 4,300 psi (on flowing) - 19,000 psi (on packed) 8,500-11,000 psi
Frac Extension Connection Down: 7-3/4" Service Tool		Service Tool Functions:	Squeeze, Circulate and Reverse Rotation - required	Water Depth / Reservoir Depth: 15,000-16,000 TVD-23,000 MD (M57 to M-56)
Frac Assembly Materials: Inconel 625, 525 and 718		Closing Sleeve Opening Force:	Minimum 15,000 lbs	Max H ₂ S: 0 initial HOS - Max Potential HOS 100 ppm after water injection is started
Blowdown / Seal Materials: MHP element, bonded seal on Closing Sleeve When Tether/Pack Seal exists		Fracture Job: Pump Rate: 45 BPM Prop Size: 20/40 & 18/20 & 16/30 Prod Type: Carbonate Max Loading: 12 psi Max Pressure: 30,000 lbs		Max CO ₂ : K-6 Mol Percent
Frac Assembly: Max CO ₂ 0.00" on XO tool Min ID: Yield: 405,000 lbs		Min Frac Assembly Burst / Collapse: 12,500 psi (on 10,000 psi pressure-balanced sections)		Max H ₂ : C-4 Mol Percent
Production Seal: Max ID: 4.850" Differential Rating: 15,000 psi burst 15,000 psi collapse 800,000 psi tensile		Min. Tension / Coll. Tension Rating: 125,000 lbs Prod Ten. / Coll.		Fluid Density (API / ppg): 25 API @ 600-1,200
Fluid Loss Control: Gravel: 3000# Max OD: 8.915" 8.000" Min ID: 4.223" 2.750" Body Burst/Collapse: 100,000 100,000 Body Tensile Differential: 5,300 psi 10,000 psi Shear Safety Joint: Max CO ₂ 0.500" Min ID: 4.85"		Min Service Tool Tension Rating: 20,000 lbs		Production Rates: 2 pps to 100 m scfm prod max tolerance Max Production Solids Rate: 5 CO ₂ - 40 CuD BPPG Injection Rates: 1 pps to 50 mscfm max tolerance Max Injection Solids Rates: tolerance
Differential Rating: 15,000 psi Swell: 0.000" to 0.000" Frac Assembly: Maximum Length: not to exceed 70 ft		Min Weight Coll. Rating: 180,000 lbs (see Annex and Supplier Particular)		Completion / Packer Fluid: 14.2 ppg Completion Fluid / Packer Fluid 8.57 ppg Glycol Medium Brine / Seals Fluid
Engineering Notes, Lessons Learned and Comments: 1. All tools with outside diameters larger than 5.91" must have a 15 degree taper on top to help deter sand bridging and erosion during frac operations. QUALIFICATION TEST REQUIREMENTS: Full Scale Erosion Test, Functional Testing, Seal Material Compatibility, and Tapered End Seal Testing				

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STATEMENT OF REQUIREMENTS - Thunder Horse Type 7.625"				
Equipment Criteria				
Equipment Type	3.85" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) / 7-8/8" # Casing			
Description	Preliminary Frac Treatment Design Info		Critical Well Factors	
Casing Size: 7-5/8" 30# 3.42 wt Max ID: 6.625" 4.6 951" Min ID: n/a Drill ID: 6.500" to 6.575"	Design Spec:		Well Type:	Production and Injection Wells
Working SBD: 5-7/8" 8.330" well Grade: S-1957 bar Connection: 27-MST Tool Joint OD: 7.000" Tool Joint ID: 4.250"	Service Conditions:		Brine / BH:	Production - 13,000-15,400 psi 115-250 F Injection - 13,000-16,400 psi / 40-100 F
Service Tool Connection:	Temp Range:		Applicable Pressure Range:	4,000 psi (min flow) - 15,000 psi (maximum) (6,529)
Frac Extension Connection Down:	Service Tool Position:		Wash Casing / Reservoir Depth:	15,000-18,000 TVD-50,000 MD (MST to M-50)
Frac Assembly Material:	Closing Sleeve Opening Force:			0 initial H2S - Max Potential H2S 500 ppm after water injection is started
Inserts: 625, 625 and 718	Frac JTD:		Max H2S:	
Materials:	Pump Rate: 30 BPM Prop Size: 2040 & 1620 & 1450 Prop Type: Carbonite Max Loading: 15 cps Min Pressure: 200,000 psi		Max CO ₂ :	6.6 Mol Percent
Frac Assembly:	Min Frac Assembly Burst / Collapse:		Max H ₂ :	0.4 Mol Percent
Min ID:	Min. Tension / Compression Rating:		Fluid Density (API / ppb): SGR (g/cc)	55 API Cr 500-1,200
Production SBD:	Min Service Tool Tension Rating:		Production Rates: Max Production Rates: Rate: Injection Rates: Max Injection Rates: Rate:	45,000 GPOD (variable zone) 2 gpo/100 m (max prod) max minimum 15,000 - 40,000 BWPD 1 gpo/100 m (max minimum
Min ID:	Min Weight Down Rating:		Completion / Packal Fluid:	14.2 ppg Completion Fluid Packal Fluid 5.87 wpp Glycol Cement-Bonded Core Fluid
Differential Rating:	Packal Qualification Test:		Max Angle / Dogleg:	45 Degrees 5 deg / 100 ft
Shut In Rating:	Engineering Notes, Loadings, Labels and Comments			
Max Burst Load:	1. All tools with outside diameters larger than 5.36" must have a 15 degree taper on top to help distribute loading and erosion during final operations.			
Max Burst Load:	QUALIFICATION TEST REQUIREMENTS: Full Scale Erosion Test, Functional Testing, Seal Material Compressibility, and Tapered Test tool testing			

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STATEMENT OF REQUIREMENTS - Tubular Bells Type 9.875"				
Equipment Criteria				
Equipment Type	8.00" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) ft 10-1/8" x 8-1/2" drift casing			
Description	Preliminary Frac Treatment Design Info		Critical Well Factors	
Casing Size Max O.D. 8.710" Min O.D. 8.525" Drift O.D. 8.500"	Design Spec.		Well Type:	
Working Size Grade Connections Tool Joint O.D. Service Tool Connections	Service Conditions		BHP / BHT	
10-1/8" 4130 steel 135 ksi XTM-57 7.000" 4.250"	Temp Range:		Absolute Pressure Range	
3-1/2" IF (NCS)	Service Tool Positions:		Water Depth / Reservoir Depth	
Frac Extension Connection Detail	Closing Squeeze Operating Force:		Max H ₂ S	
Frac Assembly Metallurgy	Min Frac Assembly Burst / Collapse		Max CO ₂	
Nickel Alloy 925 or 718 for screw-down metallurgy for flow-out termination equipment, P-110125 or 4130 Alloys acceptable for Service tools	Min Service Tool Tension Rating		Production Rates	
Blowdown / Seal Materials	Min Weight Down Rating		Injection Rates	
Alloys on Service tools and bonded seal in Casing Sleeve. Chemical O-rings with Peak BL rings. Chromaz/Tefer/Pack Seal units and V-Packing	Packer Qualification Test		Completion / Packer Fluid	
Frac Assembly Max O.D. 8.424 BBS*	Max Angle / Drilling		Max Angle / Drilling	
Production Seal Min O.D. 12,000 psi	Max Angle / Drilling		Max Angle / Drilling	
Differential Rating	Max Angle / Drilling		Max Angle / Drilling	
Fluid Loss Control Device/Valve Max O.D. 8.03"	Max Angle / Drilling		Max Angle / Drilling	
Min O.D.	Max Angle / Drilling		Max Angle / Drilling	
Body Burst/Collapse Burst/Sleeve Differential Steel Safety Valve	Max Angle / Drilling		Max Angle / Drilling	
Max O.D. Min O.D. Differential Rating Break Rating Frac Assembly Maximum Length	Max Angle / Drilling		Max Angle / Drilling	

Engineering Notes, Lessons Learned and Comments:
 1. Safety Joint/Connector Joint is required which can be used as a catch connect sub and serve to limit the packer production tension/compression loads.
 2. All tools with outside diameters larger than 7.5" must have a 15 degree taper on top to help clear sand bridging and window during frac pac operations.
 QUALIFICATION TEST REQUIREMENTS: Full Scale Break Test, Functional Testing, Seal Material Compatibility and Tapered Bell Seal Testing

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STATEMENT OF REQUIREMENTS - Tubular Bells Type 7.625"					
Equipment Criteria					
Equipment Type		3.86" Frac Pac Tool System (including Service tools, MCS, Indicator Coupling, Extensions) / 7-5/8" 36# Casing			
Description		Preliminary Frac Treatment Design Info		Critical Well Factors	
Casing Size Max ID 8.730" Min ID 8.625" DIN ID 8.690"		Design Spec:	NACE MR-0175, BP Approval of Material Specifications Required	Well Type:	Producer and Injector Wells
Working Size 5.75" - 415" well Grade 125 ksi Connections XTM-57 Tool Joint OD 7.690" Tool Joint ID 4.250"		Service Conditions:	Sour	BHP / BHT	17,500-18,000 psi / 220-290 F
Service Tool Connections	3-1/2" IF (NACE)	Temp Range:	80-350 F, 80 F Min BHT	Absolute Pressure Range	9,600 psi (min flowing) - 30,000 psi (screenout) 4300-17500
Frac Extension Connection Down	5-11/16" 8 TPI Stub Acme	Service Tool Positions:	Squeeze, Closure, and Reverse positions required	Water Depth / Reservoir Depth	24350-25,000' TVD-25600' MD (MEI)
Frac Assembly Metallurgy	Nickel Alloy 625 or 718 (or equivalent) materials for Tool-Joint, Down-Hole equipment, P-110M25 or 4130 Alloy acceptable for Service tools	Closing Sleeve Opening Force:	Minimum 5,000 lbs	Max H ₂ S	0 Initial MCS Max Potential H ₂ S TBD
Elastomers / Seal Materials	Allies on Service tools and bonded seal in Closing Sleeve. Chemical O-rings with Peak BU ring, Chemical/Teflon/Pack Seal units and V-Packing	Frac Job Pump Rate Prop Size Prop Type Max Loading Max Proppant	40 BPM 19/32 Carbo HSP 12 psi 750,000 lbs	Max CO ₂	0.40 - 1.2 Mol Percent
Frac Assembly Max OD 8.15" Min ID 3.69"		Min Frac Assembly Burst / Collapse	15,000 psi frac 12,000 psi production 10,000 psi pressure-balanced sections	Max H ₂	0.4 - 0.7 Mol Percent
Production Seal Min ID 2.95" Differential Rating 12,000 psi		Min. Tension / Compression Rating:	125,000 lbs Prod Ten / Comp	Fluid Density (API / g/gal) GOR (scf/bbl)	34-38 API Oil 2000 - 2300 (scf/bbl per zone)
Fluid Loss Control Device Valve Max OD Min ID Body Burst Collapse Ball/Sleeve Differential Seal Safety Joint	Ball Valve Assest Seals	Min Service Tool Tension Rating	200,000 lbs	Production Rates Max Production Solids Rate Injection Rates Max Injection Solids Rate	2 ppts/100 micron prod max 15,000 - 40,000 BWPD 1 pptb / 50 micron eq max max size
Max OD Min ID Differential Rating Shank Safety Joint Frac Assembly Maximum Length		Min Weight Down Rating	150,000 lb (Live Annulus and Squeeze Positions)	Completion / Packer Fluid	14-15.3 ppg Completion Fluid/ Packer Fluid TBD Zinc Blend or Calcium Formate Comp Fluid
	not to exceed 70 ft	Packer Qualification Test	180-14310 psi	Max Angle / Dogleg	40 Degrees 5 deg / 100 ft
Engineering Notes, Lessons Learned and Comments					
1. Safety Joint/ Compression Joint is required which can be used as a quick connect sub and serve to limit frac packer production tension/compression loads					
2. All tools with outside diameters larger than 5.96" must have a 15 degree bevel on top to help deter sand bridging and erosion during frac pack operations.					
QUALIFICATION TEST REQUIREMENTS: Full Scale Erosion Test, Functional Testing, Seal Material Compatibility, and Tapered Ball Seal Testing					

Section 3 – Scope of WORK
Appendix 6 – Functional and Technical Specifications
E. Completions

STATEMENT OF REQUIREMENTS - Kaskida Type				
Equipment Criteria				
Equipment Type	15,000 psi differential Multizone Single Trap Frac Pack Equipment			
Description	Preliminary Frac Treatment Design Info			
Casing Size Max ID 8.925" Min ID 8.5" CWT 1/2	Design Spec:	NACE MR-0175 BP Approval of Material Specifications Required	Well Type:	Production and Injection Wells
Working Size 5.78" 415" well Casing 135 ksi Connection BTM-57 Tool Joint OC 7.000" Tool Joint ID 4.250" "Pole-Hat" Lower Holemaking 4.121" 13.8 psi RLT, 2-140, with S-250 X 3.250 CT-M43 tool joint	Service Conditions:		BMF / BMT	34,500 psi / 22,0250 F
Service Tool Connections	Temp Range:	80-150 F	Absolute Pressure Range:	38,000 psi
Frac Extension Connection Down	Service Tool Positions:	Squeeze Circulate Low Annulus and Reverse positions required	Water Depth / Reservoir Depth:	9600-8000 31,000-3,500 FT TVD
Frac Assembly Metallurgy	Closing Sleeve Opening Force:	Minimum 5,000 lbs	Max H ₂ S:	0 inder H ₂ S Max Potential H ₂ S T30
Elastomers / Seal Materials	Frac Job Pump Rate 30-50 BPM Pump Size 18930 Pump Type Carbo-ESP Max Loading 12ppg Max Proppant 750,000 lbs per zone		Max CO ₂ :	0.295 mol frac
Frac Assembly Max OD Min ID	Max Frac Assembly Burst / Collapse	15,000 psi frac 15,000 psi production 15,000 psi pressure-balanced sections	Max N ₂ :	0.561 mol frac
Production Seal Min ID Differential Rating	Max Tension / Compression Rating	125,000 lbs (Prod Ten / Comp)	Fluid Density (API / ppg) GOR (scf/bbl)	280-230
Fluid Loss Control Device Valve Max CO ₂ Min ID Body Burst Collapse Burst/Static Collapse	Max Service Tool Tension Rating	300,000 lbs	Production Rates	30,000 - 25,000 GOPD
Shear Safety Joint Max CO ₂ Min ID Differential Rating Shear Rating	Min Weight Down Rating	180,000 lbs (Low Annulus and Squeeze Position)	Completion / Packer Fluid	15.5-15.4 ppg Completion Fluid Packer Fluid T30 2nd third or Cream Forecast Cure Fluid
Frac Assembly Minimum Length	Packer Certification Test	ISO 14310 V3	Max Angle / Dogleg	+30 Degrees 3 deg / 100 ft
Engineering Notes, Lessons Learned and Comments: 1. Safety Joint Completion Joint is required which can be used as a quick connect sub QUALIFICATION TEST REQUIREMENTS: Full Scale Erosion Test, Functional Testing, Seal Material Compatibility, and Tapered ball seal testing				

Appendix 7 – Technical Integrity

A. Cementing Services

1.0 TECHNICAL INTEGRITY FOR PROCURED EQUIPMENT

CONTRACTOR shall provide to COMPANY the WORK in accordance with the latest revision of COMPANY Integrity Assurance Specification (IAS) for the procurement of critical equipment, document reference BP-EPT-IAS-01.

2.0 TECHNICAL INTEGRITY FOR RENTAL EQUIPMENT

- 2.1 CONTRACTOR shall have established, implemented and maintained a Quality Assurance System in conformance with the requirements of ISO 9001, API Q1 (ISO TS 29001) or any other recognized or established standard / format as mutually agreed with COMPANY, providing that all aspects of the CONTRACT and WORK which affect the quality of the services supplied are defined, documented, proceduralized (where required) and controlled under the system (including subcontracted services).
- 2.2 CONTRACTOR shall implement and maintain location specific Quality Plans, and applicable working procedures for the duration of the CONTRACT.
- 2.3 CONTRACTOR's Quality Plan shall be submitted to COMPANY for approval prior to commencement of the WORK.
- 2.4 CONTRACTOR shall allow COMPANY QA auditors full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting quality audits.
- 2.5 "Ad hoc" quality inspections may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY, and may be carried out without any prior notice to CONTRACTOR.
- 2.6 Where non conformances are identified during audits and / or inspections by COMPANY or COMPANY third party inspectors, CONTRACTOR shall undertake the corrective actions as required by COMPANY, within agreed specified time limits.
- 2.7 Corrective actions undertaken by CONTRACTOR as a result of non conformances being identified during a quality audit or inspection shall be undertaken at no cost to COMPANY.
- 2.8 CONTRACTOR shall compile all necessary documentation in accordance with specified requirements, and such relevant documentation shall be made available to COMPANY and / or the Certifying Authority for certification purposes when and where appropriate.
- 2.9 CONTRACTOR's Quality Management System shall, as a minimum, include:
 - 2.9.1 Design and Verification

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Appendix 7 – Technical Integrity
A. Cementing Services**

CONTRACTOR will have an auditable and documented design and verification system for all the goods and materials supplied.

2.9.2 Formal job descriptions / responsibilities / authority

All CONTRACTOR's personnel will have formal job descriptions detailing their responsibilities for work and their authorities to act. These will reflect the actual jobs they perform.

2.9.3 Receiving inspection for all equipment (new, unused and used)

CONTRACTOR will establish and maintain a system for the receipt of all goods and materials being supplied by CONTRACTOR. This will include suitable inspection criteria which allows for identification of conforming and non conforming equipment. A quarantine area for non conforming equipment will be established.

3.0 NON-CONFORMING GOODS

- 3.1 CONTRACTOR will establish and maintain a system that identifies any goods and materials supplied which do not conform to specifications i.e., Non Conformance Reports (NCRs).
- 3.2 The system will be capable of managing any non conformances identified either through design, goods receipt inspection, assembly and testing, inspection and maintenance regimes, CONTRACTOR internal audits, COMPANY audits or inspections and any failed in service items as identified either by CONTRACTOR's field personnel or COMPANY's field representatives.
- 3.3 Where non conformances are identified, CONTRACTOR will perform, within a time period acceptable to COMPANY, all corrective actions required to prevent recurrence.
- 3.4 Corrective actions undertaken by CONTRACTOR as a result of non-conformances identified will be undertaken at no cost to COMPANY.

4.0 INSPECTION AND TESTING STANDARDS: including acceptance / reject criteria, using Original Equipment Manufacturer or Supplier (OEM) specifications as a minimum.

- 4.1 CONTRACTOR will establish and maintain a formal inspection management system for all goods and materials supplied; the system will as a minimum:
 - 4.1.1 Provide detailed inspection specifications, including acceptance and rejection criteria for proprietary equipment and materials supplied by CONTRACTOR and any SUBCONTRACTOR.
 - 4.1.2 Meet DS-1 Category 4 inspection requirements for components covered by TH Hill Associates, Inc. Standard DS-1 Drill Stem Design Inspection latest revision or alternatively the Drilling Equipment Inspection Procedures (DEIP), as applicable to the goods and services supplied by CONTRACTOR and any SUBCONTRACTOR.
 - 4.1.3 Provide competent inspectors of the equipment, qualified and competent to perform

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A. Cementing Services**

the inspection required.

- 4.1.4 Will use and demonstrate compliance with DS-1 / DEIP (where applicable) and specified inspection criteria. The requirements are applicable to all pipe / tubulars used down hole.
- 4.2 CONTRACTOR will provide the specifications and criteria used for the inspection of goods and materials supplied.
- 4.3 CONTRACTOR will establish and maintain a system for verifying the integrity of the equipment through testing and inspection. The testing specification and standards for equipment will be made available for review by COMPANY and COMPANY will have the right to implement changes.
- 4.4 All assemblies will be tested in accordance with procedures approved by COMPANY prior to release and shipment. Verification of testing may be required by COMPANY through its own representatives. COMPANY and CONTRACTOR will develop a quality assurance plan as part of the Statement of Requirements (SOR) which will provide details of the inspection and acceptance criteria, witness and hold points required by COMPANY during manufacture, test, and assembly.
- 4.5 All load bearing equipment, lifting equipment and lifting points will be inspected and tested in accordance with LOLER requirements and with current certification for the duration of the CONTRACT.
- 4.6 CONTRACTOR will be responsible for ensuring that its SUBCONTRACTORS comply with the inspection and testing requirements.

5.0 MAINTENANCE MANAGEMENT SYSTEM

In accordance with OEM as a minimum, including compliance to US legislative requirements.

- 5.1 CONTRACTOR will establish and maintain a planned maintenance system for all goods and materials supplied by CONTRACTOR and SUBCONTRACTORS.
- 5.2 The maintenance regimes will be as per OEM unless otherwise demonstrated that changes to the routines are justified.

6.0 REPAIR STANDARDS AND PROCEDURES

In accordance with OEM as a minimum.

- 6.1 CONTRACTOR will establish and maintain refurbishment and repair procedures to ensure the integrity of goods and materials supplied. These will be OEM standards as a minimum, unless otherwise demonstrated that changes to the approved repair standard are justified.
- 6.2 CONTRACTOR will establish, qualify, and maintain approved welding procedures for the goods and materials which require welding and will use suitably competent and coded welders (ASME IX) for any weld repair work.
- 6.3 CONTRACTOR will ensure SUBCONTRACTORS comply with this requirement.

7.0 FINAL INSPECTION PRIOR TO DISPATCH TO WORKSITE

- 7.1 CONTRACTOR will establish and maintain a final inspection system prior to dispatch of the equipment to the WORKSITE. Signed release notes will be provided with the equipment.
- 7.2 The final inspection and check control system must ensure that the final product complies with the original SOR and that all NCRs and any associated Corrective Action Requests (CAR) have been closed out prior to release and shipping.

8.0 PURCHASING STANDARDS AND SPECIFICATIONS

- 8.1 Where CONTRACTOR purchases materials, spares and other equipment, CONTRACTOR will establish and maintain a system that details and documents clearly the specifications required to supply fit for purpose equipment. The specifications will include all material and technical requirements, QA and legislative needs and any drawings (latest revisions).
- 8.2 OEM specifications will be used unless COMPANY agrees to use alternative specifications.

9.0 MATERIALS / EQUIPMENT TRACEABILITY

CONTRACTOR will establish and maintain a fully traceable system, including appropriate documentation and certification for all the equipment including spares. As a minimum this will provide:

- 9.1 Full traceability to heat numbers or lots (for all forgings and castings etc.)
- 9.2 Full traceability to cure and expiry dates (for all elastomers).
- 9.3 Full tool and service history (inspection, testing, maintenance, replacement of spare parts and repairs undertaken).
- 9.4 Mapping and recording of tests, complete with verification testing undertaken (i.e., NDT including hardness testing etc.), on any weld repair or heat treatment undertaken after manufacture.
- 9.5 CONTRACTOR will compile all necessary documentation in accordance with specified requirements, and such relevant documentation will be made available to COMPANY and / or COMPANY's representative.
- 9.6 The minimum documentation to be held by CONTRACTOR relating to equipment supplied will include:
 - 9.6.1 Data books with full traceability.
 - 9.6.2 Material certificate(s) for any equipment.
 - 9.6.3 Load test records for load bearing and / or lifting hoisting equipment.
 - 9.6.4 Rental history movements.
 - 9.6.5 Refurbishment history including any weld repair maps.
 - 9.6.6 Inspection and maintenance reports.

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9.6.7 Failure histories.

9.6.8 Originals of documents supplied with the tools.

9.7 CONTRACTOR will provide the following documentation with all equipment shipped to the WORKSITE:

9.7.1 Certificate(s) of conformity.

9.7.2 Current inspection certificate.

9.7.3 Current pressure test certificate.

9.7.4 Certificate for slings and baskets.

9.8 Each item of equipment will be marked with a clearly identifiable unique permanent traceable / serial and part number.

10.0 CALIBRATION MANAGEMENT OF EQUIPMENT

10.1 CONTRACTOR will identify all equipment that requires calibration. CONTRACTOR will establish and maintain a Calibration Management System and all equipment will conform to the calibration schedules and technical requirements.

10.2 Calibration will be in accordance with calibration system specifications and include API Spec 7 requirements for API threads.

10.3 All equipment requiring calibration will be marked with last calibration, next due calibration date and display details of the individual responsible for the calibration.

11.0 MANAGEMENT OF CHANGE

11.1 CONTRACTOR will establish and maintain a system for identifying and approving changes to approved equipment design, standards, specifications and procedures. All changes to approved designs etc. whether permanent or temporary will be controlled and managed. All changes will be technically reviewed and will not compromise the integrity of the equipment and will be suitable for the anticipated operating environment as specified. COMPANY's representatives will take part in the review process.

11.2 The system for managing change will be auditable and managed by competent personnel with appropriate technical and financial authorities.

11.3 The Management of Change System will be communicated to all CONTRACTOR personnel and CONTRACTOR will use its best endeavors to ensure an appropriate level of understanding of the system.

11.4 CONTRACTOR will establish and maintain a quality management process to control equipment modification or repairs carried out by a SUBCONTRACTOR.

12.0 DOCUMENT CONTROL SYSTEM

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- 12.1 All critical documents (standards, specifications, procedures, drawings, technical and operating manuals etc.) will be identified and controlled through a formal document control management system.
- 12.2 The system will identify recipients of the controlled documents and have the facility to gather and destroy old and out of date revisions.

13.0 SELECTION AND APPROVAL OF COMPETENT SUBCONTRACTORS

- 13.1 CONTRACTOR will establish and maintain an auditable process and system for selecting and approving competent SUBCONTRACTORS.
- 13.2 CONTRACTOR will identify the criticality of the goods and services being provided by its SUBCONTRACTORS and depending upon criticality will implement necessary checks, controls and safeguards to ensure quality and reliable goods and services are provided. Such checks, controls, and safeguards will be detailed in the SUBCONTRACT.
- 13.3 CONTRACTOR will establish and maintain an approved list of SUBCONTRACTORS indicating which materials, goods, or services are being supplied. The list will be made available to COMPANY.

14.0 MANAGING SUBCONTRACTORS

- 14.1 CONTRACTOR will establish and maintain a performance measuring and monitoring system for SUBCONTRACTORS. The system will include regular auditing and reviewing of a SUBCONTRACTOR commensurate with the criticality of the goods and services being provided. The system will provide both assurance to CONTRACTOR and COMPANY that SUBCONTRACTORS are providing fit for purpose, quality and reliable equipment.
- 14.2 CONTRACTOR will identify and implement checks and controls as part of its goods receipt inspection system that provide CONTRACTOR and COMPANY with assurance that goods and materials supplied by SUBCONTRACTORS comply with the purchase specification.
- 14.3 CONTRACTOR shall supply a copy of its planned audit schedule for SUBCONTRACTORS during the life of the CONTRACT. COMPANY shall have the option of placing a representative with the audit team to monitor audits.

15.0 INTERNAL AUDIT SYSTEM

- 15.1 CONTRACTOR will establish and maintain its own internal auditing processes for assessing and assuring compliance of its QMS and management control systems. Audit reports and corrective action arising from these internal audits will be made available to COMPANY upon request and CONTRACTOR will advise progress against recommended actions.
- 15.2 CONTRACTOR shall supply a copy of its planned internal audit schedule during the life of the CONTRACT. COMPANY shall have the option of placing a representative with the audit team to monitor audits.

16.0 AUDIT BY THE COMPANY

- 16.1 COMPANY reserves the right and will from time to time perform audits on CONTRACTOR

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against the Scope of Work and CONTRACTOR's management systems and controls, as part of COMPANY's assurance system.

- 16.2 CONTRACTOR will allow COMPANY's representatives full access to the work in progress, personnel, records, and documentation for the purpose of conducting quality audits; this requirement also applies to SUBCONTRACTORS.
- 16.3 "Ad hoc" quality audits may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY, and may be carried out without any prior notice to CONTRACTOR.

17.0 MANAGEMENT SYSTEM FOR INVENTORY INCLUDING SPARES, STORAGE, AND HANDLING OF EQUIPMENT

- 17.1 CONTRACTOR will establish and maintain an inventory stock and spares control system. The level of stock and spares will reflect the operational needs and work activities of COMPANY. CONTRACTOR will be responsible for ensuring that adequate stock and spares and including rental type equipment is available for COMPANY's use.
- 17.2 CONTRACTOR will be responsible for the storage and protection of all goods and materials supplied. Goods and materials will be adequately protected against damage and deterioration; protection methods shall include:
 - 17.2.1 Correct thread protectors for all threaded connections (composite plastic breathable type for premium connections, steel type for API type connections).
 - 17.2.2 All seal faces and areas will be adequately protected commensurate with their service criticality; these materials will be stored inside and away from corrosive environments and handled using non metallic lifting appliances.
 - 17.2.3 Elastomers will be stored inside in an environmentally controlled atmosphere in closed packets (complete with cure date and expiry date details).
 - 17.2.4 Packer, seal elements, and other elastomeric materials will be stored in an environmentally controlled facility, suitably protected against impact and corrosion damage.
 - 17.2.5 Shear pins will be closely controlled to avoid the risk of improper use in the hanger assembly and preparation. Procedures will be in place to ensure segregation of new and used shear stock and other consumable items.

B. Fluids Services

1.0 GENERAL GUIDELINES AND PRINCIPLES

- 1.1 CONTRACTOR will be required to submit a QA / QC plan for the equipment, services, materials, and personnel furnished to COMPANY for review and approval. This QA / QC plan shall be tailored after a recognized quality standard such as API-Q1, ISO 9001, MIL-Q9858A or equivalent. Upon approval by COMPANY, this mutually agreed QA / QC plan shall be made a part of this CONTRACT and shall apply not only to CONTRACTOR's activities, but also to those of any SUBCONTRACTORS. The QA / QC plan shall, at a minimum, include:
- 1.2 The mutually agreed upon stimulation QA / QC guidelines are to be site specific for a particular area of operations. These guidelines will be based on the recommendations found in, but not limited to, COMPANY Frac QA / QC Manual (see the attached Example QA / QC Plan).
- 1.3 Detailed description of the stages of performance of a service or manufacture of equipment components and final product.
- 1.4 Location of service to be provided, sources of materials and equipment, and manufacture, inspection, assembly, testing and storage of any purchased equipment.
- 1.5 A matrix that shall list the full description of the individual services, products, and equipment utilized in conducting required services, or of individual components and assembly of purchased equipment, along with the documentation, traceability, testing, inspection and process that shall be performed by CONTRACTOR or his agents. This matrix shall be utilized by COMPANY to list any COMPANY required inspections, standards and testing in addition to COMPANY's witness, review, traceability and documentation requirements.
- 1.6 Provisions for COMPANY to review and approve CONTRACTOR's and SUBCONTRACTOR's QA / QC plans, processes, procedures, documentation, drawings, materials, parts lists and non-conformance deviation reports.
- 1.7 Location of the handling and disposal of rejected parts after service.
- 1.8 The QA / QC plan shall contain certain inspections and manufacturing processes which COMPANY may or may not witness, verify or review. This does not absolve CONTRACTOR from performing any and all tests, inspections, equipment calibrations, or dimensional measurements that are required in CONTRACTOR's approved QA / QC plan.
- 1.9 COMPANY reserves the right to conduct any and all tests and any other inspection deemed necessary by COMPANY at COMPANY's sole expense.
- 1.10 CONTRACTOR shall afford COMPANY reasonable access to:
 - Perform audits.
 - Perform relevant inspections.
 - Review all QA / QC records and documents.
 - Review all Safety and Environmental documents.

C. Well Placement

1.0 GENERAL GUIDELINES AND PRINCIPLES

- 1.1 CONTRACTOR will be required to submit a QA / QC plan for the equipment, services, materials, and personnel furnished to COMPANY for review and approval. This QA / QC plan shall be tailored after a recognized quality standard such as API-Q1, ISO 9001, MIL-Q9858A or equivalent. Upon approval by COMPANY, this mutually agreed QA / QC plan shall be made a part of this CONTRACT and shall apply not only to CONTRACTOR's activities, but also to those of any SUBCONTRACTORS. The QA / QC plan shall, at a minimum, include:
- 1.2 The mutually agreed upon QA / QC guidelines are to be site specific for a particular area of operations.
- 1.3 Detailed description of the stages of performance of a service or manufacture of equipment components and final product.
- 1.4 Location of service to be provided, sources of materials and equipment, and manufacture, inspection, assembly, testing and storage of any purchased equipment.
- 1.5 A matrix that shall list the full description of the individual services, products, and equipment utilized in conducting required services, or of individual components and assembly of purchased equipment, along with the documentation, traceability, testing, inspection and process that shall be performed by CONTRACTOR or his agents. This matrix shall be utilized by COMPANY to list any COMPANY required inspections, standards and testing in addition to COMPANY's witness, review, traceability and documentation requirements.
- 1.6 Provisions for COMPANY to review and approve CONTRACTOR's and SUBCONTRACTOR's QA / QC plans, processes, procedures, documentation, drawings, materials, parts lists and non-conformance deviation reports.
- 1.7 Location of the handling and disposal of rejected parts after service.
- 1.8 The QA / QC plan shall contain certain inspections and manufacturing processes which COMPANY may or may not witness, verify or review. This does not absolve CONTRACTOR from performing any and all tests, inspections, equipment calibrations, or dimensional measurements that are required in CONTRACTOR's approved QA / QC plan.
- 1.9 COMPANY reserves the right to conduct any and all tests and any other inspection deemed necessary by COMPANY at COMPANY's sole expense.
- 1.10 CONTRACTOR shall afford COMPANY reasonable access to:
 - Perform audits.
 - Perform relevant inspections.
 - Review all QA / QC records and documents.
 - Review all Safety and Environmental documents.

D. Wireline Services

1.0 TECHNICAL INTEGRITY FOR PROCURED EQUIPMENT

CONTRACTOR shall provide to COMPANY the WORK in accordance with the latest revision of COMPANY Integrity Assurance Specification (IAS) for the procurement of critical equipment, document reference BP-EPT-IAS-01.

2.0 TECHNICAL INTEGRITY FOR RENTAL EQUIPMENT

- 2.1 CONTRACTOR shall have established, implemented and maintained a Quality Assurance System in conformance with the requirements of ISO 9001, API Q1 (ISO TS 29001) or any other recognized or established standard / format as mutually agreed with COMPANY, providing that all aspects of the CONTRACT and WORK which affect the quality of the services supplied are defined, documented, proceduralized (where required) and controlled under the system (including subcontracted services).
- 2.2 CONTRACTOR shall implement and maintain location specific Quality Plans, and applicable working procedures for the duration of the CONTRACT.
- 2.3 CONTRACTOR's Quality Plan shall be submitted to COMPANY for approval prior to commencement of the WORK.
- 2.4 CONTRACTOR shall allow COMPANY QA auditors full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting quality audits.
- 2.5 "Ad hoc" quality inspections may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY, and may be carried out without any prior notice to CONTRACTOR.
- 2.6 Where non conformances are identified during audits and / or inspections by COMPANY or COMPANY third party inspectors, CONTRACTOR shall undertake the corrective actions as required by COMPANY, within agreed specified time limits.
- 2.7 Corrective actions undertaken by CONTRACTOR as a result of non conformances being identified during a quality audit or inspection shall be undertaken at no cost to COMPANY.
- 2.8 CONTRACTOR shall compile all necessary documentation in accordance with specified requirements, and such relevant documentation shall be made available to COMPANY and / or the Certifying Authority for certification purposes when and where appropriate.
- 2.9 CONTRACTOR's Quality Management System shall, as a minimum, include:
 - 2.9.1 Design and Verification

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CONTRACTOR will have an auditable and documented design and verification system for all the goods and materials supplied.

2.9.2 Formal job descriptions / responsibilities / authority

All CONTRACTOR's personnel will have formal job descriptions detailing their responsibilities for WORK and their authorities to act. These will reflect the actual jobs they perform.

2.9.3 Receiving inspection for all equipment (new, unused and used)

CONTRACTOR will establish and maintain a system for the receipt of all goods and materials being supplied by CONTRACTOR. This will include suitable inspection criteria which allows for identification of conforming and non conforming equipment. A quarantine area for non conforming equipment will be established.

3.0 NON-CONFORMING GOODS

3.1 CONTRACTOR will establish and maintain a system that identifies any goods and materials supplied which do not conform to specifications i.e., Non Conformance Reports (NCRs).

3.2 The system will be capable of managing any non conformances identified either through design, goods receipt inspection, assembly and testing, inspection and maintenance regimes, CONTRACTOR internal audits, COMPANY audits or inspections and any failed in service items as identified either by CONTRACTOR's field personnel or COMPANY's field representatives.

3.3 Where non conformances are identified, CONTRACTOR will perform, within a time period acceptable to COMPANY, all corrective actions required to prevent recurrence.

3.4 Corrective actions undertaken by CONTRACTOR as a result of non-conformances identified will be undertaken at no cost to COMPANY.

4.0 INSPECTION AND TESTING STANDARDS: including acceptance / reject criteria, using Original Equipment Manufacturer or Supplier (OEM) specifications as a minimum.

4.1 CONTRACTOR will establish and maintain a formal inspection management system for all goods and materials supplied; the system will as a minimum:

4.1.1 Provide detailed inspection specifications, including acceptance and rejection criteria for proprietary equipment and materials supplied by CONTRACTOR and any SUBCONTRACTOR.

4.1.2 Meet DS-1 Category 4 inspection requirements for components covered by TH Hill Associates, Inc. Standard DS-1 Drill Stem Design Inspection latest revision or alternatively the Drilling Equipment Inspection Procedures (DEIP), as applicable to the goods and services supplied by CONTRACTOR and any SUBCONTRACTOR.

4.1.3 Provide competent inspectors of the equipment, qualified and competent to perform

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the inspection required.

- 4.1.4 Will use and demonstrate compliance with DS-1 / DEIP (where applicable) and specified inspection criteria. The requirements are applicable to all pipe / tubulars used down hole.
- 4.2 CONTRACTOR will provide the specifications and criteria used for the inspection of goods and materials supplied.
- 4.3 CONTRACTOR will establish and maintain a system for verifying the integrity of the equipment through testing and inspection. The testing specification and standards for equipment will be made available for review by COMPANY and COMPANY will have the right to implement changes.
- 4.4 All assemblies will be tested in accordance with procedures approved by COMPANY prior to release and shipment. Verification of testing may be required by COMPANY through its own representatives. COMPANY and CONTRACTOR will develop a quality assurance plan as part of the Statement of Requirements (SOR) which will provide details of the inspection and acceptance criteria, witness and hold points required by COMPANY during manufacture, test, and assembly.
- 4.5 All load bearing equipment, lifting equipment and lifting points will be inspected and tested in accordance with LOLER requirements and with current certification for the duration of the CONTRACT.
- 4.6 CONTRACTOR will be responsible for ensuring that its SUBCONTRACTORS comply with the inspection and testing requirements.

5.0 MAINTENANCE MANAGEMENT SYSTEM

In accordance with OEM as a minimum, including compliance to US legislative requirements.

- 5.1 CONTRACTOR will establish and maintain a planned maintenance system for all goods and materials supplied by CONTRACTOR and SUBCONTRACTORS.
- 5.2 The maintenance regimes will be as per OEM unless otherwise demonstrated that changes to the routines are justified.

6.0 REPAIR STANDARDS AND PROCEDURES

In accordance with OEM as a minimum.

- 6.1 CONTRACTOR will establish and maintain refurbishment and repair procedures to ensure the integrity of goods and materials supplied. These will be OEM standards as a minimum, unless otherwise demonstrated that changes to the approved repair standard are justified.
- 6.2 CONTRACTOR will establish, qualify, and maintain approved welding procedures for the goods and materials which require welding and will use suitably competent and coded

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welders (ASME IX) for any weld repair work.

6.3 CONTRACTOR will ensure SUBCONTRACTORS comply with this requirement.

7.0 FINAL INSPECTION PRIOR TO DISPATCH TO WORKSITE

7.1 CONTRACTOR will establish and maintain a final inspection system prior to dispatch of the equipment to the WORKSITE. Signed release notes will be provided with the equipment.

7.2 The final inspection and check control system must ensure that the final product complies with the original SOR and that all NCRs and any associated Corrective Action Requests (CAR) have been closed out prior to release and shipping.

8.0 PURCHASING STANDARDS AND SPECIFICATIONS

8.1 Where CONTRACTOR purchases materials, spares and other equipment, CONTRACTOR will establish and maintain a system that details and documents clearly the specifications required to supply fit for purpose equipment. The specifications will include all material and technical requirements, QA and legislative needs and any drawings (latest revisions).

8.2 OEM specifications will be used unless COMPANY agrees to use alternative specifications.

9.0 MATERIALS / EQUIPMENT TRACEABILITY

CONTRACTOR will establish and maintain a fully traceable system, including appropriate documentation and certification for all the equipment including spares. As a minimum this will provide:

9.1 Full traceability to heat numbers or lots (for all forgings and castings etc.)

9.2 Full traceability to cure and expiry dates (for all elastomers).

9.3 Full tool and service history (inspection, testing, maintenance, replacement of spare parts and repairs undertaken).

9.4 Mapping and recording of tests, complete with verification testing undertaken (i.e., NDT including hardness testing etc.), on any weld repair or heat treatment undertaken after manufacture.

9.5 CONTRACTOR will compile all necessary documentation in accordance with specified requirements, and such relevant documentation will be made available to COMPANY and / or COMPANY's representative.

9.6 The minimum documentation to be held by CONTRACTOR relating to equipment supplied

will include:

9.6.1 Data books with full traceability.

9.6.2 Material certificate(s) for any equipment.

9.6.3 Load test records for load bearing and / or lifting hoisting equipment.

9.6.4 Rental history movements.

9.6.5 Refurbishment history including any weld repair maps.

9.6.6 Inspection and maintenance reports.

9.6.7 Failure histories.

9.6.8 Originals of documents supplied with the tools.

9.7 CONTRACTOR will provide the following documentation with all equipment shipped to the WORKSITE:

9.7.1 Certificate(s) of conformity.

9.7.2 Current inspection certificate.

9.7.3 Current pressure test certificate.

9.7.4 Certificate for slings and baskets.

9.8 Each item of equipment will be marked with a clearly identifiable unique permanent traceable / serial and part number.

10.0 CALIBRATION MANAGEMENT OF EQUIPMENT

10.1 CONTRACTOR will identify all equipment that requires calibration. CONTRACTOR will establish and maintain a Calibration Management System and all equipment will conform to the calibration schedules and technical requirements.

10.2 Calibration will be in accordance with calibration system specifications and include API Spec 7 requirements for API threads.

10.3 All equipment requiring calibration will be marked with last calibration, next due calibration date and display details of the individual responsible for the calibration.

11.0 MANAGEMENT OF CHANGE

11.1 CONTRACTOR will establish and maintain a system for identifying and approving changes to approved equipment design, standards, specifications and procedures. All changes to approved designs etc. Whether permanent or temporary will be controlled and managed. All

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changes will be technically reviewed and will not compromise the integrity of the equipment and will be suitable for the anticipated operating environment as specified. COMPANY's representatives will take part in the review process.

- 11.2 The system for managing change will be auditable and managed by competent personnel with appropriate technical and financial authorities.
- 11.3 The Management of Change System will be communicated to all CONTRACTOR personnel and CONTRACTOR will use its best endeavors to ensure an appropriate level of understanding of the system.
- 11.4 CONTRACTOR will establish and maintain a quality management process to control equipment modification or repairs carried out by a SUBCONTRACTOR.

12.0 DOCUMENT CONTROL SYSTEM

- 12.1 All critical documents (standards, specifications, procedures, drawings, technical and operating manuals etc.) will be identified and controlled through a formal document control management system.
- 12.2 The system will identify recipients of the controlled documents and have the facility to gather and destroy old and out of date revisions.

13.0 SELECTION AND APPROVAL OF COMPETENT SUBCONTRACTORS

- 13.1 CONTRACTOR will establish and maintain an auditable process and system for selecting and approving competent SUBCONTRACTORS.
- 13.2 CONTRACTOR will identify the criticality of the goods and services being provided by its SUBCONTRACTORS and depending upon criticality will implement necessary checks, controls and safeguards to ensure quality and reliable goods and services are provided. Such checks, controls, and safeguards will be detailed in the SUBCONTRACT.
- 13.3 CONTRACTOR will establish and maintain an approved list of SUBCONTRACTORS indicating which materials, goods, or services are being supplied. The list will be made available to COMPANY.

14.0 MANAGING SUBCONTRACTORS

- 14.1 CONTRACTOR will establish and maintain a performance measuring and monitoring system for SUBCONTRACTORS. The system will include regular auditing and reviewing of a SUBCONTRACTOR commensurate with the criticality of the goods and services being provided. The system will provide both assurance to CONTRACTOR and COMPANY that SUBCONTRACTORS are providing fit for purpose, quality and reliable equipment.

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- 14.2 CONTRACTOR will identify and implement checks and controls as part of its goods receipt inspection system that provide CONTRACTOR and COMPANY with assurance that goods and materials supplied by SUBCONTRACTORS comply with the purchase specification.
- 14.3 CONTRACTOR shall supply a copy of its planned audit schedule for SUBCONTRACTORS during the life of the CONTRACT. COMPANY shall have the option of placing a representative with the audit team to monitor audits.

15.0 INTERNAL AUDIT SYSTEM

- 15.1 CONTRACTOR will establish and maintain its own internal auditing processes for assessing and assuring compliance of its QMS and management control systems. Audit reports and corrective action arising from these internal audits will be made available to COMPANY upon request and CONTRACTOR will advise progress against recommended actions.
- 15.2 CONTRACTOR shall supply a copy of its planned internal audit schedule during the life of the CONTRACT. COMPANY shall have the option of placing a representative with the audit team to monitor audits.

16.0 AUDIT BY COMPANY

- 16.1 COMPANY reserves the right and will from time to time perform audits on CONTRACTOR against the Scope of Work and CONTRACTOR's management systems and controls, as part of COMPANY's assurance system.
- 16.2 CONTRACTOR will allow COMPANY's representatives full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting quality audits; this requirement also applies to SUBCONTRACTORS.
- 16.3 "Ad hoc" quality audits may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY, and may be carried out without any prior notice to CONTRACTOR.

17.0 MANAGEMENT SYSTEM FOR INVENTORY INCLUDING SPARES, STORAGE, AND HANDLING OF EQUIPMENT

- 17.1 CONTRACTOR will establish and maintain an inventory stock and spares control system. The level of stock and spares will reflect the operational needs and WORK activities of COMPANY. CONTRACTOR will be responsible for ensuring that adequate stock and spares and including rental type equipment is available for COMPANY's use.
- 17.2 CONTRACTOR will be responsible for the storage and protection of all goods and materials supplied. Goods and materials will be adequately protected against damage and deterioration; protection methods shall include:
- 17.2.1 Correct thread protectors for all threaded connections (composite plastic breathable type for premium connections, steel type for API type connections).

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- 17.2.2 All seal faces and areas will be adequately protected commensurate with their service criticality; these materials will be stored inside and away from corrosive environments and handled using non metallic lifting appliances.
- 17.2.3 Elastomers will be stored inside in an environmentally controlled atmosphere in closed packets (complete with cure date and expiry date details).
- 17.2.4 Packer, seal elements, and other elastomeric materials will be stored in an environmentally controlled facility, suitably protected against impact and corrosion damage.
- 17.2.5 Shear pins will be closely controlled to avoid the risk of improper use in the hanger assembly and preparation. Procedures will be in place to ensure segregation of new and used shear stock and other consumable items.

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1.0 TECHNICAL INTEGRITY FOR PROCURED EQUIPMENT

- 1.1 CONTRACTOR shall have established, implemented, and maintained a Quality Management System (QMS) in conformance with the requirements of ISO 9001, API Q1 (ISO TS 29001) or any other recognized or established standard / format as mutually agreed with COMPANY, providing that all aspects of the CONTRACT and WORK which affect the quality of the services supplied are defined, documented, proceduralized (where required), and controlled under the system (including subcontracted services).
- 1.2 CONTRACTOR shall provide to COMPANY the WORK in accordance with the latest revision of COMPANY Integrity Assurance Specification (IAS) for the procurement of critical equipment, document references: BP-EPT-IAS-01; BP-EPT-IAS-02.
- 1.3 CONTRACTOR shall implement and maintain location specific Quality Control Plans (QCPs) and applicable working procedures for the duration of the CONTRACT.
- 1.4 CONTRACTOR's QCP shall be submitted to COMPANY for acceptance prior to commencement of the WORK.
 - 1.4.1 Where a BP Global QCP has been established for the location, the BP Global QCP shall be used for the procurement of critical equipment. COMPANY shall designate which equipment is critical.
 - 1.4.2 Where a BP Global QCP has not been established for the location, a Quality Control Plan that is compliant with the IAS appropriate to the equipment shall be developed and used for the procurement of critical equipment. This QCP shall be at Examination Level 2. COMPANY shall designate which equipment is critical.
- 1.5 CONTRACTOR shall allow COMPANY QA auditors full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting quality audits.
- 1.6 CONTRACTOR shall allow COMPANY's Nominated Inspection Bodies (NIBs) full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting surveillance activities.
- 1.7 "Ad hoc" quality inspections may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY, and may be carried out without any prior notice to CONTRACTOR.
- 1.8 CONTRACTOR shall provide desk space and internet access for COMPANY personnel engaged in audits, "Ad hoc" quality inspections, and surveillance activities.

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- 1.9 Where non conformances are identified during audits and / or inspections by COMPANY or COMPANY third party inspectors, CONTRACTOR shall undertake the corrective actions as required by COMPANY, within agreed specified time limits.
- 1.10 Corrective actions undertaken by CONTRACTOR as a result of non conformances being identified during a quality audit or inspection shall be undertaken at no cost to COMPANY.
- 1.11 CONTRACTOR shall compile all necessary documentation in accordance with specified requirements, and such relevant documentation shall be made available to COMPANY and / or the Certifying Authority for certification purposes when and where appropriate.
 - 1.11.1 Where an IAS appropriate to the equipment exists, documentation compiled shall be in accordance with the requirements specified in that IAS, the associated QCP, and the CONTRACT.
 - 1.11.2 Where an IAS appropriate to the equipment does not exist, documentation compiled shall be in accordance with the requirements specified in the associated QCP and the CONTRACT.

2.0 TECHNICAL INTEGRITY FOR RENTAL EQUIPMENT AND SERVICE FACILITIES

- 2.1 CONTRACTOR shall have established, implemented, and maintained a QMS in conformance with the requirements of ISO 9001, API Q1 (ISO TS 29001) or any other recognized or established standard / format as mutually agreed with COMPANY, providing that all aspects of the CONTRACT and WORK which affect the quality of the services supplied are defined, documented, proceduralized (where required), and controlled under the system (including subcontracted services).
- 2.2 CONTRACTOR shall implement and maintain location-, product-, and job-specific QCPs and applicable working procedures for the duration of the CONTRACT. All CONTRACTOR working procedures shall clearly codify acceptance and rejection criteria.
- 2.3 CONTRACTOR's QCP shall be submitted to COMPANY for acceptance prior to commencement of the WORK.
- 2.4 COMPANY may require surveillance by a COMPANY Nominated Inspection Bodies (NIBs) during inspection, disassembly, assembly, re-dress, repair and / or testing activities associated with WORK.
- 2.5 CONTRACTOR shall allow COMPANY QA auditors full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting quality audits.
- 2.6 CONTRACTOR shall allow COMPANY's NIB full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting surveillance activities.

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- 2.7 "Ad hoc" quality inspections may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY and may be carried out without any prior notice to CONTRACTOR.
- 2.8 Where non conformances are identified during audits and / or inspections by COMPANY or COMPANY third party inspectors, CONTRACTOR shall undertake the corrective actions as required by COMPANY, within agreed specified time limits.
- 2.9 Corrective actions undertaken by CONTRACTOR as a result of non conformances being identified during a quality audit or inspection shall be undertaken at no cost to COMPANY.
- 2.10 CONTRACTOR shall compile all necessary documentation in accordance with specified requirements and such relevant documentation shall be made available to COMPANY and / or the Certifying Authority for certification purposes when and where appropriate.
- 2.11 CONTRACTOR's QMS shall, as a minimum, include:
- 2.11.1 Design and Verification
- CONTRACTOR shall have an auditable and documented design and development process for all the equipment, materials, and services supplied. The design and development process shall be in accordance with the requirements specified in ISO 9001 (latest revision) and / or API Q1 (latest revision).
- 2.11.2 Formal job descriptions / responsibilities / authority
- CONTRACTOR's personnel shall have formal job descriptions detailing their responsibilities for work and their authorities to act. These shall reflect the actual jobs that they perform and shall identify the required competencies and training requirements. These job descriptions, as well as the associated competencies and training requirements, shall be made available for review by COMPANY upon request.
- CONTRACTOR shall maintain records that provide evidence of personnel having met all required competency and training requirements. These shall be made available for review by COMPANY upon request.
- 2.11.3 Receiving inspection for all equipment (new, unused and used)
- CONTRACTOR shall establish and maintain a system for the receipt of all goods and materials being supplied by CONTRACTOR. This shall include suitable inspection criteria which allows for identification of conforming and non conforming equipment. A quarantine area for non conforming equipment shall be established.
- 2.11.4 Non Conformance Reporting System
- CONTRACTOR shall establish a non conformance reporting (NCR) system at CONTRACTOR's Service facility that will serve to document any equipment failures or any other type of noncompliance to requirements (e.g., process failures, personnel not following procedures, etc.).

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The system shall provide the means for CONTRACTOR to document and track failures as well as provide the vehicle for "root cause" failure analysis leading to corrective and preventive actions to prevent repeat failures and advance continuous improvement.

The system shall be capable of managing any non conformances identified either through design, goods receipt inspection, assembly and testing, inspection and maintenance regimes, CONTRACTOR internal audits, COMPANY audits or inspections, and any failed in service items as identified either by CONTRACTOR's field personnel or COMPANY's field representatives.

NCRs associated with COMPANY equipment, including but not limited to assembly non conformances, shall be reported to COMPANY in a timely fashion (within 30 days).

CONTRACTOR shall establish and maintain a system that identifies any goods and materials received which do not conform to specifications i.e., non conformance reports (NCRs).

Where non conformances are identified, CONTRACTOR shall perform, within a time period acceptable to COMPANY, all corrective actions required to prevent recurrence.

Corrective actions undertaken by CONTRACTOR as a result of non-conformances identified shall be undertaken at no cost to COMPANY.

2.11.5 Inspection and testing standards (including acceptance / rejection criteria) using Original Equipment Manufacturer or Supplier (OEM) specifications as a minimum.

CONTRACTOR shall establish and maintain a formal inspection management system for all equipment, materials, and services supplied as a component of the WORK. The system shall as a minimum:

- (a) Provide detailed inspection specifications, including acceptance and rejection criteria, for proprietary equipment and materials supplied by CONTRACTOR and any SUBCONTRACTOR.
- (b) Meet DS-1 Category 4 inspection requirements for components covered by T H Hill Associates, Inc. Standard DS-1 Drill Stem Design Inspection latest revision and which is applicable to the goods and services supplied by CONTRACTOR and any SUBCONTRACTOR.
- (c) Provide competent inspectors of the equipment, i.e., inspectors shall be qualified and competent to perform the inspection required.
- (d) Shall use and demonstrate compliance with DS-1 (where applicable) and specified inspection criteria. The DS-1 requirements are applicable to all pipe / tubulars used downhole.

Where the specifications and criteria used for the inspection of equipment, materials, and services supplied as a component of the WORK are not specified by COMPANY, CONTRACTOR shall provide the specifications and criteria used for the inspection of equipment, materials, and services supplied.

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CONTRACTOR shall establish and maintain a system for verifying the integrity of the equipment through inspection, disassembly, assembly, re-dress, repair, and / or testing activities associated with WORK. The specifications and / or standards for equipment inspection, disassembly, assembly, re-dress, repair, and / or testing activities associated with WORK shall be made available for review by COMPANY and COMPANY shall have the right to implement changes.

All assemblies shall be inspected, disassembled, assembled, re-dressed, repaired, and / or tested in accordance with procedures approved by COMPANY prior to release and shipment. Verification of testing may be required by COMPANY through its own representatives. COMPANY and CONTRACTOR shall develop a QCP as part of the Statement of Requirements (SOR) which shall provide details of the inspection and acceptance criteria, witness and hold points required by COMPANY during inspection, disassembly, assembly, re-dress, repair, and / or testing activities.

Where COMPANY has identified the well as critical, all service and / or installation tools must be completely disassembled, inspected, re-dressed, re-assembled, and functionally tested in accordance with CONTRACTOR procedures.

All load bearing equipment, lifting equipment, and lifting points shall be inspected and tested in accordance with LOLER requirements and with current certification for the duration of the CONTRACT.

CONTRACTOR shall be responsible for ensuring that its SUBCONTRACTORS comply with the inspection and testing requirements.

- 2.11.6 Maintenance management system in accordance with OEM as a minimum, including compliance to US legislative requirements.

CONTRACTOR shall establish and maintain a planned maintenance system for all equipment, materials, and services supplied as a component of the WORK by CONTRACTOR and SUBCONTRACTORS.

The maintenance regimes shall be as per OEM unless otherwise demonstrated that changes to the routines are justified.

- 2.11.7 Repair standards and procedures in accordance with OEM as a minimum.

CONTRACTOR shall establish and maintain refurbishment and repair procedures to ensure the integrity of equipment, materials, and services supplied. These shall be OEM standards as a minimum, unless otherwise demonstrated that changes to the approved repair standard are justified.

CONTRACTOR shall establish, qualify, and maintain approved welding procedures for the goods and materials which require welding and shall use suitably competent and coded welders (ASME IX) for any weld repair work.

CONTRACTOR shall ensure SUBCONTRACTORS comply with this requirement.

- 2.11.8 Final inspection prior to dispatch to WORKSITE

CONTRACTOR shall establish and maintain a final inspection system prior to dispatch of the equipment to the WORKSITE. A copy of COMPANY's signed release notes shall be provided with the equipment.

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The final inspection and control system shall ensure that the final equipment, materials, and services supplied as a component of the WORK comply with the original SOR and that all NCRs and any associated Corrective Action Requests (CAR) have been closed out to COMPANY's satisfaction prior to release and shipping.

2.11.9 Purchasing standards and specifications

Where CONTRACTOR purchases materials, spares, and other equipment, CONTRACTOR shall establish and maintain a system that details and documents clearly the specifications required to supply fit for purpose equipment. The specifications shall include all material and technical requirements, QA, and legislative needs and any drawings (latest revisions).

OEM specifications shall be used unless COMPANY agrees to use alternative specifications.

2.11.10 Materials / equipment traceability and full tool histories including documentation and certification

CONTRACTOR shall establish and maintain a fully traceable system for all the equipment including spares. As a minimum this shall include:

- (a) Full traceability to heat numbers or lots (for all forgings and castings etc.).
- (b) Full traceability to cure and expiration dates (for all elastomers).
- (c) Full tool and service history (inspection, testing, maintenance, replacement of spare parts, and repairs undertaken).
- (d) Mapping and recording of tests, complete with verification testing undertaken (i.e., NDT including hardness testing, etc.), on any weld repair or heat treatment undertaken after manufacture.

CONTRACTOR shall compile all necessary documentation in accordance with specified requirements, and such relevant documentation shall be made available to COMPANY and / or COMPANY's representative.

The minimum documentation to be held by CONTRACTOR relating to equipment supplied shall include:

- (a) Data books with full traceability.
- (b) Material test report(s) for any equipment.
- (c) Load test records for load bearing and / or lifting hoisting equipment.
- (d) Rental history movements.
- (e) Refurbishment history including any weld repair maps.
- (f) Inspection and maintenance reports.
- (g) Failure histories.

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(h) Originals of documents supplied with the tools.

CONTRACTOR shall provide the following documentation with all equipment shipped to the WORKSITE:

- (a) Certificate(s) of conformity.
- (b) Current inspection certificate.
- (c) Current pressure test certificate.
- (d) Certificate for slings and baskets.

Each item of equipment shall be marked with a clearly identifiable unique permanent traceable / serial and part number.

2.11.11 Calibration management of equipment

CONTRACTOR shall identify all equipment that requires calibration. CONTRACTOR shall establish and maintain a Calibration Management System and all equipment shall conform to the calibration schedules and technical requirements.

Calibration shall be in accordance with calibration system specifications and include API Spec 7 requirements for API threads.

All equipment requiring calibration shall be marked with last calibration, next due calibration date and display details of the individual responsible for the calibration.

2.11.12 Equipment necessary to perform WORK

At each workshop location that will be utilized to supply the whole or any portion of the WORK, CONTRACTOR shall identify and maintain, in proper working order and calibration status, all equipment, tools, gauges, instruments, devices, etc. that are required to perform the WORK in accordance with OEM, CONTRACTOR, and / or Industry Standards.

2.11.13 Management of Change: design / materials / approved programs and standards changes / deviations (temporary or permanent)

CONTRACTOR shall establish and maintain a system for identifying and approving changes to approved equipment design, standards, specifications, and procedures. All changes to approved designs etc., whether permanent or temporary, shall be controlled and managed. All changes shall be technically reviewed and shall not compromise the integrity of the equipment and shall be suitable for the anticipated operating environment as specified. CONTRACTOR shall notify COMPANY of the intention to make changes in a timely manner in order to allow COMPANY's representatives to take part in the review process.

The system for managing change shall be auditable and managed by competent personnel with appropriate technical and financial authorities.

The Management of Change System shall be communicated to all CONTRACTOR personnel and CONTRACTOR shall use its best endeavors to ensure an appropriate level of understanding of the system.

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CONTRACTOR shall establish and maintain a quality management process to control equipment modification or repairs carried out by a SUBCONTRACTOR.

2.11.14 Document Control System

CONTRACTOR shall establish a document control system (DCS), as part of its QMS to control all documents required by the system. All critical documents, including standards, specifications, procedures, drawings, technical and operating manuals, work instructions, forms, checklists, etc. shall be controlled such that their revision level and revision status can be immediately identified. All the relevant documents (i.e., the most current revision of the documents) shall be available at the points of use at the WORKSITE or workshop facility.

The DCS shall include a "master list" or some equivalent control feature to identify the current revision status of documents so that anyone questioning the revision status of a document can determine they do indeed have the most current document.

The DCS shall identify recipients of the controlled documents and have the facility to gather and destroy old and out of date revisions.

2.11.15 Selection and Approval of Competent SUBCONTRACTORS

CONTRACTOR shall establish and maintain an auditable process and system identification, evaluation, measurement, and continued management of suppliers of competent SUBCONTRACTORS of equipment, materials, and services supplied as a component of the WORK.

CONTRACTOR shall identify the criticality of the equipment, materials, and services supplied as a component of the WORK which are being provided by its SUBCONTRACTORS. CONTRACTOR shall identify and implement necessary checks, controls, and safeguards consistent with the criticality of subcontracted WORK in order to ensure that quality and reliable equipment, materials, and services are provided. Such checks, controls, and safeguards shall be detailed in the SUBCONTRACT.

CONTRACTOR shall establish and maintain a controlled list of approved SUBCONTRACTORS. This list, the Approved Supplier List (ASL), shall identify the scope of supply indicating which materials, goods, or services are being supplied by the individual SUBCONTRACTOR. The list shall be made available to COMPANY for review.

2.11.16 Managing SUBCONTRACTORS

CONTRACTOR shall establish and maintain a performance measuring and monitoring system for SUBCONTRACTORS. The system shall include regular auditing and reviewing of a SUBCONTRACTOR commensurate with the criticality of the goods and services being provided. The system shall provide both assurance to CONTRACTOR and COMPANY that SUBCONTRACTORS are providing fit for purpose, quality, and reliable equipment.

CONTRACTOR shall identify and implement checks and controls as part of its goods receipt inspection system that provide CONTRACTOR and COMPANY with assurance that equipment, materials, and services supplied by SUBCONTRACTORS comply with the purchase specification.

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CONTRACTOR shall supply a copy of its planned audit schedule for SUBCONTRACTORS during the life of the CONTRACT. COMPANY shall have the option of placing a representative with the audit team to monitor audits.

2.11.17 Internal audit system

CONTRACTOR shall establish and maintain an internal assessment system and perform periodic internal assessments of its QMS and management control systems to ensure the system is effectively implemented and detect any areas that need attention and enhancement.

CONTRACTOR shall schedule and conduct internal assessments at least annually (i.e., within a twelve month period). These assessments shall be conducted by personnel independent of those who performed or directly supervised the activity being assessed.

Audit reports and corrective actions arising from these internal audits shall be made available to COMPANY upon request, and CONTRACTOR shall advise progress against recommended actions.

CONTRACTOR shall supply a copy of its planned internal audit schedule during the life of the CONTRACT. COMPANY shall have the option of placing a representative with the audit team to monitor audits.

2.11.18 Audit by COMPANY

COMPANY reserves the right and will from time to time perform audits on CONTRACTOR against the WORK and CONTRACTOR's management systems and controls, as part of COMPANY's assurance system.

CONTRACTOR shall allow COMPANY's representatives full access to the WORK in progress, personnel, records, and documentation for the purpose of conducting quality audits. This requirement also applies to SUBCONTRACTORS.

"Ad hoc" quality audits may be undertaken by COMPANY on CONTRACTOR's quality systems, as and when deemed necessary by COMPANY, and may be carried out without any prior notice to CONTRACTOR.

2.11.19 Management System for inventory including spares, storage, and handling of equipment.

CONTRACTOR shall establish and maintain an inventory stock and spares control system. The level of stock and spares shall reflect the operational needs and work activities of COMPANY. CONTRACTOR shall be responsible for ensuring that adequate stock and spares and including rental type equipment is available for COMPANY's use.

CONTRACTOR shall be responsible for the storage and protection of all goods and materials supplied. Goods and materials shall be adequately protected against damage and deterioration. Protection methods shall include:

- (a) Correct thread protectors for all threaded connections (composite plastic breathable type for premium connections, steel type for API type connections).

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- (b) All seal faces and areas shall be adequately protected commensurate with their service criticality; these materials shall be stored inside and away from corrosive environments and handled using non metallic lifting appliances.
- (c) Elastomers shall be stored inside in an environmentally controlled atmosphere in closed packets (complete with cure date and expiration date details).
- (d) Packer, seal elements, and other elastomeric materials shall be stored in an environmentally controlled facility, suitably protected against impact and corrosion damage.
- (e) Shear pins shall be closely controlled to avoid the risk of improper use. Procedures shall be in place to ensure segregation of new and used shear stock and other consumable items.

3.0 TECHNICAL INTEGRITY FOR SERVICE AND INSTALLATION ACTIVITIES

- 3.1 CONTRACTOR's Kick Off / Start Up Activities shall occur prior to each job and shall, as a minimum, include:

3.1.1 Review of requirements

CONTRACTOR shall review CONTRACT associated with service and installation activities for stated Technical, Functional, Quality, and Integrity Assurance requirements and develop a job specific Quality Control Plan (QCP) for compliance. The QCP is to be a stand alone document (not inherent to the QMS).

3.1.2 Kick off meeting

CONTRACTOR shall review the CONTRACT with COMPANY CAM and / or the Discipline Engineer responsible for the WORK and identify all requirements specified in the CONTRACT. A documented Kick off Meeting, held prior to any work on a new CONTRACT will be the venue for the CONTRACT review. The CAM may request the presence of or designate this task to the appropriate COMPANY 'Specialist'.

3.1.3 Finalized list of equipment and personnel

CONTRACTOR shall:

- (a) Finalize a list of required equipment and personnel based on the stated requirements as stipulated in the CONTRACT.
- (b) Ensure that equipment and personnel meet the minimum requirements of the CONTRACT.
- (c) Submit CVs of proposed alternate key personnel and obtain documented acceptance no less than 2 weeks prior to the KOM or performing any of the WORK, shall any of the finalized key personnel list differ from what was first accepted during the bidding exercise as per the Technical Specification submitted.
- (d) Ensure that the handover process related to key personnel is documented, especially where in-country personnel take holiday and training leave.

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3.1.4 Pre-Job Preparation and Service Installation Procedures and Checklists

CONTRACTOR shall maintain and implement Pre-Job Preparation and Service Installation Procedures and Checklists that address all aspects of CONTRACTOR's operations and activities in conjunction with:

- (a) Receiving.
- (b) Storing.
- (c) Preparing.
- (d) Shipping to the WORKSITE.
- (e) Installing the required products.

CONTRACTOR shall submit the Pre-Job Procedures and Checklists for COMPANY acceptance.

3.2 CONTRACTOR's pre-installation / service activities shall, as a minimum, include:

3.2.1 Receiving Inspection

CONTRACTOR shall perform receiving inspection on all equipment, materials, and tools (service etc.) as they are received either at CONTRACTOR's "local" facility and / or at any other facility relative to receiving product from CONTRACTOR's affiliate facility / outside location.

3.2.2 Storage of equipment

CONTRACTOR shall ensure that the equipment is suitably protected for storage until required for use. CONTRACTOR shall document the equipment as being stored and ready for use. COMPANY will approve the storage documentation and will determine if a Third Party (TH Hill or other inspection service) is on hand to verify that the equipment (assembled or not) is stored appropriately.

3.2.3 Equipment readiness check

CONTRACTOR shall perform equipment readiness checks to ensure / verify that equipment is in a working state and fit for purpose.

3.2.4 CONTRACTOR focal point

CONTRACTOR shall nominate a focal person for COMPANY Discipline Engineer(s). The focal point shall be responsible for scheduling pre-job meetings and attending pre-job meetings as required by the Discipline Engineer(s).

CONTRACTOR shall document these meetings and provide minutes as required.

3.3 CONTRACTOR's equipment preparation, inspection and mobilization activities shall, as a minimum, include:

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3.3.1 Equipment preparation and inspection

CONTRACTOR shall conduct an equipment preparation and inspection exercise to ensure the equipment and / or service tools meet all requirements and are fit for purpose.

Equipment / service tool preparation (make-up) and inspections shall be conducted utilizing COMPANY accepted Pre-Job Preparation and Service Installation Procedures and Checklists, and shall be witnessed and endorsed (if required) by COMPANY Discipline Engineer(s) (or their delegated specialists).

3.3.2 Lifting equipment

CONTRACTOR shall ensure that all lifting equipment (i.e., equipment basket pad eyes, wire rope slings, and shackles, etc.) has 'valid certifications' in accordance with COMPANY Quality Specification requirements. All the certification documentation shall be included in the Pre-Job Equipment Data Book provided with the equipment and service tools going to COMPANY's supply base or WORKSITE.

3.3.3 Identification of non conforming equipment

CONTRACTOR shall ensure that any equipment found to be non conforming during the exercise shall be handled in accordance with CONTRACTOR's non conformance system (i.e., identified as non conforming, documented on an NCR, and segregated if practical, etc.). Depending on the nature of the non conformance, COMPANY may also document an NCR.

3.3.4 Preparation of Pre-Job Procedures and Checklists Data Book

CONTRACTOR shall complete all checklists / procedures and prepare Pre-Job Procedures and Checklists Data Book for delivery to COMPANY to provide objective evidence that all pre-job maintenance and inspection activities have been completed.

Copies of the Pre-Job Procedures and Checklists Data Book shall be available and / or provided to COMPANY personnel designated in the KOM.

3.3.5 Preservation of product conformity

CONTRACTOR shall preserve the conformity of the product when:

- (a) Preparing equipment to go to WORKSITE.
- (b) Returning equipment as excess stock.
- (c) During all phases of equipment handling, storage, repair, maintenance, mobilization, and shipment.

This preservation shall include identification, handling, packaging, storage, and protection. Preservation shall also apply to the constituent parts of a product such as elastomers and other parts that may require special storage.

3.4 CONTRACTOR's Pre-job Activities – WORKSITES – activities shall, as a minimum, include:

3.4.1 Receiving of equipment

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Appendix 7– Technical Integrity
E. Completions**

CONTRACTOR shall establish detailed and rigorous procedures and / or checklists to be used for the on-site delivery of the WORK in order to verify that the specified requirements have been met.

CONTRACTOR Field Service Engineer (FSE) shall receive the equipment at the WORKSITE and ensure that all required equipment is available, fit for purpose, and free of any shipping and / or handling damage.

3.4.2 Preservation of product conformity

CONTRACTOR FSE shall preserve and protect the conformity of the equipment on location. The FSE shall prepare equipment received at the WORKSITE for temporary storage to preserve the conformity of the equipment until utilized or shipped back to CONTRACTOR.

3.4.3 Review of procedure at worksite

CONTRACTOR FSE shall review (with COMPANY representative) COMPANY approved procedures relative to the equipment and service. Where the procedures impact other Third Parties (i.e.; Casing Crew) they shall be included in the review. During this review, the FSE and COMPANY representative will confirm that they are in possession of the most current approved service procedures.

3.4.4 Job quality assurance analysis (JQAA)

CONTRACTOR FSE shall perform a JQAA, prior to the actual execution of the work activities, to ensure that all required QA / QC steps have been completed. This shall consist of a final review of all Quality documentation (primarily the documentation / checklists included in the "Pre-Job P&C Data Book"), to ensure that all equipment preparation and inspection checklists have been completed and signed off and all calibration records are available for each piece of measuring and test equipment (if applicable).

3.5 CONTRACTOR's service implementation and installation of equipment activities shall, as a minimum, include:

3.5.1 Service job or installation

CONTRACTOR FSE shall perform the service job or installation in accordance with the appropriate CONTRACTOR service and / or installation procedure(s) that were pre-approved by COMPANY Discipline Engineer(s).

3.5.2 Non conforming product or service

CONTRACTOR shall utilize their in-house non conformance reporting system to address any non conforming product or service.

Any incident arising from non conforming product or service shall require notification of COMPANY representative.

3.6 CONTRACTOR's post job activities shall, as a minimum, include:

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3.6.1 Assess service performance

CONTRACTOR FSE shall present the appropriate documents to COMPANY representative in order to assess service performance. The FSE shall complete the job ticket and obtain COMPANY representative's acceptance signature.

3.6.2 Dispatch equipment and support personnel

CONTRACTOR FSE shall dispatch equipment and support personnel back to CONTRACTOR's base. Shipping and handling (including packaging for shipment) shall be performed in accordance with CONTRACTOR's documented procedures.

3.6.3 Inspection, repair, and maintenance

CONTRACTOR shall perform Inspection, Repair, and Maintenance (R&M) on returned equipment.

CONTRACTOR shall develop, apply, and maintain comprehensive repair, maintenance, and calibration procedures on all rental and service equipment.

3.6.4 Repair and Maintenance Program

CONTRACTOR's R&M program shall include the following minimum elements:

- (a) The R&M and calibration procedures shall include R&M schedules for each of the tools / components and shall require a detailed R&M operation.
- (b) The calibration procedures shall include calibration frequency / schedules for the re-calibration of all monitoring and measuring devices.
- (c) All repair, maintenance, and calibration operations shall be documented to provide objective evidence of the R&M activities.
- (d) Records of R&M activities shall be traceable to the equipment via unique equipment serial numbers.
- (e) All CONTRACTOR's shop personnel performing R&M shall be trained, qualified, and competent in accordance with CONTRACTOR's training and competency system.

Section 4 – Remuneration

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General Terms and Conditions

A. Cementing Services

1.0 GENERAL

- 1.1 Remuneration detailed herein shall be all inclusive rates including, but not limited to, all consumables, spares, and other extras such as any inspection or overhaul charges, all maintenance and repair, hot shot, inspection, certification, and transportation for all categories of equipment required, unless specifically noted otherwise, at the WORKSITE during the various well sections, and is deemed to allow for all costs incurred by CONTRACTOR in complying with all the terms and conditions of the CONTRACT, and shall represent the total remuneration due to CONTRACTOR in full consideration of the satisfactory performance of the WORK.
- 1.2 CONTRACTOR shall not be entitled to remuneration in respect of personnel or equipment time incurred non-productively:
 - 1.2.1 through shortages or delays in the supply by CONTRACTOR of personnel, equipment, information, or materials, provided that COMPANY shall have given to CONTRACTOR adequate notice of the need for such supply; and/or
 - 1.2.2 due to a lack of planning on the part of CONTRACTOR provided adequate planning time and TECHNICAL INFORMATION were provided by COMPANY
- 1.3 No remuneration shall be made for WORK not performed in accordance with the CONTRACT.
- 1.4 All equipment, materials, and/or services must be as specified in the CONTRACT, as amended from time to time, prior to CONTRACTOR providing or using same. Failure to include equipment, materials, or services will result in COMPANY not paying CONTRACTOR for these items.
- 1.5 All rates and prices stated herein are in United States Dollars.
- 1.6 The rates and prices are exclusive of any incidence for Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty applicable to the goods and services provided by CONTRACTOR under the CONTRACT, and to the extent that similar taxes such as sales, use or excise or business tax are implicit or specifically defined in Appendix 2 to Section 2 – General Conditions of the Contract. The amount of Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty and such other agreed taxes chargeable less any reduction in taxes CONTRACTOR may benefit from shall be paid to CONTRACTOR by COMPANY in addition to any other payments becoming due under the CONTRACT upon production of a valid tax invoice.

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A. Cementing Services

1.7 CONTRACTOR shall advise COMPANY of availability of equipment and personnel upon receipt of requirements from COMPANY.

1.7.1 In the event that CONTRACTOR has a concurrent alternative customer requirement for the equipment and / or personnel, CONTRACTOR shall advise COMPANY of said alternative requirements and COMPANY's options to ensure equipment and / or personnel availability. In the event one of those options is for COMPANY to secure the equipment and / or personnel in advance, then COMPANY shall compensate CONTRACTOR at fifty percent (50%) of the applicable Standby Rate to secure the availability of the equipment and / or personnel. All such agreements shall be documented in the WORK ORDER or CHANGE ORDER.

1.7.2 Where the alternative customer is another COMPANY asset, then CONTRACTOR shall be responsible for keeping each of the assets informed of such requirements. COMPANY shall be informed by CONTRACTOR at all times of such exceptional circumstances. As regards any standby payments made in conjunction with Clause 1.7.1 herein above, COMPANY shall only make one standby payment regardless of the number of COMPANY assets waiting to use the equipment. Unless so directed by COMPANY, said standby payment shall be charged to the first COMPANY asset ensuring equipment availability.

2.0 MOBILIZATION AND DEMOBILIZATION

2.1 Unless otherwise provided for herein, CONTRACTOR shall be responsible for the mobilization and demobilization of its personnel, equipment, and material to and from the WORKSITE, COMPANY designated heliport, or supply base.

Where changes to the Scope of Work or agreed delivery schedule by COMPANY are sufficient to require CONTRACTOR to execute additional mobilizations for a job, the cost for these additional mobilizations will be to COMPANY account.

2.2 CONTRACTOR shall be responsible for obtaining all necessary visas, customs clearances, or other government authorizations required for moving its personnel and equipment into and out of the country having jurisdiction over the operating area. In the event COMPANY is specifically required herein to reimburse CONTRACTOR for customs duties or fees levied on CONTRACTOR in relation to the import or export of CONTRACTOR's equipment and material, CONTRACTOR shall follow COMPANY's instructions in respect thereof so as to qualify for any available exemptions or reductions of such duties or fees.

2.3 If equipment or personnel are demobilized to a location closer than the originally intended Point of Demobilization, in order to perform work for another company or for reasons of CONTRACTOR's own convenience, any demobilization fee shall be reduced in an amount commensurate with the resulting documented reduction in CONTRACTOR's demobilization costs.

2.4 Applicable expenses for travel approved by COMPANY in advance of the travel will be reimbursed – with no mark-up – according to the following:

2.4.1 For expenses incurred outside of the United States see current version (revised periodically) of US Department of State web-site at:
http://aoprals.state.gov/content.asp?content_id=184&menu_id=81

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A. Cementing Services**

- 2.4.2 For expenses incurred within the United States see current version (revised periodically) of US General Services Administration web-site at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentId=17943&contentType=GSA_BASIC
 - 2.4.3 Charges for the use of personal automobiles and light trucks shall be at the IRS mileage rate applicable at the time of service. CONTRACTOR shall employ best efforts to reduce aggregate transportation charges to COMPANY through the use of carpools, crew vans, and other related methods of transportation.
 - 2.4.4 Airfare will be lowest discounted coach fare at the time of purchase with most direct routing.
 - 2.4.5 Where agreed to in advance by COMPANY, COMPANY shall reimburse reasonable travel expenses for attendance of CONTRACTOR personnel at sundry meetings (e.g., Crew Engagement Meetings, etc.) requested by COMPANY. Day rates for all personnel attending sundry meetings shall be for no more than eight (8) hours at the applicable onshore rate.
- 2.5 COMPANY shall provide air transportation for medical evacuation of CONTRACTOR's personnel from COMPANY's WORKSITES. The cost of air transportation shall be borne by the parties in accordance with Section 2 – General Conditions of Contract, Clause 31.9.

3.0 CHARGE RATE

- 3.1 Unless otherwise specified in Section 4, Appendix 3 – Sub-Sector Terms and Conditions, prices included in this CONTRACT together with any relevant discounts shall remain firm and fixed for the first twelve (12) months from the EFFECTIVE DATE of the CONTRACT.
- 3.1.1 Price Adjustments – General Principles
- (a) Unless elsewhere specified, the methodology agreed between PARTIES shall apply to all line items contained within the applicable Schedule of Rates and Charges. These price adjustments shall be based on objective criteria (e.g., published indices or other available market information) and not subject to a form of negotiation process, except for unique circumstances when it is not possible to utilize an appropriate indexation tool or indexation methodology.
 - (b) Unless otherwise specified in Appendix 3 or otherwise agreed between the PARTIES, price adjustments will be calculated on an annual basis inclusive of any extension periods.
 - (c) Occasionally an index may be unavailable for a particular time period or sometimes an index is permanently discontinued. If this occurs, the next higher level data series or another index may be substituted, subject to mutual agreement by COMPANY and CONTRACTOR. If the title of an index changes or is recoded without changing the inputs, it is considered to be the same index.
 - (d) Indices are sometimes re-based. Price Adjustments will be calculated using indices expressed on the reference base period in effect when the Price

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A. Cementing Services

Adjustment is applied, i.e., the calculation of adjustments shall always use the latest version of the index.

3.1.2 Price Adjustment Process

- (a) No later than three (3) months from the EFFECTIVE DATE of the CONTRACT, the PARTIES shall agree on an appropriate methodology for adjusting pricing for each subsequent twelve (12) month period of the CONTRACT.
- (b) In order to develop this methodology, CONTRACTOR shall provide for COMPANY's approval a percentage breakdown of the cost drivers for each category of items so that appropriate indices may be selected and accurate composite calculations may be made.
- (c) Unless agreed otherwise between the PARTIES, the Rates and Charges to be adjusted shall be subject to annual review and adjusted up or down commencing from the first Anniversary Date of the CONTRACT ("CONTRACT Anniversary Date") and annually thereafter on the CONTRACT Anniversary Date.
- (d) No later than 45 days prior to the CONTRACT Anniversary Date, CONTRACTOR shall present a written recommendation to COMPANY detailing the Rates and Charges to be adjusted and full back-up documentation in support of any adjustments. Any approved adjustments shall be the subject of a CONTRACT amendment between the PARTIES.

3.1.3 The baseline month and year for indexation and pricing purposes shall be the EFFECTIVE DATE of the CONTRACT.

- 3.2 The descriptions attached to the respective items detailed in Section 4, Appendix 3 and/or Appendix 4, are intended as brief descriptions sufficient for identification purposes only and do not exhaustively detail every operation involved in carrying out the WORK.
- 3.3 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed offshore shall begin the day equipment arrives at COMPANY supply base or WORKSITE, whichever occurs first, and terminates upon arrival at COMPANY supply base or CONTRACTOR base, whichever occurs first.
- 3.4 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed onshore shall begin the day equipment arrives at WORKSITE and terminates upon leaving WORKSITE.
- 3.5 CONTRACTOR shall prepare tools and equipment for back loading and complete a detailed manifest. Where COMPANY provided transportation is used, should CONTRACTOR fail to properly prepare equipment for shipment and cause delay, equipment shall be charged at zero rates until such time as equipment has been back loaded on COMPANY provided transportation.
- 3.6 For air or marine personnel transportation, unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, crew charges begin when crew reaches COMPANY's embarkation point

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A. Cementing Services**

for transport to WORKSITE and ends when crew arrives back at COMPANY's disembarkation point. There shall be no duplicate crew charges on crew change days.

- 3.7 Unless otherwise specified, equipment operating charges shall apply when equipment is on the WORKSITE, fully functional and operational in accordance with Section 3, Scope of Work, and being used in performance of the WORK.
- 3.8 All equipment rates per day refer to a day of twenty-four hours. For parts of a day, all such day rates shall be prorated to the nearest hour. Monthly rates refer to a calendar month. Parts of a month shall be prorated to the nearest day.
- 3.9 Unless otherwise specified herein, in the event of equipment failure, when equipment was used within CONTRACTOR's specifications and control, the charges will cease immediately. Charges will recommence when equipment is replaced or is deemed to have started working to the satisfaction of COMPANY. This non-payment shall also apply to other equipment CONTRACTOR may have in the same tool string and / or other related equipment and personnel at the WORKSITE unless COMPANY continues to drill or circulate and the other equipment continues to function. COMPANY shall not pay land transportation charges and fees for replacement equipment due to CONTRACTOR failures deemed as operated within CONTRACTOR specifications. If CONTRACTOR utilizes COMPANY provided land transportation, then CONTRACTOR shall reimburse COMPANY for all charges. No payment will be made for any item of equipment which fails within twenty-four (24) hours of commencement of operational use.
- 3.10 In the event CONTRACTOR upgrades the technical specification or specifications of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be employed by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.
- 3.11 In the event CONTRACTOR is unable to provide any part of the WORK for which CONTRACTOR has agreed to provide and there exists agreed rates and / or charges in the CONTRACT and has to source such WORK from a Third Party, CONTRACTOR shall invoice COMPANY for such part of the WORK at the rates or charges contained herein or the Third Party cost with no mark-up, whichever is the lesser.
- 3.12 NEW TECHNOLOGY – COMPANY is procuring services and associated equipment and materials, which COMPANY expects to improve incrementally over the duration of the CONTRACT. However, it is recognized that acquisitions and development of new technology during the term of the CONTRACT may result in the development of products and services not included in the CONTRACT. In such a situation, CONTRACTOR and COMPANY shall:
- 3.12.1 Discuss and agree upon any such inclusion which shall be considered on a case-by-case basis. Prior to acceptance of new technology, COMPANY requires business case justification by CONTRACTOR which shall consist of but is not limited to the following documentation to be provided by CONTRACTOR:

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A. Cementing Services**

- (a) description of technological benefits and risks
- (b) delineation of commercial benefits accruing to COMPANY (including, where applicable, incremental NPV, savings in drilling unit time, increased production, or other measurable value generation)
- (c) new technology delivery plan

3.12.2 not seek adjustments to rates for:

- (a) revision of tool specifications
- (b) improved processes

All adjustments shall be made in accordance with COMPANY's internal procedure for addition of materials, equipment, or personnel charges to the Schedule of Rates and Charges. These discussions and agreements shall be held in advance of performing such services for COMPANY. When CONTRACTOR does not seek and obtain necessary approvals for inclusion of new or additional services, payments shall not be made by COMPANY to CONTRACTOR, nor shall COMPANY be responsible in any manner should the equipment be lost or damaged.

3.12.3 Agree that CONTRACTOR shall charge COMPANY at the commercial rates of the previous generation of technology in the event of failure to deliver all of the benefits specified in the new technology business case.

3.13 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, should CONTRACTOR's tool(s) and equipment become stuck in the hole, the operating rates shall automatically terminate and standby rates commence unless the incident is caused by CONTRACTOR negligence or if due to COMPANY failure or other CONTRACTORS failure(s) to follow COMPANY established procedures and practices. If due to CONTRACTOR negligence, the operating rate will terminate and a zero rate will be applicable. The appropriate rates shall remain in effect until the tools are retrieved and released to CONTRACTOR or when officially declared lost. Aggregate standby payment shall not exceed the Lost-in-Hole value for said tool(s) and equipment. The tools are officially declared lost when the decision is made to no longer attempt to recover the tools.

3.14 CONTRACTOR unit prices shall be all inclusive of consumption of that material. No additional charges for packing (i.e., pallets, plastic wrap, drums, buckets, etc.) will be accepted above the unit cost of the product.

3.15 Unless otherwise stated herein in Section 4, Appendix 3 and/or Appendix 4, there shall be no additional charges for backup tools or equipment necessary to perform the WORK without interruption.

4.0 THIRD PARTY SERVICES / MATERIALS

4.1 Where Third Party services or materials are required by COMPANY under this CONTRACT and CONTRACTOR provides these services or materials, CONTRACTOR shall be reimbursed at net documented cost. These services or materials may be direct-billed by

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A. Cementing Services

Third Party to COMPANY. No invoice processing or similar charge shall be payable by COMPANY to CONTRACTOR.

4.2 COMPANY reserves the right to take advantage of commercial pricing from COMPANY contracts with Third Party material providers in lieu of CONTRACTOR providing said materials.

4.3 Unless otherwise provided in this CONTRACT, in the event that COMPANY's provision of third party materials results in a major scope of work change for CONTRACTOR then the Parties will mutually agree on any commercial revisions necessary.

5.0 PAYMENT AND INVOICING PROVISIONS

Payment and Invoicing procedures are as per Appendix 1, hereto.

6.0 LOST-IN-HOLE CHARGES

Lost-in-Hole Charges are as per Appendix 2, hereto.

7.0 SUB-SECTOR TERMS AND CONDITIONS / SCHEDULE OF RATES AND CHARGES

7.1 Sub-Sector Terms and Conditions are found as Appendix 3 attached hereto.

7.2 Schedule of Rates and Charges are found as Appendix 4 attached hereto.

B. Fluids Services

1.0 GENERAL

- 1.1 Remuneration detailed herein shall be all inclusive rates including, but not limited to, all consumables, spares, and other extras such as any inspection or overhaul charges, all maintenance and repair, hot shot, inspection, certification, and transportation for all categories of equipment required, unless specifically noted otherwise, at the WORKSITE during the various well sections, and is deemed to allow for all costs incurred by CONTRACTOR in complying with all the terms and conditions of the CONTRACT, and shall represent the total remuneration due to CONTRACTOR in full consideration of the satisfactory performance of the WORK.
- 1.2 CONTRACTOR shall not be entitled to remuneration in respect of personnel or equipment time incurred non-productively:
 - 1.2.1 through shortages or delays in the supply by CONTRACTOR of personnel, equipment, information, or materials, provided that COMPANY shall have given to CONTRACTOR adequate notice of the need for such supply; and / or
 - 1.2.2 due to a lack of planning on the part of CONTRACTOR provided adequate planning time and TECHNICAL INFORMATION were provided by COMPANY
- 1.3 No remuneration shall be made for WORK not performed in accordance with the CONTRACT.
- 1.4 All equipment, materials, and / or services must be as specified in the CONTRACT, as amended from time to time, prior to CONTRACTOR providing or using same. Failure to include equipment, materials, or services will result in COMPANY not paying CONTRACTOR for these items.
- 1.5 All rates and prices stated herein are in United States Dollars.
- 1.6 The rates and prices are exclusive of any incidence for Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty applicable to the goods and services provided by CONTRACTOR under the CONTRACT, and to the extent that similar taxes such as sales, use or excise or business tax are implicit or specifically defined in Appendix 2 to Section 2 – General Conditions of the Contract. The amount of Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty and such other agreed taxes chargeable less any reduction in taxes CONTRACTOR may benefit from shall be paid to CONTRACTOR by COMPANY in addition to any other payments becoming due under the CONTRACT upon production of a valid tax invoice.
- 1.7 CONTRACTOR shall advise COMPANY of availability of equipment and personnel upon receipt of requirements from COMPANY.

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- 1.7.1 In the event that CONTRACTOR has a concurrent alternative customer requirement for the equipment and / or personnel, CONTRACTOR shall advise COMPANY of said alternative requirements and COMPANY's options to ensure equipment and / or personnel availability. In the event one of those options is for COMPANY to secure the equipment and / or personnel in advance, then COMPANY shall compensate CONTRACTOR at fifty percent (50%) of the applicable Standby Rate to secure the availability of the equipment and / or personnel. All such agreements shall be documented in the WORK ORDER or CHANGE ORDER.
- 1.7.2 Where the alternative customer is another COMPANY asset, then CONTRACTOR shall be responsible for keeping each of the assets informed of such requirements. COMPANY shall be informed by CONTRACTOR at all times of such exceptional circumstances. As regards any standby payments made in conjunction with Clause 1.7.1 herein above, COMPANY shall only make one standby payment regardless of the number of COMPANY assets waiting to use the equipment. Unless so directed by COMPANY, said standby payment shall be charged to the first COMPANY asset ensuring equipment availability.

2.0 MOBILIZATION AND DEMOBILIZATION

- 2.1 Unless otherwise provided for herein, CONTRACTOR shall be responsible for the mobilization and demobilization of its personnel, equipment, and material to and from the WORKSITE, COMPANY designated heliport, or supply base.

Where changes to the Scope of Work or agreed delivery schedule by COMPANY are sufficient to require CONTRACTOR to execute additional mobilizations for a job, the cost for these additional mobilizations will be to COMPANY account.

- 2.2 CONTRACTOR shall be responsible for obtaining all necessary visas, customs clearances, or other government authorizations required for moving its personnel and equipment into and out of the country having jurisdiction over the operating area. In the event COMPANY is specifically required herein to reimburse CONTRACTOR for customs duties or fees levied on CONTRACTOR in relation to the import or export of CONTRACTOR's equipment and material, CONTRACTOR shall follow COMPANY's instructions in respect thereof so as to qualify for any available exemptions or reductions of such duties or fees.
- 2.3 If equipment or personnel are demobilized to a location closer than the originally intended Point of Demobilization, in order to perform work for another company or for reasons of CONTRACTOR's own convenience, any demobilization fee shall be reduced in an amount commensurate with the resulting documented reduction in CONTRACTOR's demobilization costs.
- 2.4 Applicable expenses for travel approved by COMPANY in advance of the travel will be reimbursed, with no mark-up, according to the following:
- 2.4.1 For expenses incurred outside of the United States see current version (revised periodically) of US Department of State web-site at:

http://aoprals.state.gov/content.asp?content_id=184&menu_id=81

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2.4.2 For expenses incurred within the United States see current version (revised periodically) of US General Services Administration web-site at:

http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentId=17943&contentType=GSA_BASIC

2.4.3 Charges for the use of personal automobiles and light trucks shall be at the IRS mileage rate applicable at the time of service. CONTRACTOR shall employ best efforts to reduce aggregate transportation charges to COMPANY through the use of carpools, crew vans, and other related methods of transportation.

2.4.4 Airfare will be lowest discounted coach fare at the time of purchase with most direct routing.

2.4.5 Where agreed to in advance by COMPANY, COMPANY shall reimburse reasonable travel expenses for attendance of CONTRACTOR personnel at sundry meetings (e.g., Crew Engagement Meetings, etc.) requested by COMPANY. Day rates for all personnel attending sundry meetings shall be for no more than eight (8) hours at the applicable onshore rate.

2.5 COMPANY shall provide air transportation for medical evacuation of CONTRACTOR's personnel from COMPANY's WORKSITES. The cost of air transportation shall be borne by the parties in accordance with Section 2 – General Conditions of Contract, Clause 31.9.

2.6 If CONTRACTOR uses third-parties for transportation, CONTRACTOR shall make reasonable efforts to use COMPANY's preferred trucking companies. COMPANY shall not assume any liability due to delay, lost or damaged cargo, or any other loss as a result of CONTRACTOR's use of COMPANY's preferred trucking companies.

3.0 CHARGE RATE

3.1 Unless otherwise specified in Section 4, Appendix 3 – Sub-Sector Terms and Conditions, prices included in this CONTRACT together with any relevant discounts shall remain firm and fixed for the first twelve (12) months from the EFFECTIVE DATE of the CONTRACT.

3.1.1 Price Adjustments – General Principles

- (a) Unless elsewhere specified, the methodology agreed between PARTIES shall apply to all line items contained within the applicable Schedule of Rates and Charges. These price adjustments shall be based on objective criteria (e.g., published indices or other available market information) and not subject to a form of negotiation process, except for unique circumstances when it is not possible to utilize an appropriate indexation tool or indexation methodology.
- (b) Unless otherwise specified in Appendix 3 or otherwise agreed between the PARTIES, price adjustments will be calculated on an annual basis inclusive of any extension periods.
- (c) Occasionally an index may be unavailable for a particular time period or sometimes an index is permanently discontinued. If this occurs, the next higher level data series or another index may be substituted, subject to mutual agreement by COMPANY and CONTRACTOR. If the title of an index changes

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or is recoded without changing the inputs, it is considered to be the same index.

- (d) Indices are sometimes re-based. Price Adjustments will be calculated using indices expressed on the reference base period in effect when the Price Adjustment is applied, i.e., the calculation of adjustments shall always use the latest version of the index.

3.1.2 Price Adjustment Process

- (a) No later than three (3) months from the EFFECTIVE DATE of the CONTRACT, the PARTIES shall agree on an appropriate methodology for adjusting pricing for each subsequent twelve (12) month period of the CONTRACT.
- (b) In order to develop this methodology, CONTRACTOR shall provide for COMPANY's approval a percentage breakdown of the cost drivers for each category of items so that appropriate indices may be selected and accurate composite calculations may be made.
- (c) Unless agreed otherwise between the PARTIES, the Rates and Charges to be adjusted shall be subject to annual review and adjusted up or down commencing from the first Anniversary Date of the CONTRACT ("CONTRACT Anniversary Date") and annually thereafter on the CONTRACT Anniversary Date.
- (d) No later than 45 days prior to the CONTRACT Anniversary Date, CONTRACTOR shall present a written recommendation to COMPANY detailing the Rates and Charges to be adjusted and full back-up documentation in support of any adjustments. Any approved adjustments shall be the subject of a CONTRACT amendment between the PARTIES.

3.1.3 The baseline month and year for indexation and pricing purposes shall be the EFFECTIVE DATE of the CONTRACT.

- 3.2** The descriptions attached to the respective items detailed in Section 4, Appendix 3 and/or Appendix 4, are intended as brief descriptions sufficient for identification purposes only and do not exhaustively detail every operation involved in carrying out the WORK.
- 3.3** Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed onshore shall begin the day equipment arrives at WORKSITE and terminates upon leaving WORKSITE.
- 3.4** CONTRACTOR shall prepare tools and equipment for back loading and complete a detailed manifest. Where COMPANY provided transportation is used, should CONTRACTOR fail to properly prepare equipment for shipment and cause delay, equipment shall be charged at zero rates until such time as equipment has been back loaded on COMPANY provided transportation.
- 3.5** For air or marine personnel transportation, unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, crew charges begin when crew reaches COMPANY's embarkation point

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for transport to WORKSITE and ends when crew arrives back at COMPANY's disembarkation point. There shall be no duplicate crew charges on crew change days.

- 3.6 Unless otherwise specified, equipment operating charges shall apply when equipment is on the WORKSITE, fully functional and operational in accordance with Section 3, Scope of Work, and being used in performance of the WORK.
- 3.7 All equipment rates per day refer to a day of twenty-four hours. For parts of a day, all such day rates shall be prorated to the nearest hour. Monthly rates refer to a calendar month. Parts of a month shall be prorated to the nearest day.
- 3.8 Unless otherwise specified herein, in the event of equipment failure, when equipment was used within CONTRACTOR's specifications and control, the charges will cease immediately. Charges will recommence when equipment is replaced or is deemed to have started working to the satisfaction of COMPANY. This non-payment shall also apply to other equipment CONTRACTOR may have in the same tool string and / or other related equipment and personnel at the WORKSITE unless COMPANY continues to drill or circulate and the other equipment continues to function. COMPANY shall not pay land transportation charges and fees for replacement equipment due to CONTRACTOR failures deemed as operated within CONTRACTOR specifications. If CONTRACTOR utilizes COMPANY provided land transportation, then CONTRACTOR shall reimburse COMPANY for all charges. No payment will be made for any item of equipment which fails within twenty-four (24) hours of commencement of operational use.
- 3.9 In the event CONTRACTOR upgrades the technical specification or specifications of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be employed by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.
- 3.10 In the event CONTRACTOR is unable to provide any part of the WORK for which CONTRACTOR has agreed to provide and there exists agreed rates and / or charges in the CONTRACT and has to source such WORK from a Third Party, CONTRACTOR shall invoice COMPANY for such part of the WORK at the rates or charges contained herein or the Third Party cost with no mark-up, whichever is the lesser.
- 3.11 NEW TECHNOLOGY – COMPANY is procuring services and associated equipment and materials, which COMPANY expects to improve incrementally over the duration of the CONTRACT. However, it is recognized that acquisitions and development of new technology during the term of the CONTRACT may result in the development of products and services not included in the CONTRACT. In such a situation, CONTRACTOR and COMPANY shall:
- 3.11.1 Discuss and agree upon any such inclusion which shall be considered on a case-by-case basis. Prior to acceptance of new technology, COMPANY requires business case justification by CONTRACTOR which shall consist of but is not limited to the following documentation to be provided by CONTRACTOR:

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- (a) description of technological benefits and risks
- (b) delineation of commercial benefits accruing to COMPANY (including, where applicable, incremental NPV, savings in drilling unit time, increased production, or other measurable value generation)
- (c) new technology delivery plan

3.11.2 not seek adjustments to rates for:

- (a) revision of tool specifications
- (b) improved processes

All adjustments shall be made in accordance with COMPANY's internal procedure for addition of materials, equipment, or personnel charges to the Schedule of Rates and Charges. These discussions and agreements shall be held in advance of performing such services for COMPANY. When CONTRACTOR does not seek and obtain necessary approvals for inclusion of new or additional services, payments shall not be made by COMPANY to CONTRACTOR, nor shall COMPANY be responsible in any manner should the equipment be lost or damaged.

3.11.3 Agree that CONTRACTOR shall charge COMPANY at the commercial rates of the previous generation of technology in the event of failure to deliver all of the benefits specified in the new technology business case.

3.12 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, should CONTRACTOR's tool(s) and equipment become stuck in the hole, the operating rates shall automatically terminate and standby rates commence unless the incident is caused by CONTRACTOR negligence or if due to COMPANY failure or other CONTRACTORS failure(s) to follow COMPANY established procedures and practices. If due to CONTRACTOR negligence, the operating rate will terminate and a zero rate will be applicable. The appropriate rates shall remain in effect until the tools are retrieved and released to CONTRACTOR or when officially declared lost. Aggregate standby payment shall not exceed the Lost-in-Hole value for said tool(s) and equipment. The tools are officially declared lost when the decision is made to no longer attempt to recover the tools.

3.13 CONTRACTOR unit prices shall be all inclusive of consumption of that material. No additional charges for packing (i.e., pallets, plastic wrap, drums, buckets, etc.) will be accepted above the unit cost of the product.

3.14 Unless otherwise stated herein in Section 4, Appendix 3 and/or Appendix 4, there shall be no additional charges for backup tools or equipment necessary to perform the WORK without interruption.

4.0 THIRD PARTY SERVICES / MATERIALS

4.1 Where Third Party services or materials are required by COMPANY under this CONTRACT and CONTRACTOR provides these services or materials, CONTRACTOR shall be reimbursed at net documented cost. These services or materials may be direct-billed by

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B. Fluids Services

Third Party to COMPANY. No invoice processing or similar charge shall be payable by COMPANY to CONTRACTOR.

- 4.2 COMPANY reserves the right to take advantage of commercial pricing from COMPANY contracts with Third Party material providers in lieu of CONTRACTOR providing said materials.
- 4.3 Unless otherwise provided in this CONTRACT, in the event that COMPANY's provision of third party materials results in a major scope of work change for CONTRACTOR then the Parties will mutually agree on any commercial revisions necessary.

5.0 PAYMENT AND INVOICING PROVISIONS

Payment and Invoicing procedures are as per Appendix 1, hereto.

6.0 LOST-IN-HOLE CHARGES

Lost-in-Hole Charges are as per Appendix 2, hereto.

7.0 SUB-SECTOR TERMS AND CONDITIONS / SCHEDULE OF RATES AND CHARGES

- 7.1 Sub-Sector Terms and Conditions are found as Appendix 3 attached hereto.
- 7.2 Schedule of Rates and Charges are found as Appendix 4 attached hereto.

C. Well Placement

1.0 GENERAL

- 1.1 Remuneration detailed herein shall be all inclusive rates including, but not limited to, all consumables, spares, and other extras such as any inspection or overhaul charges, all maintenance and repair, hot shot, inspection, certification, and transportation for all categories of equipment required, unless specifically noted otherwise, at the WORKSITE during the various well sections, and is deemed to allow for all costs incurred by CONTRACTOR in complying with all the terms and conditions of the CONTRACT, and shall represent the total remuneration due to CONTRACTOR in full consideration of the satisfactory performance of the WORK.
- 1.2 CONTRACTOR shall not be entitled to remuneration in respect of personnel or equipment time incurred non-productively:
 - 1.2.1 Through shortages or delays in the supply by CONTRACTOR of personnel, equipment, information, or materials, provided that COMPANY shall have given to CONTRACTOR adequate notice of the need for such supply; and/or
 - 1.2.2 Due to a lack of planning on the part of CONTRACTOR provided adequate planning time and TECHNICAL INFORMATION were provided by COMPANY
- 1.3 No remuneration shall be made for WORK not performed in accordance with the CONTRACT.
- 1.4 All equipment, materials, and/or services must be as specified in the CONTRACT, as amended from time to time, prior to CONTRACTOR providing or using same. Failure to include equipment, materials, or services will result in COMPANY not paying CONTRACTOR for these items.
- 1.5 All rates and prices stated herein are in United States Dollars.
- 1.6 The rates and prices are exclusive of any incidence for Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty applicable to the goods and services provided by CONTRACTOR under the CONTRACT, and to the extent that similar taxes such as sales, use or excise or business tax are implicit or specifically defined in Appendix 2 to Section 2 – General Conditions of the Contract. The amount of Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty and such other agreed taxes chargeable less any reduction in taxes CONTRACTOR may benefit from shall be paid to CONTRACTOR by COMPANY in addition to any other payments becoming due under the CONTRACT upon production of a valid tax invoice.
- 1.7 CONTRACTOR shall advise COMPANY of availability of equipment and personnel upon receipt of requirements from COMPANY.

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C. Well Placement**

- 1.7.1 In the event that CONTRACTOR has a concurrent alternative customer requirement for the equipment and / or personnel, CONTRACTOR shall advise COMPANY of said alternative requirements and COMPANY's options to ensure equipment and / or personnel availability. In the event one of those options is for COMPANY to secure the equipment and / or personnel in advance, then COMPANY shall compensate CONTRACTOR at fifty percent (50%) of the applicable Standby Rate to secure the availability of the equipment and / or personnel. All such agreements shall be documented in the WORK ORDER or CHANGE ORDER.
- 1.7.2 Where the alternative customer is another COMPANY asset, then CONTRACTOR shall be responsible for keeping each of the assets informed of such requirements. COMPANY shall be informed by CONTRACTOR at all times of such exceptional circumstances. As regards any standby payments made in conjunction with Clause 1.7.1 herein above, COMPANY shall only make one standby payment regardless of the number of COMPANY assets waiting to use the equipment. Unless so directed by COMPANY, said standby payment shall be charged to the first COMPANY asset ensuring equipment availability.

2.0 MOBILIZATION AND DEMOBILIZATION

Terms and Conditions applicable to Mobilization and Demobilization are found in Section 4, Appendix 3, Part C, Clause 2.

3.0 CHARGE RATE

- 3.1 Unless otherwise specified in Section 4, Appendix 3 – Sub-Sector Terms and Conditions, prices included in this CONTRACT together with any relevant discounts shall remain firm and fixed for the first twelve (12) months from the EFFECTIVE DATE of the CONTRACT.
- 3.1.1 Price Adjustments – General Principles
- (a) Unless elsewhere specified, the methodology agreed between PARTIES shall apply to all line items contained within the applicable Schedule of Rates and Charges. These price adjustments shall be based on objective criteria (e.g., published indices or other available market information) and not subject to a form of negotiation process, except for unique circumstances when it is not possible to utilize an appropriate indexation tool or indexation methodology.
 - (b) Unless otherwise specified in Appendix 3 or otherwise agreed between the PARTIES, price adjustments will be calculated on an annual basis inclusive of any extension periods.
 - (c) Occasionally an index may be unavailable for a particular time period or sometimes an index is permanently discontinued. If this occurs, the next higher level data series or another index may be substituted, subject to mutual agreement by COMPANY and CONTRACTOR. If the title of an index changes or is recoded without changing the inputs, it is considered to be the same index.
 - (d) Indices are sometimes re-based. Price Adjustments will be calculated using indices expressed on the reference base period in effect when the Price Adjustment is applied, i.e., the calculation of adjustments shall always use the latest version of the index.

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3.1.2 Price Adjustment Process

- (a) No later than three (3) months from the EFFECTIVE DATE of the CONTRACT, the PARTIES shall agree on an appropriate methodology for adjusting pricing for each subsequent twelve (12) month period of the CONTRACT.
- (b) In order to develop this methodology, CONTRACTOR shall provide for COMPANY's approval a percentage breakdown of the cost drivers for each category of items so that appropriate indices may be selected and accurate composite calculations may be made.
- (c) Unless agreed otherwise between the PARTIES, the Rates and Charges to be adjusted shall be subject to annual review and adjusted up or down commencing from the first Anniversary Date of the CONTRACT ("CONTRACT Anniversary Date") and annually thereafter on the CONTRACT Anniversary Date.
- (d) No later than 45 days prior to the CONTRACT Anniversary Date, CONTRACTOR shall present a written recommendation to COMPANY detailing the Rates and Charges to be adjusted and full back-up documentation in support of any adjustments. Any approved adjustments shall be the subject of a CONTRACT amendment between the PARTIES.

3.1.3 The baseline month and year for indexation and pricing purposes shall be the EFFECTIVE DATE of the CONTRACT.

- 3.2 The descriptions attached to the respective items detailed in Section 4, Appendix 3 and/or Appendix 4, are intended as brief descriptions sufficient for identification purposes only and do not exhaustively detail every operation involved in carrying out the WORK.**
- 3.3 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed offshore shall begin the day equipment arrives at COMPANY supply base or WORKSITE, whichever occurs first, and terminates upon arrival at COMPANY supply base or CONTRACTOR base, whichever occurs first.**
- 3.4 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed onshore shall begin the day equipment arrives at WORKSITE and terminates upon leaving WORKSITE.**
- 3.5 CONTRACTOR shall prepare tools and equipment for back loading and complete a detailed manifest. Where COMPANY provided transportation is used, should CONTRACTOR fail to properly prepare equipment for shipment and cause delay, equipment shall be charged at Zero Rates until such time as equipment has been back loaded on COMPANY provided transportation.**
- 3.6 For air or marine personnel transportation, unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, crew charges begin when crew reaches COMPANY's embarkation point for transport to WORKSITE and ends when crew arrives back at COMPANY's disembarkation point. There shall be no duplicate crew charges on crew change days.**

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- 3.7 For the avoidance of doubt, this Clause is superseded by Section 4, Appendix 3, Part C, Clause 3.2.3.

Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, equipment operating charges shall apply when equipment is on the WORKSITE, fully functional and operational in accordance with Section 3, Scope of Work, and being used in performance of the WORK.

- 3.8 All equipment rates day refer to a day of twenty-four hours. For parts of a day, all such day rates shall be prorated to the nearest hour for each well. Monthly rates refer to a calendar month. Parts of a month shall be prorated to the nearest day.

- 3.9 For the avoidance of doubt, this Clause is superseded by Section 4, Appendix 3, Part C, Clause 3.3.

Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, in the event of equipment failure, when equipment was used within CONTRACTOR's specifications and control, the charges will cease immediately. Charges will recommence when equipment is replaced or is deemed to have started working to the satisfaction of COMPANY. This non-payment shall also apply to other equipment CONTRACTOR may have in the same tool string and / or other related equipment and personnel at the WORK SITE unless COMPANY continues to drill or circulate and the other equipment continues to function. COMPANY shall not pay land transportation charges and fees for replacement equipment due to CONTRACTOR failures deemed as operated within CONTRACTOR specifications. If CONTRACTOR utilizes COMPANY provided land transportation, then CONTRACTOR shall reimburse COMPANY for all charges. No payment will be made for any item of equipment which fails within twenty-four (24) hours of commencement of operational use.

- 3.10 In the event CONTRACTOR upgrades the technical specification or specifications of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be employed by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.

- 3.11 For the avoidance of doubt, this Clause is superseded by Section 4, Appendix 3, Part C, Clause 3.1.24.

In the event CONTRACTOR is unable to provide any part of the WORK for which CONTRACTOR has agreed to provide and there exists agreed rates and / or charges in the CONTRACT and has to source such WORK from a Third Party, CONTRACTOR shall invoice COMPANY for such part of the WORK at the rates or charges contained herein or the Third Party cost with no mark-up, whichever is the lesser.

- 3.12 NEW TECHNOLOGY – COMPANY is procuring services and associated equipment and materials, which COMPANY expects to improve incrementally over the duration of the CONTRACT. However, it is recognized that acquisitions and development of new technology during the term of the CONTRACT may result in the development of products and services not included in the CONTRACT. In such a situation, CONTRACTOR and COMPANY shall:

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C. Well Placement

3.12.1 Discuss and agree upon any such inclusion which shall be considered on a case-by-case basis. Prior to acceptance of new technology, COMPANY requires business case justification by CONTRACTOR which shall consist of but is not limited to the following documentation to be provided by CONTRACTOR:

- (a) Description of technological benefits and risks.
- (b) Delineation of commercial benefits accruing to COMPANY (including, where applicable, incremental NPV, savings in drilling unit time, increased production, or other measurable value generation).
- (c) New technology delivery plan.

3.12.2 Not seek adjustments to rates for:

- (a) Revision of tool specifications.
- (b) Improved processes.

All adjustments shall be made in accordance with COMPANY's internal procedure for addition of materials, equipment, or personnel charges to the Schedule of Rates and Charges. These discussions and agreements shall be held in advance of performing such services for COMPANY. When CONTRACTOR does not seek and obtain necessary approvals for inclusion of new or additional services, payments shall not be made by COMPANY to CONTRACTOR, nor shall COMPANY be responsible in any manner should the equipment be lost or damaged.

3.12.3 Agree that CONTRACTOR shall charge COMPANY at the commercial rates of the previous generation of technology in the event of failure to deliver all of the benefits specified in the new technology business case.

3.13 For the avoidance of doubt, this Clause is superseded by Section 4, Appendix 3, Part C, Clause 3.4.

Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, should CONTRACTOR's tool(s) and equipment become stuck in the hole, the Operating Rates shall automatically terminate and Standby Rates commence unless the incident is caused by CONTRACTOR negligence. If due to CONTRACTOR negligence, the Operating Rate will terminate and a Zero Rate will be applicable. The appropriate rates shall remain in effect until the tools are retrieved and released to CONTRACTOR or when officially declared lost. Aggregate standby payment shall not exceed the Lost-in-Hole value for said tool(s) and equipment. The tools are officially declared lost when the decision is made to no longer attempt to recover the tools.

3.14 CONTRACTOR unit prices shall be all inclusive of consumption of that material. No additional charges for packing (i.e., pallets, plastic wrap, drums, buckets, etc.) will be accepted above the unit cost of the product.

3.15 For the avoidance of doubt, this Clause is superseded by Section 4, Appendix 3, Part C, Clause 3.2.4.

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C. Well Placement**

Unless otherwise stated herein in Section 4, Appendix 3 and/or Appendix 4, there shall be no additional charges for backup tools or equipment necessary to perform the WORK without interruption.

4.0 THIRD PARTY SERVICES / MATERIALS

- 4.1 Where Third Party services or materials are required by COMPANY under this CONTRACT and CONTRACTOR provides these services or materials, CONTRACTOR shall be reimbursed at net documented cost. These services or materials may be direct-billed by Third Party to COMPANY. No invoice processing or similar charge shall be payable by COMPANY to CONTRACTOR.
- 4.2 COMPANY reserves the right to take advantage of commercial pricing from COMPANY contracts with Third Party material providers in lieu of CONTRACTOR providing said materials.
- 4.3 Unless otherwise provided in this CONTRACT, in the event that COMPANY's provision of third party materials results in a major scope of work change for CONTRACTOR then the Parties will mutually agree on any commercial revisions necessary.

5.0 PAYMENT AND INVOICING PROVISIONS

Payment and Invoicing procedures are as per Appendix 1, hereto.

6.0 LOST-IN-HOLE CHARGES

Lost-in-Hole Charges are as per Appendix 2, hereto.

7.0 SUB-SECTOR TERMS AND CONDITIONS / SCHEDULE OF RATES AND CHARGES

- 7.1 Sub-Sector Terms and Conditions are found as Appendix 3 attached hereto.
- 7.2 Schedule of Rates and Charges are found as Appendix 4 attached hereto.

D. Wireline Services

1.0 GENERAL

- 1.1 Remuneration detailed herein shall be all inclusive rates including, but not limited to, all consumables, spares, and other extras such as any inspection or overhaul charges, all maintenance and repair, hot shot, inspection, certification, and transportation for all categories of equipment required, unless specifically noted otherwise, at the WORKSITE during the various well sections, and is deemed to allow for all costs incurred by CONTRACTOR in complying with all the terms and conditions of the CONTRACT, and shall represent the total remuneration due to CONTRACTOR in full consideration of the satisfactory performance of the WORK.
- 1.2 CONTRACTOR shall not be entitled to remuneration in respect of personnel or equipment time incurred non-productively:
 - 1.2.1 through shortages or delays in the supply by CONTRACTOR of personnel, equipment, information, or materials, provided that COMPANY shall have given to CONTRACTOR adequate notice of the need for such supply; and / or
 - 1.2.2 due to a lack of planning on the part of CONTRACTOR provided adequate planning time and technical information were provided by COMPANY
- 1.3 No remuneration shall be made for WORK not performed in accordance with the CONTRACT. There shall be no surcharges of any manner.
- 1.4 COMPANY shall place CONTRACTOR on Zero Rate at any time during the CONTRACT period if CONTRACTOR fails to meet the full obligations and requirements of the CONTRACT in whole or in part. CONTRACTOR shall remain on Zero Rate until corrective action is taken and accepted by COMPANY. Zero rate applies to all CONTRACTOR charges without exception, and includes but is not limited to the base service charge unit rate and the individual tool/equipment unit rates in the CONTRACT schedule of rates and charges.
- 1.5 All equipment, materials, and/or services must be as specified in the CONTRACT, as amended from time to time, prior to CONTRACTOR providing or using same. Failure to include equipment, materials, or services will result in COMPANY not paying CONTRACTOR for these items.
- 1.6 All rates and prices stated herein are in United States Dollars.
- 1.7 The rates and prices are exclusive of any incidence for Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty applicable to the goods and services provided by CONTRACTOR under the CONTRACT, and to the extent that similar taxes such as sales, use or excise or business tax are implicit or specifically defined in Appendix 2 to Section 2 – General Conditions of the Contract. The amount of Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty and such other agreed taxes chargeable less any reduction in taxes CONTRACTOR may benefit from shall be paid to CONTRACTOR by

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D. Wireline Services

COMPANY in addition to any other payments becoming due under the CONTRACT upon production of a valid tax invoice.

- 1.8 CONTRACTOR shall advise COMPANY of availability of equipment and personnel upon receipt of requirements from COMPANY.
- 1.8.1 In the event that CONTRACTOR has a concurrent alternative customer requirement for the equipment and / or personnel, CONTRACTOR shall advise COMPANY of said alternative requirements and COMPANY's options to ensure equipment and / or personnel availability. In the event one of those options is for COMPANY to secure the equipment and / or personnel in advance, then COMPANY shall compensate CONTRACTOR at fifty percent (50%) of the applicable Standby Rate to secure the availability of the equipment and / or personnel. All such agreements shall be documented in the WORK ORDER or CHANGE ORDER.
- 1.8.2 Where the alternative customer is another COMPANY asset, then CONTRACTOR shall be responsible for keeping each of the assets informed of such requirements. COMPANY shall be informed by CONTRACTOR at all times of such exceptional circumstances. As regards any standby payments made in conjunction with Clause 1.8.1 herein above, COMPANY shall only make one standby payment regardless of the number of COMPANY assets waiting to use the equipment. Unless so directed by COMPANY, said standby payment shall be charged to the first COMPANY asset ensuring equipment availability.

2.0 MOBILIZATION AND DEMOBILIZATION

- 2.1 Unless otherwise provided for herein, CONTRACTOR shall be responsible for the mobilization and demobilization of its personnel, equipment, and material to and from the WORKSITE, COMPANY designated heliport, or supply base.
- Where changes to the Scope of Work or agreed delivery schedule by COMPANY are sufficient to require CONTRACTOR to execute additional mobilizations for a job, the cost for these additional mobilizations will be to COMPANY account.
- 2.2 CONTRACTOR shall be responsible for obtaining all necessary visas, customs clearances, or other government authorizations required for moving its personnel and equipment into and out of the country having jurisdiction over the operating area.
- 2.3 COMPANY shall provide air transportation for medical evacuation of CONTRACTOR's personnel from COMPANY's WORKSITES. The cost of air transportation shall be borne by the parties in accordance with Section 2 - General Conditions of Contract, Clause 31.9.
- 2.4 The point of mobilization for onshore operations will be COMPANY's WORKSITE unless specifically stated prior to the operation.
- 2.5 All costs and charges relating to the mobilization of crew and equipment to the WORKSITE shall be included in the Base Service Charge Unit Rates.

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D. Wireline Services

- 2.6 For offshore operations the mobilization point will be COMPANY's shore base, or place of Crew embarkation.
- 2.7 CONTRACTOR is responsible for ensuring that all equipment and services required for the WORK are delivered by land or sea freight, as specified by the WORK, to meet the schedule detailed in the CONTRACT. In the event that CONTRACTOR is required to air freight any equipment in order to meet the agreed CONTRACT schedule, such additional air freight costs shall be to CONTRACTOR's account.

3.0 CHARGE RATE

- 3.1 Unless otherwise specified in Section 4, Appendix 3 – Sub-Sector Terms and Conditions, prices included in this CONTRACT together with any relevant discounts shall remain firm and fixed for the first twelve (12) months from the EFFECTIVE DATE of the CONTRACT.

3.1.1 Price Adjustments – General Principles

- (a) Unless elsewhere specified, the methodology agreed between PARTIES shall apply to all line items contained within the applicable Schedule of Rates and Charges. These price adjustments shall be based on objective criteria (e.g., published indices or other available market information) and not subject to a form of negotiation process, except for unique circumstances when it is not possible to utilize an appropriate indexation tool or indexation methodology.
- (b) Unless otherwise specified in Appendix 3 or otherwise agreed between the PARTIES, price adjustments will be calculated on an annual basis inclusive of any extension periods.
- (c) Occasionally an index may be unavailable for a particular time period or sometimes an index is permanently discontinued. If this occurs, the next higher level data series or another index may be substituted, subject to mutual agreement by COMPANY and CONTRACTOR. If the title of an index changes or is recoded without changing the inputs, it is considered to be the same index.
- (d) Indices are sometimes re-based. Price Adjustments will be calculated using indices expressed on the reference base period in effect when the Price Adjustment is applied, i.e., the calculation of adjustments shall always use the latest version of the index.

3.1.2 Price Adjustment Process

- (a) No later than three (3) months from the EFFECTIVE DATE of the CONTRACT, the PARTIES shall agree on an appropriate methodology for adjusting pricing for each subsequent twelve (12) month period of the CONTRACT.
- (b) In order to develop this methodology, CONTRACTOR shall provide for COMPANY's approval a percentage breakdown of the cost drivers for each category of items so that appropriate indices may be selected and accurate composite calculations may be made.
- (c) Unless agreed otherwise between the PARTIES, the Rates and Charges to be adjusted shall be subject to annual review and adjusted up or down

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D. Wireline Services

commencing from the first Anniversary Date of the CONTRACT ("CONTRACT Anniversary Date") and annually thereafter on the CONTRACT Anniversary Date.

- (d) No later than 45 days prior to the CONTRACT Anniversary Date, CONTRACTOR shall present a written recommendation to COMPANY detailing the Rates and Charges to be adjusted and full back-up documentation in support of any adjustments. Any approved adjustments shall be the subject of a CONTRACT amendment between the PARTIES.

3.1.3 The baseline month and year for indexation and pricing purposes shall be the EFFECTIVE DATE of the CONTRACT.

- 3.2 The descriptions attached to the respective items detailed in Section 4, Appendix 3 and/or Appendix 4, are intended as brief descriptions sufficient for identification purposes only and do not exhaustively detail every operation involved in carrying out the WORK.
- 3.3 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed offshore shall begin the day equipment arrives at COMPANY supply base, WORKSITE or COMPANY specified time whichever occurs later, and terminates upon arrival at COMPANY supply base or CONTRACTOR base, whichever occurs first.
- 3.4 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed onshore shall begin the day equipment arrives at COMPANY supply base, WORKSITE or COMPANY specified time whichever occurs later, and terminates upon release from the WORKSITE.
- 3.5 CONTRACTOR shall prepare tools and equipment for back loading and complete a detailed manifest. Where COMPANY provided transportation is used, should CONTRACTOR fail to properly prepare equipment for shipment and cause delay, equipment shall be charged at Zero Unit Rates, if applicable, until such time as equipment has been back loaded on COMPANY provided transportation.
- 3.6 For air or marine personnel transportation, unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, crew charges begin when crew reaches COMPANY's embarkation point for transport to WORKSITE, or COMPANY specified time whichever occurs later, and ends when crew arrives back at COMPANY's disembarkation point. There shall be no duplicate crew charges on crew change days.
- 3.7 Where appropriate all equipment Standby Rates per day refer to a day of twenty-four hours. For parts of a day, all such day rates shall be prorated to the nearest hour. Monthly rates refer to a calendar month. Parts of a month shall be prorated to the nearest day.
- 3.8 COMPANY shall not pay land transportation charges and fees for replacement equipment due to CONTRACTOR failures deemed as operated within CONTRACTOR specifications. If CONTRACTOR utilizes COMPANY provided land transportation, then CONTRACTOR shall reimburse COMPANY for all charges.

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- 3.9 In the event CONTRACTOR upgrades the technical specification OR SPECIFICATIONS of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be EMPLOYED by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.
- 3.10 In the event CONTRACTOR is unable to provide any part of the WORK for which CONTRACTOR has agreed to provide and there exists agreed rates and / or charges in the CONTRACT and has to source such WORK from a Third Party, CONTRACTOR shall invoice COMPANY for such part of the WORK at the rates or charges contained herein or the Third Party cost with no mark-up, whichever is the lesser.
- 3.11 NEW TECHNOLOGY – COMPANY is procuring data, services and associated equipment and materials, which COMPANY expects to improve incrementally over the duration of the CONTRACT. However, it is recognized that acquisitions and development of new technology during the term of the CONTRACT may result in the development of products and services not included in the CONTRACT. In such a situation, CONTRACTOR and COMPANY shall:
- 3.11.1 discuss and agree upon any such inclusion which shall be considered on a case-by-case basis. Prior to acceptance of new technology, COMPANY requires business case justification by CONTRACTOR which shall consist of but is not limited to the following documentation to be provided by CONTRACTOR:
- (a) description of technological benefits and risks
 - (b) delineation of commercial benefits accruing to COMPANY, including, where applicable, incremental NPV, savings in drilling unit time, increased production, or other measurable value generation.
 - (c) new technology delivery plan
- 3.11.2 not seek adjustments to rates for:
- (a) revision of tool specifications
 - (b) improved processes
- All adjustments shall be made in accordance with COMPANY's internal procedure for addition of materials, equipment, or personnel charges to the Schedule of Rates and Charges. These discussions and agreements shall be held in advance of performing such services for COMPANY. When CONTRACTOR does not seek and obtain necessary approvals for inclusion of new or additional services, payments shall not be made by COMPANY to CONTRACTOR, nor shall COMPANY be responsible in any manner should the equipment be lost or damaged.
- 3.11.3 agree that CONTRACTOR shall charge COMPANY at the Unit Rates of the previous generation of technology in the event of failure to deliver all of the benefits specified in the new technology business case.

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D. Wireline Services**

3.12 CONTRACTOR Unit Rates shall be all inclusive of consumption of material. No additional charges for packing (i.e., pallets, plastic wrap, drums, buckets, etc.) will be accepted above the Unit Rate of the product.

3.13 Unless otherwise stated herein in Section 4, Appendix 3 and/or Appendix 4, there shall be no additional charges for back-up tools or equipment necessary to perform the WORK without interruption.

4.0 THIRD PARTY SERVICES / MATERIALS

4.1 Where Third Party services or materials are required by COMPANY under this CONTRACT and CONTRACTOR provides these services or materials, CONTRACTOR shall be reimbursed at net documented cost. These services or materials may be direct-billed by Third Party to COMPANY. No invoice processing or similar charge shall be payable by COMPANY to CONTRACTOR.

4.2 COMPANY reserves the right to take advantage of commercial pricing from COMPANY contracts with Third Party material providers in lieu of CONTRACTOR providing said materials.

4.3 Unless otherwise provided in this CONTRACT, in the event that COMPANY's provision of third party materials results in a major scope of work change for CONTRACTOR then the Parties will mutually agree on any commercial revisions necessary.

5.0 PAYMENT AND INVOICING PROVISIONS

Payment and Invoicing procedures are as per Appendix 1, hereto.

6.0 LOST-IN-HOLE CHARGES

Lost-in-Hole Charges are as per Appendix 2, hereto.

7.0 SUB-SECTOR TERMS AND CONDITIONS / SCHEDULE OF RATES AND CHARGES

7.1 Sub-Sector Terms and Conditions are found as Appendix 3 attached hereto.

7.2 Schedule of Rates and Charges are found as Appendix 4 attached hereto.

E. Completions

1.0 GENERAL

- 1.1 Remuneration detailed herein shall be all inclusive rates including, but not limited to, all consumables, spares, and other extras such as any inspection or overhaul charges, all maintenance and repair, hot shot, inspection, certification, and transportation for all categories of equipment required, unless specifically noted otherwise, at the WORKSITE during the various well sections, and is deemed to allow for all costs incurred by CONTRACTOR in complying with all the terms and conditions of the CONTRACT, and shall represent the total remuneration due to CONTRACTOR in full consideration of the satisfactory performance of the WORK.
- 1.2 CONTRACTOR shall not be entitled to remuneration in respect of personnel or equipment time incurred non-productively:
 - 1.2.1 through shortages or delays in the supply by CONTRACTOR of personnel, equipment, information, or materials, provided that COMPANY shall have given to CONTRACTOR adequate notice of the need for such supply; and / or
 - 1.2.2 due to a lack of planning on the part of CONTRACTOR provided adequate planning time and TECHNICAL INFORMATION were provided by COMPANY
- 1.3 No remuneration shall be made for WORK not performed in accordance with the CONTRACT.
- 1.4 All equipment, materials, and / or services must be as specified in the CONTRACT, as amended from time to time, prior to CONTRACTOR providing or using same. Failure to include equipment, materials, or services will result in COMPANY not paying CONTRACTOR for these items.
- 1.5 All rates and prices stated herein are in United States Dollars.
- 1.6 The rates and prices are exclusive of any incidence for Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty applicable to the goods and services provided by CONTRACTOR under the CONTRACT, and to the extent that similar taxes such as sales, use or excise or business tax are implicit or specifically defined in Appendix 2 to Section 2 – General Conditions of the Contract. The amount of Value Added Tax (VAT), Goods and Services Tax or any other similar tax or duty and such other agreed taxes chargeable less any reduction in taxes CONTRACTOR may benefit from shall be paid to CONTRACTOR by COMPANY in addition to any other payments becoming due under the CONTRACT upon production of a valid tax invoice.
- 1.7 CONTRACTOR shall advise COMPANY of availability of equipment and personnel upon receipt of requirements from COMPANY.

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- 1.7.1 In the event that CONTRACTOR has a concurrent alternative customer requirement for the equipment and / or personnel, CONTRACTOR shall advise COMPANY of said alternative requirements and COMPANY's options to ensure equipment and / or personnel availability. In the event one of those options is for COMPANY to secure the equipment and / or personnel in advance, then COMPANY shall compensate CONTRACTOR at fifty percent (50%) of the applicable Standby Rate to secure the availability of the equipment and / or personnel. All such agreements shall be documented in the WORK ORDER or CHANGE ORDER.
- 1.7.2 Where the alternative customer is another COMPANY asset, then CONTRACTOR shall be responsible for keeping each of the assets informed of such requirements. COMPANY shall be informed by CONTRACTOR at all times of such exceptional circumstances. As regards any standby payments made in conjunction with Clause 1.7.1 herein above, COMPANY shall only make one standby payment regardless of the number of COMPANY assets waiting to use the equipment. Unless so directed by COMPANY, said standby payment shall be charged to the first COMPANY asset ensuring equipment availability.

2.0 MOBILIZATION AND DEMOBILIZATION

- 2.1 Unless otherwise provided for herein, CONTRACTOR shall be responsible for the mobilization and demobilization of its personnel, equipment, and material to and from the WORKSITE, COMPANY designated heliport, or supply base.

Where changes to the Scope of Work or agreed delivery schedule by COMPANY are sufficient to require CONTRACTOR to execute additional mobilizations for a job, the cost for these additional mobilizations will be to COMPANY account.

- 2.2 CONTRACTOR shall be responsible for obtaining all necessary visas, customs clearances, or other government authorizations required for moving its personnel and equipment into and out of the country having jurisdiction over the operating area. In the event COMPANY is specifically required herein to reimburse CONTRACTOR for customs duties or fees levied on CONTRACTOR in relation to the import or export of CONTRACTOR's equipment and material, CONTRACTOR shall follow COMPANY's instructions in respect thereof so as to qualify for any available exemptions or reductions of such duties or fees.
- 2.3 If equipment or personnel are demobilized to a location closer than the originally intended Point of Demobilization, in order to perform work for another company or for reasons of CONTRACTOR's own convenience, any demobilization fee shall be reduced in an amount commensurate with the resulting documented reduction in CONTRACTOR's demobilization costs.
- 2.4 Applicable expenses for travel approved by COMPANY in advance of the travel will be reimbursed, with no mark-up, according to the following:
- 2.4.1 For expenses incurred outside of the United States see current version (revised periodically) of US Department of State web-site at:

http://aoprals.state.gov/content.asp?content_id=184&menu_id=81

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- 2.4.2 For expenses incurred within the United States see current version (revised periodically) of US General Services Administration web-site at:

http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentId=17943&contentType=GSA_BASIC

- 2.4.3 Charges for the use of personal automobiles and light trucks shall be at the IRS mileage rate applicable at the time of service. CONTRACTOR shall employ best efforts to reduce aggregate transportation charges to COMPANY through the use of carpools, crew vans, and other related methods of transportation.
- 2.4.4 Airfare will be lowest discounted coach fare at the time of purchase with most direct routing.
- 2.4.5 Where agreed to in advance by COMPANY, COMPANY shall reimburse reasonable travel expenses for attendance of CONTRACTOR personnel at sundry meetings (e.g., Crew Engagement Meetings, etc.) requested by COMPANY. Day rates for all personnel attending sundry meetings shall be for no more than eight (8) hours at the applicable onshore rate.
- 2.5 COMPANY shall provide air transportation for medical evacuation of CONTRACTOR's personnel from COMPANY's WORKSITES. The cost of air transportation shall be borne by the parties in accordance with Section 2 - General Conditions of Contract, Clause 31.9.
- 2.6 If CONTRACTOR uses Third-Parties for transportation, CONTRACTOR shall make reasonable efforts to use COMPANY's preferred trucking companies. COMPANY shall not assume any liability due to delay, lost or damaged cargo, or any other loss as a result of CONTRACTOR's use of COMPANY's preferred trucking companies.

3.0 CHARGE RATE

- 3.1 Unless otherwise specified in Section 4, Appendix 3 – Sub-Sector Terms and Conditions, prices included in this CONTRACT together with any relevant discounts shall remain firm and fixed for the first twelve (12) months from the EFFECTIVE DATE of the CONTRACT.
- 3.1.1 Price Adjustments – General Principles
- (a) Unless elsewhere specified, the methodology agreed between PARTIES shall apply to all line items contained within the applicable Schedule of Rates and Charges. These price adjustments shall be based on objective criteria (e.g., published indices or other available market information) and not subject to a form of negotiation process, except for unique circumstances when it is not possible to utilize an appropriate indexation tool or indexation methodology.
 - (b) Unless otherwise specified in Appendix 3 or otherwise agreed between the PARTIES, price adjustments will be calculated on an annual basis inclusive of any extension periods.
 - (c) Occasionally an index may be unavailable for a particular time period or sometimes an index is permanently discontinued. If this occurs, the next higher level data series or another index may be substituted, subject to mutual agreement by COMPANY and CONTRACTOR. If the title of an index changes

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or is recoded without changing the inputs, it is considered to be the same index.

- (d) Indices are sometimes re-based. Price Adjustments will be calculated using indices expressed on the reference base period in effect when the Price Adjustment is applied, i.e., the calculation of adjustments shall always use the latest version of the index.

3.1.2 Price Adjustment Process

- (a) No later than three (3) months from the EFFECTIVE DATE of the CONTRACT, the PARTIES shall agree on an appropriate methodology for adjusting pricing for each subsequent twelve (12) month period of the CONTRACT.
- (b) In order to develop this methodology, CONTRACTOR shall provide for COMPANY's approval a percentage breakdown of the cost drivers for each category of items so that appropriate indices may be selected and accurate composite calculations may be made.
- (c) Unless agreed otherwise between the PARTIES, the Rates and Charges to be adjusted shall be subject to annual review and adjusted up or down commencing from the first Anniversary Date of the CONTRACT ("CONTRACT Anniversary Date") and annually thereafter on the CONTRACT Anniversary Date.
- (d) No later than 45 days prior to the CONTRACT Anniversary Date, CONTRACTOR shall present a written recommendation to COMPANY detailing the Rates and Charges to be adjusted and full back-up documentation in support of any adjustments. Any approved adjustments shall be the subject of a CONTRACT amendment between the PARTIES.

3.1.3 The baseline month and year for indexation and pricing purposes shall be the EFFECTIVE DATE of the CONTRACT.

- 3.2** The descriptions attached to the respective items detailed in Section 4, Appendix 3 and/or Appendix 4, are intended as brief descriptions sufficient for identification purposes only and do not exhaustively detail every operation involved in carrying out the WORK.
- 3.3** Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed offshore shall begin the day equipment arrives at COMPANY supply base or WORKSITE, whichever occurs first, and terminates upon arrival at COMPANY supply base or CONTRACTOR base, whichever occurs first.
- 3.4** Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, charges for equipment to be employed onshore shall begin the day equipment arrives at WORKSITE and terminates upon leaving WORKSITE.
- 3.5** CONTRACTOR shall prepare tools and equipment for back loading and complete a detailed manifest. Where COMPANY provided transportation is used, should CONTRACTOR fail to properly prepare equipment for shipment and cause delay, equipment shall be charged at

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zero rates until such time as equipment has been back loaded on COMPANY provided transportation.

- 3.6 For air or marine personnel transportation, unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, crew charges begin when crew reaches COMPANY's embarkation point for transport to WORKSITE and ends when crew arrives back at COMPANY's disembarkation point. There shall be no duplicate crew charges on crew change days.
- 3.7 Unless otherwise specified, equipment operating charges shall apply when equipment is on the WORKSITE, fully functional and operational in accordance with Section 3, Scope of Work, and being used in performance of the WORK. The Standby Rate will apply if the equipment is not mobilized to the WORKSITE from COMPANY embarkation point within 23 hours. The Standby Rate will apply if the WORK does not begin within 12 hours of equipment arriving at the WORKSITE. Where backup equipment is required per COMPANY WORK ORDER, charges will begin for this equipment on arrival at COMPANY's WORKSITE. Equipment charges will cease when COMPANY notifies CONTRACTOR that equipment has been returned to COMPANY's initial embarkation point.
- 3.8 All equipment rates per day refer to a day of twenty-four hours. For parts of a day, all such day rates shall be prorated to the nearest hour. Monthly rates refer to a calendar month. Parts of a month shall be prorated to the nearest day.
- 3.9 Unless otherwise specified herein, in the event of equipment failure, when equipment was used within CONTRACTOR's specifications and control, the charges will cease immediately. Charges will recommence when equipment is replaced or is deemed to have started working to the satisfaction of COMPANY. This non-payment shall also apply to other equipment CONTRACTOR may have in the same tool string and / or other related equipment and personnel at the WORKSITE unless COMPANY continues to drill or circulate and the other equipment continues to function. COMPANY shall not pay land transportation charges and fees for replacement equipment due to CONTRACTOR failures deemed as operated within CONTRACTOR specifications. If CONTRACTOR utilizes COMPANY provided land transportation, then CONTRACTOR shall reimburse COMPANY for all charges. No payment will be made for any item of equipment which fails within twenty-four (24) hours of commencement of operational use.
- 3.10 In the event CONTRACTOR upgrades the technical specification or specifications of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be employed by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.
- 3.11 In the event CONTRACTOR is unable to provide any part of the WORK for which CONTRACTOR has agreed to provide and there exists agreed rates and / or charges in the CONTRACT and has to source such WORK from a Third Party, CONTRACTOR shall invoice COMPANY for such part of the WORK at the rates or charges contained herein or the Third Party cost with no mark-up, whichever is the lesser.

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3.12 NEW TECHNOLOGY – COMPANY is procuring services and associated equipment and materials, which COMPANY expects to improve incrementally over the duration of the CONTRACT. However, it is recognized that acquisitions and development of new technology during the term of the CONTRACT may result in the development of products and services not included in the CONTRACT. In such a situation, CONTRACTOR and COMPANY shall:

3.12.1 Discuss and agree upon any such inclusion which shall be considered on a case-by-case basis. Prior to acceptance of new technology, COMPANY requires business case justification by CONTRACTOR which shall consist of but is not limited to the following documentation to be provided by CONTRACTOR:

- (a) description of technological benefits and risks
- (b) delineation of commercial benefits accruing to COMPANY (including, where applicable, incremental NPV, savings in drilling unit time, increased production, or other measurable value generation)
- (c) new technology delivery plan

3.12.2 not seek adjustments to rates for:

- (a) revision of tool specifications
- (b) improved processes

All adjustments shall be made in accordance with COMPANY's internal procedure for addition of materials, equipment, or personnel charges to the Schedule of Rates and Charges. These discussions and agreements shall be held in advance of performing such services for COMPANY. When CONTRACTOR does not seek and obtain necessary approvals for inclusion of new or additional services, payments shall not be made by COMPANY to CONTRACTOR, nor shall COMPANY be responsible in any manner should the equipment be lost or damaged.

3.12.3 Agree that CONTRACTOR shall charge COMPANY at the commercial rates of the previous generation of technology in the event of failure to deliver all of the benefits specified in the new technology business case.

3.13 Unless otherwise specified in Section 4, Appendix 3 and/or Appendix 4, should CONTRACTOR's tool(s) and equipment become stuck in the hole, the operating rates shall automatically terminate and standby rates commence unless the incident is caused by CONTRACTOR negligence or if due to COMPANY failure or other CONTRACTORS failure(s) to follow COMPANY established procedures and practices. If due to CONTRACTOR negligence, the operating rate will terminate and a zero rate will be applicable. The appropriate rates shall remain in effect until the tools are retrieved and released to CONTRACTOR or when officially declared lost. Aggregate standby payment shall not exceed the Lost-in-Hole value for said tool(s) and equipment. The tools are officially declared lost when the decision is made to no longer attempt to recover the tools.

3.14 CONTRACTOR unit prices shall be all inclusive of consumption of that material. No additional charges for packing (i.e., pallets, plastic wrap, drums, buckets, etc.) will be accepted above the unit cost of the product so long as the packaging requirements remain consistent with current COMPANY requirements.

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- 3.15 Unless otherwise stated herein in Section 4, Appendix 3 and/or Appendix 4, there shall be no additional charges for backup tools or equipment necessary to perform the WORK without interruption.

4.0 THIRD PARTY SERVICES / MATERIALS

- 4.1 Where Third Party services or materials are required by COMPANY under this CONTRACT and CONTRACTOR provides these services or materials, CONTRACTOR shall be reimbursed at net documented cost. These services or materials may be direct-billed by Third Party to COMPANY. No invoice processing or similar charge shall be payable by COMPANY to CONTRACTOR.
- 4.2 COMPANY reserves the right to take advantage of commercial pricing from COMPANY contracts with Third Party material providers in lieu of CONTRACTOR providing said materials.
- 4.3 Unless otherwise provided in this CONTRACT, in the event that COMPANY's provision of third party materials results in a major scope of work change for CONTRACTOR then the Parties will mutually agree on any commercial revisions necessary.

5.0 PAYMENT AND INVOICING PROVISIONS

Payment and Invoicing procedures are as per Appendix 1, hereto.

6.0 LOST-IN-HOLE CHARGES

Lost-in-Hole Charges are as per Appendix 2, hereto.

7.0 SUB-SECTOR TERMS AND CONDITIONS / SCHEDULE OF RATES AND CHARGES

- 7.1 Sub-Sector Terms and Conditions are found as Appendix 3 attached hereto.
- 7.2 Schedule of Rates and Charges are found as Appendix 4 attached hereto.

Appendix 1 – Special Local Invoicing Procedures

1.0 SCHEDULE OF RATES AND CHARGES

- 1.1 In the first ten (10) calendar days of each month or upon completion of job, CONTRACTOR shall submit to COMPANY an invoice for WORK performed in respect of services given and/or materials supplied (if any) for which payment is due.
- 1.2 CONTRACTOR shall not be entitled to payment where it submits an invoice beyond ninety (90) calendar days from the completion of a WORK ORDER, or submits incomplete documentation with an invoice and does not rectify and resubmit the required documentation within ninety (90) calendar days from being instructed to do so.
- 1.3 CONTRACTOR's invoices shall be sequentially numbered and shall be substantiated by the following:
 - 1.3.1 Reference to the approved WORK ORDER and CONTRACT
 - 1.3.2 Approved daily job tickets detailing the status of each piece of equipment (employed, standby, not available / under repair); materials consumed by type; and number of personnel by position
 - 1.3.3 Approved monthly summary / reconciliation of consumable materials – the Materials Inventory Balance (applicable solely to equipment and materials owned by COMPANY and held at CONTRACTOR's premises)
 - 1.3.4 Reference to COMPANY Schedule(s) of Rates and Charges item number for each invoice line item, if mutually agreed by COMPANY and CONTRACTOR. That is, CONTRACTOR will continue to work with COMPANY to define, develop, and implement a mutually beneficial automated procurement process.
 - 1.3.5 Pay Key Number, if applicable

In event of disagreement, IADC drilling records and other applicable documents shall be reviewed to reach mutual agreement.

1.4 Invoices shall be submitted as stated below:

BP Exploration and Production, Inc.
ATTN: Scanning Department S-646
PO Box 22024
Tulsa, Oklahoma 74121-2024
Pay Key Number or PO Number Per WORK ORDER

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Appendix 1 – Special Local Invoicing Procedures

2.0 Payments by COMPANY

- 2.1 If approved by COMPANY, COMPANY shall pay correct invoices within thirty (30) days after receipt at address specified in Clause 1.4 above.
- 2.2 Invoice disputes shall be handled in accordance with Section 2 – General Conditions of Contract, Clause 14.7.
- 2.3 The bank account to which COMPANY shall make payment under the CONTRACT shall be as follows

Beneficiary Name = Halliburton Energy Services, Inc.
Account Number = 00032969
SWIFT Code = CITIUS33
Bank Routing Number = 021000089

Appendix 2 – Lost-in-Hole Charges

1. INITIAL REPLACEMENT COST BASIS

Equipment and tool replacement costs (LIHC) for equipment which may be lost or damaged beyond economical repair shall be submitted by CONTRACTOR for reimbursement as described in the following categories:

- 1.1 Actual replacement costs for equipment and, if required major subcomponents, at source, i.e. Specific manufacturing / assembly point. For the avoidance of doubt, replacement cost is defined as provable cash replacement cost with no profit. Provable cash replacement cost shall be substantiated by original invoices or detailed cost accounting records,
- 1.2 Replacement cost for each source (if they differ) only if equipment is manufactured at multiple sites,
- 1.3 Actual documented CONTRACTOR's shipping charges from source to CONTRACTOR's base,
- 1.4 Actual documented duties and associated taxes payable from the source to CONTRACTOR's base from the closest equipment source to CONTRACTOR's base,
- 1.5 Actual documented costs anticipated for the re-use of salvaged equipment such as splicing a wireline cable or coiled tubing.
- 1.6 For the avoidance of doubt, item 1.1 and 1.2 above are directly applicable to equipment associated with Open and Cased hole logging services. The CONTRACT and, where appropriate, Section 4 – Remuneration, Appendix 4, Schedule of Rates and Charges will govern the LHC for other services.

2. NOTIFICATION OF LOST OR DAMAGED EQUIPMENT

If a tool is damaged beyond repair, lost, or lost in the hole, it will be documented on CONTRACTOR job history and or field ticket approved by COMPANY representative. Such documentation shall accompany any claim by CONTRACTOR. In the event that CONTRACTOR is providing equipment only and there is not a CONTRACTOR representative at the WORKSITE when incident occurred, CONTRACTOR documentation requirements will be mutually agreed between COMPANY and CONTRACTOR.

CONTRACTOR shall document to COMPANY in writing within thirty (30) days or longer if mutually agreed a detailed incident report which includes well name, tools and/ or component part involved, reference dates, when and where the loss and/or damaged occurred and any other information as may be reasonably required by COMPANY

3. INSPECTION REQUIREMENTS FOR DAMAGED TOOLS

In the event that a tool or component part thereof is damaged or damaged beyond economical repair, CONTRACTOR upon request shall provide COMPANY with a damage inspection report conducted by a mutually agreed third party or with CONTRACTOR's detailed report in the case of CONTRACTOR proprietary tools. COMPANY reserves the right to carry out an independent verification by a mutually agreed third party. The foregoing third party report shall be prepared at COMPANY expense except in those cases where the report concludes that the damage in question is attributable to defects in the tool or normal wear and tear. The scope of the work to be charged to CONTRACTOR shall be limited to those activities directly associated with determination of root cause or root causes of failure of CONTRACTOR equipment. COMPANY representative shall signify on the said report, or otherwise in writing his agreement that the equipment is damaged or damaged beyond economical repair. Such report or COMPANY written agreement shall accompany any claim by CONTRACTOR. COMPANY shall not unreasonably refuse or delay CONTRACTOR'S request.

COMPANY may elect to waive third party inspection report requirement if:

- 3.1 third party inspection report charges will be excessive in comparison to loss or damage or,
- 3.2 COMPANY may advise CONTRACTOR that when damage or loss is known to be attributable to conditions outside of CONTRACTOR's control and COMPANY does not require further investigation or documentation.

4. RE-IMBURSEMENT FOR LOST OR DAMAGED BEYOND REPAIR EQUIPMENT

For tools lost or damaged beyond repair, COMPANY shall be liable to reimburse CONTRACTOR:

- 4.1 Actual replacement costs for equipment and major subcomponents at source, i.e. Specific manufacturing / assembly point from closest manufacturing / assembly point. For the avoidance of doubt, replacement cost is defined as provable cash replacement cost with no profit. Provable cash replacement cost shall be substantiated by original invoices or detailed cost accounting records
- 4.2 Actual documented CONTRACTOR's shipping charges from source to CONTRACTOR's base, not to exceed charges detailed in LIHC tables.
- 4.3 Actual duties and associated taxes payable from the source to CONTRACTOR's base from the closest equipment source to CONTRACTOR's base, not to exceed charges detailed in LIHC tables.
- 4.4 Actual costs for the re-use of salvaged equipment such as splicing a wireline cable or coiled tubing.
- 4.5 For the avoidance of doubt, item 4.1 above is directly applicable to equipment associated with Open and Cased hole logging services. The CONTRACT and, where appropriate, Section 4 – Remuneration, Appendix 4, Schedule of Rates and Charges, will govern the LHC for other services.

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In the event that a reference date cannot be documented, the replacement cost will be at the value calculated from the minimum residual value percentage times the replacement cost.

5. RESIDUAL / SALVAGE VALUE

When any equipment is damaged beyond economical repair, replacement cost will also be reduced by any salvage value realized. In the event of loss in hole or damage beyond repair for electric logging cable, slickline wire, and coiled tubing, the replacement footage shall be calculated from the unit's available footage at commencement of WORK minus any footage removed for maintenance during the WORK minus any footage available on the unit after loss. Replacement cost will then be calculated as replacement footage divided by new spool footage times new spool cost plus the cost of splicing the salvaged footage to enable its re-use. If remaining footage on the unit cannot be utilized in other work, COMPANY and CONTRACTOR will mutually agree that the remaining footage will be calculated as zero in replacement footage calculation.

6. WELL TEST EQUIPMENT

Notwithstanding the provisions of Section 2, Clause 19.1(a), in the event that the WORK involves well test services and CONTRACTOR can demonstrate that CONTRACTOR GROUP's surface well test equipment has incurred abnormal damage (meaning damage which could not be reasonably expected) which has resulted directly from corrosion, erosion or abrasion caused by the nature of the well effluent, CONTRACTOR shall be reimbursed for the costs of repair of such damage except to the extent that such damage is caused by the negligence or breach of duty (statutory or otherwise) of CONTRACTOR GROUP and except to the extent of fair wear and tear.

7. EQUIPMENT REPAIRS

When repair is possible, COMPANY shall reimburse CONTRACTOR either the foregoing documented repair or replacement costs, whichever is less. If requested by COMPANY, CONTRACTOR will provide supporting detailed QA/QC documentation confirming re-build or if applicable, third party refurbishment company documentation. If requested by COMPANY, CONTRACTOR will provide refurbishment / repair cost documentation segregated into labor (rate and hours) and parts and said documentation will be treated confidential by COMPANY, in accordance with Section 2, Clause 22.

8. DEPRECIATION CALCUALTIONS

The following "straight line" depreciation schedule and associated definitions shall apply to CONTRACTOR's equipment which has been damaged beyond economical repair or lost in hole as per the following categories:

Category	Description	Reference Clause	Reference Date	Depreciation Rate / month	Maximum Reduction	Minimum Residual Value
1	Dumb Iron	10 a)	Initial Purchase Date	1.50%	40.0%	60.0%
2	Tubulars	10 b)	Initial Purchase Date	1.50%	30.0%	70.0%

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Category	Description	Reference Clause	Reference Date	Depreciation Rate / month	Maximum Reduction	Minimum Residual Value
3	Mechanical / Hydraulic Tools	10 c)	Initial Purchase Date	1.25%	40.0%	60.0%
4	BOP Equipment	10 d)	Initial Purchase Date (100%) or last refurbished with 3 rd Party Certification (80%)	1.25%	40.0%	60.0%
5	Surface Test Equipment	10 e)	Initial Purchase Date	1.50%	40.0%	60.0%
6	Wireline logging tools	10 f)	Initial Purchase Date	0%	0.0%	100.0%
7	Directional Drilling Tools	10 (f)	Initial Purchase Date or last Level 3 repair	1.50%	30%	70%
8	Hi tech / intelligent tools	10 g)	Initial Purchase Date or last Level 3 repair	1.50%	30%	70%

9. EQUIPMENT RELATED DEFINITIONS

Downhole equipment used in the well shall be classified in categories for the purpose of depreciation calculations. Where:

- 9.1 “Dumb iron” is defined as equipment with no or very few moving parts excluding parts which are historically replaced for wear and tear. Dumb iron shall include, but shall not necessarily be limited to equipment baskets, shipping containers, hand tools, power tools, tanks, retrievable bridge plugs, coring equipment, stabbing guides, junk baskets, chiksans, co-flexip hoses, slickline tools excluding flow control equipment, fishing tools, magnets, bails, elevators, slips, spiders, false rotaries, manual tongs, lift nubbins, clamps, casing scrapers, casing rollers, casing thread protectors, subs, nipples, crossovers, drifts, stabilizers, spools, single and double studded adapters, side door entry subs, hole openers, underreamer bodies, etc.
- 9.2 “Tubulars” is defined as drill pipe, spiral / heavy-weight drillpipe (HWDP), drill collars, spiral drill collars, pony collars, monel drill collars, kellys, washpipe, and tubing.
- 9.3 “Mechanical tools” are defined as equipment with some moving parts, mechanical, hydraulic, etc, which are typically refurbished after runs in the hole. Mechanical / hydraulic tools shall include, but shall not be necessarily limited to, hydraulic tongs, hydraulic units, engines, running tools, test packers, perforation wash tools, filtration units, slip joints, drilling jars, fishing jars, test jars, bumper subs, shock subs, slickline flow control equipment including associated running / pulling tools, pumps, shakers, centrifuges, surface high pressure gauges / sensors, etc. Refurbishment for “mechanical tools” puts them in operational condition, but does not under any circumstance re-set reference date.

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- 9.4 "BOP Equipment" (BOPE) is defined as ram preventers, annular preventers, rotating BOPE, high pressure (10,000 psi or greater) adjustable drilling chokes, drilling choke manifolds and associated valves.
- 9.5 "Surface test equipment" is defined as separators, testing manifolds and associated valves, surface test trees, flare booms, H2S scrubbers and other well test specific equipment.
- 9.6 "Standard logging / directional and other tools" are defined as equipment which are used in base logging packages and standard directional programs and mutually agreed with COMPANY. Standard logging / directional packages shall include, but shall not be necessarily limited to, computer systems, sonic, resistivity, and conductivity sondes, percussion core guns, cement bond log tools, cased hole logging tools, downhole electronic pressure gauges, mills, PDM motors, turbines, thrusters, and subsea test trees. Any other equipment classified as "Standard logging / directional and other tools" shall be mutually agreed during LIHC negotiations.
- 9.7 "Hi tech / intelligent tools" are defined as instrumented downhole equipment which typically undergoes thorough shop analysis and refurbishment after each run and shall be mutually agreed with COMPANY. Hi Tech / Intelligent tools shall include MWD, LWD, wireline rotary core tools, formation testing tools, specialty logging tools, 3D seismic tools, advanced imaging tools, rotary steerable systems, and intelligent downhole testing tools. Any other equipment classified as "Hi tech / intelligent tool" shall be mutually agreed during LIHC negotiations.
- 9.8 "Reference Date" shall mean the date depreciation commences. Where applicable, for a reference date to be rolled forward from original purchase to a refurbishment, CONTRACTOR if requested will provide detailed specific tool refurbishment and QA/QC documentation and will ensure documentation is retained for audit in event of lost equipment. If documentation is not available as stated or is deemed inadequate by COMPANY, original purchase date or date of manufacture will be deemed the effective Reference Date. Specifically for BOP equipment, the BOP Reference Date will be the initial new equipment purchase date from original equipment manufacturer (OEM) where 100% of original purchase price will be used for calculations. In the event that BOP is refurbished and re-certified by a reputable third party, the Reference Date will be moved forward to re-certification date, but value calculations will start at 80% of replacement cost.
- 9.9 "Initial Service / Purchase" is defined as the date of manufacture by CONTRACTOR or the date of initial purchase of equipment. It is recognized that some equipment may have been previously owned, so Reference Date goes back to origin.
- 9.10 "Refurbishment" shall be defined as the activity where CONTRACTOR tools have undergone a complete overhaul at the component level. This refurbishment will have materially extended the available service life of the tool. Normal maintenance on dumb iron or mechanical tools which is required to put the equipment in operating condition does not constitute refurbishment.
- 9.11 "Rental bits LIH price" will be the replacement price subject to initial condition and specific wear and tear reductions as specifically set forth in the WORK ORDER.

Appendix 3 – Sub-Sector Terms and Conditions

A. Cementing Services

1.0 GENERAL

- 1.1 Unless specifically stated otherwise, the rates included herein are fully inclusive and shall constitute full and complete compensation to CONTRACTOR in executing any WORK ORDER or CHANGE ORDER.
- 1.2 CONTRACTOR agrees to suspend rental and operating charges for all rental equipment and personnel following a CONTRACTOR tool failure that disrupts operation for more than thirty minutes.
- 1.3 In the event that through the fault of CONTRACTOR, CONTRACTOR has insufficient personnel and/or equipment to commence, or complete any operation, a zero rate shall apply for equipment and personnel for the period of delay.

2.0 FIXED RATE

- 2.1 Subject to Clause 3.0 below and Clause 3.0, Section 4 – General Terms and Conditions, the rates and charges specified in Appendix 4 to Section 4 shall remain firm and fixed for twelve (12) months from the EFFECTIVE DATE of the CONTRACT.
- 2.2 Subject to Clause 3.0 below and Clause 3.0, Section 4 – General Terms and Conditions, should COMPANY exercise its option to extend the CONTRACT beyond the initial three (3) year term, the PARTIES shall mutually agree rates and charges for the duration of the Extension Period.

3.0 VARIABLE RATE

- 3.1 The initial Bulk Cement prices shall be fixed for a period of one (1) year from the EFFECTIVE DATE, and shall be reviewed sixty (60) days prior to the end of the one year period (Review Date). Prices will be determined by the incremental increase or decrease in relation to the ratio of the Cementing PPI Index given by the United States Bureau of Labor Statistics for the average of the three (3) months preceding the Review Date. This average of the three (3) preceding months is referred to as the "PPI Index New." The NEW PRICE to be paid for Bulk Cement for the next year is the INITIAL PRICE multiplied by the ratio of the PPI Index New to the PPI Index in effect as of the date of CONTRACT execution, referred to as "PPI Index Initial." The new pricing shall become effective on the anniversary of the EFFECTIVE DATE. Bulk Cement prices will be reviewed and adjusted according to the following formula:

$$\text{NEW PRICE} = \text{INITIAL PRICE} \times (\text{PPI Index New} / \text{PPI Index Initial})$$

- 3.2 With each subsequent year, the same review and recalculation of the Bulk Cement prices shall be performed sixty (60) days prior to the EFFECTIVE DATE anniversary.

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4.0 CONSUMABLES

4.1 Terms and Conditions related to Consumables

- 4.1.1 COMPANY reserves the right to purchase all consumable items under a Call-Off Purchase Order.
- 4.1.2 Unit Prices – COMPANY shall reimburse CONTRACTOR for the unit prices listed in Schedule of Rates and Charges– Consumables." The prices contained herein are inclusive of packaging, installation, and required back-up costs. Prices shall include transportation to the nearest service base for the particular region for which the price is being provided.
 - (a) Offshore – All unit prices should be FOB COMPANY's designated supply base.
- 4.1.3 Third Party Consumables – CONTRACTORs that desire to use a Third Party to provide consumables should advise COMPANY and identify their consumables supplier.
- 4.1.4 Consignment Basis – All consumable items, including but not limited to cement retainers, bridge plugs, and associated equipment, shall be provided on a consignment basis. No equipment shall be consigned to COMPANY for longer than 45 days from date of arrival at WORKSITE. For equipment that is invoiced due to exceeding the 45 days and is subsequently returned to CONTRACTOR, no restocking or similar charges shall apply if goods are received in a condition that COMPANY is prepared to use on a future well. COMPANY shall be invoiced for items consumed within the operation.

5.0 CEMENT ADDITIVES

5.1 Terms and Conditions related to "Sub-Sector Terms and Conditions– Cement Additives"

- 5.1.1 COMPANY reserves the right to purchase all Cement Additives under a Call-Off Purchase Order.
- 5.1.2 Unit Prices – COMPANY shall reimburse CONTRACTOR for the unit prices listed in the "Sub-Sector Terms and Conditions– Cement Additives". The prices contained herein are inclusive of packaging. Unit price should include the following transportation:
 - (a) Offshore – All unit prices should be FOB COMPANY's designated supply base.
- 5.1.3 Disposal of Waste – Where a product has been dry blended into a bulk product and the excess blend deemed to be unusable, disposal will be charged at documented costs and chemicals invoiced as if they had been used on the well.
- 5.1.4 Pricing for Non-Standard Blends – Materials may be duplicated in the bulk schedules; however, this is to enable preparation of special blends not covered within the bulk schedules. Non-standard blends will be agreed and approved by COMPANY.
- 5.1.5 Restocking – Where products are supplied to the rig, in liquid or solid form, and the sacks or drums are unopened, the product will be restocked with no associated

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restocking charge. Opened and partially used sacks / drums will be invoiced as if material used during execution of the job.

- 5.1.6 Bulk Liquid Additives – Where the product has been supplied in bulk via tote tank and more than 10% of the tote tank volume remains it shall be QA/QC tested and restocked or held for supply for another COMPANY operation.
- 5.1.7 Consignment Basis – All additives shall be provided on a consignment basis. No additives shall be consigned to COMPANY for longer than 45 days from date of arrival at WORKSITE. For additives that are invoiced due to exceeding the 45 days and are subsequently returned to CONTRACTOR, no re-stocking or similar charges shall apply if goods are received in a condition that COMPANY is prepared to use on a future well. COMPANY shall be invoiced for items consumed within the operation.

6.0 BULKS

6.1 Terms and Conditions related to Bulks

- 6.1.1 Unit Prices – COMPANY shall reimburse CONTRACTOR for the unit prices listed in "Schedule of Rates and Charges – Bulks". The prices contained herein are inclusive of packaging. Pricing is to be based on the unit prescribed, sacks (94 lb sacks) or short tons (2000 lb) as detailed in each line item. For bulks provided in sacks the prices are to be inclusive of palletization, shrink wrapping, and banding. Unit price should include the following transportation:

(a) Offshore – All unit prices should be FOB COMPANY's designated supply base.

- 6.1.2 Cement Specifications – Cement types are not required to carry the API Monogram; however, evidence of compliance with the relevant technical specifications must be available to COMPANY on request. Where cement has been supplied as complying with an ASTM specification, evidence of compliance will be made available to COMPANY on request.
- 6.1.3 Bulk Supplier – For each bulk item, CONTRACTOR will only change source with prior approval of COMPANY.
- 6.1.4 Restocking – All unused sacked material in reusable condition shall be returned to CONTRACTOR. No associated restocking charge shall be applied. Opened and partially used sacks / drums will be invoiced as if material was completely used during execution of the job.

7.0 RENTALS

7.1 Terms and Conditions related to "Schedule of Rates and Charges– Rentals"

- 7.1.1 Pricing Requirements – COMPANY shall reimburse CONTRACTOR for the unit rates listed in the "Schedule of Rates and Charges – Rentals," as per Scope for Work including all necessary pipe work / hoses / gauges / safety equipment for primary and remedial cementing.

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- 7.1.2 Cement Heads – Surface cement heads will include any manifolds and pipe work required to operate the system.
- 7.1.3 Sub-Sea Cement Plugs – There will be no charge for rental of plug containers for preloading of sub-sea cementing plugs.
- 7.1.4 Squeeze Packers – Where a squeeze packer is supplied, the rate (daily, for 6 hour minimum rental, or hourly) will include packer with circulating subs, storm valves, safety joints and surface control valves and recommended spare parts. Proposed rate shall be all inclusive and no additional charges are to be made.
- 7.1.5 Offshore Cementing – CONTRACTOR shall propose a single operating day rate for a complete system that includes one cementing supervisor and all necessary treating iron and valves, plug containers, etc. This rate shall apply regardless of whether the unit is pumping CONTRACTOR cement products or Third Party cement products. Day rate will include all pumping services, including but not limited to, cementing, BOP testing, miscellaneous pumping, circulation of well, any pressure, any rate, any depth, and any temperature.
- (a) New Installations – For new installations CONTRACTOR will review the technical requirements in Section 3 – Scope of Work and the relevant WORK ORDER, prepare a proposal, and obtain approval from COMPANY.
- (b) Pride PS-2 Cementing Unit – CONTRACTOR, at no cost or liability to COMPANY will ensure that the cementing unit for the new build Pride PS-2 ("Unit") will be delivered to Geoje Island, Korea - Samsung Heavy Industries Shipyard ("Shipyard"), on or before August 12, 2009 ("Delivery Date"). COMPANY shall provide CONTRACTOR with all reasonable assistance with respect to the initial mobilization and installation of the Unit onboard the rig including provision of reasonable assistance at the Shipyard. Such assistance shall include access to craneage, labor, power, water, air, certified lifting facilities, etc. to aid in the installation of the unit. The operating day rate as specified in Section 4, Appendix 4, Schedule of Rates and Charges, is for a complete system including the cementing supervisor.
- This operating day rate shall commence once the rig has been mobilized to the Gulf of Mexico and accepted by COMPANY, the Cementing Supervisor is aboard, and the unit is in all respects ready to commence operations. This unit must be manned with a qualified cement operator available on a 24-hour basis. This unit must include all necessary treating iron and valves, plug containers, etc. This per day basis must be all inclusive of all pumping services of any kind (cementing, BOP testing, miscellaneous pumping, circulation of well, any pressure, any rate, any depth, and any temperature). The cementing unit and iron must have a minimum, but not limited to 15K psi rating. Once operations commence, CONTRACTOR per day price will be acceptable only during times when CONTRACTOR personnel man the cement unit on the rig. Paid time for unit will commence when cement operator reaches COMPANY's dock and will cease when cement operator returns to COMPANY's dock.
- (c) Mobile Equipment – Mobile equipment rates shall be based on daily rental from point of receipt at COMPANY nominated supply base until it is returned to the same point.
- (d) Day Rate – For purposes of rental rates a day rate shall comprise a consecutive 24 hour period unless specified otherwise in the CONTRACT.

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8.0 PERSONNEL

8.1 Terms and Conditions related to "Schedule of Rates and Charges – Personnel"

- 8.1.1 Personnel charges are as specified in "Schedule of Rates and Charges – Personnel"
- 8.1.2 Onshore Personnel
 - (a) Personnel onshore hourly rates start when the person departs from the nominated service center/overnight accommodation until they return to the same point or arrive at the overnight accommodation.
 - (b) Onshore day rates will consist of any twelve hours within a 24 hour day.
- 8.1.3 Offshore Personnel – Offshore personnel day rate applies to personnel on location for a consecutive 24 hour period.

9.0 LOCATION INFORMATION

- 9.1 All unit prices and rates shall be FOB Fouchon, LA. CONTRACTOR must include transportation to Fouchon for all prices and rates.

B. Fluids Services

1.0 GENERAL

- 1.1 CONTRACTOR's job tickets approved by COMPANY shall be used to define all events and timing for the definition and application of the appropriate rates associated with this CONTRACT. In event of disagreement, IADC drilling records, where available, and other applicable documents will be reviewed to reach mutual agreement.
- 1.2 COMPANY will reimburse CONTRACTOR for:
- Chemicals, fluids and equipment used in the performance of the WORK
 - The following personnel: lead mud engineer, mud engineer, PFM compliance engineer, completion engineer, solids control equipment supervisor and operator if required by COMPANY
 - Project Engineers at COMPANY office, if required.
- 1.3 In addition to Section 4, Clause 1.1 (not Clause 1.1 of this Appendix) and for the purpose of clarification, CONTRACTOR's rates for reimbursement of the above chemicals, equipment and personnel are deemed to be inclusive of the provision of the following:
- Project Coordinator
 - Maintenance and repair personnel for CONTRACTOR's equipment
 - Costs incurred with respect to testing of equipment, warehousing and transportation of chemicals.
 - Electronic and hard copies of reports as detailed in Section 3
 - Regulatory approval for importation of chemicals and equipment as required.
 - Personnel training as required in Section 3
- 1.4 As regards charges associated with Section 3 (Scope of Work) Appendix 5, Clause 8.6, all cost and charges of any kind shall be for CONTRACTOR's account.

2.0 CHARGE RATES

- 2.1 Further to Section 4, Clause 3.12.1, any introduction of new technology shall include a specific definition of the "success criteria" to be agreed by COMPANY and CONTRACTOR before the implementation of new technology.
- 2.2 The standby charge for equipment called out shall commence and apply from when the equipment is delivered to COMPANY's supply base or WORKSITE, until the time of its arrival back at COMPANY's supply base or WORKSITE (or other mutually agreed location) except when the equipment operating charge shall apply.
- 2.3 Equipment operating charges shall apply when equipment is on the WORKSITE, is fully functional, and is being used in performance of the WORK.

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Equipment and personnel standby charges shall be 50% of the operating rate as specified in the Schedule of Rates and Charges.

- 2.4 The prices are to be inclusive of palletization, shrink wrapping, and banding. Any unused chemicals may be returned to CONTRACTOR without any handling, re-stocking, or similar charges if the chemicals are returned in a saleable condition.

3.0 ADDITIONAL REQUIREMENTS

- 3.1 Bulk Barite and bulk Bentonite transferred to COMPANY's provided transportation is to be through certified calibrated tanks. The transfer tank should be set on weight scales with a print out. The print out signed by COMPANY Representative will form the basis of invoicing.
- 3.2 CONTRACTOR shall have all tanks to / from which volumes are pumped from / to COMPANY's supply vessels, calibrated, and certified as such with charts available at CONTRACTOR's WORKSITE.
- 3.3 Where CONTRACTOR supplies synthetic, diesel, or mineral low toxicity base oil to COMPANY, CONTRACTOR will be expected to take back for credit any synthetic, diesel, or low toxicity mineral base oil back-loaded from the rig or supply vessel provided that it was supplied by CONTRACTOR.
- 3.4 Reconditioning of the mud at the WORKSITE is recommended where all products and materials are available and COMPANY will be billed for such quantities to acquire the mud specification.
- 3.5 The initial Diesel Base Oil and Diesel Base Mud prices shall be fixed for the first quarter from the EFFECTIVE DATE, and shall be reviewed every quarter thereafter. Said review shall commence thirty (30) days prior to the end of the then current quarter period (Review Date). Prices will be determined by the incremental increase or decrease in relation to the ranges of the West Texas Intermediate Crude Price Index (WTICPI) for the average of three (3) months preceding the Review Date. This average of three (3) preceding months of the WTICPI rate is then applied to the Table for Diesel Base Oil and Diesel Based Mud found in the Schedule of Rates and Charges. The price of Diesel Base Oil and Diesel Base Mud on the EFFECTIVE DATE of the CONTRACT shall be established based upon the closing WTICPI on the EFFECTIVE DATE of the CONTRACT.
- 3.6 The initial Low Toxicity Mineral Oil and Low Toxicity Mineral Base Mud prices shall be fixed for the first quarter from the EFFECTIVE DATE, and shall be reviewed every quarter thereafter. Said review shall commence thirty (30) days prior to the end of the then current quarter period (Review Date). Prices will be determined by the incremental increase or decrease in relation to the ranges of the West Texas Intermediate Crude Price Index (WTICPI) for the average of three (3) months preceding the Review Date. This average of three (3) preceding months of the WTICPI rate is then applied to the Table for Diesel Base Oil and Diesel Based Mud found in the Schedule of Rates and Charges. The price of Low Toxicity Mineral Oil and Low Toxicity Mineral Base Mud on the EFFECTIVE DATE of the CONTRACT shall be established based upon the closing WTICPI on the EFFECTIVE DATE of the CONTRACT.

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- 3.7 The initial Synthetic Base Oil and Synthetic Base Mud prices shall be fixed for the first six (6) months from the EFFECTIVE DATE, and shall be reviewed every six (6) months thereafter. Said review shall commence thirty (30) days prior to the end of the then current period (Review Date). Prices will be determined by the incremental increase or decrease in relation to the ranges of the West Texas Intermediate Crude Price Index (WTICPI) for the average of six (6) months preceding the Review Date. This average of six (6) preceding months of the WTICPI rate is then applied to the Table for Diesel Base Oil and Diesel Based Mud found in the Schedule of Rates and Charges. The price of Synthetic Base Oil and Synthetic Base Mud on the EFFECTIVE DATE of the CONTRACT shall be established based upon the closing WTICPI on the EFFECTIVE DATE of the CONTRACT.
- 3.8 The initial Bulk Barite 4.2 specific gravity prices, in cost per sack, and cost per ton, shall be fixed for a period of one (1) year from the EFFECTIVE DATE, and shall be reviewed thirty (30) days prior to the end of the one (1) year period (Review Date). Prices will be determined by the incremental increase or decrease in relation to the ranges of the West Texas Intermediate Crude Price Index (WTICPI) for the average of twelve (12) months preceding the Review Date. This average of twelve (12) preceding months of the WTICPI rate is then applied to the Table for Diesel Base Oil and Diesel Based Mud found in the Schedule of Rates and Charges. The price of Bulk Barite on the EFFECTIVE DATE of the CONTRACT shall be established based upon the closing WTICPI on the EFFECTIVE DATE of the CONTRACT.
- 3.9 Bromides shall be provided on a unit rate basis that shall be all inclusive, including, but not limited to, all management, administrative, direct and indirect manufacturing services, quality control and assurance services, transportation, labor costs, taxes, government regulations, and all consumables.

Bromide prices shall be fixed for a period of six months from the EFFECTIVE DATE, and shall be reviewed 30 days prior to the end of the six (6) month period. Prices will be determined by the incremental increase or decrease of the elements found in the Schedule of Rates and Charges. The price of Bromides on the EFFECTIVE DATE of the CONTRACT shall be those prices provided in the Schedule of Rates and Charges for said Bromides. CONTRACTOR shall provide the percentage relationship of all elements contributing to the cost structure of bromides.

4.0 REGIONAL SPECIFIC REQUIREMENTS

4.1 Gulf of Mexico Specific Remuneration Requirements

4.1.1 Drilling Fluids

- (a) Reconditioning of returned synthetic invert emulsion mud may be required at CONTRACTOR's shore base. Where such reconditioning is carried out, it will only be completed after agreement by COMPANY. There will be no charge made for the reconditioning process including centrifugation and personnel requirements. The chemical cost shall be in accordance with the Schedule of Rates and Charges. Waste produced from the reconditioning will be disposed of by CONTRACTOR in accordance with all applicable regulations and good practice at no cost to COMPANY.

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B. Fluids Services

- (b) Where synthetic oil based mud is contaminated by well-bore hydrocarbons the maximum percentage contamination level will be one percent (1.0%) for Gulf of Mexico by volume.
- (c) Contaminated fluid shall be credited as low toxicity mineral oil based mud. Contaminated fluid is determined by both COMPANY and CONTRACTOR as being fluid which cannot be reconditioned.
- (d) Synthetic Based Mud ("SBM") supplied to COMPANY shall be invoiced as follows:
 - (i) SBM supplied to COMPANY at one price for all mud weights ranging from 8.0 to 17.0 ppg, with ranges of the Synthetic Water Ratios (SWR) from 70:30 to 90:10.
 - (ii) Invoices shall be prepared by interval, unless otherwise agreed in writing by the PARTIES.

(e) **Mud Loss Calculations – End of Well**

CONTRACTOR shall charge for total end of well down hole mud losses as a result of lost circulation. End of well down-hole mud loss calculations are performance based which include potential for bonus payments being made to CONTRACTOR for superior performance in minimizing down-hole mud losses.

There is to be no bonus nor reduction in invoice should CONTRACTOR execute operations within the normal or expected range of mud losses.

In the event there are losses which exceed normal or expected levels, there shall be a discount applied to the charges for the fluids lost in excess of the normal range.

The following tables set forth the mechanism for the calculation of the charges to be paid CONTRACTOR in relation to mud losses for the first year of the CONTRACT and which shall be subject to reevaluation of the loss ranges and bonus / reduction on the anniversary of the CONTRACT.

SIDE TRACK WELL

Losses	≤ 500 bbl	501 – 1,000 bbl	1,001 – 3,000 bbl	≥ 3,001 BBL
Bonus or Reduction	\$20,000 Bonus	No bonus no reduction	10% reduction	15% reduction

DEVELOPMENT WELL

Losses	≤ 1,000 BBL	1,001 - 2,000 BBL	2,001- 4,000 BBL	≥ 4,001 BBL
Bonus or Reduction	\$30,000 Bonus	No bonus no reduction	10% reduction	15% reduction

EXPLORATION WELL

Losses	≤ 3,000	3,001 - 5,000 BBL	5,001 - 7,000 BBL	≥ 7,001 BBL
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	BBL			
Bonus or Reduction	\$50,000 Bonus	No bonus no reduction	10% reduction	15% reduction

Using a Development Well as an example, the following cases would apply with the following assumptions:

Assume: Cost of SBM = \$100/bbl Cost of base oil = \$1/gal

Case 1: 800 bbls lost down hole to the formation. A bonus of \$30,000 will be paid at the end of the well.

Case 2: 1,500 bbls lost down hole to the formation, no bonus, no reduction at the end of the well.

Case 3: 4,000 bbls lost down hole to the formation, a reduction in the invoice will be applied at the end of the well for \$20,000.

$(2,000 \text{ bbls} \times -0.10 \times 100) = -\$20,000$

Case 4: 6,000 bbls lost down hole to the formation, a reduction in the invoice will be applied at the end of the well for \$50,000.

$(2,000 \text{ bbls} \times -0.10 \times 100) + (2,000 \text{ bbls} \times -0.15 \times 100) = -\$50,000$

- (f) All handling, mixing, rental, and consignment fees are included in the price.
- (g) Drilling fluid returned to CONTRACTOR's base will be reconditioned back to the equivalent synthetic water ratio (SWR) specification. The only charge for this reconditioning will be the cost of the synthetic base fluid required to achieve the original volume. If drilling fluid returned contains more base oil than the original composition an equivalent credit will be issued by CONTRACTOR.

Example:

Assume Cost of SBM = \$100/bbl Cost of base oil = \$1.00/gal

1000 bbl of SBM @ 10.6 ppg and 70/30 SWR was sent to rig. At the end of a given interval, 500 bbl @ 15.6 ppg and 75/25 SWR was returned to CONTRACTOR'S base

Cost of Mud Consumed: $500 \text{ bbl} \times \$100/\text{bbl} = \$50,000$

Cost to Recondition Mud:

500 bbls of original mud @ 10.6 ppg with 70/30 SWR contains 293 bbls base oil. 500 bbls of returned mud @ 15.6 ppg and 75/25 SWR contains 246 bbls base oil, therefore,

$293 - 246 = 47 \text{ bbl}$ base oil is required to recondition back to the original formulation, therefore,

Reconditioning Charge:

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47 bbl base oil x 42 gal/bbl x \$1.00/gal = \$ 1,974

TOTAL COST for interval = \$50,000 + \$1974 = \$51,974

- (h) Liquid Water Based Mud ("WBM") mixed in CONTRACTOR's plant shall be priced as the cost of the products used in the mix to meet COMPANY specifications plus a mixing charge of \$5.00/bbl.
- (i) COMPANY reserves the right to audit the laboratory analysis and retort measurements. After COMPANY approves audit results, COMPANY will sign off on the supporting documentation. If drilling fluid is returned as per Clause 4.2.1(g) herein above, any associated charge for reconditioning shall be attached to a job ticket for payment.

4.1.2 Completion Fluids

- (a) Unused base fluids that are transported in approved above deck tanks can be returned and no restocking charge will be assessed. Fluids included in this provision are: un-weighted hydrate inhibited systems, Calcium Chloride, Calcium Chloride/Calcium Bromide, and Zinc Bromide.
- (b) CONTRACTOR will credit back from COMPANY, the net volume of fluid returned after any applicable reclamation procedures at the density of reclaimed fluid. There is a flat \$5.00 per barrel reclamation charge for heavy brines and un-weighted hydrate inhibitor systems which includes products, cartridges, D.E. material, etc.

4.1.3 Waste Management

CONTRACTOR will provide the daily operation cost as well as monthly operational cost for all the equipment required to comply with the oil on cuttings requirements for the area.

C. Well Placement

1.0 GENERAL

- 1.1 Rates and charges contained herein shall be deemed to include but not be limited to the following:
 - 1.1.1 All of CONTRACTOR's overhead costs including corporate, departmental and yard overheads, finance charges on capital employed, office rents, rates, taxes, all royalties, licenses, fees, insurances, all travel, all power and lighting, telephone, facsimile, telex, office equipment and supplies, postage, courier services, reprographics, computer usage and associated consumables, maintenance and cleaning and all other overhead costs not specifically identified elsewhere;
 - 1.1.2 The provision of all equipment required for the WORK;
 - 1.1.3 The provision of all direct, indirect, productive and non-productive labor, supervision and management;
 - 1.1.4 The procurement, expediting, purchase and documentation of all material necessary for the WORK other than COMPANY provided items;
 - 1.1.5 All costs associated with taking delivery of COMPANY provided items;
 - 1.1.6 Provision of all necessary support services and facilities for COMPANY representative and CONTRACTOR representatives;
 - 1.1.7 The requirements of any Regulatory Body relevant to the WORK;
 - 1.1.8 CONTRACTOR's profit.
- 1.2 CONTRACTOR's post-job tickets approved by COMPANY shall be used to establish all events and timings for the definition and application of the appropriate rates associated with this CONTRACT. In event of disagreement, IADC drilling records, where available, and other applicable documents will be reviewed to reach mutual agreement.
- 1.3 The total amount payable for the WORK against the Schedule of Rates and Charges constitutes the CONTRACT PRICE. No claim or submission for additional monies will be accepted by COMPANY for failure to price an item identifiable from the Scope of Work or other CONTRACT documents but not specifically identified herein, or for any item which proves to be required for the safe and proper performance of the WORK.
- 1.4 Where any item is not included in the Schedule of Rates and Charges, then the cost of providing or complying with such item shall be deemed to have been included within the rates and charges entered elsewhere herein.
- 1.5 During the term of the CONTRACT new rates may be required for unforeseen items. Rates for these unforeseen items, and even for rate amendments, shall be determined and agreed on the same basis as existing rates, i.e., on a fully transparent basis. Any and all amendments to the prices, terms or conditions contained in the CONTRACT or for any additional services requested shall only made with the prior formal approval of COMPANY REPRESENTATIVE as set out in Section 2. Any amendments or additions to prices shall not be valid unless such approval has been obtained and duly executed.

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- 1.6 COMPANY may, at its sole discretion, elect to separately source Data Transmission Services, Mud Logging and Surveying Services, at any time. Irrespective of COMPANY's decision in this matter, none of the rights and obligations, rates and charges of the agreement arising under the terms of the CONTRACT shall be affected.

2.0 MOBILIZATION AND DEMOBILIZATION

- 2.1 For the avoidance of doubt, this Clause 2 of Appendix 3 to Section 4 Remuneration replaces Clause 2 of Section 4 in its entirety.

- 2.2 CONTRACTOR shall be responsible for the mobilization and demobilization of its personnel, equipment, and material to, from, and within the WORKSITE or COMPANY designated heliport or supply base and will be to CONTRACTOR's account. The points of mobilization and demobilization for the Gulf of Mexico Strategic Performance Unit, hereinafter referred to as SPU, is Fourchon, LA or Galveston, TX.

- 2.3 The following are exceptions to Clause 2.2:

- (a) CONTRACTOR shall be responsible for obtaining all the necessary visas, customs clearances, or other government authorizations required for moving its personnel and equipment into and out of the country having jurisdiction over the operating area. COMPANY will nonetheless give assistance to CONTRACTOR, if so requested, to the extent reasonably necessary with regard to the obtaining of visas, travel permits, import assistance, or other governmental authorizations required for moving its personnel and equipment into and out of the country having jurisdiction over the operating area.
- (b) If applicable, in the event the equipment or personnel are demobilized to a location closer than the originally intended Point of Demobilization in order to perform work for another company or for reasons of CONTRACTOR's own convenience, any demobilization fee will be reduced in an amount commensurate with the resulting reduction in CONTRACTOR's demobilization costs.
- (c) COMPANY shall not pay transportation charges and fees for replacement equipment due to those CONTRACTOR failures deemed as operated within CONTRACTOR specifications as documented in the Schedule of Rates and Charges or CONTRACTOR's published specifications, whichever is superior. If CONTRACTOR utilizes COMPANY provided transportation dedicated to the mobilization of the replacement equipment, then CONTRACTOR shall reimburse COMPANY for all charges and fees.
- (d) COMPANY shall provide air transportation for medical evacuation of CONTRACTOR's personnel from COMPANY's WORKSITES. The cost of air transportation shall be borne by the parties in accordance with Section 2 - General Conditions of Contract, Clause 31.9.

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- (e) Where changes to Scope of Work or agreed delivery schedule by COMPANY are sufficient to require CONTRACTOR to execute additional mobilizations for a job, the cost for these additional mobilizations will be to COMPANY account.

3.0 PROVISION OF EQUIPMENT – APPLICATION OF RATES: GENERAL

3.1 General

- 3.1.1 Rates and charges herein for WORK shall be deemed to be fully inclusive of, but not limited to, End of Well Datasets, all usual pre and post run inspections, tool set-up and preparation, accessories, spare parts, consumables, batteries, service tools, all thread types, thread protectors (even if not returned or damaged), ring gauges, cargo baskets and associated slings, rig up/down, environmental compliance, DOT charges, maintenance and repair charges, redresses, saver subs, crossover to string connectors, rotor catchers, rebuilds, testing, transportation (except as provided for in Clause 2 of this Appendix 3), sleeve breakers, and backup tools and equipment, but shall exclude the provision of personnel where separately identified herein. CONTRACTOR shall also be responsible for costs for Naturally Occurring Radioactive Material (NORM) Testing and testing for Hot Spots on Non-magnetic drill collars.
- 3.1.2 CONTRACTOR equipment specifications as documented in the Sub-Sector Terms and Conditions take precedence over CONTRACTOR's published specifications unless published specifications are superior.
- 3.1.3 Appendix 6, Technical and Functional Specification to Section 3, Scope of Work defines the minimum requirements for each level of service identified in the Schedule of Rates and Charges.
- 3.1.4 The base Rates for Rotary Steerable Services exclude MWD.
- 3.1.5 The Rates for the transmission of high resolution (memory quality) data through wired pipe is included in the Operating Rate of the associated down-hole equipment. No additional Rates for data transmission shall apply unless the wired pipe communication fails and the backup MWD telemetry provides real time down-hole data transmission.
- 3.1.6 If CONTRACTOR has only one class of 3-D Rotary Steerable Systems, then the service shall be placed in the 'Standard RSS' category in the Schedule of Rates and Charges.
- 3.1.7 Add-on charges as specified in the Schedule of Rates and Charges are incremental to the base data or equipment charges for such category.
- 3.1.8 A "Bottom Hole Assembly" or "BHA" is defined as the string of tools and associated down-hole equipment necessary to perform the specified work scope.
- 3.1.9 A "Service Package" is defined as a specific collection/bundle of services, tools, equipment, and products/data sets as identified in the Schedule of Rates and Charges. Service Package rates may or may not be the sum of individual line item rates identified in the Schedule of Rates and Charges. It is at COMPANY's discretion to use either the Service Package rate or individual item rates.

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- 3.1.10 "Normal Drilling Operations" is defined as when the drill bit is back at the same True Vertical Depth or Measured Depth, whichever is the deepest, and the BHA is making forward progress.
- 3.1.11 CONTRACTOR shall provide guidance to COMPANY to ensure the most efficient use of BHAs and Service Packages.
- 3.1.12 If COMPANY chooses to utilize a Service Package and requires incremental services above the base Service Package Rate, the appropriate line item rate for the additional service applies.
- 3.1.13 CONTRACTOR is responsible for ensuring that all equipment and services required for the WORK is delivered by land or sea freight to meet the agreed schedule. In the event that CONTRACTOR requires to air freight any equipment in order to meet the agreed schedule, such additional air freight costs shall be to CONTRACTOR's account.
- 3.1.14 No footage, pumping/circulating, shock, special depth, high temperature equipment, high pressure equipment, high flow rate, LCM content or concentration, inclination, water depth, sand content, barite, hematite, ilmenite, batteries, special elastomers, rotors, retrieval devices, stators, re-line, corrosive fluids, memory, telemetry rate, or other service surcharges of any kind shall apply unless specifically quoted in the Schedule of Rates and Charges.
- 3.1.15 High Pressure equipment Operating Rates apply when COMPANY requests CONTRACTOR to provide its High Pressure equipment service regardless of operating conditions. If Standard Flow equipment is utilized in high pressure operating conditions, outside of specifications, then Clauses 3.3 and 3.4 apply. The High Pressure Operating Rate does not apply to Standard Equipment.
- 3.1.16 High Temperature equipment Operating Rates apply when COMPANY requests CONTRACTOR to provide its High Temperature equipment service regardless of operating conditions. If Standard Flow equipment is utilized in high temperature operating conditions, outside of specifications, then Clauses 3.3 and 3.4 apply. The High Temperature Operating Rate does not apply to Standard Equipment.
- 3.1.17 High Pressure-High Temperature hereinafter referred to as HPHT, equipment Operating Rates apply when COMPANY requests CONTRACTOR to provide its HPHT equipment service regardless of operating conditions. If Standard Flow equipment is utilized in HPHT operating conditions, outside of specifications, then Clauses 3.3 and 3.4 apply. The HPHT Operating Rate does not apply to Standard Equipment.
- 3.1.18 No minimum job or cancellation charges or rates of any kind shall apply for personnel, equipment, or services.
- 3.1.19 COMPANY reserves the right to provide its own or third party tools and equipment and make them part of CONTRACTOR's BHA. No surcharges whatsoever are applicable.
- 3.1.20 All the rates contained herein are inclusive of all transmission systems and/or transmission protocols, and pulsing frequency. No additional charges shall apply for these items or services apply unless specifically quoted in the Schedule of Rates and Charges.

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- 3.1.21 All real time processing and interpretation services including multi axis directional corrections, all borehole corrected measurements, all caliper corrections, compressional and shear processing are included with the Rates. No additional charges shall apply for correcting or processing directional survey, gamma ray, resistivity, neutron porosity, bulk density, Pe, sonic or any other MWD/LWD data unless specifically quoted in the Schedule of Rates and Charges.
- 3.1.22 In the event where a CONTRACTOR's Representative is not present on COMPANY's WORKSITE and the equipment is returned in a used condition CONTRACTOR can request a review of COMPANY's drilling reports covering the rental period of the equipment to qualify how the equipment has been run.
- 3.1.23 COMPANY shall request and pay rates for services that meet the specific functional requirement as defined in the Basis of Design or WORK ORDER, and shall not pay for additional or optional tool functionality provided by CONTRACTOR's equipment, which have not been specifically requested or subsequently used by COMPANY. For example, if CONTRACTOR provides a rotary steerable tool which has directional control, gamma, resistivity, and vibration measurement capabilities, where only the rotary steerable directional control services are requested, the gamma, resistivity and vibration shall not be charged for by CONTRACTOR. In the event of Lost-in-Hole or Damaged Beyond Repair, COMPANY's liability shall only be for the functionality requested for the run. If CONTRACTOR's tools have multi-functional capability it is incumbent upon CONTRACTOR to advise COMPANY of said capabilities and to optimize the use of tools to meet the minimum service requirement.
- 3.1.24 **For the avoidance of doubt, this Clause replaces Clause 3.11 in Section 4 Remuneration.** In the event that CONTRACTOR is unable to provide any part of the WORK for which CONTRACTOR has agreed to provide and for which there are agreed rates and/or charges contained herein CONTRACTOR is requested to source such part of the WORK from a third party, and have that selection approved in writing by COMPANY prior to use. In this case CONTRACTOR shall source equipment and services preferentially from companies that COMPANY has contracts with, and CONTRACTOR shall invoice COMPANY for such part of the WORK either as per Clause 4.0 of Section 4 or per the Schedule of Rates and Charges, whichever is the lesser. COMPANY shall also have the option to hire such third party equipment or services directly if it so wishes.
- 3.1.25 If COMPANY requests specific equipment or specialty tools outside the specified Scope of Work, CONTRACTOR shall endeavor to provide said equipment. Such services that are not identified within the Sub-Sector Terms and Conditions but which CONTRACTOR may wish or is requested to supply for performance of the WORK shall be provided under the same terms and conditions as contained within the CONTRACT. A duly executed WORK ORDER or CONTRACT amendment per Clause 1.5 of this Appendix 3 applies in such an instance.
- 3.1.26 Surveying Services – Application of Rates
- (a) Application of Rates shall be per Clause 3.2, 3.3, and 3.4.
 - (b) The rates charged for these services shall include the costs for providing all equipment to run surveying instruments and equipment in any hole size should this service be required unless specifically quoted in the Schedule of Rates and Charges. Provision of labor will be per Clause 4 of this Appendix 3.

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- (c) IN runs and OUT runs may both be required depending on the service. However, the footage charges, where applicable, shall apply in only one direction for the interval being surveyed.
- (d) The rates specified shall only be payable for the provision of a successful well-bore survey. A well-bore survey shall be considered successful when it complies with the acceptable QA/QC, validation and delivery requirements established in JORPS and COMPANY's Directional Survey Handbook Document Number: BPA-D-004.
- (e) The prices for electronic multi-shot surveys, e.g., EMS/ESS or gyro surveys, are with instruments run in tandem and include all surface equipment needed for the operation and processing excluding the respective monel drill collars in which the survey is to be taken unless specifically quoted in the Schedule of Rates and Charges.

3.2 Treatment of Standby Rates, Operating Rates, and Backup Tools

- 3.2.1 For marine operations, with prior COMPANY agreement to delivery schedule, the Standby Rates for equipment called out shall commence from when the equipment is delivered and accepted at COMPANY's point of mobilization/demobilization until the time of its arrival back at COMPANY's point of mobilization/demobilization (or other mutually agreed location), except when the equipment Operating Rate or Zero Rate applies. Standby Rates shall only apply when equipment is fully functional and certified in accordance with Section 3, Scope of Work.
- 3.2.2 For land operations, with prior COMPANY agreement to delivery schedule, the Standby Rates for equipment called out shall commence and apply from when the equipment is delivered and accepted at COMPANY's WORKSITE until the time of its departure except when the equipment Operating Rate or Zero Rate applies. Standby Rates shall only apply when equipment is fully functional and certified in accordance with Section 3 Scope of Work.
- 3.2.3 **For the avoidance of doubt, this Clause replaces Clause 3.7 in Section 4 Remuneration.** Equipment Operating Rates shall apply when equipment is on the WORKSITE, is fully functional and certified in accordance with Section 3 Scope of Work and is below the rotary table in performance of the WORK, except for when Standby Rate and Zero Rate applies.
- 3.2.4 **For the avoidance of doubt, this Clause replaces Clause 3.15 in Section 4 Remuneration.** All backup tools and equipment requested by COMPANY shall be compensated for separately from the Operating Rate.
- 3.2.5 CONTRACTOR shall be responsible for and shall ensure that adequate fully functional equipment to successfully execute the WORK shall be available at the WORKSITE. Generally COMPANY shall not specify the exact quantity or types of equipment to be used by way of equipment lists. In the event that COMPANY directs CONTRACTOR to provide more equipment than CONTRACTOR believes is required to successfully execute the WORK then CONTRACTOR shall advise COMPANY in writing prior to shipment of such equipment to the WORKSITE, specifying the additional equipment requested and requesting payment for such equipment, which, if agreed by COMPANY, shall be in accordance with CONTRACTOR's prices as incorporated within the Schedule of Rates and Charges. In the event that payment for such additional equipment is not requested and agreed in advance by COMPANY, then no additional equipment charge shall be applicable.

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- 3.2.6 All backup equipment provided by CONTRACTOR shall be a fully functional backup. A "fully functional backup" means that the backup tools must be fully operable and capable of performing the same tasks as the primary equipment. COMPANY reserves the right to select backup equipment with different technical and functional specifications.
- 3.2.7 If CONTRACTOR is unable to provide backup equipment of identical or superior technical and functional specifications, then only 50% of the Standby Rate of the backup equipment provided shall apply. If CONTRACTOR is able to provide backup equipment of superior technical and functional specifications, then only the Standby Rate of the primary equipment shall apply.
- 3.2.8 In the event that requested equipment is not available as scheduled, COMPANY shall be notified in a timely manner and prior to equipment leaving CONTRACTOR's base, so that alternative provisions can be made.
- 3.2.9 For marine operations, in the event that individual tools from a Service Package remain at the WORKSITE at COMPANY's request, but the other items constituting that Service Package are demobilized, then COMPANY shall compensate CONTRACTOR the full Service Package Standby Rate for the demobilized equipment until the time of its arrival at COMPANY's point of demobilization. After which, those items from the Service Package remaining at the WORKSITE shall be reimbursed as individual components in accordance with the Schedule of Rates and Charges.
- 3.2.10 This Clause intentionally left blank.
- 3.2.11 It is possible that several Service Packages or equipment may be run within the same hole section. The Operating Rate applicable shall be for the Service Package run in the hole. If the equipment run has reduced functionality than the Service Package available at the WORKSITE, then the individual equipment Operating and Standby Rates shall apply, unless this equipment cannot be run due to malfunction and/or failure, in which case a Zero Rate shall apply to the unused portion of the Service Package per Clause 3.3 and 3.4 of this Appendix 3.

3.3 Service Non-Compliance

- 3.3.1 **For the avoidance of doubt, Clause 3.3 of this Appendix 3 to Section 4 Remuneration replaces Clause 3.9 of Section 4 in its entirety.**
- 3.3.2 CONTRACTOR shall suspend all rates and charges for all items below the rotary table, backup equipment, and surface equipment utilized in the operation following a CONTRACTOR equipment failure as per the conditions and circumstances as described in this Clause 3.3.
- 3.3.3 In the event of equipment failure, provided the equipment is used within CONTRACTOR's specifications or COMPANY was not given adequate notification that the equipment was being operated outside of specification, the following applies.
- (a) If the failure necessitates a trip, all Operating Rates and Standby Rates for backup equipment will cease immediately and go to Zero Rate. A Zero Rate will apply until either the equipment is replaced or the equipment is deemed to have started working to the satisfaction of COMPANY while still in the hole and

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Normal Drilling Operations have resumed, less time for rig repairs or other time as decided by COMPANY.

- (b) Should COMPANY wish to conduct rig repairs or other items causing delay in tripping back into the hole, following a trip for failure attributable to CONTRACTOR, COMPANY shall pay the Standby Rate for the remaining fully functional components for the time of the delay.
 - (c) If COMPANY decides to drill ahead or circulate, then COMPANY shall pay CONTRACTOR for that part of the BHA or Service Package that is fully functional, i.e., Zero Rate shall be applicable for the components that have failed. The Operating Rate shall be reduced by the amount listed in Sub-Sector Terms and Conditions for the failed component(s).
 - (d) In the case of a real time failure of an MWD/LWD sensor, where the memory data is subsequently recovered at surface, payment shall be made for fit for purpose memory data, which is of comparable/superior quality to the real time data.
- 3.3.4 CONTRACTOR shall thoroughly investigate the service non-compliance and follow up as per Appendix 2, Lost-in-Hole Charges.
- 3.3.5 CONTRACTOR shall be responsible for charges associated with relogging due to missing or poor quality data from any tool malfunction unless failure was due to causes outside CONTRACTOR control. Charges for re-logging shall be limited to the full acquisition cost specified in CONTRACTOR's applicable Schedule of Rates and Charges for obtaining solely the information from the failed sensor for the interval of data missed or for the interval of poor quality data. Re-logging operations will be on either electric line or LWD and will be to CONTRACTOR's account. Where re-logging operations are conducted by Third Party electric line, tool pusher services shall not be for CONTRACTOR's account. Determination of the concession and all matters with regard to service non-compliance will be at the sole and final judgment of COMPANY.
- 3.3.6 No charge, including Standby, shall be assessed for any item of equipment which fails surface functional tests and/or shallow hole tests or within twenty-four (24) hours of commencement of operations below the rotary table.
- 3.3.7 In the event of a sidetrack directly caused by the tool failure, the Zero Rate will apply until such time as Normal Drilling Operations has resumed. Inadvertent sidetracks due to poor subsurface conditions and not due to CONTRACTOR's negligence or CONTRACTOR tool failure will be excluded from this clause. Provided any of the aforementioned conditions exist then, charges may resume upon commencement of initiating drilling of the planned sidetrack.
- 3.3.8 CONTRACTOR is responsible for monitoring down-hole conditions to ensure equipment is not operated outside of CONTRACTOR's specifications. If CONTRACTOR determines that equipment is operating outside of specifications, CONTRACTOR must notify COMPANY and take corrective action immediately, in concert with other Third Party Contractors. If CONTRACTOR equipment is damaged and it is determined that the equipment was operated outside of CONTRACTOR specifications, then COMPANY will reimburse CONTRACTOR for repair and maintenance charges provided that COMPANY:
- (a) Was given adequate notification;

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- (b) Was given a minimum of thirty (30) minutes from the time of notification to resolve the situation;
 - (c) Chooses to proceed against CONTRACTOR recommendations. Otherwise, CONTRACTOR will assume responsibility for all repair and maintenance charges that occur due to drilling at parameters acceptable to the on-site CONTRACTOR personnel.
 - 3.3.9 In cases where CONTRACTOR claims the failure was caused by operating the equipment out of specification and Clause 3.3.8 of this Appendix 3 was complied with, then CONTRACTOR will comply with Appendix 2 Lost-in-Hole Charges.
 - 3.3.10 Failures which occur at the end of long runs will not be subject to concession by CONTRACTOR unless COMPANY determines failure was preventable. Determination of the non-concession and all matters with regard to service non-compliance will be at the sole and final judgment of COMPANY.
 - 3.3.11 In the event that primary equipment fails or malfunctions for any reason and there is no backup at the WORKSITE, CONTRACTOR shall advise COMPANY when a replacement can be ready for shipment to the WORKSITE. If CONTRACTOR can not provide the replacement equipment within twenty-four (24) hours at the WORKSITE and failed equipment are due to IADC failure then, Clause 2.6 of this Appendix 3 shall apply.
 - 3.3.12 CONTRACTOR shall produce End of Well Datasets per Section 3, Scope of Work and shall be provided to COMPANY within thirty (30) days of completion of WORK. In the event that CONTRACTOR does not provide the required Datasets within thirty (30) days, COMPANY reserves the right to withhold payment on all payables owed to CONTRACTOR until the Datasets are provided.
- 3.4 Interruption of Service
- 3.4.1 **For the avoidance of doubt, Clause 3.4 of this Appendix 3 to Section 4 Remuneration replaces Clause 3.13 of Section 4 in its entirety.**
 - 3.4.2 In the event of a stuck BHA or Service Package, the Operating Rates shall terminate after one hour. After this time, the Standby Rate applies unless the incident is caused by CONTRACTOR negligence. If the event is due to CONTRACTOR negligence, the Operating Rate will terminate and a Zero Rate will be applicable until such time as the BHA is freed or is declared abandoned in the hole and cementing or free point occurs, whichever is later. CONTRACTOR Operating Rate will only resume when the new BHA is made up and is below the rotary table and the assembly returns to Normal Drilling Operations.
 - 3.4.3 Maximum Lost-in-Hole/damage beyond repair costs and lost equipment protection fees shall be per Schedules of Rates and Charges. If COMPANY retrieves CONTRACTOR equipment and it is damaged beyond repair and it was determined that the service interruption was not due to CONTRACTOR's fault or negligence, then COMPANY will reimburse CONTRACTOR as per Appendix 2 Clause 3 of Section 4 Remuneration, which shall not exceed the Lost-in-Hole costs in Schedule of Rates and Charges.

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- 3.4.4 Lost equipment protection charges are only payable when the Operating Rate applies. If COMPANY chooses to purchase lost equipment protection, then the documented Lost-in-Hole costs or net tax book value will be reduced by 50%, whichever is the least cost to COMPANY. Lost equipment protection is applicable in the case of lost equipment down-hole and for equipment damaged beyond repair, unless COMPANY decides to continue drilling operations when outside of equipment specifications.
- 3.4.5 If it is found that the minimum inspection criteria and technical standards have not been met by CONTRACTOR or that CONTRACTOR's own Procedures and Standards have not been met, then no Lost-in-Hole/damage beyond repair costs shall be paid for any BHA component.
- 3.4.6 In the event of severe inclement weather or other delays due to nature and Normal Drilling Operations have ceased for longer than twenty-four (24) hours, then all CONTRACTOR Standby Rates will be reduced to fifty per cent (50%) of the Standby Rate until the BHA or Service Package has commenced operations below the rotary table. Personnel Rates shall be unaffected.
- 3.4.7 In the event that CONTRACTOR has insufficient personnel and equipment to commence or complete any operation, CONTRACTOR shall be reimbursed at Zero Rate for equipment and personnel for the period of delay whilst the rig is waiting. The Zero Rate shall apply to each day when any part of that day has been lost due to such delay. CONTRACTOR shall be solely responsible for ensuring that sufficient equipment including backup is available at the WORKSITE and personnel at CONTRACTOR's onshore base in order to cover for such equipment malfunction or illness.

4.0 PROVISION OF PERSONNEL – APPLICATION OF RATES

- 4.1 The Schedule of Rates and Charges for WORK shall be deemed to be fully inclusive of but not limited to all accommodation, subsistence, transportation, benefits, taxes, personnel protective equipment including fire retardant clothing, employee compensation, unless otherwise provided for herein. COMPANY will provide accommodations and subsistence for individuals staying at the WORKSITE.
- 4.2 For marine operations, with prior COMPANY agreement to arrival schedule, the Operating Rate for personnel shall commence from when they arrive at COMPANY's point of mobilization/demobilization until the time of their arrival back at COMPANY's point of mobilization/demobilization (or other mutually agreed location).
- 4.3 This Clause intentionally left blank.
- 4.4 In the event of redundant classes of personnel on location simultaneously then, COMPANY shall only pay for primary personnel.
- 4.5 Personnel Standby Rates shall apply per day or part thereof for each calendar day when CONTRACTOR's personnel are attending COMPANY directed onshore training sessions, which are in addition to normal industry working practice and the general requirements that are covered in the CONTRACT. For the avoidance of doubt, this excludes attendance at training courses such as, Well Control/Pressure Control and Offshore Survival. It would include attendance at COMPANY Away-Days and Stuck Pipe Courses, Incident and Injury Free, Technical Limit, Drill the Well on Paper, Improve the Plan and Plan the Well in a Day

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workshops. With prior COMPANY approval in writing, transportation costs and per diem shall only be reimbursed up to the limit of USD 150 at the time of service per overnight stay.

- 4.6 No additional payment shall be made for personnel held onshore or in between wells unless COMPANY's specific written instructions to place personnel on standby pending utilization at the WORKSITE. Such payment shall be at the personnel Standby Rates.
- 4.7 Personnel crew rotation schedule shall be determined by each SPU.
- 4.8 It is COMPANY's intention to pay Personnel Rates for all time when required crew members are at the WORKSITE regardless of equipment performance or drilling rig activity. COMPANY reserves the right to withhold payment for responsible personnel if it deems CONTRACTOR's performance and or service non-compliance was directly caused by individuals at the WORKSITE. Determination of the non-concession and all matters with regard to service non-compliance will be at the sole and final judgment of COMPANY.
- 4.9 Personnel charges shall be supported by CONTRACTOR's timesheets or other recording system agreed with COMPANY detailing the hours worked in providing support to COMPANY. No dual time writing for any one individual working on multiple projects is acceptable. Timesheets shall be submitted for approval at the end of each calendar month.

5.0 SUPPORT SERVICES – DIRECTIONAL DRILLING ENGINEERING, WELL PLANNING, OPERATIONS SUPPORT, COORDINATION AND SURVEY MANAGEMENT SERVICES

- 5.1 Charges for these services are deemed to be included in the Personnel Rates for engineers and shall include the complete package of Directional Drilling Engineering, Well Planning and Survey Data Management Services necessary to provide the full scope of directional drilling service as specified in Section 3, Scope of Work. These charges also include all costs associated with the provision of:
 - 5.1.1 Software required during well operations and critical well support;
 - 5.1.2 Plots and consumables required for the support of COMPANY's Directional Drilling operations.
- 5.2 CONTRACTOR shall optimize engineering activities and promote the efficient use of personnel performing the services.
- 5.3 Ad hoc Engineering Studies may be requested by COMPANY during the performance of the WORK. These studies shall include but not be limited to Drillstring Dynamics and Vibration Studies, Failure Modes and Effects Analysis Studies and Well Design Feasibility Studies. Charges for performing these studies shall be based upon a prescribed Scope of Work and CONTRACTOR's Deliverables and Completion Date. The Scope Of Work, Deliverables, Rates, and Completion Date shall be defined, agreed and approved by COMPANY in a duly executed WORK ORDER prior to the commencement of any WORK by CONTRACTOR.

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1.0 GENERAL

- 1.1 Unless specifically stated otherwise, the rates included herein are fully inclusive and shall constitute full and complete compensation to CONTRACTOR in executing any WORK ORDER or CHANGE ORDER.
- 1.2 CONTRACTOR agrees to suspend all charges, and goes on Zero Unit Rates for all equipment and personnel following a CONTRACTOR tool failure that disrupts operation until operations return to pre-failure operations or job cancellation.
- 1.3 "Operating Time" is the total time between wireline rig-up and rig-down after successfully completing the WORK on a single trip to the WORKSITE, excluding, but not limited to:
 - wiper trips
 - rig repairs
 - non-productive operating time not attributable to CONTRACTOR
 - pre and post job tool calibrations and checks, and
 - any other normal preparation and cleanup as required.
- 1.4 No Standby Unit Rates will apply to equipment. The exception being:
 - 1.4.1 Equipment standby onshore where time exceeds one (1) day greater than Operating time. This one day shall be referred to as the Onshore Equipment Free Time Allowance.
 - 1.4.2 Equipment standby offshore where time exceeds four (4) days greater than Operating time. These four days shall be referred to as the Offshore Equipment Free Time Allowance.
- 1.5 In the event that through the fault of CONTRACTOR, CONTRACTOR has insufficient personnel and/or equipment to commence, or complete any operation, a zero rate shall apply for equipment and personnel for the period of delay.
- 1.6 The rates and charges specified in Section 4, Appendix 4 shall remain firm and fixed as specified in Section 4, General Terms and Conditions, Part D.
- 1.7 Should COMPANY exercise its option to extend the CONTRACT beyond the initial three (3) year term, the PARTIES shall mutually agree rates and charges for the duration of the Extension Period.
- 1.8 COMPANY may elect to pay a monthly minimum guaranteed rate per spread of surface equipment and associated toolbox services for their exclusive use. All tools, services, consumables and expendables, standby etc. contribute to the monthly minimum rate with no exclusions. SPUs will gross up the monthly spend, and use the total against the monthly

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minimum charges for a mixture of callout, ad-hoc and exclusive wireline services from the same CONTRACTOR. All Wireline operations will be charged in accordance with the appropriate COMPANY Schedule of Rates and Charges. CONTRACTOR shall provide and maintain a pool of toolbox equipment and services required to complete the WORK in accordance with the CONTRACT.

- 1.9 The Base Service Charge Unit Rate may be applied once only for each job or WORK within an agreed Scope of Work and covers any interruptions that include, but which are not limited to:

- Well-bore conditioning trips
- Waiting on weather
- Rig repairs
- Other interruptions to the WORK

The Base Service Charge Unit Rate is applicable in the event of additional rig-up and services following hole deepening.

- 1.10 Surface equipment spread shall contain all CONTRACTOR's surface equipment required to perform the WORK, including but not limited to the following equipment as required, Logging unit, Cables, Doghouse, Generators, Tool and transport racks, lifting equipment, adaptors, storage racks, containers and magazines for dangerous goods, backup surface equipment etc. All CONTRACTOR rates and charges associated with the surface equipment spread shall be included in the down-hole tool and service Unit Rates for Open Hole, Cased Hole and Perforating services.

- 1.11 CONTRACTOR shall provide and ensure all basic equipment design, manufacturing, operations, maintenance, inspection and testing is appropriate, conforms to BP DWOP, API, ISO, ASME, NACE and other industry best practices and is documented for the lifecycle of the equipment. In particular CONTRACTOR shall provide the necessary and appropriate cable, cable heads, rope sockets, weak points, release devices and swivels which are used for logging and perforating applications, subjected to high shock, vibration and load variations, environmental attack from including, but not limited to mud systems and well bore fluids, and wide temperature variations.

- 1.12 CONTRACTOR shall provide and maintain a toolbox of all equipment, tools and services (including but not limited to spares, backups and consumables) necessary to perform the WORK in a safe and efficient manner for the duration of the CONTRACT. The quantity and type of tools, equipment, and services available in the toolbox will vary by SPU WORK program requirements. Toolbox equipment, tools, and services (including but not limited to spares, back-ups and consumables) shall be available to COMPANY for both standard call-out service and exclusive service options, with an appropriate quantity (by tool / service type). A back-up is deemed to be one additional identical tool beyond the primary downhole tool.

- 1.13 Cancelled Operations: Should COMPANY request CONTRACTOR to provide services covered within the Scope of Work, then cancel said request after CONTRACTOR has prepared for the Job, having already mobilized the crew and required equipment and tools to COMPANY's designated well site, CONTRACTOR shall be compensated, subject to COMPANY's review and approval, at ten percent (10%) of the Operating Unit Rate that would have applied to the Job per the Schedule of Rates and Charges. The Base Service Charge

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Unit Rate is not applicable to Cancelled Operations. No compensation is applicable if the WORK is cancelled, or delayed prior to the Crew, tools and equipment arriving at COMPANY's WORKSITE. No compensation is applicable if the cancelled operations are due in whole or in part to CONTRACTOR.

- 1.14 Incomplete Operations (Multiple Logging Attempts): Should CONTRACTOR, regardless of fault (EXCEPT IN THE EVENT THAT COMPANY FAILS TO FOLLOW EITHER INDUSTRY OR BP STANDARD PRACTICES), fail to meet COMPANY logging or perforating objectives as required by the WORK, then subject to COMPANY's review and approval, CONTRACTOR shall be fully compensated at twenty-five percent (25%) of the Operating Unit Rate for the specific service being run in addition to the Base Service Charge Unit Rate. Examples include, but are not limited to well-bore logging and perforating WORK which cannot be completed due to environmental factors beyond the control of CONTRACTOR such as borehole conditions, adverse mud properties, bridging and unstable well bores, debris, scale, damaged tubulars, washouts etc. This charge would apply only if there is a rig-up and rig-down, and a maximum of once per twenty-four (24) hours even if multiple, unsuccessful attempts in the well were made in this period. No compensation is applicable if the Incomplete Operation is due in whole or in part to CONTRACTOR, and Zero Rate shall apply.
- 1.15 A "Crew" is defined as the team of trained and competent CONTRACTOR personnel (with experienced supervision) necessary to perform the WORK in a safe and efficient manner. Crew should always be based on twenty-four (24) hours availability, and twenty-four (24) hour operations, and comply with COMPANY's sixteen (16) hour maximum work day rules. Crew charges will be defined by unit rates independent of the number of personnel in the Crew. CONTRACTOR shall ensure the Crew unit rate fully reflects the number of personnel required to perform the WORK in a safe and efficient manner, and in full conformance with the CONTRACT. The Crew Unit Rates only apply during standby, and only over and above the Free Time Allowance which is twenty-four (24) hours onshore, and three (3) days offshore.
- 1.16 Standby Unit Rates are applicable for non-exclusive call-out services only. Standby Unit Rates are applicable only when WORKSITE operations are interrupted or delayed for a period of time, and COMPANY's WORKSITE representative has requested in writing that tools, equipment and crews remain on the WORKSITE (or assigned to COMPANY in CONTRACTOR's operations base). The Free Time Allowance for equipment used in onshore operations is twenty-four (24) hours, for offshore operations is four (4) days. The Free Time Allowance for crews used in onshore operations is twenty-four (24) hours, offshore operations is three (3) days. CONTRACTOR may be compensated for Standby time over and above the free allowance after review and agreement by COMPANY, provided CONTRACTOR is not responsible in whole or in part for the Standby.
- 1.17 Monthly rental charges for tools, equipment, and crews are not applicable. A single "all inclusive" unit rate, hereafter called a "Monthly Minimum Unit Rate" shall be proposed by CONTRACTOR in place of multiple individual rental rates for exclusive service. The Monthly Minimum Unit Rate covers the Wireline surface equipment spread, Crews and toolbox of services required by the SPU to perform the WORK.
- 1.18 In the event CONTRACTOR upgrades the technical specification or specifications of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment

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with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be EMPLOYED by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.

- 1.19 The Appendices hereto allocate in general terms the WORK against individual categories. The total amount payable for the WORK against the rates and prices included in the Appendices constitutes the CONTRACT PRICE. No claim or submission for additional monies will be accepted by COMPANY for failure to price an item identifiable from the Scope of Work or other CONTRACT documents but not specifically identified herein, or for any item which proves to be required for the safe and proper performance of the WORK.
- 1.20 CONTRACTOR's job tickets approved by COMPANY shall be used to define all events and timings for the definition and application of the appropriate rates associated with this CONTRACT. In event of disagreement, IADC drilling records, where available, and other applicable documents will be reviewed to reach mutual agreement.
- 1.21 CONTRACTOR will have no minimum charges for equipment, crews or perforators etc other than the unit rates requested. CONTRACTOR will have no minimum standby or rental charges, crew or other charges except where requested by COMPANY.

2.0 PRICING BASIS AND PRICING TERMS

- 2.1 Unit Rate Basis (UR) - The pricing for all equipment, tools, labor, services and materials shall be provided on a Unit Rate Basis that shall be all inclusive. CONTRACTOR's full compensation for complete performance of activities to supply and QA / QC all materials, provide all equipment and services and comply with all terms and conditions of this CONTRACT shall be in accordance with the applicable Unit Rate(s).
- 2.2 The Unit Rates are deemed to be fully inclusive rates and shall include, without limitation, all management and supervision of whatever nature, corporate administrative, direct and indirect manufacturing services, QA / QC services (including testing), computer services, administration and labor costs, travel costs, traveling time and expenses, fares and transportation, allowances, housing and accommodations, wages, salaries, overheads, profits, bonus and incentive payments, overtime costs, holidays with pay, vacation allowances, sick pay, CONTRACTOR's portion of employee insurance and social security benefits, payroll and income taxes, premium for public liability and property damage insurance, employers' liability insurance, workers' compensation and all insurance premiums measured by payroll costs, pensions and all other compensation and expenses which CONTRACTOR may make under national or local agreements with trade unions, compliance with government regulations, office facilities, safety requirements, protective clothing, all consumables, tools, CONTRACTOR's and its SUBCONTRACTOR's equipment, maintenance and repair of CONTRACTOR's and its SUBCONTRACTORS' equipment, materials, establishment charges, communications, ordinary risks and services together with all expenses and liabilities, obligations and risks which under this CONTRACT shall be borne by CONTRACTOR and all other costs whatsoever incurred by CONTRACTOR in the performance of this CONTRACT.

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- 2.3 Should COMPANY provide room and board for CONTRACTOR's personnel at or near the onshore WORKSITES, COMPANY may invoice CONTRACTOR at a mutually agreed rate per day, per person.
- 2.4 As provided within the Schedule of Rates and Charges, CONTRACTOR shall provide data acquisition and other services to meet the statement of requirements as specified by COMPANY.

3.0 PRE-JOB PLANNING

CONTRACTOR will be required to provide some or all, but not limited to, the following pre-job planning services, the cost of which will be included in the Base Service Charge Unit Rate outlined in Clause 1.9 above. CONTRACTOR is expected to fully participate in the development of each data acquisition program, by:

- Assessing the combinability of individual tools in a string
- Assessing the suitability of specific tool strings with respect to maximum working tool length, weight and optimal acquisition speed for each tool
- Performing tension analysis of each run to ensure in hole risks are assessed and a mitigation put in place
- Evaluating the maximum each tool string could be pulled to in the event of a tool string becoming stuck
- Preparing a written document to outline the best practice to fish a stuck tool
- Optimizing the technical set-up of a tool to acquire the data requested by COMPANY as outlined in COMPANY's technical objectives
- Preparing a written document outlining specific risks and their mitigation in acquiring all data
- Producing a written document outlining CONTRACTOR's best practice of operation planning, mobilization, rig up, execution, rig down and demobilization including clear presentation of all calibrations and tool checks performed prior to the operation, specific to that operation and the dates on which these calibrations and tool checks were performed.
- Prior to any operation, should COMPANY require it, accommodating a wireline witness at CONTRACTOR's base to witness calibrations, tool checks and scrutinize tool histories as supplied by CONTRACTOR from their global tool history database
- Making available the designated CONTRACTOR Representative and the senior logging engineer at a pre-determined pre-spud meeting for each well in COMPANY's specified location

4.0 DATA ACQUISITION AND SERVICE PROVISION

- 4.1 The Scope of Work requires delivery of data and samples to COMPANY and this will be reflected in the Schedule of Rates and Charges.
- 4.2 Unless otherwise specified by COMPANY, all data acquired is expected to be transmitted real time for access by designated COMPANY representatives from any location using the world-wide web. The cost of providing this service should be included in the Base Service Charge Unit Rate.

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- 4.3 The provision of the required data will also mean delivery of the raw curves that were acquired from which the data required could be processed and re processed if necessary. This should be delivered as a DLIS file to COMPANY by a time specified in COMPANY's data acquisition program following completion of the operation. Where the tool utilized to deliver the data was of higher specification then there is no obligation to provide the extra data that the higher specification tool provides as long as it does not compromise the integrity of the data required or its possibility of reprocessing or quality controlling.
- 4.4 Where necessary, all raw data images, well site product images, and the quality control presentations as required by COMPANY are to be provided at no extra cost.
- 4.5 Hard copy data (5 copies, not counting field prints), electronic data of the hard copy, digital data of the raw and quality control data in DLIS format and LAS data of the presentation curves are to be provided at no extra cost to COMPANY. The cost of providing this data should be included in the cost of the data required in COMPANY Schedule or Rates and Costs. This applies to both well site data and final processed products.
- 4.6 CONTRACTOR will ensure best practice depth measurement techniques and calibrations are employed and that subsequent runs are tied in to the preceding logging operations. The activity of shifting wireline data to a common depth as indicated by COMPANY will be done by CONTRACTOR at no additional cost.
- 4.7 COMPANY will outline the data interval required for each data type. High resolution data will not carry a surcharge for this acquisition mode.
- 4.8 To ensure best data quality possible, CONTRACTOR will utilize the latest vintage equipment that meets the minimum specification outlined in COMPANY's Schedule of Rates and Charges for that respective data requirement.
- 4.9 For Borehole Seismic Services, COMPANY's Schedule of Rates and Charges is constructed to enable multi level tools to be charged at different rates depending on the arrays used.
- 4.10 When a logging operation requires acquisition to continue from the Open Hole into the Cased Hole, e.g., sonic behind pipe or gamma ray to surface this will be considered acquiring of the required data and the cost of which will be included in the price for the data as outlined in COMPANY's Schedule of Rates and Charges.
- 4.11 In the offshore environment, if required, CONTRACTOR will provide all the necessary hardware and adaptors for motion compensation that are essential to offshore operation and the cost of this will be included as an item in COMPANY's Schedule of Rates and Charges.
- 4.12 All environmental corrections requested by COMPANY shall be applied by CONTRACTOR at no extra cost.
- 4.13 In the event CONTRACTOR upgrades the technical specification or specifications of the equipment EMPLOYED during the CONTRACT period to include additional features, capabilities, or functionalities, CONTRACTOR shall supply such upgraded tools or equipment

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with originally requested features, capabilities, or functionalities at no additional cost to COMPANY. Any additional features, capabilities, or functionalities so provided in new equipment can be EMPLOYED by COMPANY at the rates placed by amendment into the applicable schedule of rates and charges.

- 4.14 The charge for data shall also include a designated fully functional like for like same generation and same revision level back-up tool. All tools shall have a back-up for each job present at the WORKSITE at all times as required for the satisfactory performance of the WORK, unless relief is otherwise granted by COMPANY.

CONTRACTOR will mobilize additional back-up equipment to the WORKSITE following any CONTRACTOR non-productive time event or in any event of primary equipment failure. The cost of mobilization of additional back-up equipment to cover COMPANY's minimum operational requirements shall be for CONTRACTOR's account. CONTRACTOR will ensure that tools and equipment are operated within published and accepted specifications, limits and operating criteria at all times. In general, exceptions where tools / equipment are damaged by environmental conditions should be minimal, in this instance COMPANY and CONTRACTOR will agree on mobilization and costs of back-up equipment.

- 4.15 Fully functional back-up means that the back-up tool must be fully operable and capable of performing the same tasks and provide the same scope and accuracy of measurement as the primary equipment.
- 4.16 If a primary tool and its back-up are not available CONTRACTOR shall notify COMPANY.
- 4.17 No additional charge shall be applicable in the event that CONTRACTOR deems it necessary to provide more than one set of functional back-up tools except unless otherwise previously agreed in advance with COMPANY.
- 4.18 Where auxiliary systems, such as high tension wireline equipment are required, then CONTRACTOR shall ensure the cost for this service is provided in the appropriate section in COMPANY's Schedule of Rates and Charges.
- 4.19 COMPANY shall request and pay rates for services that meet the specific functional requirement as defined in the CONTRACT, but shall not pay for additional or optional tool functionality provided by CONTRACTOR's equipment or personnel which have not been specifically requested. For example:
- 4.19.1 if CONTRACTOR uses any form of borehole imaging type logging tool to provide a multi-arm caliper, the rates charged by CONTRACTOR will only be for the multi-arm caliper log, or
- 4.19.2 if a multi-propagation resistivity tool is used in a well where only single frequency measurements were required then COMPANY shall only pay for what was specified on the call out and well plan.
- 4.19.3 If CONTRACTOR's tools have multi-functional capability it is incumbent upon CONTRACTOR to advise COMPANY of said capabilities and to optimize the use of tools to meet the minimum service requirement.

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5.0 OPEN HOLE

- 5.1 Cable tension conveyance modeling and operations optimization, weak point and release system determination shall be included as part of the pre-planning Scope of Work and the cost for this will be included in the Base Service Charge Unit Rate in COMPANY's Schedule of Rates and Charges.
- 5.2 The Open Hole Base Service Charge Unit Rate shall apply to all Wireline Open Hole jobs and as specified in COMPANY's Schedule of Rates and Charges.

6.0 CASED HOLE

- 6.1 As provided within the Schedule of Rates and Charges, all pressure control equipment for live well wireline operations shall conform to DWOP and API, NACE, ISO and ASME best practices. All equipment shall be fully certified by manufacturer with complete QA / QC records, have traceability for all materials, manufacturing, maintenance, testing and certification.
- 6.2 As provided within the Schedule of Rates and Charges, COMPANY requires appropriate equipment packages for 5,000 psi, 10,000 psi, 15,000 psi, 20,000 psi pressure control operations, H₂S and Arctic Temperature rated where applicable in each SPU or region.
- 6.3 As provided within the Schedule of Rates and Charges, CONTRACTOR shall ensure operations are conducted in a safe, efficient and environmentally friendly manner with minimal grease / seal loss. Grease type and viscosity to suit application, cable and temperature range, and dual viscosity grease systems shall be used where appropriate for large temperature ranges. Methanol / Taner fluid injection ports to be available on all equipment for hydrate mitigation as required.
- 6.4 As provided within the Schedule of Rates and Charges, cable used with grease injection pressure control equipment shall not be spliced.
- 6.5 The Cased Hole Base Service Charge Unit Rate shall apply to all Wireline Cased Hole jobs as specified in COMPANY's Schedule of Rates and Charges.

7.0 PERFORATING

- 7.1 All perforating gun system unit rates shall include all normal and customary expendables and other hardware necessary to complete the WORK. This includes but is not limited to:
- Redress and use of adaptors
 - Firing systems
 - Cable heads
 - Release devices
 - Positioning devices
 - Ruggedized correlation device (SP, GR, CCL, neutron)

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- Shock absorbers
 - Safety systems
- 7.2 Highly deviated wells and long gun strings may require low friction adaptors and additional hardware. This should be included in COMPANY's Schedule of Rates and Charges for perforating and used only as required.
- 7.3 The Perforating Base Service Charge Unit Rate shall apply to all Wireline Perforating jobs and as specified in COMPANY's Schedule of Rates and Charges.
- 7.4 All prices will be on a shoot and pull basis unless otherwise noted.
- 7.5 Unless otherwise specified all firing systems will be intrinsically safe systems capable of operating in non-radio silence environments.

8.0 POST WELL PROCESSING AND SERVICES

- 8.1 Data that requires post well processing in CONTRACTOR's Computer Processing Center will be done by CONTRACTOR and the cost of this should be included in the particular tool or service Unit Rate in COMPANY's Schedule of Rates and Charges for the respective data request. The cost should also include provision of software tools to view and interpret data and access to CONTRACTOR's workstation at CONTRACTOR's facilities to Q/C and integrate CONTRACTOR's processing and interpretation. This includes, but is not restricted to the following data:
- Array Resistivity Imaging
 - Tensor Resistivity
 - Rv
 - Rh
 - Rsand
 - Formation dip and azimuth
 - NMR Data including but not restricted to
 - T1 data
 - T2 Data
 - Coates permeability
 - CONTRACTOR permeability
 - Bound water
 - Total NMR porosity
 - Intermediate volumes of various pore sizes
 - Fluid typing (multiple depths of investigation)
 - Ultra Sonic Imaging Data
 - Image dynamic normalization
 - Image static normalization
 - Resistivity Imaging Data
 - Image dynamic normalization
 - Image static normalization

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- Array Sonic Data
 - Monopole Dtc
 - Monopole Dts
 - Upper Dipole Dts
 - Lower dipole Dts
 - Xdipole Dts
 - VpVs ratio

8.2 Where COMPANY requires specific interpretation services or re-processing of existing data, then this should be charged at rates outlined in the Schedule of Rates and Charges, examples of this are:

- Detailed stratigraphic dip computation
- Bore hole stability and rock mechanics

9.0 PERSONNEL

9.1 No personnel charges will apply. The exceptions being:

9.1.1 Crew standby onshore where time exceeds one (1) day greater than Operating time, and this one day shall be referred to as the Onshore Personnel Free Time Allowance.

9.1.2 Crew standby offshore where time exceeds three (3) days greater than Operating time, and these three days shall be referred to as the Offshore Personnel Free Time Allowance.

9.1.3 Operating time is defined as the time from rig up to rig down. The one (1) day of onshore time and three (3) days of offshore time are considered Free Time Allowance and should be covered in the cost of the job and will be used for, but not exclusively for:

- Pre and post job checks and calibrations
- Tool verifications
- Fluid and formation sampling transfers and sample tool preparation
- Successful delivery of all well site products

9.2 CONTRACTOR's personnel co-located at COMPANY's offices to provide dedicated engineering support and pre job planning, where required, shall be for CONTRACTOR's account.

9.3 No additional payments shall be made for personnel held onshore unless COMPANY's specific written instructions to place personnel on "Onshore Standby" status pending utilization at the WORKSITE. Such payment shall be at the Crew Standby Rates if beyond the Free Time Allowance per job.

9.4 Personnel Standby Rates shall apply at times beyond the Free Time Allowance in Clause 9.1 herein above, where COMPANY has requested personnel and such personnel are present at COMPANY's base waiting on orders, waiting on aircraft; waiting on weather. Standby Rates

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shall not apply where personnel are not available for WORK for any reason including unavailability for reasons resulting from CONTRACTOR's negligence.

- 9.5 Personnel Standby Rates shall not apply when CONTRACTOR's personnel are attending training sessions, which are required for CONTRACTOR's personnel to complete normal industry working practice and the general requirements that are covered in the CONTRACT. Examples of such courses or events which are covered in the CONTRACT and that would not attract Personnel Standby Rates are pre-spud meetings, pre-job meetings, Performance Review Meetings, After Action Review meeting, FOCUS or STOP training and other such events.
- 9.6 Charges for CONTRACTOR's personnel shall be supported by CONTRACTOR's timesheets or other recording system agreed with COMPANY detailing the hours worked in providing support to COMPANY. No dual time writing for any one individual working on multiple projects shall be permitted.
- 9.7 Mobilization time for personnel shall commence from the time personnel arrive at COMPANY's WORKSITE or crew change location, until the time of their departure from the worksite or arrival back at the said or alternative crew change location. CONTRACTOR will be responsible for their own personnel costs of travel, accommodation and subsistence expenses incurred traveling to and from and within the WORKSITE. In the case of offshore WORK, CONTRACTOR will be responsible for personnel travel costs, subsistence and accommodation costs in travel to and from the crew change location.

10.0 SPECIALIST SERVICES

- 10.1 As provided within the Schedule of Rates and Charges, CONTRACTOR shall provide all high tension wireline equipment required to support high tension wireline operations safely and efficiently in the Gulf of Mexico and other SPUs. Typically with surface cable tensions exceeding the safe drum storage and insulation cold flow limits for logging cables, generally used for WORK with expected cable surface tensions ranging from 12,000 – 25,000 lbs using current technology. The current upper limit will increase as cable armor, core and packaging and torque control technology improves during the CONTRACT period.
- 10.2 As provided within the Schedule of Rates and Charges, CONTRACTOR shall provide wireline logging while fishing continuation of planned logging / perforating operations after cable or tool is stuck in the well. This service is similar to pipe conveyed logging, requires minimal additional hardware and is undertaken while performing standard Wireline fishing operations.
- 10.3 As provided within the Schedule of Rates and Charges, CONTRACTOR shall provide pipe conveyance for high angle wells, large tool string combinations, high differential pressures and sticking risk, or wells with washouts in key sections.

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11.0 THIRD PARTY

COMPANY may require Third Party services, including but not limited to conveyance equipment such as wireline tractors, wireline jars, seismic down-hole and surface equipment and other devices that would enable operations to continue efficiently.

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1.0 GENERAL

- 1.1 Prices for Permanently Installed Equipment shall be Ex-Factory and shall include all costs associated with standard transportation markings, packaging, shipping paperwork, etc.
- 1.2 For Permanently Installed Equipment, CONTRACTOR shall be reimbursed for Third Party charges for transportation, shipping, handling, duties, and VAT. These requests shall:
 - be made within sixty (60) days of their occurrence
 - be supported with a valid invoice or receipt, which may be audited by COMPANY
 - not be subject to surcharges and / or markups by CONTRACTOR, and
 - clearly identify the product or material for which reimbursement is being requested. Clear identification shall be constituted by reference to WORK ORDER Number (and associated line item), COMPANY Item Code, Well Name and a complete manifest of the relevant shipping container.
- 1.3 CONTRACTOR shall be reimbursed for transportation charges for equipment and materials from CONTRACTOR's Base of Departure to COMPANY's embarkation point for transfer to WORKSITE. CONTRACTOR shall present valid invoices from the transportation company in order to receive reimbursement, and COMPANY reserves the right to be invoiced directly by transportation companies (i.e., direct billing).
- 1.4 COMPANY may choose multiple suppliers, and their respective products and services in a single well. Accordingly, COMPANY expects compatibility among all suppliers' tools and equipment resulting in successful completion of the job.
- 1.5 Except for New Technology as addressed in Section 4, Clause 3.12 herein above, the "Reasonable Facsimile" concept shall be the guiding principle for adding items to the CONTRACT that are either a second or successive generation of existing materials and / or equipment, or where there is existing materials and / or equipment of a similar nature already in the CONTRACT. COMPANY and CONTRACTOR shall agree on the item in the Schedule of Rates and Charges that is the closest "Reasonable Facsimile" to the new item. CONTRACTOR shall provide written justification that establishes the basis for new price.
- 1.6 CONTRACTOR's "sustaining engineering activities" shall be undertaken at no charge to COMPANY. Examples include amending engineering records, and preparation and hosting of COMPANY requested design reviews. Engineering activities associated with design reviews which may be chargeable to COMPANY are delineated in the QCP Memorandum of Understanding (MOU) dated November 8, 2007, as may be amended from time to time. This MOU covers the development of global quality plans.
- 1.7 In the event COMPANY equipment is damaged while in the possession of CONTRACTOR due to negligence of CONTRACTOR, CONTRACTOR shall be responsible for all costs associated with returning the equipment to a state where it is fit for purpose and meets all the

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original technical requirements. This includes, but is not limited to transportation charges associated with all movements of the equipment between the location and an authorized repair and / or test facility, dis-assembly and re-assembly consistent with the original technical specifications, re-testing of the equipment consistent with the original technical specifications, or rework or replacement of parts due to damage.

- 1.8 In the event CONTRACTOR equipment arrives at the WORKSITE, is not fully functional and operational in accordance with Section 3, Scope of Work through fault of CONTRACTOR, CONTRACTOR shall be responsible for all equipment costs, parts costs, and labor costs associated with returning equipment to a fully functional state.
- 1.9 In reference to Section 4, Clause 3.9, CONTRACTOR charges shall recommence following conclusion of remedial actions required to return the well to the condition prior to a failure of CONTRACTOR's equipment or service attributable to CONTRACTOR.
- 1.10 The Delivery Date shall be specifically stated in the WORK ORDER.
- 1.11 If CONTRACTOR fails to deliver the end of well report (EOWR) within the specified time period and / or the EOWR is factually incorrect, CONTRACTOR's invoice shall be reduced at a rate of \$1,000/day until such time that the EOWR is delivered or corrected. The EOWR will normally consist of an 'as-run' well schematic showing base dimensions, complete descriptions (including, inter alia, serial numbers), depths, and associated notes. COMPANY and CONTRACTOR shall agree as to the contents of the EOWR prior to the completion of the well.

2.0 CHARGE RATES

- 2.1 Operating charge rate shall be inclusive of any pre-job analysis, job set-up activities, and any post-job maintenance or refurbishment of any kind.
- 2.2 The Standby charge for equipment shall begin the day equipment arrives at COMPANY's supply base or WORKSITE, whichever occurs first, and terminates upon return to COMPANY's supply base or CONTRACTOR's base, whichever occurs first. Cumulative standby charges shall not exceed 10 days total per well. Cumulative Standby charges for a well shall not exceed fifty percent (50%) of the purchase price of the item being charged. Once total charges (Standby plus Operating) reach the fair market value of the asset on a per well basis, CONTRACTOR shall suspend charges for the item in question.
- 2.3 Flow wetted metallurgy listed is the minimum requirement. However, CONTRACTOR may select higher metallurgies at no additional cost to COMPANY except in those cases where COMPANY request an expedited delivery and a higher metallurgy is the only option to meet COMPANY's stated delivery time.
- 2.4 Subject to Clause 3.1 of Section 4 – Remuneration, General Terms and Conditions, should COMPANY desire to exercise its option to extend the CONTRACT beyond the initial three (3) year term, the PARTIES shall mutually agree upon rates and charges for the duration of the extension. An example of an indexation formula is as follows:

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$$P = P_i * [(0.8 * \Phi_{ML}) + 1]$$

MATERIALS

LABOR

$$\Phi_{ML} = \left[0.xx \left(\frac{Ms}{Ms1} - 1 \right) \right] + \left[0.yy \left(\frac{Mc}{Mc1} - 1 \right) \right] + \left[0.zz \left(\frac{Mn}{Mn1} - 1 \right) \right] + \left[0.60 \left(\frac{L}{L1} - 1 \right) \right]$$

Where:

P = New Rate

P_i = Initial Contract Price

Φ_{ML} = Material and Labor Indexed Adjustments

$0.xx + 0.yy + 0.zz = 40\%$

MATERIALS:

Ms = (Material – Steel) Twelve Month average (Jan-December) of the U.S. Department of Labor Producer Price Index Series, PCU3311113311113, Industry: Iron and Steel mills, Product: Steel Ingots and semi-finished products.

Ms_1 = Index equivalent at CONTRACT execution

Mc = (Material – 13 Chrome) Twelve Month average (Jan-December) of the last year of the CONTRACT Primary Term of a Chrome index to be agreed upon by the PARTIES.

Mc_1 = Index equivalent at CONTRACT execution

Mn = (Material – Nickel 34.0%) Twelve Month average (Jan-December) of the last year of the CONTRACT Primary Term of a Nickel index to be agreed upon by the PARTIES.

Mn_1 = Index equivalent at CONTRACT execution

LABOR:

L = Three month average (Jan-Mar) of the U.S. Department of Labor, Employment, Hours, and Earnings for the Current Employment Statistics survey (National), Series ID: CEU1021100006, Natural resources and mining super sector, Oil and gas extraction Industry, NAICS code 211, Data Type: Average Hourly earnings of Production Workers

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L_1 = Index equivalent at CONTRACT execution

3.0 Delivery

- 3.1 Where CONTRACTOR fails to deliver materials and / or equipment by the specified date agreed upon between the PARTIES as set forth in the associated WORK ORDER, CONTRACTOR shall be assessed the following reduction in the Gross Purchase Price for each item delineated on the WORK ORDER that is delivered later than the specified date:

Delay (Deviation from WORKORDER)	Percentage of Purchase Price Reduction
Zero to Fifteen (15) days	No reduction
Sixteen (16) to Thirty (30) days	Five percent (5%) reduction
Thirty One (31) to Sixty (60) days	Ten percent (10%) reduction
Greater than Sixty (60) days	Fifteen percent (15%) reduction

In the event CONTRACTOR's delivery is late by more than sixty (60) days, CONTRACTOR shall be deemed to be in breach of the CONTRACT, and COMPANY shall be entitled, at their sole discretion, to source the same materials that were delivered later than the specified date from an alternate supplier at CONTRACTOR's cost and the respective WORK ORDER shall be null and void.

The following conditions also apply to this Clause:

- Any changes to materials specifications or delivery dates shall be documented by a CHANGE ORDER, such that any modifications are mutually agreed by COMPANY and CONTRACTOR
 - Lead time adjustments may be modified by CONTRACTOR during the course of annual price adjustments to the Schedule of Rates and Charges
- 3.2 Where COMPANY and CONTRACTOR have agreed to a delivery schedule and due to CONTRACTOR's fault, a late delivery on the part of CONTRACTOR results in additional transportation costs to COMPANY, any additional cost will be deducted from CONTRACTOR's invoice, and shall be clearly noted on the applicable invoice.
- 3.3 Subject to Clause 3.2 immediately above, CONTRACTOR shall be responsible for all expedited logistics (e.g., chartered air craft, hot shots, chartered boats, etc.) charges for or to prevent a late delivery on the part of CONTRACTOR.
- 3.4 Where COMPANY requests for late delivery by CHANGE ORDER due to delay in plan, no charges shall be incurred by COMPANY except for expediting charges already incurred by CONTRACTOR at time of CHANGE ORDER.
- 3.5 Where CONTRACTOR delivers early, not at the request of COMPANY, payment shall not be made until the actual requested delivery date on WORK ORDER or CHANGE ORDER. Any applicable storage, re-dressing, and / or testing charges shall be at CONTRACTOR's account.

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- 3.6 CONTRACTOR shall deliver all equipment to COMPANY's Point of Embarkation by the agreed upon time as set forth in the WORK ORDER. In cases where equipment or personnel arrive late to the Point of Embarkation due to fault of CONTRACTOR and said delay creates Non-Productive Time at the WORKSITE, CONTRACTOR shall be liable to pay for the rental charges of any supply boat and / or Third Party equipment and personnel waiting on said supply boat for the period of the delay.

4.0 PERSONNEL

- 4.1 Unless otherwise agreed to by COMPANY, CONTRACTOR shall provide sufficient number of people (crew) to allow for twenty-four (24) hour operations for the duration of the WORK.
- 4.2 All personnel rates per day refer to a day of twenty-four hours. For parts of a day, all such day rates shall be prorated to the nearest 12 hours.
- 4.3 CONTRACTOR shall not charge for "Trainee" personnel who are not fully qualified to perform the WORK for which they are assigned
- 4.4 Applicable Standby Rate for personnel shall be thirty-three percent (33%) of the applicable Daily Rate.
- 4.5 In the event that CONTRACTOR has a concurrent alternative customer requirement for personnel, CONTRACTOR shall advise COMPANY of said alternative requirements and COMPANY's options to ensure personnel availability. COMPANY may elect to secure the personnel in advance and compensate CONTRACTOR at the applicable Standby Rate to secure the availability of the personnel. All such agreements shall be documented in the WORK ORDER or CHANGE ORDER.

5.0 COMPANY COST RECOVERY

- 5.1 CONTRACTOR shall reimburse COMPANY for COMPANY engineering or technical support and related costs which are agreed upon in advance in writing and shall cover the following:
- 5.1.1 Cost of conducting incident investigations when the result of the investigation reveals the incident was due to direct failure of CONTRACTOR supplied products or equipment.
- 5.1.2 Cost of conducting manufacturing audits when caused by a major QA/QC incident.
- 5.1.3 Cost of time spent in remediation / re-design of CONTRACTOR's equipment or products when necessitated by equipment or product failure in COMPANY well or significant COMPANY rig NPT.
- 5.1.4 The following Charges shall apply:

ITEM DESCRIPTION	RATE
COMPANY Drilling/Completion Engineer	\$200/Hour

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COMPANY Integrity Assurance Engineer	\$150/Hour
Third Party Inspection Personnel	At Cost
Other Related Charges (Travel, Lab fees, etc.)	At Cost

5.2 CONTRACTOR shall reimburse COMPANY for COMPANY Third Party Inspector (TPI) charges (Nominated Inspection Body) associated with QCPs and / or ITPs which are a result, but not limited to the following:

- 5.2.1 Re-scheduling of surveillance activities due to CONTRACTOR or SUBCONTRACTOR not being prepared for said activities at agreed upon time;
- 5.2.2 Re-scheduling of surveillance activities in cases where activities have to have be repeated due to rejections associated with activity being surveilled (e.g., re-test, re-inspection, re-review of documentation, etc.); and,
- 5.2.3 TPI non-productive time (NPT) as a result of CONTRACTOR and / or SUBCONTRACTOR inefficiencies.

Appendix 4 – Schedule of Rates and Charges

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Appendix 4 – Schedule of Rates and Charges

Schedules of Rates and Charges (SORACs) referenced throughout this CONTRACT are found only as electronic pdf (Portable Document Format) documents (one or more pdf documents for each Sub-Sector). These pdf documents (SORACs) accompany the electronic copy of the CONTRACT entitled "CONTRACT FOR GULF OF MEXICO STRATEGIC PERFORMANCE UNIT OFFSHORE WELL SERVICES between BP EXPLORATION AND PRODUCTION, INC. and HALLIBURTON ENERGY SERVICES, INC" and are an integral part of this CONTRACT. The file names for these SORACs are provided below:

- Cementing Services – "SORAC – HES – GOM – CEMENTING SERVICES"
- Fluids Services – "SORAC – HES – GOM – FLUIDS SERVICES"
- Well Placement – "SORAC – HES – GOM – WELL PLACEMENT"
- Wireline Services – "SORAC – HES – GOM – WIRELINE SERVICES"
- Completions, including separate SORACs for each of the following areas of Completions:
 - o "SORAC – HES – GOM – COMPLETIONS (TCP / DST)"
 - o "SORAC – HES – GOM – COMPLETIONS (OSFP)"
 - o "SORAC – HES – GOM – COMPLETIONS (LOWER COMP)"
 - o "SORAC – HES – GOM – COMPLETIONS (I WELLS)"
 - o "SORAC – HES – GOM – COMPLETIONS (UPPER COMP)"

**Section 5 – Integrity Management
(Conformance Guidelines for Contractors)
Halliburton for GOM**

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1.0 INTRODUCTION TO THE COMPANY INTEGRITY MANAGEMENT STANDARD

1.1 Overview

The COMPANY Integrity Management Standard (IM Standard) was first published in 2006 and is primarily aimed at management system integrity and specifically the mitigation or elimination of major accident risk. The IM Standard comprises ten fundamental elements which are broadly aligned with "Getting HSE Right" (GHSER), ISO 9001 Quality Management and OSHA 1910 process safety management. The COMPANY GROUP has set a global conformance deadline for the new standard, effective Dec 31, 2008, or to have an approved deviation in place. More detail on the IM Standard and copies of the E&P Integrity Management Implementation guide are available on request. It should be noted by all CONTRACTORS that the IM Standard and in particular the 36 minimum requirements contained in the E&P Integrity Management Implementation Guide are internal obligations for COMPANY only. However they can significantly impact the way CONTRACTORS provide products and services (see the obligation for CONTRACTORS on Page 6).

The Ten IM Standard elements include:

- Accountabilities
- Competence
- Hazard Evaluation and Risk Management
- Facilities and Process Integrity
- Protective Systems
- Practices and Procedures
- Management of Change
- Emergency Response
- Incident Investigation and Learning
- Performance Management and Learning

1.2 Purpose of the Group Integrity Management Standard

- 1.2.1 Sets out the IM Standard requirements necessary to comply with the Group values, particularly those relating to Risk, Health and Safety and Environmentally Sound Operations.
- 1.2.2 Requires the controlled application of hazard evaluation including major accident risk assessment, process safety and engineering management, combined with internationally recognized industry standards and engineering, maintenance and operating practices developed by COMPANY.
- 1.2.3 Aims to reduce the number and severity of uncontrolled releases of hydrocarbons, chemicals, hazardous materials and other high-energy sources (including catastrophic and chronic releases) to the atmosphere, water, or ground, and to help prevent the failure of equipment and infrastructure in order to avoid serious harm to people, the environment and COMPANY assets.
- 1.2.4 Will help COMPANY to benefit from greater operational integrity; better Health, Safety, Security, and Environment (HSSE) performance; increased lifecycle value of COMPANY assets; and greater engineering standardization and productivity.

**Section 5 – Integrity Management
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1.2.5 Will help sustain COMPANY's license to operate, improve its operational reputation, reduce future environmental liabilities, and achieve internal targets as defined in COMPANY's management framework.

1.2.6 The IM Standard and Control of Work Standards are complementary. Control of Work focuses on the safe execution of workplace activities while integrity management concerns the total lifecycle integrity of COMPANY operations through design, construction, operation, maintenance, and decommissioning.

1.3 Scope and Applicability of the COMPANY IM Standard

The IM Standard applies to all COMPANY operations globally. The standard contains 10 elements and 36 minimum requirements. Each element has an intent statement, which can be referenced in the E&P Integrity Management Implementation Guide. All the elements require both systematic and well documented management system processes to be both in place and effective for the operations lifecycle. Specifically this ensures that for all COMPANY operations, the equipment used in each operation, the people performing the operation, the practices and procedures being used for the operation are ALL fit for service – the aim being to avoid loss of containment events, to maintain structural integrity throughout the lifecycle of the facility and equipment in question, and most importantly to prevent major incidents.

1.4 Commitment and Implementation timetable

COMPANY's global implementation of the IM Standard by December 31, 2008 is a key priority commitment made by COMPANY's then CEO, Lord John Browne, and latterly CEO Tony Hayward.


1.5 Accountability for delivery of Integrity Management

For every product and/or service that is purchased by COMPANY, the IM Standard requirements involved in the Scope of Work are covered by a "the Single Point of Accountability" (SPA) that is responsible for delivery of integrity management for COMPANY. If the name of the Integrity Management SPA is not provided by COMPANY at the appropriate time, CONTRACTORS should inquire as of her/his contact information.

1.6 The COMPANY Integrity Management Process

The definition of "Integrity Management" is a continuous assessment process applied throughout Design, Construction, Operations, Maintenance, and Decommissioning to assure that wells, facilities, and structures are managed safely.

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IM Process	Key Activities	Elements
	Assign accountabilities for IM Systematically identify major hazards Conduct risk assessment Assess equipment criticality Define safe operating envelope	1, 3
	Define practices and procedures Identify required IM competencies Build equipment risk - based IM plan Develop corrosion management plan Build emergency response plan	2, 4, 5, 6, 8
	Implement equipment IM plan Test emergency response plan Management of change	4, 5, 7, 8
	Incident investigation Performance management Assessment against KPIs Audit and peer review	9, 10

1.7 Safety Critical Equipment

The Exploration and Production Segment requires the identification of Safety Critical Equipment (SCE) for the purposes of assuring availability and functionality of equipment that provides the greatest relative contribution to risk reduction for major accident hazards. The identification of SCE facilitates the prioritization of inspection, testing and maintenance tasks and the associated performance management.

1.8 Integrity Management Assurance

COMPANY Business Units and Functions are accountable for implementing the IM Standard with CONTRACTORS and suppliers and for providing auditable evidence of conformance.

1.9 Regulatory Requirements

The IM Standard is intended to complement regulations and defines a process to provide assurance that COMPANY's minimum requirements for the IM Standard are being met, including conformance with the Engineering Technical Practices (ETP) and with appropriate industry codes and standards. In the event of a conflict between the IM Standard and a relevant law or regulation, the relevant law or regulation shall be followed. Any such conflict shall be reported to the relevant SPU engineering authority. If the standard creates a higher obligation, it should be followed as long as this also achieves compliance with the law or regulation.

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1.10 The intent of the IM Standard with respect to CONTRACTORS is to promote the adoption of the IM Standard by companies working on behalf of COMPANY. COMPANY shall seek to hire CONTRACTORS with integrity management programs that are just as encompassing as this IM Standard – if not more so – and to encourage those who do not have such a program to adopt one.”

1.11 The applicability of the IM Standard with respect to CONTRACTORS:

“Where COMPANY relies on a CONTRACTOR to carry out work that would be subject to this Standard if performed by COMPANY employees, COMPANY shall, after an appropriate risk assessment, endeavor to ensure that the CONTRACTOR adopts this IM Standard. It will also seek to amend relevant contracts, immediately or on renewal, to reflect this IM Standard.”

The term CONTRACTOR also covers SUBCONTRACTORS and includes the suppliers of goods and services.

2.0 IM CONFORMANCE PLAN FOR CONTRACTORS

This section sets out the IM Standard conformance requirements for key CONTRACTORS. Key CONTRACTORS are considered on the basis of Major Accident Risk (MAR) potential of their respective COMPANY operations. The list of CONTRACTORS selected for IM Standard conformance assessment is reviewed and approved by the Technical Authority (TA), the Integrity Management SPA (Single Point of Accountability), the Integrity Assurance representatives (IA), the PSCM representatives (Procurement & Supply Chain Management), and the EA (Engineering Authority) for the application.

2.1 Each selected CONTRACTOR shall perform the following steps.

Step	Integrity Management conformance plan for CONTRACTORS
1	Complete the IM Standard self assessment checklist (Appendix 1)
2	Report any IM Standard self assessment gaps
3	Develop and implement a plan to close any gaps before commencement of the WORK
4	Identify all safety critical equipment and report SCE preventative maintenance programs (total SCE work orders, SCE failures, overdue SCE work orders)

2.2 Use of the COMPANY Global CONTRACTOR IM Standard conformance checklist

The assessment of the CONTRACTOR's management system will be conducted using the Global COMPANY checklist contained in Appendix 1. The checklist is designed to highlight management system gaps, relative to the ten IM Standard elements of the COMPANY IM Standard. Ideally the CONTRACTOR will have broadly equivalent systems in place that align with the intent for each element in the standard, such as for instance ISO9001 or API equivalent ISO29001.

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Deviations will be managed and reviewed as part of the Supplier Performance Management (SPM) process. The methodology used in this document is consistent with and based on the global COMPANY PSCM team's model. The key objective is a globally consistent IM Standard conformance message to all CONTRACTORS engaged by COMPANY irrespective of geographical location, business segment, and / or SPU.

2.3 CONTRACTOR IM Standard requirements

CONTRACTORS shall conform to the minimum IM Standard requirements as specified in Appendix 2.

2.4 Identification of CONTRACTOR Safety Critical Equipment (SCE)

The objective of SCE is to identify the subset of equipment that is most critical to the management of major accident hazards. These are the equipment items that prevent, control and mitigate major hazards, and therefore are required to have a high reliability and availability before and during an incident. Much of this SCE will require planned inspection, testing, and maintenance to confirm the reliability and calibration to function on demand in accordance with applicable performance standards.

The designation of SCE allows management to optimize inspection, testing, and maintenance resources to mitigate major accident risks. As such, the SCE should typically represent approximately 20% of the equipment items on the Master Equipment List. Although this percentage is not mandated, significantly higher percentages will likely result in a lack of focus on those items that require preferential attention.

In general, SCE equipment should be identified as part of a risk assessment or hazard evaluation study. A generic Land rig SCE table and SCE decision tree have been provided as examples, which may help CONTRACTORS identify SCE in their operations.

2.4.1 Appendix 4 contains - as an example - a generic land rig SCE register which can be modified by the CONTRACTOR to suit their specific operations.

2.4.2 Appendix 5 contains an SCE decision tree which should be used or adapted by the CONTRACTOR to help identify their SCE.

For Wells related operations, SCE is broadly characterized by any lifting/hoisting or pressure containing equipment, fuel systems, and protective systems.

2.4.3 The aim of identifying SCE in CONTRACTOR operations is to ensure equipment integrity through rigorous and appropriate application of equipment selection criteria, operating practices and procedures, and lifecycle management including maintenance, inspection and testing frequencies.

2.4.4 The SCE register is a communication tool that contains equipment that is absolutely "critical" to the safe Rig or Non-rig operations on COMPANY leases. A higher degree of vigilance and rigor is expected of this equipment and its use by COMPANY and CONTRACTOR staff.

2.4.5 Planned preventative maintenance events and overdue events reporting will be required by COMPANY.

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- 2.4.6 Likewise any SCE incident or related failures will require rigorous investigation to ensure root causality is identified and appropriate actions are taken to restore the SCEs integrity. COMPANY will require written notification of any SCE failure event.

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Appendix 1 – COMPANY Global CONTRACTOR Integrity Management Conformance Checklist

CONTRACTOR:

SERVICE/SEGMENT:

NORMAL FONT - MANDATORY FOR 2008

ITALICISED FONT - CONTINUOUS IMPROVEMENT 2008+

Integrity Management Element	What role do CONTRACTORs play in helping COMPANY comply?	Relevant to this Contract? (Y/N)	Conformance?	Gap?
1. Accountability	Identify responsibilities and accountabilities of personnel who make decisions affecting technical integrity and service/product quality.			
	Identify for each Contract/Service line single point contacts for technical integrity and service/product quality			
	<i>Establish how technical/ risk management decisions are controlled and how they are verified.</i>			
2. Competency	Demonstrate that competency processes exist and are being followed for all staff.			
	Confirm that staff impacting integrity management has been identified and have suitable job descriptions that identify competency requirements.			
	Supplier / CONTRACTOR retain documented employee competency assessments and training records.			
	<i>Confirm that staff is assessed versus their competency requirements and that training programs exist and are implemented to close competency gaps.</i>			
3. Hazard Evaluation and Risk Management	Confirm Operations Planning and Procedures address risk management, in particular: Demonstrate that hazards within the CONTRACTOR organization are systematically identified and the risks assessed and managed			

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Integrity Management Element	What role do CONTRACTORS play in helping COMPANY comply?	Relevant to this Contract? (Y/N)	Conformance?	Gap?
	<p>via formal documentation and communication with affected staff. Demonstrate Implementation of risk mitigations based on hazard assessments</p> <p>Performed evaluation to identify SCE based on risk assessment, CONTRACTOR specified, or generic COMPANY SCE lists.</p> <p>Where appropriate, take part in Risk assessment meetings.</p> <p>Where applicable, implement COMPANY-identified risk mitigations and / or participate in the COMPANY risk assessment process and assist in providing solutions for the risks identified.</p> <p>Communicate and implement with the required degree of rigor QA/QC requirements specified in the contract, COMPANY standards and specifications.</p>			
4. Facilities and Process Integrity	Demonstrate systems and procedures to assure that design and any construction, installation or maintenance activity confirms materials, equipment, structures, and temporary equipment are fit for purpose, life-cycle service, will avoid loss of containment, and maintain structural integrity.			
	Confirm that manufacturing processes are documented, and where necessary processes and operators are qualified to provide assurance that design intent and integrity is achieved.			
	Demonstrate understanding of and adherence to relevant COMPANY specifications, Engineering Technical Practices (ETP), Site Technical Practices (STP), Site Operating Procedures (SOP), and regulatory requirements.			
	CONTRACTORS participating in maintenance, inspection, and operating procedures that impact integrity management (onsite and offsite) are aware of IM Standard implications relating to their activities.			
5. Protective Systems	CONTRACTORS working on protective systems follow relevant STPs and SOPs and other site specific guidelines and practices.			
	Suppliers will identify, verify, and turn over key data for procured materials, equipment, and/or services for Projects, O&M, Drilling and Wells related to protective systems to comply with COMPANY			

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Integrity Management Element	What role do CONTRACTORS play in helping COMPANY comply?	Relevant to this Contract? (Y/N)	Conformance?	Gap?
	specifications and regulatory requirements.			
	Suppliers will also have a key role in ensuring that systems are properly designed, installed, documented, and appropriately tested, certified, inspected and maintained.			
	Protective systems and/or devices shall not be bypassed, removed from service, or prevented from working as intended, either permanently or temporarily, without special controls putting in place and COMPANY approval obtained.			
	Deviations to specification will require COMPANY Management of Change (MOC) approval.			
	<i>Where appropriate, suppliers will need to work with COMPANY to identify requirements for protective systems.</i>			
6. Practices and Procedures	CONTRACTORS / suppliers working on COMPANY sites will need to be familiar with relevant ETP, STP, SOP, Regulatory Procedures (RP), and Drilling and Wells Operations Policy (DWOP) as defined by COMPANY.			
	CONTRACTOR's / supplier's internal shop practices & procedures should be consistent with the intent of this element. Where appropriate the field practices and procedures will be reviewed and commented on by COMPANY.			
7. Management of Change	CONTRACTORS will have an internal MOC system in place. CONTRACTORS / suppliers to interface with COMPANY MOC process as required.			
	A CONTRACTOR's internal MOC processes will need to confirm IM Standard risks are mitigated and are subject to their in-house specialist approval.			
	Clear process shall be in place to confirm when COMPANY TA approval is needed for changes and / or rectification work.			
	MOC shall be approved by COMPANY before work is completed			
8. Emergency Response and Crisis	When working at COMPANY sites, CONTRACTORS will need to be familiar with COMPANY's CM and ER plans. They may also be involved in COMPANY CM and ER training programs and drills as			

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Integrity Management Element	What role do CONTRACTORs play in helping COMPANY comply?	Relevant to this Contract? (Y/N)	Conformance?	Gap?
Management	appropriate.			
	CONTRACTORs operating their own equipment (drilling rigs, vessels, construction equip) on behalf of COMPANY will have CM and ER plans that are compatible with COMPANY's.			
	Document a program to alert COMPANY management and technical authorities of material recalls and materials-related safety alerts and to take necessary actions to mitigate risk.			
	<i>A documented process to account for the location of materials after an emergency Alert Notice is validated.</i>			
9. Incident Investigation and Learning	CONTRACTORs and suppliers shall advise COMPANY of IM Standard-related incidents during the contract/ PO execution and any that may result in a product recall/ rectification program.			
	<i>Suppliers may become involved in investigation of a COMPANY incident or on occasion may be required to conduct their own investigations.</i>			
	<i>After an IM Standard incident related to materials or equipment, assure implementation of mitigations to avoid recurrence.</i>			
10. Performance Management	Maintain external accreditation to quality and environmental standards organizations such as ISO9001/2000 and ISO14001			
	Demonstrate systems and procedures for management review, internal audit, non-conformance identification / close out and preventative action.			
	<i>Put in place meaningful and measurable KPIs to monitor internal and CONTRACTOR/ sub-suppliers integrity management and quality management performance.</i>			
	<i>Suppliers / CONTRACTORs may be required to participate in gathering and reporting metrics on COMPANY Operations or their own.</i>			

Appendix 2 – CONTRACTOR IM REQUIREMENTS

Integrity management is the overall practice of managing the activities associated with the integrity of operations and facilities. The COMPANY IM Standard is a COMPANY global requirements document under the COMPANY Operating Management System (OMS) that enforces rigor around technical accountability, risk management, and adherence to Group Engineering Technical Practices (ETP), Site Technical Practices (STP) and COMPANY Operating procedures. The primary objective of the IM Standard is to ensure that life cycle technical, safety and environmental performance is inherent and maintained in our facilities.

The IM Standard applies to all projects, O&M, drilling, and well activities related to the design, procurement, construction, maintenance, and/or operation of integrity management critical equipment and/or materials.

When COMPANY delegates work activities, accountability still remains with COMPANY, therefore all COMPANY operating units are expected to develop and implement a rigorous assessment process applied throughout design, procurement, construction, maintenance, and operations to assure our facilities are built and managed safely and to comply with the IM Standard. In general, the COMPANY Integrity Management SPA and EA are accountable for assuring the actions specified in this document are carried out. As always with the IM Standard, it is assumed that the Integrity Management SPA and EA may delegate these accountabilities to other staff at the COMPANY Operation.

CONTRACTORS

CONTRACTORS and suppliers play a crucial role in many areas of our operations. The IM Standard is applied as rigorously to CONTRACTORS and suppliers as it is to COMPANY staff. This document provides guidance on application of the IM Standard to CONTRACTORS and suppliers.

For the purposes of this document, the term "CONTRACTOR" is used to describe any third party with the potential to impact IM Standard at a COMPANY facility or operation. The term "CONTRACTOR" will include those vendors traditionally thought of as CONTRACTORS (e.g., Firms that supply labor or services to the facility) and will also include suppliers of equipment, engineering services, and non-COMPANY staff individuals who COMPANY contracts with to do work on COMPANY owned and/or leased facilities. This document does not intend to duplicate all requirements of the IM Standard. This document highlights those activities specifically related to CONTRACTORS and SUBCONTRACTORS.

SUBCONTRACTORS

As CONTRACTORS work with COMPANY Operations to implement the IM Standard, they will inevitably use CONTRACTORS of their own (SUBCONTRACTORS from COMPANY's perspective). The following criteria should apply to the application of the IM Standard to SUBCONTRACTORS

- SUBCONTRACTORS who impact IM Standard at a site/project should be held to the same standards and rigor as direct CONTRACTORS and COMPANY Staff.
- In general, the CONTRACTOR should be accountable for ensuring that their SUBCONTRACTORS understand and effectively implement the IM Standard. CONTRACTORS should therefore be given the flexibility to apply the intent of the IM Standard to their SUBCONTRACTORS in the most efficient manner possible.
- There may be instances where COMPANY chooses to take accountability for application of the IM Standard to SUBCONTRACTORS because of the critical nature of the activity.

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Application of the elements of the IM Standard shall be fit for purpose for the specific CONTRACTOR and work scope. The actions listed below will be reviewed for each CONTRACTOR relationship. COMPANY will prioritize engagement with their CONTRACTORs based on the risk associated with the CONTRACTOR's activity, size of the CONTRACTOR, and scope of the activity.

Element 1 – Accountabilities

- CONTRACTOR shall appoint an equivalent of the Integrity Management SPA to act as a central point of contact for COMPANY on IM Standard related issues and to ensure the CONTRACTOR is meeting the intent of the IM Standard.
- CONTRACTOR shall appoint an equivalent of the EA to monitor correct application of the CONTRACTOR's and/or COMPANY's technical practices and other relevant aspects of the IM Standard.
- The Integrity Management SPA shall ensure that COMPANY's contract with the CONTRACTOR specifies requirements to meet the IM Standard. (see the contract scope of work)

Element 2 – Competence

- CONTRACTOR will have a program in place to ensure competence of their employees. At a minimum the competence program will:
 - o Define the competences required to effectively deliver the IM Standard
 - o Include assessments against the required competences,
 - o Identify and track gaps, and
 - o Include training programs and training records to close any gaps.
- COMPANY shall ensure an audit or monitoring process is implemented to ensure CONTRACTORs are executing their competence program. COMPANY's auditing or monitoring of the CONTRACTOR's program shall not contravene local labor laws. COMPANY will comply with auditing standard ISO19011.
- The Integrity Management SPA shall ensure COMPANY staff have the competence to adequately monitor performance of the CONTRACTOR competence program.
- COMPANY operations will maintain an approved CONTRACTOR list that includes integrity management capabilities in the criteria.
- COMPANY operations will maintain a supplier performance management process that includes integrity management in the assessment criteria.

Element 3 – Hazard Evaluation and Risk Management

- CONTRACTOR shall have internal processes to identify IM Standard hazards that impact their work for COMPANY.
- CONTRACTOR shall have internal processes to manage, document, and communicate risks that could impact integrity management performance.
- Where appropriate, CONTRACTOR shall understand and be able to participate in COMPANY's internal hazard evaluation and risk management programs.
- The Integrity Management SPA shall ensure that a risk management policy exists for the procurement of materials and services that could impact integrity management at the COMPANY Operation.
- The integrity management SPA shall ensure that hazard identification processes (e.g., HAZOPs) identify CONTRACTOR interfaces and activities that could impact integrity management at the COMPANY Operations.

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- The Integrity Management SPA shall ensure that risk mitigation activities exist to manage identified risks. The application of hazard identification processes may be prioritized based on the perceived risk or criticality of the material or service.

Element 4 – Facilities and Process Integrity

- CONTRACTOR shall have in place and be able to demonstrate that systems and procedures exist and are being followed to ensure that design, construction, installation, maintenance, and other activities that could impact IM are fit for purpose and will avoid loss of containment and maintain structural integrity for the life cycle of the equipment, material, or structure.
- CONTRACTORS shall ensure that manufacturing processes are documented, and where necessary, processes and operators are qualified to ensure that design intent and integrity is achieved.
- CONTRACTORS shall demonstrate understanding of and adherence to relevant COMPANY Specifications (e.g., ETP, STP, SOP, and regulatory requirements).
- CONTRACTORS participating in maintenance, inspection, testing, operating, and other procedures that impact IM (onsite and offsite) shall demonstrate they are aware of IM implications relating to their activities.
- The COMPANY Operation EA shall ensure that any CONTRACTOR deviations to ETP or STP are properly vetted and approved.
- The IM Standard SPA shall ensure that any CONTRACTOR deviations to SOP are properly vetted and approved.

Element 5 – Protective Systems

- CONTRACTORS working on protective systems shall follow relevant STP and SOP and other site specific guidelines and practices.
- CONTRACTORS shall follow relevant ETP, STP, and SOP to identify requirements for the design, installation, documentation, testing, certification, inspection, and maintenance of protective systems.
- CONTRACTORS shall ensure that protective systems and/or devices are not bypassed, removed from service, or prevented from working as intended, either permanently or temporarily, without following procedures approved by the COMPANY Operation.
- CONTRACTORS shall ensure that any changes or deviations to protective systems are subject to the COMPANY Operations MOC process.
- CONTRACTORS will identify, verify, and turn over key data for procured materials, equipment, and/or services related to protective systems to comply with COMPANY specifications and regulatory requirements.
- The COMPANY operation EA and Integrity Management SPA shall ensure that all relevant technical practices and procedures related to protective systems are communicated to the CONTRACTOR.

Element 6 – Practices and Procedures

- CONTRACTORS must comply with ETP, STP, SOP, and Statement of Requirements (SOR) relevant to the service, equipment, or material they are providing or provide a deviation request if conflicting or capability issues arise.
- CONTRACTOR internal procedures associated with technical practices and operating procedures shall be consistent with the intent of Element 6 of the IM Standard.
- CONTRACTORS shall demonstrate that an appropriate management of change process exists for their internal practices and procedures.

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- The COMPANY operation Engineering Authority and Integrity Management SPA Standard shall establish which ETP, STP, and SOP apply to the CONTRACTOR.
- The COMPANY operation EA shall ensure appropriate technical review of requisitions and bid documents (PO or contract) occurs to ensure correct interpretation of requirements against identified risks and to ensure award is made to competent CONTRACTORS
- The COMPANY operation shall ensure that appropriate QA/QC programs exist and are documented to verify compliance of materials and equipment to design requirements.
- The COMPANY operation EA and SPA IM shall ensure that a MOC to include risk assessment is conducted for deviations to ETP, STP, and SOP requested by CONTRACTORS.

Element 7 – Management of Change (MOC)

- CONTRACTORS shall utilize and participate as required in the COMPANY operation MOC process.
- CONTRACTORS shall maintain and utilize an internal MOC to mitigate risks that impact IM Standard.
- All COMPANY operation MOC requirements shall be approved by COMPANY before work commences.
- The COMPANY operation shall maintain an MOC process for contract and PO processes to include qualification of new CONTRACTORS.
- The COMPANY operation shall have a process to ensure all COMPANY operations MOC requirements are complete before work commences.

Element 8 – Crisis Management and Emergency Response (CM&ER)

- CONTRACTORS shall be familiar with the COMPANY operation CM&ER plans and shall understand their role in execution of the plan.
- CONTRACTORS operating their own equipment on behalf of COMPANY will have CM&ER plans that are compatible with COMPANY's.
- CONTRACTORS shall maintain a documented program to alert the COMPANY operation of material recalls and materials related safety alerts and will take necessary actions to mitigate risk.
- CONTRACTORS shall maintain a documented process to account for the location of materials after an emergency is validated.
- The COMPANY operation shall ensure the CONTRACTOR's roles in executing the CM&ER plan are understood and clearly communicated.
- The COMPANY operation shall ensure that the CONTRACTOR's people, materials, and processes required to execute the CM&ER plan are ready and tested.

Element 9 – Incident Investigation and Learning

- CONTRACTORS may become involved in investigation of a COMPANY incident or on occasion may be required to conduct their own investigations.
- After an integrity management incident related to materials or equipment, CONTRACTOR shall assure implementation of mitigations to avoid recurrence.
- CONTRACTORS shall advise COMPANY of any integrity management related incidents during the contract/ PO execution and any that may result in a product recall / rectification program.
- COMPANY incident investigation shall include incidents that are related to CONTRACTOR activities or supply.

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- CONTRACTORS shall maintain and execute performance management processes to capture and record integrity management incidents.
- The SPA IM shall ensure that, when appropriate, CONTRACTORS are included in formalized procedures to share results of investigations and to transfer "lessons learned."

Element 10 – Performance Management and Learning

- CONTRACTORS shall demonstrate systems and procedures for management review, internal audit, non-conformance identification / close out and preventative action.
- CONTRACTORS shall put in place meaningful and measurable KPIs to monitor internal and SUBCONTRACTOR / sub-suppliers IM performance
- CONTRACTORS may be required to participate in gathering and reporting metrics on COMPANY operations or their own.
- The COMPANY operation shall put in place meaningful and measurable KPIs to monitor IM performance for CONTRACTORS considered to have an impact on IM performance.
- The COMPANY operations shall implement verification and audit programs to ensure IM requirements are being delivered and that any learning's are fed into the continuous improvement cycle
- The COMPANY operation shall implement suitable corrective / preventative action for CONTRACTORS not performing to the required standard.

**Appendix 3 – ISO 9001 verses COMPANY Integrity Management
System**

Activity	Quality (ISO9001)	IM Standard
Responsibility	Section 5	Element 1
Organization	Section 6	Element 2
Resource, Competence & Awareness	Section 6	Element 2
Policy & Management system	Sections 5.3 & 5.4	Element 6
Planning	Sections 5.4 & 7.3	
Communication	Sections 5.5 & 7.2	
Documents & Records	Section 4	Elements 3,4 & 5
Requirements for the Product	Section 7.2	Element 3
Review	Sections 5.6 & 7.2	
Process, Sequence & Interaction	Section 4	
Process Effectiveness & Measurement	Section 4	Element 10
Design Input, Output, Review, Verification & Validation	Section 7.3	Element 4
Control of Change	Section 7.3.7	Element 7
Purchasing	Section 7.4	Element 4
Production	Section 7.5	Element 4
Criticality Assessment (Risk)	Sections 7.1 & 7.3	Elements 3 & 4
Verification, Validation, Inspection & Test Activities	Sections 7.1 & 7.3	Element 4
Identification & Traceability	Section 7.5.3	
Preservation	Section 7.5.5	
Measurement, Analysis & Improvement	Section 8	Elements 9 & 10

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**Appendix 4 – EXAMPLE: Generic list of Safety Critical Equipment
(Land Rigs)**

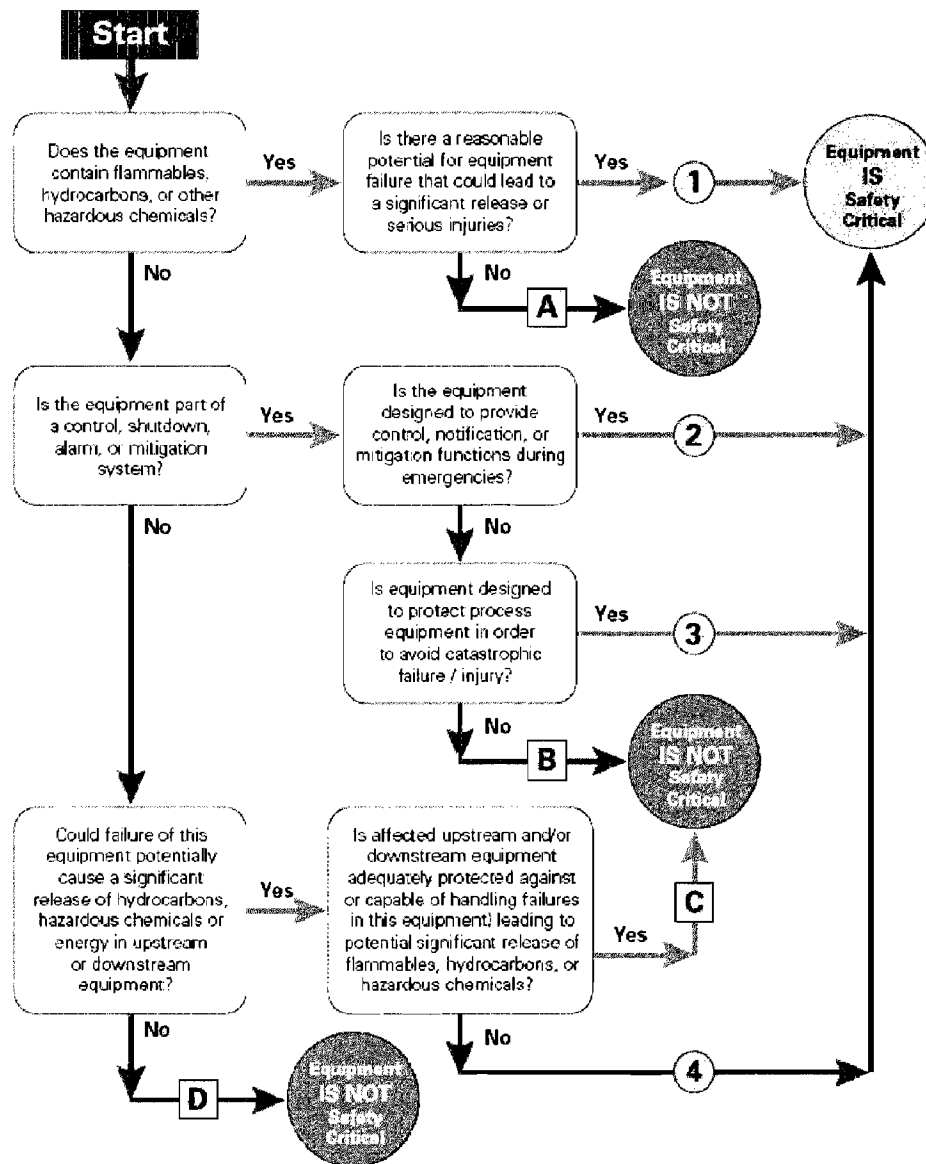
Generic SCE Register
System and Equipment Number and Description

Ref	System or Equipment**	Land Operation	System Tag Number	Equipment Tag Number	System Description	Equipment Description
1.00	Power Generation & Electrical					
1.01	Emergency Generator	N/A				
1.02	UPS	N/A				
1.03	Batteries	ER				
1.04	Cables for Back Up Systems	ER				
1.05	Egress Lighting	N/A				
1.06	Emergency Shut Down Systems	M, ER				
1.07	Hazardous Area Equipment	P, M				
1.08	Rig Call – PAGA	ER				
1.09	Safety Devices on Engines	P, M				
	Safety Devices on Generator					
1.1	Controls	P, M				
	Safety Devices on Electrical					
1.11	Switchboards	P, M				
	Safety Devices on SCR and					
1.12	VFD Systems	P, M				
2.00	Fire & Gas Detection					
2.01	Smoke Detectors	N/A				
2.02	Flame Detectors	N/A				
2.03	Heat Detectors	N/A				
2.04	CH4 Detectors	D				
2.05	H2S Detectors	D				
2.06	Manual Call Point	D				
2.07	Control Panel	D				
3.00	Fire Fighting/Control					
3.01	Fire Pump	N/A				
3.02	Hydrants & Hoses	N/A				
3.03	Fire Extinguishers	M				
3.04	Deluge and sprinkler systems	N/A				
3.05	Passive fire protection	N/A				
4.00	Well Control					
4.01	BOP Annular	P, C, M				
4.02	BOP Rams	P, C, M				
4.03	BOP Hoses	P, C, M				
4.04	HCR Gate Valves	P, C, M				
	IBOPs, other string safety					
4.05	valves	P, C, M				
4.06	Choke & Kill Manifold	P, C, M				
4.07	Mud Gas Separator	P, C, M				

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Ref	System or Equipment**	Land Operation	System Tag Number	Equipment Tag Number	System Description	Equipment Description
4.08	Diverter System	P, C, ER				
4.09	HP Piping (Mud, cement, flare if used for Well Control)	P, C, M, ER				
4.1	BOP Control System	P, C, M				
5.00	Pressure Systems					
5.01	Pressure Vessels (Bulk tanks, air recv.)	P, C				
5.02	Pressure Relief Device (PSVs, rupture disks)	C				
5.03	Pressure Switches	D				
6.00	Hoisting System					
6.01	Zone Management System	N/A				
6.02	Crown Saver	P				
6.03	Drawworks Brake	P				
6.04	Elmagco Brake	P				
12	Critical Load Path Equipment					
12	Pipe Handling (elevators, etc.)	P, C				
12	Traveling Equipment	P, C				
12	Derrick	P, C				
12	Substructure	P, C				
12.1	Draw-works & Controls	P, C				
13	Environmental Impact					
13	Oil Based Mud Containment Systems	C				
13	Oily Water Separator	N/A				
13	Waste Oil Tanks	C				
13	Drains	N/A				
13.1	Flare Lines	C				
14	Emergency Response & Evacuation					
14.1	SCBAs	ER				
14.1	Fire Suits, other PPE	ER				
14.1	Emergency Communication Devices (Radios, PAGA)	ER				
20	Miscellaneous					
20	Cold Start Compressor	M				
20.1	HVAC Pressurization Systems	P				
20.xx	Other items Identified in Risk Assessments	P, C, D, M, ER				
Code	Descriptor					
P	Prevents Major Accident Risk					
C	Controls Major Accident Risk					
D	Detects onset of Major Accident Risk					
M	Mitigates Major Accident Risk					
ER	Provides response measure					

Appendix 5 – EXAMPLE: Safety Critical Equipment Decision Tree



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**Section 6 – Quality Assurance and Quality Control
Halliburton for GOM**

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1.0 SCOPE

This document is a guide to the application of Quality Assurance (QA) and Quality Control (QC) for products and services.

2.0 REFERENCES

International Organization for Standardization (ISO):

- ISO 9000 Quality Management Systems – Fundamentals and vocabulary.
- ISO 9001 Quality Management Systems – Requirements.
- ISO 9004 Quality Management Systems – Guidelines for performance improvement.
- ISO 29001 API Q1.
- ISO 10005 Quality Management Systems – Guidelines for Quality Plans.
- ISO 10006 Quality Management Systems – Guidelines for quality management in projects.
- ISO 19011 Guidelines for quality and/or environmental management systems auditing.
- ISO 13879 Petroleum and natural gas industries – Content and drafting of functional specifications.
- ISO 13880 Petroleum and natural gas industries – Content and drafting of a technical specification.
- ISO 10012 Quality Assurance for measuring equipment – Control of measurement processes.

3.0 TERMS AND DEFINITIONS

The following terms and definitions apply:

3.1 CERTIFICATION

The action of determining, verifying, and attesting in writing to the qualification of personnel, processes, procedures or items in accordance with applicable requirements and standards.

3.2 CRITICALITY RATING

A formalized technique for assessing and measuring the importance of a piece of equipment or material, in regard to the effect that its failure would have on the system or scheme as a whole, and consequently the level of assurance and/or verification to be applied.

3.3 INTEGRITY MANAGEMENT (IM)

The controlled application of major risk, process safety, and engineering management combined with internationally recognized industry standards and COMPANY developed practices.

3.4 PROVISION OF RESOURCES

Type and amount of resources needed for the successful execution of the Quality Plan (QP).

These resources may include materials, human resources, infrastructure and work environment.

3.5 QUALITY ASSURANCE (QA)

Part of quality management focused on providing confidence that quality requirements will be fulfilled. The Quality Assurance process uses Integrity Management, provided by a document-based system of procedures in the attainment of technical integrity in design, procurement, and construction. The procedures are used to set the base technical integrity requirements to be followed by CONTRACTORS. They set the risk based assurance and verifications to be performed by COMPANY during design, procurement and well construction activities.

3.6 QUALITY CONTROL (QC)

Part of quality management focused on verifying quality requirements. CONTRACTOR's certified Quality Assurance and Quality Control systems supplemented by COMPANY's Integrity Management requirements are part of the Technical Integrity Assurance process. These are used as the primary process to assure and verify that the project integrity assurance system and integrity plan requirements have been met, the facility is safe, and meets the required performance standards at an acceptable cost. Quality Control for products and services is part of the verification system used to provide confidence that the required technical integrity has been adhered to. It involves checking that specified requirements have been met, often by using inspection and testing techniques, ensuring that the required technical integrity is achieved.

3.7 QUALITY PLAN (QP)

Document specifying which processes (set of interrelated or interacting activities which transforms inputs into outputs), procedures (specified way to carry out an activity or a process), and associated resources which will be applied by whom and when, to meet the requirement of a specific project, product, process or contract.

Note: Definitions for Quality Assurance, Quality Plan, Provision Resources, and Quality Control are similar to those found in the ISO 9000 series.

3.8 TECHNICAL INTEGRITY

Ensuring equipment and services used in well construction and intervention meet safety/specified requirements, are fit for the intended service, and maintain structural integrity and operational reliability throughout the full lifecycle.

4.0 SYMBOLS AND ABBREVIATIONS

BU	Business Unit
DE	Discipline Engineer
E&P	Exploration & Production
EA	Engineering Authority
FSE	Field Service Engineer
HAZOP	Hazardous Operation
NC	Non-Conformance
NCR	Non-Conformance Report
MOC	Management of Change

PEP	Project Execution Plan
PPM	Pre-Production Meeting
QMS	Quality Management System
RCA	Root Cause Analysis
SOP	Safe Operating Procedure
SOR	Statement of Requirements
SPU	Strategic Performance Unit
TA	Technical Authority
TI	Technical Integrity
TIA	Technical Integrity Assurance

5.0 TIMELINE OF PROCESS

Delivery is assured through the implementation of a comprehensive Quality Management System (QMS) focused on Quality Management (QM) processes including Quality Assurance (QA) and Quality Control (QC) for all activities from design through to operation. The COMPANY QMS is aligned with the Group Integrity Management (IM) standard.

The COMPANY QMS timeline ensures:

5.1 PLAN:

- 5.1.1 Quality objectives are set and delivered (Statement of Requirements (SOR) is issued by COMPANY);
- 5.1.2 Quality management resources are identified and put in place (Quality Plan (QP) is issued by the CONTRACTOR and accepted by COMPANY prior to the commencement of WORK); and
- 5.1.3 Focus on prevention of non-conformity and/or quality/process improvement.

5.2 EXECUTE:

- 5.2.1 A Pre-production meeting is held prior to the commencement of WORK; and
- 5.2.2 Execution by the CONTRACTOR adheres to the accepted QP.

5.3 CHECK:

- 5.3.1 Verification and validation complies with the QP; and
- 5.3.2 Non-conformities are documented through NCR's.

5.4 ACT:

- 5.4.1 NCR's generate RCA's and preventive actions.

6.0 REQUIREMENTS

- 6.1 CONTRACTOR shall have established, implemented and maintained a Quality Management System in compliance with the requirements of ISO 9001 (latest revision) or another recognized or established standard/format as mutually agreed with COMPANY, providing that all aspects of the CONTRACT and WORK which affect the quality of the services supplied are defined, documented, proceduralized (where required) and controlled under the system (including subcontracted services).

- 6.2 CONTRACTOR shall implement and maintain product or service specific Quality Plans that will apply for the duration of the CONTRACT. The Quality Plans shall include:
- 6.2.1 Compliance to the CONTRACTOR's Documentation Systems of the applicable QMS;
 - 6.2.2 A statement of the principle stages of the operation of the WORK, in a trace forward fashion, and that shall include a description of each stage;
 - 6.2.3 A list, for each stage of the WORK, of the applicable documents that defines the Requirements submitted for review and approval by the COMPANY;
 - 6.2.4 A list, for each stage of the WORK, of the verifying document that the completed stage complies with the Requirement;
 - 6.2.5 Provision for the COMPANY to populate Surveillance points for each stage of the WORK, and corresponding to one of the following: Review; Monitor; Witness; or Hold; and
 - 6.2.6 A list of sub-suppliers or SUBCONTRACTORS and the basis for the qualification and competence assessment.
 - 6.2.7 Provision for the COMPANY to review and approve:
 - (a) The SUBCONTRACTORS and/or sub-suppliers;
 - (b) The material and/or construction;
 - (c) The CONTRACTOR's QA systems; and
 - (d) The completed QP prior to the commencement of WORK.
- 6.3 CONTRACTOR shall ensure that all calibrated equipment used in the course of the WORK shall be calibrated and maintained in compliance with ISO 10012.
- 6.4 CONTRACTOR shall allow COMPANY QA auditors full access to the WORK in progress, facilities, personnel, records, and documentation for the purpose of conducting quality audits in compliance with ISO19011.
- 6.5 CONTRACTOR's Quality Plan shall be submitted to COMPANY for approval prior to commencement of the WORK. See 6.2.7(d).
- 6.6 All corrective actions shall comply with ISO 9001 (Chapter 8.5.2) and the report of prevention of reoccurrence shall be submitted to the COMPANY within 30 days of issuance of the CAR.
- 6.7 Corrective actions undertaken by CONTRACTOR as a result of non-conformances being identified during a quality audit or inspection shall be undertaken at no cost to COMPANY.
- 6.8 CONTRACTOR shall compile all necessary documentation in accordance with specified requirements, and such relevant documentation shall be made available to COMPANY and/or the Certifying Authority for validation purposes.
- 6.9 CONTRACTOR shall maintain a document register in compliance with the CONTRACTOR's Document system of the QMS. The document register shall be reviewed by the COMPANY Integrity Assurance Engineer at agreed intervals. Further clarification can be obtained during the PPM.
- 6.10 CONTRACTOR shall comply with the ISO10005 and ISO9001 relating to the Provision of Resources. If the Provision of Resources is not available at the time of the PPM, the gap

Section 6 – Quality Assurance and Quality Control

shall be treated as a deviation and submitted to the COMPANY Integrity Assurance Engineer for review and approval.

- 6.11 CONTRACTOR shall provide a Point of Contact to the COMPANY Integrity Assurance Engineer for all issues relating to the WORK.
- 6.12 Lifting equipment (i.e., equipment baskets, pad eyes, wire rope slings and shackles, etc.) shall have "valid certifications" in accordance with BP Quality Specification requirements. Rigging shall comply with ASME B30.26, slings with B30.9 and hooks with B30.10.
- 6.13 CONTRACTOR shall adhere to the Management of Change procedures as outlined in Appendix 2 of Section 7.
- 6.14 CONTRACTOR shall agree to assist the COMPANY in achieving the maximum effectiveness of the product/ service delivered, in improving the reliability of the equipment/service delivered, and in avoiding unplanned equipment downtime.

**Section 7 – Health, Safety, Security, and Environment
Halliburton for GOM**

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1.0 INTRODUCTION

COMPANY places prime importance on health, safety, security, and environmental ("HSSE") issues and requires that CONTRACTOR and its SUBCONTRACTORS subscribe to and actively pursue the highest standards of HSSE performance. COMPANY's expectations in terms of HSSE are stated in Appendices and references contained herein.

2.0 HSSE MANAGEMENT SYSTEM

- 2.1 CONTRACTOR shall provide COMPANY with a statement on its HSSE policy. The policy shall pay due regard to the responsibilities of individuals, incident reporting, safety meetings and safety training. CONTRACTOR shall also have established arrangements for monitoring this policy.
- 2.2 CONTRACTOR must have in place a formal HSSE management system which demonstrates commitment to continuous improvement and excellence in HSSE issues.
- 2.3 CONTRACTOR's HSSE management system shall be adequately documented, shall be shown to be effective in implementing the aims and objectives of CONTRACTOR's HSSE policy, and shall include provisions for auditing the effectiveness of CONTRACTOR's HSSE management system as applied to the WORK.
- 2.4 CONTRACTOR shall review its HSSE management system at least annually and update it as necessary.
- 2.5 Certain activities pose a higher risk to the safety of personnel, property, and the environment. Higher risk activities will accordingly demand a higher level of HSSE management from CONTRACTOR. The use of a SUBCONTRACTOR involves the importation of higher risk activity; therefore CONTRACTOR shall ensure and demonstrate the appropriate higher level of HSSE management. Each CONTRACTOR will ensure that any SUBCONTRACTOR it employs meets these HSSE requirements.
- 2.6 Risk can vary from location to location and, where the WORK is performed at more than one location, CONTRACTOR may be required to provide different levels of HSSE management for each location.

3.0 COMPATIBILITY TO HSSE MANAGEMENT SYSTEMS

CONTRACTOR shall co-operate with COMPANY to ensure that the roles and responsibilities in CONTRACTOR and COMPANY systems are clearly defined and allocated and are clearly understood by all parties. Where appropriate, an interface document shall incorporate any specific requirements relevant to the WORKSITE or platform on which CONTRACTOR will perform the WORK.

4.0 COMPLIANCE

- 4.1 CONTRACTOR shall observe and comply with all relevant and current applicable statutory requirements, approved codes of practice, and industry guidance on HSSE matters.
- 4.2 CONTRACTOR shall observe and comply with all relevant and current COMPANY standards and expectations on HSSE matters and which are described in Clause 31 of Section 2- General Conditions of Contract.

5.0 COMPETENCE ASSURANCE

- 5.1 CONTRACTOR shall have in place a competence assurance system for its personnel, the scope of which will cover as a minimum:
 - 5.1.1 All trade/discipline skills employed in the performance of the WORK;
 - 5.1.2 Understanding of safe working practices including, without limitation, communications, permit-to-work systems, and risk assessment (including risk to the environment); and
 - 5.1.3 A means of confirmation that the system is effective and verification that all personnel are covered and have been assessed for competence.
- 5.2 COMPANY has the right to object to and require CONTRACTOR to remove from the performance of the WORK any personnel who, in the opinion of COMPANY, misconduct themselves or are incompetent or negligent in the proper performance of their duties and such personnel shall not be employed again in the WORK or any other WORK of COMPANY without COMPANY's approval.

6.0 REPORTING

- 6.1 CONTRACTOR shall submit a formal report quarterly which summarizes CONTRACTOR's and SUBCONTRACTOR's HSSE performance in the preceding reporting period with regard to WORK performed on behalf of COMPANY. This report shall detail the following unless otherwise mutually agreed:
 - 6.1.1 Performance against agreed/planned HSSE targets;
 - 6.1.2 All Occupational Safety and Health Administration (OSHA) recordable injuries;
 - 6.1.3 All other accidents, spills or other unplanned discharges which either result in, or have potential for, significant injury/damage/loss or are reportable to a statutory authority;
 - 6.1.4 All near miss incidents which have potential for injury/damage/loss;
 - 6.1.5 The issue or proposed issue of an Improvement or Prohibition Notice, notice of intended prosecution or other legal process;
 - 6.1.6 Any other event reportable to a statutory authority;
 - 6.1.7 A summary of monitoring activity, reviews, inspections and audits;
 - 6.1.8 A summary of the status of any remedial actions; and
 - 6.1.9 Estimated total working hours for CONTRACTOR GROUP personnel on the WORKSITE.
- 6.2 Notwithstanding the provision of a report, CONTRACTOR shall follow the requirements of COMPANY's accident and incident reporting and investigation procedures as mutually agreed.

7.0 MEDICALS, TRAINING, AND PROTECTIVE CLOTHING

- 7.1 All personnel proposed by CONTRACTOR GROUP for the WORK shall be as medically fit for duty in accordance with the applicable statutory requirements.
- 7.2 All personnel proposed by CONTRACTOR GROUP shall have successfully attended fire fighting and refresher courses as necessary in accordance with applicable statutory requirements at a recognized and approved training centre.
- 7.3 CONTRACTOR shall, at its own expense, provide its personnel with all necessary protective clothing and equipment suitable for the working conditions. Such clothing/equipment shall be in accordance with applicable statutory requirements.

8.0 WORKING CONDITIONS

- 8.1 CONTRACTOR shall ensure that all personnel provided by CONTRACTOR GROUP on the WORK shall keep all places of work as clean and tidy as is reasonably practicable under the circumstances, to minimize the risk of causing injury to persons, damage to property or delays in providing the WORK.
- 8.2 On completion of the WORK, CONTRACTOR shall, without delay, clear away and remove from the WORKSITE all surplus materials and equipment and leave all areas in a clean and tidy condition to the satisfaction of COMPANY REPRESENTATIVE.

9.0 PORTABLE AND TRANSPORTABLE EQUIPMENT

- 9.1 CONTRACTOR shall observe and comply with COMPANY's procedures with regard to the selection, deployment, operation, and maintenance of equipment except where CONTRACTOR procedures are fully documented and applicable.
- 9.2 CONTRACTOR is responsible for ensuring that all equipment is operated in accordance with safe working practices.
- 9.3 Location of equipment at the WORKSITE shall be agreed in advance with COMPANY REPRESENTATIVE.

10.0 HSSE PLAN

- 10.1 CONTRACTOR shall prepare a plan for the management of all aspects of the WORK, known as the "HSSE Plan". The HSSE Plan shall address the requirements of these HSSE provisions, including the requirements of the HSSE management system and the SMS (Safety Management System) and EMS (Environmental Management System) interface document where appropriate. The HSSE Plan shall be submitted to COMPANY REPRESENTATIVE for review and endorsement in a time frame as agreed with COMPANY.
- 10.2 CONTRACTOR shall develop and agree with COMPANY REPRESENTATIVE, performance measures that indicate that the HSSE Plan is being implemented.
- 10.3 The HSSE Plan shall form part of the CONTRACT. It shall be reviewed at least annually and updated as necessary to incorporate any changes to the WORK and/or CONTRACT.

- 10.4 The HSSE Plan shall address identification of HSSE risks associated with the WORK and definition of methods of controlling those risks to an acceptable level.
- 10.5 The HSSE Plan shall include details of the proposed method of auditing the effectiveness of CONTRACTOR's HSSE management system as applied to the WORK.

11.0 HSSE PERFORMANCE STANDARDS

- 11.1 When working at a WORKSITE owned or controlled by COMPANY, all personnel provided by CONTRACTOR GROUP shall comply with all current and relevant COMPANY HSSE practices as they relate to the WORK. At other WORKSITES, CONTRACTOR and COMPANY shall agree which of COMPANY's HSSE practices are appropriate to the WORK and will be addressed in the SMS and EMS interface document. Where necessary and appropriate, CONTRACTOR shall seek advice from COMPANY on the interpretation of COMPANY's HSSE practices.
- 11.2 CONTRACTOR shall, where appropriate, refer to COMPANY's "Getting HSSE Right" and associated HSSE standards as a guide in the management of technical integrity as relevant to the WORK.

12.0 WASTE DISPOSAL AND ENVIRONMENTAL SAFEGUARDS

In the performance of the WORK, CONTRACTOR shall at all times:

- 12.1 Observe and comply with all laws and regulations concerning the production, carrying, keeping, treating and/or disposal of waste;
- 12.2 Act to minimize the quantity of wastes;
- 12.3 Be responsible for and ensure the environmentally acceptable handling, storage, treatment, transportation, and disposal of its own wastes, in accordance with above guidelines, except when otherwise agreed to be handled and disposed of by COMPANY; and
- 12.4 If required by law, CONTRACTOR shall register as a Registered Waste Broker or a Licensed Waste Manager.

13.0 REFERENCE DOCUMENTS

In the performance of the WORK, CONTRACTOR shall refer to and observe the following HSSE reference documents attached hereto:

- BP HSSE Expectations – Getting HSSE "Right"
- BP's Golden Rules for Safety
- Scope specific HSSE Reference Documents
- Location specific HSSE Policies and requirements

APPENDIX 1 – BP's HSSE EXPECTATIONS – GETTING HSSE RIGHT

BP's HSSE Expectations comprises 13 primary Units as highlighted below

Leadership and Accountability

People at all levels in the BP organization are responsible for leading and engaging the workforce in meeting our health, safety, technical integrity and environmental goals and objectives. Leaders will be held accountable for accomplishing this by demonstrating correct HSSE behaviors, by clearly defining HSSE roles and responsibilities, by providing needed resources, and by measuring, reviewing, and continuously improving our HSSE performance.

Expectations:

- Leaders model positive HSSE behaviors by personal example both on and off the job, and reinforce and reward positive behaviors.
- Leaders engage in clear, two-way communication with employees, contractors and others on HSSE issues.
- Leaders integrate the HSSE Expectations into business planning and decision making processes, ensuring that documented systems are in place to deliver these Expectations.
- Leaders establish clear HSSE goals and objectives, roles and responsibilities, performance measures and allocate competent resources and, where necessary, specialist expertise.
- HSSE Management systems are developed, documented, implemented, and supported throughout the organization. These address health, safety, technical integrity, environmental, security, product and operational risks in accordance with the appropriate Expectations.
- Leaders HSSE performance is assessed against their annual objectives, based on feedback from line management, peers, and others in the Business Unit.
- Leaders integrate Group HSSE targets into their business activities. *(These include, for example, external verifications, climate change, sustainable development, biodiversity, and emissions reductions.)*
- Leaders promote the sharing of HSSE lessons learned inside and outside their Business Unit.

Risk Assessment and Management

Management of risk is a continuous process and the cornerstone of all the HSSE Elements. We will regularly identify the hazards and assess the risks associated with our activities. We will take appropriate action to manage the risks and hence prevent or reduce the impact of potential accidents or incidents.

Expectations:

- Leaders put into place and promote the use of processes to identify hazards associated with BP's activities, assess risks, control the hazards, and manage the risks to acceptable levels.
- Potential hazards and risks to personnel, facilities, the public, customers and the environment are assessed for existing operations, products, business developments, acquisitions, modifications, new projects, closures, divestments and decommissionings.
- Assessed risks are addressed by levels of management appropriate to the nature and magnitude of the risk. Decisions are clearly documented and resulting actions implemented through local procedures.
- Risk assessments and risk management/control measures are referenced in project approval documentation.
- Risk assessments are updated at specified intervals and as changes are planned.

People, Training and Behaviors

People's behavior is critical to BP's success; therefore, our workforce will be carefully selected and trained, and their skills and competencies regularly assessed.

Expectations:

- Employees and contractors practice, encourage, and reinforce safe, healthy, and environmentally sound behaviors.
- HSSE roles, responsibilities, and accountabilities are developed and used to define individual performance targets. These are documented, and feedback on personal performance is provided.
- Recruitment, selection, and placement processes ensure that personnel are qualified, competent, and physically and mentally fit for their assigned tasks.
- BP's workforce has the required skills and training to competently perform their tasks in a healthy, safe, and environmentally sound manner. Training is evaluated to determine its effectiveness.
- With employees' involvement, physical, chemical, biological, ergonomic and psychological health hazards are identified and the risks managed in the workplace.
- Each worksite has access to an appropriate level of medical support and to resources/facilities that promote health and wellness.
- A program is in place to ensure that the performance of our workforce and others on our premises is not impaired by drugs or alcohol.
- New or transferred employees, contractors and other visiting personnel undergo appropriate site orientation/induction training which covers HSSE rules and emergency procedures.

Working with Contractors and Others

Contractors, suppliers and others are key to our Group business performance and we will assess their capabilities and competencies to perform work on our behalf. We will work together with them to ensure our HSSE Expectations are aligned. We will monitor contractors' and partners' performance and ensure our procurement processes contain the rigor to deliver our Expectations.

Expectations:

- Pre-qualification, selection and retention criteria are established for work performed by contractors, suppliers, and others, including a system for assuring their compliance.
- Hazards and risks associated with contractor and procurement activities in our businesses are identified, managed, and communicated.
- Interfaces between BP and suppliers of services and products are identified and effectively managed.
- Clear deliverables and performance standards are agreed to and systems are put in place to assure HSSE and technical compliance.
- Purchased products and services are, where possible, verified as meeting national/international health, safety, and environmental standards.
- Joint venture and alliance partners have HSSE management systems that are aligned with those of BP, meet legal

Section 7 – Health, Safety, Security and Environment

Appendix 1 – BP's HSSE Expectations "Getting HSSE Right"

compliance requirements and satisfy the Group's Expectations and targets.

Facilities Design and Construction

New facilities and modifications to existing facilities will be designed, procured, constructed, and commissioned to enable safe, secure, healthy, and environmentally sound performance throughout their operational life, by using recognized standards, procedures, and management systems.

Expectations:

- Baseline technical, environmental and health data are collected before the development of any new operation, facility, or major modification.
- Facilities are designed and constructed using technology which balances commercial risks and financial benefits to manage technical risk and minimize or eliminate emissions, discharges, impacts on biodiversity, and other environmental impacts.
- Project management systems and procedures addressing technical integrity and HSSE accountabilities are documented and well understood. Design, procurement, and construction standards are formally approved by the designated technical/engineering authority. Formal design review, verification, and validation studies are carried out based on risk assessment.
- Operational, maintenance and HSSE expertise are integrated early in the project/design stage. Experience from previous projects and current operations are applied.
- Potential hazards are identified and HSSE risks assessed using appropriate risk assessment tools (e.g. quantified risk assessments, HAZOPS, and HSSE reviews) at specific stages of a project from concept through to start-up, and risks are mitigated through risk management techniques.
- Deviations from design standards are identified and managed at an appropriate level, with the reasons documented and retained.
- Local regulatory requirements are met or exceeded. Where these are absent or inadequate, standards are set that protect people and the environment.
- Quality assurance and inspection systems are in place to ensure that facilities meet design and procurement specifications and that construction is in accordance with approved standards.
- Documented pre-startup reviews are carried out for all newly installed or modified equipment to confirm that construction is in accordance with design, all required verification testing is complete and acceptable, and all recommendations/deviations are closed and approved by the designated technical authority.

Operations and Maintenance

Facilities will be operated and maintained within the current design envelope to ensure safe, secure, healthy, and environmentally sound performance.

Expectations:

- Post-startup reviews are carried out for all newly installed or modified equipment to confirm that construction is in accordance with design, all required verification testing is complete and acceptable, and all recommendations/deviations are closed and approved by the designated technical authority.
- Applicable regulatory requirements are met or exceeded and operational/technical/mechanical integrity is maintained by use of clearly defined and documented operational, maintenance, inspection, and corrosion control systems.
- Key operating parameters are established and regularly monitored. The workforce understands their roles and responsibilities to maintain operations within these parameters.
- Clearly defined start-up, operating, maintenance, and shutdown procedures are in place with designated authorities identified (e.g. permit to work, hand-over, equipment and process isolation, etc).
- Equipment that has been out of service for maintenance or modification is subject to documented inspection and testing prior to use.
- Reliability and availability of protective systems are maintained by appropriate testing and maintenance programs, including management of temporary disarming or deactivation.

- Risks introduced by simultaneous operations are assessed and managed.
- HSSE impacts associated with waste, emissions, noise, biodiversity and energy use are monitored and minimized.
- Comprehensive waste management programs are in place to ensure that wastes are minimized, re-used, recycled, or properly disposed of.
- Decommissioning, remediation, and restoration plans are established using risk-based studies for end of life of equipment/facilities.
- A quality assurance programme exists to ensure that equipment replacement or modification maintains operations integrity.

Management of Change

All temporary and permanent changes to organization, personnel, systems, procedures, equipment, products, materials, or substances will be evaluated and managed to ensure that health, safety and environmental risks arising from these changes remain at an acceptable level. We will comply with changes to laws and regulations and take account of new scientific evidence relating to HSSE effects.

Expectations:

- The health, safety, security, environmental, technical, and other impacts of temporary and permanent changes are formally assessed, managed, documented, and approved.
- Changes in legal and regulatory requirements, technical codes, and knowledge of health and environmental effects, are tracked and appropriate changes implemented.
- Effects of change on the workforce/organization, including training requirements, are assessed and managed.
- The impact on product quality of changes in manufacturing processes is assessed, associated hazards are evaluated, and risks are controlled.
- The original scope and duration of temporary changes are not exceeded without review and approval.

Information and Documentation

We will maintain accurate information on our operations and products. It will be held securely yet readily available.

Expectations:

- A system is in place to securely manage drawings, design data, and other documentation including definition of responsibilities for maintaining this information.
- Applicable regulations, permits, codes, standards, and practices are identified. The resultant operating requirements are documented and communicated to the workforce.
- Pertinent records are maintained, available and retained as necessary. Obsolete documentation is identified and removed from circulation.
- Scope and format of technical documentation will be agreed for each facility and will form part of the design input for new facilities and modifications.
- Employee health, medical and occupational exposure records are maintained with appropriate confidentiality and retained as necessary.

Customers and Products

Section 7 – Health, Safety, Security and Environment

Appendix 1 – BP's HSSE Expectations "Getting HSSE Right"

We will assess, manage, and communicate the hazards associated with BP's products. We will communicate up-to-date information to help users and others handle our products in a safe and environmentally responsible manner.

Expectations:

- Assessments are conducted for new products prior to marketing or distribution, to identify health, safety and environmental hazards and risks associated with normal use and foreseeable misuse.
- Periodic reassessments are conducted for all manufactured and re-branded products and intermediate streams. This includes a review of adverse effects reported or experienced by those handling these products.
- New uses or markets for existing products are evaluated to ensure that health, safety and environmental hazards and risks are identified and addressed.
- Records of assessment, background information, and conclusions are kept up-to-date throughout the product's life and retained as appropriate.
- Up-to-date information on health, safety and environmental hazards and risks relating to the use, storage, handling, transport, and disposal of our products is available to the workforce, customers and others. Material Safety Data Sheets (MSDS), labels and other information are developed and issued to handlers and users in accordance with legislative and customer requirements, and as information changes.
- A system exists to collect and review adverse effects reported or experienced by those handling our products. Causes for concern are identified and actions are taken.
- An effective recall system exists for products where a defect could give rise to health, safety, or environmental hazards.
- A system is in place to respond on a 24-hour basis to emergency requests for product health, safety, and environmental information.

Community and Stakeholder Awareness

We value the importance of community awareness and will actively engage in dialogue with various stakeholders to maintain public confidence in the integrity of our operations and products and our Commitment to HSSE Performance.

Expectations:

- Open and proactive communications are established and maintained with employees, contractors, regulatory agencies, public organizations, and communities regarding the HSSE aspects of our business.
- BP recognizes and responds to government and community HSSE related Expectations and concerns about our operations and our products.
- HSSE impacts of new business development on local communities are openly assessed, communicated, and integrated into the business case.
- HSSE impacts of any divestment or decommissioning on existing operations, neighbors, or local community (originally identified during the new business development stage) are reviewed, communicated, and managed.
- Major business operations periodically issue an externally verified statement relating to HSSE performance and programs.

Crisis and Emergency Management

Emergency management plans will be maintained to cover all of our facilities, locations, and products. These plans will identify equipment, training, and personnel necessary to protect the workforce, customers, public, environment, and BP's reputation in the event of an incident.

Expectations:

- Emergency management plans are based on the risks that potentially impact the business. These plans are documented, accessible, clearly communicated, and align to the BP Group's emergency management system.

- Equipment, facilities, and personnel needed for emergency response are identified, tested and available.
- Personnel are trained and understand emergency plans, their roles and responsibilities, and the use of crisis management tools and resources.
- Drills and exercises are conducted to assess and improve emergency response/crisis management capabilities, including liaison with and involvement of external organizations.
- Periodic updates of plans and training are used to incorporate lessons learned from previous incidents and exercises.

Incidents Analysis and Prevention

Incidents will be reported, investigated, and analyzed to prevent recurrence and improve our performance. Our investigations will focus on root causes and/or system failures. Corrective actions and preventive measures will be utilized to reduce future injuries and losses.

Expectations:

- All health, safety, technical integrity, security, and environmental incidents, including near misses, are openly reported, investigated, analyzed, and documented.
- Major incidents are investigated by a multi-function/level team with participation and leadership from outside the Business Unit.
- Incident investigations, including identification of root causes and preventive actions, are documented and closed-out.
- Information gathered from incident investigations is analyzed to identify and monitor trends and develop prevention programs.
- Lessons learned from investigations are shared across BP and personnel take appropriate action upon receipt of such information.
- Mutual sharing of lessons learned and good practice is encouraged within the wider energy and chemical industry.

Assessment, Assurance and Improvement

We will periodically assess the implementation of and compliance with these Expectations to assure ourselves and stakeholders that management processes are in place and working effectively. This will involve both internal self-assessments, and appropriate external assessments. We will use this information to improve our performance and processes.

Expectations:

- HSSE performance indicators (both inputs and outcomes) are established, communicated, and understood throughout the organization.
- The workforce is actively involved in periodic self-assessments of the effectiveness of processes and procedures to meet the HSSE Expectations.
- HSSE performance indicators are regularly used to determine when and what management system changes are necessary. When changes occur in one HSSE Element the impact on the entire management system is evaluated.
- A system exists to continually improve HSSE behaviors through observation, recording and coaching.
- A documented, risk-based audit programme exists to periodically evaluate progress towards HSSE targets, regulatory compliance, and the effectiveness of the Business Unit management system(s).
- The Business Unit in co-operation with the audit team, plans audits, which are objective and systematic. These are documented and conducted using expertise from inside and outside the unit.
- Findings from learning processes (e.g. audits, incident investigations, near misses, HAZOPS, etc.) are prioritized, tracked and used to systematically improve the HSSE management system.

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Appendix 1 – BP's HSSE Expectations "Getting HSSE Right"

- The Business Unit leadership team reviews the management system to ensure it is continually delivering consistent, desired performance. Based on the review, new risk-based targets are considered and established wherever necessary.
- Business Units report HSSE performance data, as part of the Group's HSSE Reporting Requirements.
- A process is in place whereby assurance is regularly provided to the Group Chief Executive demonstrating effective implementation of the BP HSSE Commitment and Expectations. Annual self-assessments against these Expectations are carried out by each Business Unit, along with external audits at least every three years.

APPENDIX 2 – THE GOLDEN RULES FOR SAFETY

COMPANY's safety policy states no harm to people and no accidents. Everyone who works for or on behalf of COMPANY is responsible for their safety and the safety of those around them.

The following safety rules will be strictly enforced to ensure the safety of our people and our communities.

COMPANY's senior leadership are accountable for communicating, training, implementing, and auditing these rules to assure compliance and performance.

Although embedded in each of these rules, it is important to emphasize that:

- *Work will not be conducted without a pre-job risk assessment and a safety discussion appropriate for the level of risk.*
- *All persons will be trained and competent in the work they conduct.*
- *Personal protection equipment will be worn as per risk assessment and minimum site requirements.*
- *Emergency response plans, developed from a review of potential emergency scenarios, will be in place before commencement of work.*
- *Everyone has an obligation to stop work that is unsafe*

*Are you trained and competent to perform this work?
You have an obligation to stop the work if it's unsafe.*

1.0 PERMIT TO WORK

Before conducting work that involves confined space entry, work on energy systems, and ground disturbance in locations where buried hazards may exist, or hot work in potentially explosive environments, a permit must be obtained that:

- defines scope of work
- identifies hazards and assesses risks
- establishes control measures to eliminate or mitigate hazards
- links the work to other associated work permits or simultaneous operations
- is authorized by the responsible person(s)
- communicates above information to all involved in the work
- ensures adequate control over the return to normal operations

2.0 ENERGY ISOLATION

Any isolation of energy systems; mechanical, electrical, process, hydraulic and others, cannot proceed unless:

- the method of isolation and discharge of stored energy are agreed and executed by a competent person(s)
- any stored energy is discharged
- a system of locks and tags is utilized at isolation points
- a test is conducted to ensure the isolation is effective
- isolation effectiveness is periodically monitored

3.0 GROUND DISTURBANCE

Work that involves a manmade cut, cavity, trench, or depression in the earth's surface formed by earth removal cannot proceed unless:

- a hazard assessment of the work site is completed by the competent person(s)
- all underground hazards, i.e., pipelines, electric cables, etc., have been identified, located and if necessary, isolated

4.0 WHERE PERSONS ARE TO ENTER AN EXCAVATION

A confined space entry permit shall be issued if the entry meets the confined space definition ground movement is controlled and collapse is prevented by systematically shoring, sloping, benching, etc., as appropriate ground and environmental conditions are continuously monitored for change.

5.0 CONFINED SPACE ENTRY

Entry into any confined space cannot proceed unless:

- all other options have been ruled out
- permit is issued with authorization by a responsible person(s)
- permit is communicated to all affected personnel and posted, as required

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Appendix 2 – BP Golden Rules

- all persons involved are competent to do the work
- all sources of energy affecting the space have been isolated
- testing of atmospheres is conducted, verified and repeated as often as defined by the risk assessment
- stand-by person is stationed
- unauthorized entry is prevented

6.0 WORKING AT HEIGHTS

Working at heights of 2 meters (6 feet) or higher above the ground cannot proceed unless: a fixed platform is used with guard or hand rails, verified by a competent person(s) or fall arrest equipment is used that is capable of supporting at least a 2275 kg (5000 lbs) static load per person and has:

- a proper anchor mounted, preferably overhead
- full body harness using double latch self locking snap hooks at each connection
- synthetic fiber lanyards
- shock absorber
- fall arrest equipment will limit free fall to 2 meters (6 feet) or less
- A visual inspection of the fall arrest equipment and system is completed and any equipment that is damaged or has been activated is taken out of service.
- person(s) are competent to perform the work

7.0 LIFTING OPERATIONS

Lifts utilizing cranes, hoists, or other mechanical lifting devices will not commence unless:

- an assessment of the lift has been completed and the lift method and equipment has been determined by a competent person(s)
- operators of powered, lifting devices are trained and certified for that equipment
- rigging of the load is carried out by a competent person(s)
- lifting devices and equipment has been certified for use within the last 12 months (at a minimum)
- load does not exceed dynamic and/or static capacities of the lifting equipment
- any safety devices installed on lifting equipment are operational
- all lifting devices and equipment have been visually examined before each lift by a competent person(s)

8.0 DRIVING SAFETY

All categories of vehicle, including self-propelled mobile plant, must not be operated unless:

- the vehicle is fit for purpose, inspected and confirmed to be in safe working order,
- number of passenger does not exceed manufacturer's design specification for the vehicle,
- loads are secure and do not exceed manufacture's design specifications or legal limits for the vehicle,
- seat belts are installed and worn by all occupants,
- safety helmets are worn by riders and passengers of motorcycles, bicycles, quads, snow-mobiles and similar types of vehicle.
- Drivers must not be authorized to operate the vehicle unless:
 - they are trained, certified and medically fit to operate the class of vehicle
 - they are not under the influence of alcohol or drugs, and are not suffering from fatigue

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- they do not use hand-held cell/mobile phones and radios while driving (best practice is to switch off all phones and two-way radios when driving)

9.0 MANAGEMENT OF CHANGE

Work arising from temporary and permanent changes to organization, personnel, systems, process, procedures, equipment, products, materials or substances, and laws and regulations cannot proceed unless a Management of Change process is completed, where applicable, to include:

- a risk assessment conducted by all impacted by the change
- development of a work plan that clearly specifies the timescale for the change and any control measures to be implemented regarding:
 - equipment, facilities and process
 - operations, maintenance, inspection procedures
 - training, personnel and communication
 - documentation
- authorization of the work plan by the responsible person(s) through completion

APPENDIX 3 – SUBSTANCE ABUSE POLICY (USA)

COMPANY has a strong commitment to provide a safe work place for its employees and other persons working or visiting on its premises and working on its projects. In order to assist in maintaining a safe working environment, and to protect COMPANY property, this Policy concerning substance abuse is established.

CONTRACTORS, SUBCONTRACTORS, and vendors who perform labor or services on COMPANY WORKSITES or premises, on COMPANY Projects, or on whose premises COMPANY employees spend substantial time, must have and administer a formal substance abuse interdiction policy. CONTRACTOR's policy, at a minimum, must include substance testing of CONTRACTOR's employees entering COMPANY WORKSITES or premises or working on COMPANY Projects, consistent with the terms of this Policy.

For the purpose of this Policy, a "COMPANY Project" refers to any work performed under the Section 3 - "Scope of Work" provision of the applicable contract between COMPANY and CONTRACTOR.

The failure of a CONTRACTOR to comply with the provisions of this policy constitutes cause for termination subject to the provisions of this CONTRACT.

SECTION I – POLICY STATEMENT

The use, possession, concealment, transportation, promotion, or sale of the following substances is strictly prohibited on COMPANY premises, including all property owned, operated, leased by, or under the control of COMPANY, as well as on the location of any authorized COMPANY Project, regardless of the physical location where such work is performed.¹

- Prohibited substances are defined as: (a) any alcoholic beverage, the use of which is not authorized by the COMPANY, (b) any substance that an individual may not sell, possess, use, or distribute under the laws of the state in which the individual is employed or is working, and (c) any otherwise legal but illicitly-used substances.
- "Otherwise legal but illicitly-used substances" include (a) prescription drugs obtained without proper medical authorization, and (b) prescribed drugs, over-the-counter drugs, and other substances not being used for their intended purposes or at intended dosage.
- Drug paraphernalia and similar items used for substance abuse are likewise prohibited on COMPANY premises.

CONTRACTORS shall submit a copy of their policy and program to the COMPANY employee designated to administer contracts, or to such other individual as may hereafter be designated by COMPANY. Such policy must provide for substance testing of employees, and must meet the minimum standards as set forth in Section II below. COMPANY reserves the right to prohibit solicitation of bids from, deny entry to COMPANY premises to, or cancel any project, or portion thereof, with, any CONTRACTOR that fails to present a written policy that meets COMPANY's minimum standards, or that fails to administer an acceptable policy.

¹ In many contracts, COMPANY reserves the right to remove a CONTRACTOR's employees for any reason. In no way does this policy detract from that right.

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Any CONTRACTOR employee found to be in violation of this Policy shall, thereafter, be prohibited from entering COMPANY premises and prohibited from working on any COMPANY Project. Reinstatement of the access privilege may be made after one year upon request of the employing CONTRACTOR. Such requests will be evaluated on the merits of each case. A request will be granted only upon receipt of evidence that the employee successfully passed a substance screen conducted within not more than thirty (30) days prior to the date of the request, successfully completed an assessment by a Substance Abuse Professional ("SAP") and complied with all recommended treatment or rehabilitation prescribed by the SAP.

SECTION II – TESTING

A. DEFINITIONS

For the purpose of this policy:

1. "Substance testing" means the analysis of urine, saliva, or breath; however, at times circumstances may warrant additional testing methods.
2. "Chain of custody" means the combination of procedures and documentation that provides a faithful and accurate written record of the custody of a biological specimen, from time of initial collection of a specimen, to final laboratory analysis.
3. "Negative test result" means a laboratory conclusion that the presence of a substance was not detected in a specimen at or above the screening and confirmation levels utilized.
4. "Screened positive result" means that an EMIT analysis has revealed one or more substances present at or above screening cut-off level.
5. "Presumptive positive result" means a laboratory conclusion that a specimen was found to contain the presence of a substance based on one or more analytical procedures, one of which must be gas chromatography/mass spectrometry (GC/MS).
6. "Confirmed positive result" means a laboratory presumptive positive result that has been confirmed as a positive substance test by a Medical Review Officer (MRO)

B. LABORATORY AND SAMPLING STANDARDS

1. Testing for the following substances, at the indicated screening and confirmation cutoffs, are recommended:

<u>Drug</u>	<u>EMIT Screen</u>	<u>Confirmation Levels</u>
Amphetamines	1000 ng	500 ng
Marijuana	50 ng	15 ng
Cocaine	300 ng	150 ng
Opiates	2000 ng	2000 ng
PCP	25 ng	25 ng
Alcohol	.02 BAC	.02 BAC

CONTRACTORs subject to DOT testing should abide by appropriate levels.

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2. The specimens of applicants and current employees will be tested using an enzyme immunoassay (such as EMIT) and/or a radioimmunoassay. (Approved on-site testing is permissible.) In this testing scheme, a positive finding is called a screened positive. All screened positives will be further tested using GC/MS. In this testing scheme, a positive finding is called a presumptive positive. All presumptive positives will undergo MRO review.
3. Alcohol screening testing may include utilization of either breath or saliva testing. Tests, which are screened positive, will undergo confirmation via the use of an evidential-quality breathalyzer for confirmation of positive alcohol test results. MRO review is not required for positive alcohol test results, unless otherwise required by applicable local, state, or federal law

C. CONFIDENTIALITY

When a CONTRACTOR conducts drug testing of its employees in order to establish eligibility to enter COMPANY premises or work on COMPANY Projects, such substance testing results that are positive will not be individually disclosed to COMPANY. COMPANY will require, however, that CONTRACTORs certify that each employee assigned to work on COMPANY premises or on COMPANY Projects has passed a substance test that meets the standards of this Policy. CONTRACTORs must maintain records related to substance tests under this Policy, which are subject to audit by COMPANY as further set forth in Sections IV and VI of this Policy.

The results of reasonable suspicion or accident/incident investigation substance tests performed by a CONTRACTOR on its employees assigned to work on COMPANY premises or projects must be disclosed to local COMPANY management upon request, unless prohibited by federal, state, or local law.

D. TESTING

1. CONTRACTORs will conduct substance testing in these situations:
 - a. before any CONTRACTOR employee may enter COMPANY premises or perform work in any COMPANY Project for the first time.
 - b. annual random drug testing of at least 25% of CONTRACTOR's workforce engaged in work on COMPANY premises and on any COMPANY Project; this requirement will be met if CONTRACTOR covers the applicable employees under a larger drug testing pool that is subject to annual testing of at least 25% of the pool population.
 - c. upon reasonable suspicion by CONTRACTOR or COMPANY that a CONTRACTOR employee on COMPANY premises, or working on a COMPANY Project, is under the influence of, or has consumed any substance or item prohibited by this policy.
 - d. when designated by COMPANY management, immediately following any incident that results in a recordable bodily injury as defined by OSHA, or damage to COMPANY or CONTRACTOR-owned property. Additionally, any substance testing, following an incident requiring DOT substance testing as regulated and described by DOT (FHA, RSPA, and USCG), must be strictly adhered to. (Note: Substance testing may also be required by CONTRACTOR or COMPANY following a near-miss incident. A near-miss incident is any incident which, if it had proceeded to a reasonably possible and more serious level of development, would have had the potential for personnel injuries, property damage, or serious liability claims).

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2. CONTRACTORS will assume all costs associated with testing.
3. The refusal of a CONTRACTOR's employee to sign a consent form or submit to any testing required by this Policy will result in revocation of the person's access privileges. A refusal to test shall include a failure to cooperate with any part of the testing process, including: (1) failing to remain until the process is completed; (2) failing to provide a sufficient or adequate specimen (without medical explanation); (3) failing to appear for testing (including failing to appear within a reasonable time after being notified of testing); (4) failing to submit to a re-collection or retesting when required; or (5) submitting a specimen that the MRO verifies as adulterated or substituted.

E. EXCEPTIONS

The following exceptions may be granted at the discretion of COMPANY management:

1. CONTRACTORS and CONTRACTORS' employees who are contracted or hired on short notice may be permitted to begin work on-site or on a COMPANY Project pending receipt of the results of pre-access substance testing. This permission will not extend beyond seven (7) calendar days from the first date after work starts by CONTRACTOR.

Any person working under this provision must be removed from the work site immediately upon receipt of a positive test result, or at the end of seven (7) calendar days if test results have not been reported.

This provision is to allow work to begin on emergency or short notice situations *only*. Testing must be done as soon as reasonably feasible, and results must be available within the seven (7) calendar days allotted. This provision covers only employees needed for immediate initial staffing and does not extend to those hired with sufficient time for pre-access testing (2-3 days after job begins).

2. CONTRACTORS or vendors who have a need for site access, and whose work on a COMPANY Project poses a minimal safety risk, may be exempted by authorized COMPANY management from compliance with this Policy.

F. VALIDITY PERIOD

A pre-access substance test must have been administered within ninety (90) days immediately preceding access. This requirement may be waived by local authorized COMPANY management for persons who are regaining access after an absence of not more than ninety (90) days.

COMPANY will recognize a substance test conducted of an employee while that employee worked for a different employer if (1) the test is conducted within the 90-day period required by this policy, and (2) the laboratory and sampling procedures meet the standards set forth in this Policy. COMPANY prefers that the testing requirements be verified by an independent agency such as CONTRACTOR's Safety Council.

SECTION III – SEARCHES AND INSPECTIONS

COMPANY reserves the right at all times on its premises to conduct unannounced substance screens, searches, and inspections of CONTRACTORS, CONTRACTORS' employees, vendors, and other persons, including their effects, lockers, baggage, desks, tool boxes, clothing, and vehicles. The purpose of such screens, searches, and inspections is to ensure compliance with this Policy.

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Any controlled substances or items prohibited by this Policy, or any materials that are illegal to possess, will be retained by COMPANY and may be destroyed or turned over to the appropriate law enforcement agency.

The refusal of a CONTRACTOR's employee to submit to a search or inspection will result in the revocation of the person's access privileges.

SECTION IV – COMPLIANCE AUDITS

COMPANY reserves the right to periodically audit a CONTRACTOR's records to verify compliance with this Policy. Such verification will include, but not be limited to:

1. examination of the CONTRACTOR's substance abuse policy and its implementing directives and procedures;
2. a determination that substance testing is being conducted in those situations where it is required, and that the testing meets the standards of this policy;
3. examination of chain of custody procedures which ensure integrity of collected specimens; or
4. evaluation of laboratory services.

Audit results will be treated as confidential in order to protect the privacy of tested persons.

SECTION V – SUBCONTRACTS

In all cases where a CONTRACTOR is permitted to employ a SUBCONTRACTOR, the CONTRACTOR is responsible for insuring that the SUBCONTRACTOR and SUBCONTRACTOR's employees are in compliance with this Policy. Contracts between CONTRACTORS and Subcontractors must stipulate that COMPANY reserves the right to audit SUBCONTRACTOR's substance programs.

SECTION VI – CONSENT FORMS

The CONTRACTOR must obtain a signed consent demonstrating each employee's agreement to release to CONTRACTOR and COMPANY the results of any substance testing performed, unless prohibited by applicable federal, state, or local law.

COMPANY will look at substance test results only during occasional compliance audits as described in Section IV, or when testing is required by COMPANY as described in Section II.

SECTION VII – NOTICE

The CONTRACTOR must ensure that each of its employees and the employees of its SUBCONTRACTORS are informed of the provisions of this Policy and of the CONTRACTOR's substance abuse policy. Notice will include the consequences of failure to comply, and notice will be made prior to any employees entering COMPANY premises or working on COMPANY Projects.

SECTION VIII – CONCLUSION

Consideration for work on COMPANY WORKSITE, premises or projects will be conditioned upon CONTRACTOR's implementation of a policy that, in COMPANY's sole judgment, conforms to the

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minimum standards expressed in this Policy. Program development and implementation are the responsibility of the CONTRACTOR.

The central goal of this Policy is to provide a safe and efficient working environment for all persons on COMPANY premises, and to ensure that COMPANY Projects are performed in a safe and efficient manner. Cooperation is vitally important to the achievement of this important goal.

APPENDIX 4 – SCOPE SPECIFIC HSSE ISSUES

Certain specific HSSE Requirements will be specifically selected for certain CONTRACTORs dependent upon scope of work and WORKSITE location. COMPANY shall advise CONTRACTOR of all that apply prior to execution of CONTRACT. COMPANY and CONTRACTOR will initial all those that apply. See web site for details: <http://nasupplierhsse.bpglobal.com>.

SPECIFIC HSSE REQUIREMENTS

1. CONTRACTOR will have a written Waste Management plan at the COMPANY Project Site for WORK performed that, at a minimum, requires identification of waste and disposal methods.
2. COMPANY requires CONTRACTOR to have an acceptable Contractor Environmental Management System (C-EMS).
3. CONTRACTORs will meet or exceed BP's COMPANY Driving Standard.
4. CONTRACTOR will have and apply a Fitness-for-Duty program which includes assessment of the physical capability of employees to perform certain specific tasks and a physical agility testing component (Gulf of Mexico only).
5. CONTRACTOR will supply COMPANY with a valid Certificate of Recognition applicable to Province of Operation certified by Petroleum Industry Training Service (PITS) or CONTRACTOR's Service Line certifying body (Canada only).
6. CONTRACTOR must have a working knowledge of the Drilling and Well Operations Policy.

APPENDIX 5 – LOCAL HSSE POLICIES AND REQUIREMENTS

1.0 GENERAL

Each COMPANY Strategic Performance Unit (SPU) will have location specific HSSE documents and provisions that will be included and attached to each CONTRACT detailing minimum HSSE requirements for that SPU. These documents may include, but not be limited to the following requirements and documents:

- Safety Management System (SMS) Bridging Document;
- Environmental Management System (EMS) Bridging Document; and
- Vehicle and Driving Safety Policy

This section may also include, but is not limited to:

- Radioactive Source Procedures (Mandatory for all applicable work in the US);
- Offshore Working Policy;
- Gulf of Mexico Safe Practices Manual (US offshore only);
- COMPANY Office Policies;
- Camp Rules; and
- Others as required

Additional SPU requirements and related HSSE minimum requirements documents are as follows and are found at the end of this Appendix 5:

Section 7, Appendix 5, Attachment 1 – BP Gulf of Mexico SPU HSSE Document

Attachment 1 – Gulf of Mexico SPU

HEALTH, SAFETY, SECURITY, AND ENVIRONMENTAL REQUIREMENTS

The following constitute Health, Safety, Security, and Environmental (HSSE) Requirements for CONTRACTOR and any SUBCONTRACTORS performing work on COMPANY Sites (real estate owned or leased by COMPANY, where COMPANY is the operator) and on COMPANY Project Sites (where work is performed exclusively for COMPANY). HSSE Requirements encompass compliance with all applicable federal, state/provincial, maritime, and local statutes, regulations, enforceable agreements, agency orders, permits, and contract documents. HSSE Requirements also include specific COMPANY requirements as disclosed below and any site-specific requirements not specified below. Each CONTRACTOR will ensure that any SUBCONTRACTOR it employs meets these HSSE Requirements. CONTRACTOR will take any additional precautions necessary to prevent harm to personnel or damage to the environment, property, or COMPANY's reputation.

CONTRACTOR's Program will strive to deliver an incident and injury-free work place and will achieve a total 12-month rolling recordable incident rate (TRIR) equal to, or better than, the TRIR hurdle set by the COMPANY for work conducted on COMPANY Sites and COMPANY Project Sites. COMPANY may revise the hurdle rate downward annually to achieve the incident and injury-free work place objective.

CONTRACTOR will provide, at COMPANY's request, a monthly breakdown of hours worked and miles/kilometers driven (including SUBCONTRACTORS' hours and miles/kilometers) on COMPANY Sites or COMPANY Project Sites.

COMPANY Specific HSSE Requirements for all CONTRACTORS

In order to meet COMPANY's specific HSSE Requirements, CONTRACTOR will have a HSSE Program with a focus on continual performance improvement (or utilize COMPANY's program). COMPANY has the right to audit CONTRACTOR's HSSE Program and documents. At a minimum, the following elements will be included in CONTRACTOR's HSSE Program:

1) Leadership

CONTRACTOR Leadership will actively communicate HSSE expectations and COMPANY requirements, routinely monitor HSSE performance, develop action plans for continuous improvement, and actively take ownership of HSSE.

CONTRACTOR will ensure that CONTRACTOR's employees understand COMPANY's HSSE policy and comply with COMPANY's Golden Rules of Safety for work performed on COMPANY Project Sites.

2) Behavior Based Safety

CONTRACTOR will have a behavior-based safety program which, at a minimum, will include a safety observation program (or utilize COMPANY's program) with performance targets. CONTRACTOR will communicate to CONTRACTOR employees the expectation that everyone has an obligation to stop work that is unsafe.

In addition, CONTRACTOR will have a hazard identification and risk assessment process for completing a daily pre-job task hazard analysis and/or work permitting system to identify and control the hazards to an acceptable level. At a minimum, a process for completing daily Job Safety Analysis (JSA), or Job Safety Environmental Analysis (JSEA), is required to facilitate the daily task hazard analysis.

3) HSSE Meetings

CONTRACTOR will conduct or take part in regularly scheduled on-site or off-site HSSE meetings discussing, among other topics, facility and job hazards, incidents, near-misses, site-specific safety and health rules, and site-specific procedures.

4) Incident Reporting and Investigations

CONTRACTOR will immediately notify COMPANY of all CONTRACTOR or SUBCONTRACTOR incidents resulting in personal injury, spills or releases, security issues, loss or damage to property, or near-misses. COMPANY may require CONTRACTOR to conduct an investigation for any HSSE incident. COMPANY retains the right to participate or conduct its own incident investigation. For all incident investigations, CONTRACTOR will provide a written investigation report to the COMPANY. The investigation report shall identify possible root causes associated with the incident as well as proposals for corrective action. When requested, CONTRACTOR will furnish COMPANY with a copy of non-privileged reports made by or on behalf of CONTRACTOR concerning an incident, including any non-privileged statements or other investigative material.

5) Personal Protective Equipment

CONTRACTOR will ensure CONTRACTOR employees have proper personal protective equipment (PPE) before work begins, and that PPE is worn as required. CONTRACTOR shall obtain and comply with individual site PPE requirements.

6) CONTRACTOR Employee Conduct

CONTRACTOR shall comply fully with the Substance Abuse Policy (Section 7, Appendix 3).

COMPANY has the right to require CONTRACTOR to remove and bar from the COMPANY Sites or COMPANY Project Sites any personnel whose conduct (condition or action) jeopardizes the safety of any person. In addition, CONTRACTOR will not permit any barred person to work at any other COMPANY Site or COMPANY Project Site without prior COMPANY written approval.

7) CONTRACTOR Employee HSSE Competency

CONTRACTOR will ensure that regulatory required training for CONTRACTOR's employees has been identified and completed. Competency must be demonstrated. COMPANY may require reasonable additional site-specific training and documentation.

8) Short Service CONTRACTOR Employee Policy

CONTRACTOR will comply with its own or COMPANY's site-specific short service employee policy, whichever policy is more restrictive.

9) Preventative Maintenance Program

CONTRACTOR will have a preventative maintenance program that includes, at a minimum, the identification and prioritization of maintenance for safety and/or environmental critical items.

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Appendix 5 – Local HSSE Policies and Requirements
Attachment 1 – Gulf of Mexico SPU

10) Chemicals Brought to COMPANY Site

CONTRACTOR will ensure Material Safety Data Sheets (MSDSs) are available at the COMPANY Sites and/or COMPANY Project Sites for all chemicals CONTRACTOR brings to the site, and that the MSDS is reviewed as part of the JSA/JSEA discussion.

COMPANY Specific HSSE Requirements Specifically Selected for Certain CONTRACTORS
(COMPANY and CONTRACTOR will initial all those that apply). See web site for details:
<http://nasupplierhsse.bpglobal.com>.

Initiated by: (if applicable)

CONTRACTORCOMPANY

- | | | |
|-------------------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1. CONTRACTOR will have a written Waste Management plan at the COMPANY Project Site for work performed that, at a minimum, requires identification of waste and disposal methods. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 2. COMPANY requires CONTRACTOR to have an acceptable CONTRACTOR Environmental Management System (C-EMS). |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3. CONTRACTORs will meet or exceed BP's Driving Standard. |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. CONTRACTOR will have and apply a Fitness-for-Duty program which includes assessment of the physical capability of employees to perform certain specific tasks and a physical agility testing component. |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. CONTRACTOR will supply COMPANY with a valid Certificate of Recognition applicable to Province of Operation certified by Petroleum Industry Training Service (PITS) or CONTRACTOR's Service Line certifying body. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 6. CONTRACTOR must have a working knowledge of the Drilling and Well Operations Policy. |

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Section 7 – Health, Safety, Security, and Environment
Appendix 5 – Local HSSE Policies and Requirements
Attachment 1 – Gulf of Mexico SPU

**Section 8 – Code of Conduct
Halliburton for GOM**

The BP Code of Conduct stands for a fundamental BP commitment – to comply with all applicable legal requirements and the high ethical standards set out in this code – wherever we operate. To help us meet this commitment, the Code defines what BP expects of its businesses and people regardless of location or background. It provides both guidance in key areas and references to more detailed standards, instructions and processes for further direction.

All employees must adhere to the principles and requirements contained in this Code and should consult the Code for guidance when acting on behalf of BP.

Employees must not use a contractor, agent, consultant, or other third party to perform any act which conflicts with this Code. Employees who engage third parties such as contractors, agents, or consultants to work on behalf of BP should include a contractual requirement to act consistently with the Code when working on our behalf.

BP wishes to make it clear that it intends its business dealings to be characterized by honesty and freedom from deception and fraud and that it finds unethical behavior unacceptable.

Practices that BP considers dishonest, unethical, or unacceptable include the following:

- Fraud, bribery or corruption;
- Deception;
- Clandestine brokering or sharing of tender information;
- Collusion for the purpose of corrupting a competitive tender; and
- Payments, gifts or entertainment from suppliers to BP staff, agents or representatives to influence decision-making.
- Harassment in the Workplace

BP is committed to ensuring that its contractors apply all of the principles contained within the "Code of Conduct" document. BP will endeavor to employ only those contractors that subscribe to these principles, demonstrate their commitment to working towards their fullest application, and agree to the measurement of their performance by BP.

The individual rights are intended to lead to greater mutual respect between both individuals and the companies they work for. They seek to encourage safer and more secure employment, increase efficiency, improve job satisfaction, and provide a better trained workforce for all those engaged in the provision of Services under the Contract.

An electronic copy of BP's Code of Conduct "Commitment to Integrity" can be downloaded from the following internet web site:

<http://www.bp.com/sectiongenericarticle.do?categoryId=9003494&contentId=7006600>

Where to go for help

If you do have a question or concern about legal or ethical standards, what, as a Contractor, should you do?

A good place to start

Contacting the **COMPANY REPRESENTATIVE** named in Section 2 – General Conditions of Contract, Appendix 1 of the Contract is usually a good place to start with a legal or business conduct issue. You

Section 8 – Code of Conduct

may also get help or advice from your own legal or compliance & ethics advisors within your own company.

The BP OpenTalk Line

If you feel unsure about where to go for help, or are uncomfortable contacting the Contract Accountable Manager, BP has an additional resource that can help – OpenTalk.

The purpose of OpenTalk is to answer questions and respond to concerns about compliance, ethics and the requirements described in this code. The OpenTalk telephone line and e-mail facility is operated by an independent company that helps businesses respond to questions and concerns about compliance and ethics.

The line operates 24 hours a day/seven days a week and also has translation services available at all times.

Call OpenTalk on your local number or on 1-800 225-6141 (US), 0800 917 3604 (UK), or the collect call number 1 704 540 2242 or at the following:

A full list of local telephone numbers can be accessed on the OpenTalk website <http://opentalk.bpweb.bp.com> or you can e-mail the following address opentalk@myalertline.com

Section 8 – Code of Conduct
