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#### DIGITAL AND DATA COMPONENTS OF SERVICE

5.6.1.CONTRACTOR shall provide the following services as requested by COMPANY as indicated in Table 2 below:

- a) Data Acquisition, Storage and Management.
- b) Provision of Drilling Unit Based Displays.
- c) Provision of Internet Based Visualization and Data Access.
- d) Transfer of Data to COMPANY at the Drilling Unit.
- e) Incorporation of Data from THIRD PARTIES into Digital Components 1 to 4.
- f) QA/QC of Data, Final Log Delivery and Archival.
- g) Digital Data Service Quality KPIs

**Table 2:** Applicability of the Digital Components of Service and Digital Data Service Quality KPIs to the Well Placement Scope of Work.

Component	Clause	Applicability
General terms	5.6.2	Y
Component 1 - Data Acquisition, Storage and Management	5.6.3	Y
Component 2 - Provision of Drilling Unit Based Displays	5.6.4	Y
Component 3 - Provision of Internet Based Visualization and Data Access	5.6.5 and 5.6.6	Y
Component 4 - Transfer of Data to COMPANY at the Drilling Unit	5.6.5 and 5.6.7	Y
Component 5 - Incorporation of Data from THIRD PARTIES into Digital Components 1 to 4	5.6.8	Y
Component 6 - Data, data submission and quality control process for field and final data deliverables	5.6.9	Y
Digital Data Service Quality KPIs	5.6.11 and 5.6.12	Y

#### 5.6.2.General

- 5.6.2.1. CONTRACTOR shall provide PERSONNEL that are familiar with the requirements of COMPANY with respect to data prior to the drilling, completion and intervention phases of the well.
- 5.6.2.2. COMPANY reserves the right to request modifications to data connections made to or from automation systems

- 5.6.2.3. CONTRACTOR shall agree with COMPANY an appropriate time to undertake maintenance and upgrades on systems.
- 5.6.2.4. CONTRACTOR shall describe in writing to COMPANY the nature of any changes in the maintenance and system upgrades.
- 5.6.2.5. Maintenance shall not interfere with real-time data transfer, where applicable, without express written permission from COMPANY.
- 5.6.2.6. CONTRACTOR shall provide and maintain a full list of Tool and Curve mnemonics as well as derived or calculated mnemonics available from CONTRACTOR with the exception of items considered by CONTRACTOR as intellectual property or experimental.
  - 5.6.2.6.1. An appendix to this list shall detail how derivations and calculations are performed for COMPANY requested derived data items with the exception of items where the derivation is considered CONTRACTOR intellectual property or experimental.
  - 5.6.2.6.2. CONTRACTOR shall maintain and update the list and appendix whenever there are significant changes to the calculations that affect data outputs.
  - 5.6.2.6.3. CONTRACTOR shall make updated versions available to COMPANY in electronic format upon request.
- 5.6.2.7. CONTRACTOR shall make provision for redundancy of CONTRACTOR's IT systems involved in data acquisition, parsing and distribution to avoid disruption to the well operation.
- 5.6.2.8. CONTRACTOR shall perform appropriate backup of all COMPANY data involved in provision of 'Digital Components of Service' such that no loss of COMPANY data occurs.
- 5.6.2.9. CONTRACTOR shall provide COMPANY with contact details for CONTRACTOR operational support.
- 5.6.2.10. All data and displays provided shall adhere to COMPANY datums, measurement systems and other criteria as described in Table 3 - Data Requirements of Well Placement Scope of Work.
- 5.6.2.11. CONTRACTOR shall, on request by COMPANY, synchronize the acquisition system clocks at an appropriate break in operations with COMPANY specified 'clock'. This provides alignment of time based data sets aggregated by COMPANY from multiple Drilling Unit providers.

### 5.6.3. Component 1: Data acquisition, storage and management

- 5.6.3.1. CONTRACTOR shall provide systems for acquisition, storage and management of sensor based data as well as manually entered data at the Drilling Unit.
- 5.6.3.2. CONTRACTOR software shall have a mechanism for calculating simple formulae if specified by COMPANY, e.g. Mechanical Specific Energy (MSE). Calculated results, at the request of COMPANY, shall be incorporated into CONTRACTOR provided Drilling Unit displays; in CONTRACTOR internet based visualization and WITSML services; and in Drilling Unit data transfer to COMPANY where applicable. CONTRACTOR will confirm whether the additional data can be displayed in Drilling Unit displays.
- 5.6.3.3. CONTRACTOR shall identify data gaps caused by CONTRACTOR sensor or acquisition system failure and clearly communicate details of such failure to COMPANY in a timely manner.
- 5.6.3.4. CONTRACTOR shall import/export ASCII, LAS, or DLIS data as applicable into their acquisition system for incorporation into Digital Components 1 to 4, as

described in Clauses 5.5.3 through 5.5.7 of this Exhibit, where applicable and when requested by COMPANY.

- 5.6.3.5. CONTRACTOR shall agree with COMPANY the regularity at which data exports are undertaken. DLIS, LAS, ASCII exports and PDF and TIFF log prints (complete with header) digital print formats shall be supported.

#### 5.6.4. **Component 2:** Provision of Drilling Unit based displays

- 5.6.4.1. CONTRACTOR shall be responsible for providing and maintaining configurable displays, both graphical and textual, of acquired and calculated data in COMPANY specified locations at Drilling Unit. The total number of Drilling Unit displays shall be agreed between COMPANY and CONTRACTOR prior to mobilization.

#### 5.6.5. General items pertaining to Component 3 and Component 4

- 5.6.5.1. CONTRACTOR shall verify that all server based WITSML tools utilized in providing services to COMPANY are certified through the Energistics WITSML Certification Program. For the avoidance of doubt, WITSML Client tools need not be certified until such time as the Energistics Certification Programme supports client tools.
- 5.6.5.2. Proof of certification shall be made available to COMPANY.
- 5.6.5.3. Where there is ambiguity in the WITSML standard with regards to data content or format, CONTRACTOR shall publish WITSML data in accordance with instructions provided by COMPANY WITSML Special Interest Group ("SIG") representative upon mutual agreement with CONTRACTOR.
- 5.6.5.4. CONTRACTOR shall populate their WITSML systems with COMPANY provided Unique Identifiers ("UIDs") if requested, enabling COMPANY to integrate data from multiple providers into a single common Well-Wellbore in COMPANY system.
- 5.6.5.5. CONTRACTOR shall agree with COMPANY and thereafter utilize standard WITSML log names across all operations for COMPANY. COMPANY reserves the right to request changes to WITSML log names at any time during the operation if they deviate away from agreed standard.
- 5.6.5.6. CONTRACTOR shall offer WITSML data transfer, for Digital Components 3 and 4, complying with a new WITSML 'Current Version' within twelve (12) months after its release.
- 5.6.5.7. CONTRACTOR shall agree with COMPANY a timeline for support of updates and changes to the standard such as those to WITSML objects and any API changes over and above major version releases.
- 5.6.5.8. During transition periods, CONTRACTOR shall provide COMPANY access to new 'Current Version' and previous 'Current Version' used in operations by CONTRACTOR with COMPANY.

#### 5.6.6. **Component 3:** Provision of internet based visualization and data access

- 5.6.6.1. CONTRACTOR shall be responsible for transfer of acquired and calculated data to CONTRACTOR's own offices using COMPANY's network connectivity and interface connection.
- 5.6.6.2. CONTRACTOR shall have an internet based system capable of providing approved COMPANY nominated users with access to all acquired, calculated, or THIRD PARTY incorporated, real time, memory or historical data, both depth-based and time-based data, where applicable, for the duration of the well and in all contracted operational phases.

- 5.6.6.3. CONTRACTOR shall provide customizable graphical and textual displays of the data, as well as making available in WITSML if requested.
- 5.6.6.4. All data gaps caused by data transmission failures shall be automatically buffered and filled on re-establishing the connection.

**5.6.7. Component 4: Transfer of data to COMPANY at the Drilling Unit**

- 5.6.7.1. CONTRACTOR shall transmit all applicable acquired, calculated, or THIRD PARTY incorporated real time, memory or historical data, both depth-based and time-based data to COMPANY or nominated THIRD PARTY at the Drilling Unit in the WITSML standard format.
- 5.6.7.2. CONTRACTOR shall propagate or re-send all changes or corrections made to real-time data already sent from the acquisition system to COMPANY WITSML server.
- 5.6.7.3. All data gaps caused by data transmission failures shall be automatically buffered and filled on re-establishing the connection.
- 5.6.7.4. CONTRACTOR and COMPANY shall agree on the provision of any other data transfer standards e.g. WITS, OPC (UA), PROFIBUS.
- 5.6.7.5. CONTRACTOR and COMPANY shall agree on appropriate project definition and resources requirement including time and cost.
- 5.6.7.6. CONTRACTOR's PERSONNEL shall be able to demonstrate competency in use of CONTRACTOR's systems for transfer of WITS and WITSML data, including at the Drilling Unit.
- 5.6.7.7. CONTRACTOR shall test the data transfer compatibility of Drilling Unit information systems prior to mobilization to the field, at no additional cost to COMPANY.
- 5.6.7.8. CONTRACTOR shall make allowance for the provision of equipment and services to perform integration testing of information systems, including those installed at the WORKSITE, prior to field mobilization, in order to have the overall system work as planned.
- 5.6.7.9. CONTRACTOR shall test data transfers between CONTRACTOR provided systems and COMPANY specified system.

**5.6.8. Component 5: Incorporation of data from THIRD PARTIES into Digital Components 1 to 4**

- 5.6.8.1. CONTRACTOR shall collect data at the Drilling Unit from THIRD PARTIES using the WITS or WITSML data standards and shall incorporate the THIRD PARTIES' data in Digital Components 1 to 4 as described in Clauses 5.5.3 through 5.5.7 of this Exhibit. Other data standards may be allowed by mutual agreement. CONTRACTOR shall develop and execute a detailed integrated test procedure prior to the operation, to verify all data flows will be accomplished successfully.
- 5.6.8.2. CONTRACTOR is responsible for working with defined THIRD PARTIES to provide continued data transfer during all operational phases.

**5.6.9. Component 6: Data, data submission and quality control process for field and final data deliverables**

- 5.6.9.1. To ensure data submission processes provide efficient and systematic transfer of all data deliverables CONTRACTOR shall agree with COMPANY the field (daily) and final deliverable data requirements, submission process, including timing, accountabilities, and delivery method and quality control process, prior to commencement of operations.

5.6.9.2. Data specification requirements as detailed in the WORK ORDER may include:

- a) Digital data and reports in agreed file formats.
- b) Scales.
- c) Sampling frequencies.
- d) Precision.
- e) Complete with headers (e.g., time and depth based data, DLIS, LAS, ASCII, XLS, DOC, PDF file formats; log data, log images, directional survey data, calibration data types).
- f) Hardcopy data and reports in a variety of file formats and scales including, where applicable: field prints; QC log prints; Reports; End of Well Report. Quantity of reports and formats to be agreed.
- g) Physical samples (e.g. cuttings, gas).

5.6.9.3. CONTRACTOR shall deliver all final Memory LWD/PWD/MWD data to COMPANY as a full digital version, called the customer file, in DLIS format.

5.6.9.4. The DLIS customer file will include:

5.6.9.4.1. A comprehensive set of raw measurements; sufficient channels for each data type to enable reprocessing of the data at a later stage.

5.6.9.4.2. Repeat sections (repeat time lapse passes of LWD data acquisition should also be supplied). Repeat sections should be supplied in separate DLIS files, as DLIS does not allow more than one value for a parameter to be stored, should it change between passes.

5.6.9.4.3. Run numbers will follow BP's respective Regional run naming convention for LWD.

5.6.9.4.4. Curve mnemonics will be the respective suppliers standard curve naming convention.

5.6.9.4.5. Final PDF, PDS, meta or any other acceptable file formats for electronic version of hardcopy data.

5.6.9.4.6. Comprehensive log information including:

- a) Complete Log header information
- b) Complete Remarks section
- c) Detailed Log Chronology
- d) Depth information Box
- e) Tool sketch
- f) Well Sketch
- g) Well Plot
- h) Definitive Directional Survey Listing as per the agreed Survey Program
- i) Main log with agreed log curve headers
- j) Parameter and parameter change information including environmental corrections applied
- k) Calibration information
- l) Repeat passes
- m) QC log/QC plots
- n) LQC Stamp
- o) Post-acquisition processed and/or interpreted data, e.g. Sonic for shear, NMR, borehole image data, which should be in the same format as above accompanied by a written report to describe the method of processing or interpretation and electronic hard copy data.
- p) Composite curve data presented as a separate DLIS file with basic standard environmental corrections applied and documented

- 5.6.9.4.7. Customer DLIS files for LWD data should include the original format Referenced in Time including time lapse passes, as well as the final data referenced in Depth MD.
  - 5.5.9.4.7.1 LWD data includes data acquired while drilling or 'mad pass' acquisition which is data acquired during a wiper trip
- 5.6.9.4.8. The DLIS Customer file may be supplied on a physical media type (CD/DVD/Tape) or electronically on the supplier's corporate data delivery system, as agreed in the WORK ORDER.
- 5.6.9.5. CONTRACTOR will deliver an auditable job delivery document summarising the data delivery and data quality checks made on the date against the WORK ORDER.
- 5.6.9.6. Delivery of Final LWD/PWD/MWD memory data in LAS format will not be acceptable unless by exception regionally.
- 5.6.9.7. CONTRACTOR shall deliver all borehole seismic data on LWD in SEGY or ASCII format. COMPANY and CONTRACTOR shall agree all listing requirements prior to commencement of the WORK.
- 5.6.9.8. CONTRACTOR shall implement and demonstrate a robust process to compile and distribute data that reflects COMPANY data management requirements and business objectives:
  - 5.6.9.8.1. Clarity and transparency of data deliverables for specific well activities.
  - 5.6.9.8.2. Process to manage provision of data to COMPANY via a CONTRACTOR single point of contact ("SPOC") for a region.
  - 5.6.9.8.3. Use of agreed data-dependent file format standards.
  - 5.6.9.8.4. Use of COMPANY digital file naming standards.
  - 5.6.9.8.5. Use of COMPANY physical media, media labelling, and media digital metadata standards.
- 5.6.9.9. CONTRACTOR shall provide a Quality Plan on request which details the process for quality control of data before submission to COMPANY.
- 5.6.9.10. COMPANY reserves the right to quality control data on submission from CONTRACTOR to verify data is fit-for-purpose and meets agreed specifications.
- 5.6.9.11. COMPANY may require data to be corrected by CONTRACTOR where data quality issues are determined, before submission of final approved deliverables.
- 5.6.9.12. CONTRACTOR shall archive and retain all acquired, entered and incorporated data for a period of six (6) years from the completion of the well activity or the end date of the contract termination, whichever sooner.
- 5.6.9.13. CONTRACTOR shall provide documentation on their data storage architecture and digital security process, when requested by COMPANY, in support of the above requirement.

5.6.10. Data Requirements

**Table 3 - Data Requirements of Well Placement Scope of Work**

Service Line	Data Type Required for business workflows (drilling, completions and interventions)	WITS Records	WITSML Object	Index	Sampling Frequency (time) ([samples]/[time] e.g. 1 Hz (1 sample per second))	Update Rate			
						Depth-Based Recording Depths (e.g. every 1m)	Time-Based Recording Frequency (e.g. every 1sec)	Transmission & Replication Frequency	Display update interval (time)
Well Placement	Downhole Mechanical Data (e.g., tool RPM, Vibration, PWD, ECD)	09 MWD Mechanical Time	Log	Time	Telemetry Frequency (pulse, acoustic, wired etc.)	n/a	Telemetry Frequency (pulse, acoustic, wired etc.)	WITS : 1 sec WITSML: Telemetry Frequency	Telemetry Frequency
		09 MWD Mechanical Depth	Log	Depth	n/a	COMPANY Specified Recording Frequency	n/a	At recording frequency	At recording frequency
	LWD Telemetry Data (e.g., Gamma, Resistivity)	08 MWD Formation Evaluation - Time 10 Pressure Evaluation - Time	Log	Time	Telemetry Frequency (pulse, acoustic, wired etc.)	n/a	Telemetry Frequency (pulse, acoustic, wired etc.)	WITS : 5 sec WITSML: Telemetry Frequency	Telemetry Frequency
		08 MWD Formation Evaluation - Depth 10 Pressure Evaluation - Depth	Log	Depth	n/a	COMPANY Specified Recording Frequency	n/a	At recording frequency	At recording frequency
	DownHole Memory Data (LWD, MWD)	n/a	Log	Time	Telemetry Frequency (pulse, acoustic, wired etc.)	n/a	Telemetry Frequency (pulse, acoustic, wired etc.)	Event Within agreed timeframe after memory download	Event Within agreed timeframe after memory download
		n/a	Log	Depth	n/a	COMPANY Specified Recording Frequency	n/a	Event Within agreed timeframe after memory download	Event Within agreed timeframe after memory download
	Static, reporting or contextual	n/a	attachment bhaRun trajectory tubular wbGeometry well wellbore	n/a	n/a	At event depth	Event Based	On addition of the data item	On addition of the data item

5.6.11. Digital Data Service Quality KPIs

5.6.11.1. CONTRACTOR shall cooperate with reasonable requests to provide COMPANY with data/reports necessary to monitor CONTRACTOR's performance.

5.6.11.2. CONTRACTOR shall track the KPIs described in this Exhibit.

5.6.11.3. Digital Data Service Quality KPIs

5.6.11.3.1. KPI #1 - Percentage of Service Time for each contracted 'Component of Service' that is without Problem Time.

$$\text{Performance} = 100 - ((\text{Problem Time} / \text{Service Time}) * 100).$$

5.6.11.3.2. KPI #2 - 100% of CONTRACTOR PERSONNEL competent in CONTRACTOR systems for delivery of Real-Time and WITSML data as described in this Exhibit, including attendance at CONTRACTOR internal or Energistics training courses, or equivalent.

- 5.6.11.3.3. KPI #3 - 100% of WITSML server and client tools utilized by CONTRACTOR in delivery of the contracted services are certified through the Energistics certification program. For the avoidance of doubt, WITSML client tools need not be certified until such time as the Energistics Certification Programme supports client tools.
- 5.6.11.4. COMPANY reserves the right to generate its own measures of compliance with the Digital Data Service Quality KPIs described in this Exhibit and to utilize the internally generated measures to compare with and to challenge CONTRACTOR measures of compliance. If there is a discrepancy in the measures of compliance COMPANY and CONTRACTOR are to compare results and calculations.
- 5.6.11.5. COMPANY and CONTRACTOR shall mutually agree to add to or refine KPIs.. COMPANY shall provide at least thirty (30) days' notice of the addition of a KPI to CONTRACTOR.
- 5.6.11.6. CONTRACTOR shall list all real-time data items required for the performance of WORK and agree them with COMPANY prior to commencement of WORK and upon any changes to the service, with the exception of items considered to CONTRACTOR intellectual property or experimental.
  - 5.6.11.6.1. CONTRACTOR shall verify that the Real-Time Data Set list specifies the 'Sampling, Recorded, Transmission and Replication and Display Update Frequencies' of all data items as they apply to the Digital Components of Service.
  - 5.6.11.6.2. CONTRACTOR shall highlight where frequencies differ from the requirements described in Table 3 - Data Requirements of Well Placement Scope of Work, above.
- 5.6.12. Definitions relating to Digital Data Service Quality KPIs
  - 5.6.12.1. Sampling Frequency:

The frequency at which data is acquired by CONTRACTOR and made available for recording.
  - 5.6.12.2. Recorded Frequency:

The frequency at which the data is recorded in CONTRACTOR acquisition system database.
  - 5.6.12.3. Transmission & Replication Frequency:

The regularity at which data is transmitted or replicated to other systems.
  - 5.6.12.4. Real-Time Data Set:

Acquired and calculated time and depth indexed data items utilized or acquired by CONTRACTOR in providing WORK to COMPANY, with the exception of items considered to CONTRACTOR intellectual property or experimental.
  - 5.6.12.5. Contextual Data Set:

WITSML objects as defined in Table 3 - Data Requirements of Well Placement Scope of Work
  - 5.6.12.6. Service Time:

For Well Placement / MWD / LWD: All active drilling or reaming hours for a drilling or reaming operation performed by CONTRACTOR on the wellbore.



For Mud Logging: Hours measured from completion of unit/systems start-up at which point data transfer commences, to the controlled shut-down of the unit/systems at the end of operations on the wellbore.

5.6.12.7. A Problem:

Includes any of the following problems, occurring during 'Service Time', in provision of Digital Components 2, 3 or 4 where applicable for COMPANY by CONTRACTOR:

- 5.6.12.7.1. A data item in the 'Real-Time Data Set' is not transmitted to; available to or viewable by COMPANY.
- 5.6.12.7.2. A current and up to date WITSML object from the 'Contextual Data Set' is not transmitted to or available to COMPANY.
- 5.6.12.7.3. WITSML Objects not transmitted to company with COMPANY provided well and wellbore UIDs.
- 5.6.12.7.4. Logs are transmitted or replicated that do not comply with standard agreed log naming convention.
- 5.6.12.7.5. A data item in the 'Real-Time Data Set' is not transmitted to, available to or viewable by COMPANY at the 'Recorded Frequency' stated and agreed upon in CONTRACTOR defined 'Real-Time Data Set'.
- 5.6.12.7.6. There is a drop in transmission of, availability of, or view ability of any items in the 'Real-Time Data Set' that cannot be attributed to the exceptions listed below that is greater than ten (10) times the frequency stated in the 'Real-Time Data Set'.
- 5.6.12.7.7. One or several gaps exist in items in the real-time data set that have not been buffered or 'filled' after a data transmission failure that cannot be attributed to the exceptions listed below.
- 5.6.12.7.8. Any other quality related issue, observed with respect to contracted data items, identified by CONTRACTOR or COMPANY and acknowledged by CONTRACTOR including:
  - a) System clocks not synchronized.
  - b) Display update intervals not taking place as agreed in Real-Time Data Set.
  - c) Wrong or missing trajectory north reference.
  - d) Wrong or missing measurement system.
  - e) Wrong or incorrect units.

5.6.12.8. Problem time:

Commences from the time when the 'Data Quality Problem' begins or occurs, to the time when the problem is resolved and reported to COMPANY as having been resolved.

Does not include issues related to problems with downhole equipment or Drilling Unit systems failures.

Does not include issues that are attributed to limitations or problems in COMPANY network and communications infrastructure.

5.6.13. Service Levels for Digital Components 1 to 4.

5.6.13.1. The service levels to be measured for problems experienced during the performance of the WORK are detailed in Table 4 - Service Levels for Well Placement Scope of Work.

**Table 4 - Service Levels for Well Placement Scope of Work**

Title	Defined	Measured	Target
'Problem' initial response time	The maximum time allowable by COMPANY for a response to be received from CONTRACTOR when notified of 'Problem'	The time taken from when 'Problem' is identified by COMPANY or by CONTRACTOR to CONTRACTOR notifying COMPANY that 'Problem' is being addressed.	15 minutes
Resolving 'Problem'	The maximum time allowable by COMPANY for CONTRACTOR to resolve 'Problem'	The time taken from when 'Problem' is identified by COMPANY or by CONTRACTOR to CONTRACTOR notifying COMPANY that the 'Problem' has been resolved.	1 hour
Identifying infrastructure failures	<p>Infrastructure failures include all systems managed by CONTRACTOR or subcontracted by CONTRACTOR. This service level is the time taken to initially troubleshoot and identify the source of the system failure.</p> <p>Infrastructure includes but is not limited to CONTRACTOR:</p> <p>Networks and networking appliances</p> <p>Databases</p> <p>Server and other computing devices</p>	The time taken from when infrastructure failure is identified by CONTRACTOR to CONTRACTOR notifying COMPANY that 'Problem' is being addressed.	1 hour
Restoring data flow following an infrastructure failure	<p>Infrastructure failures include all systems managed by CONTRACTOR or subcontracted by CONTRACTOR. This service level is the time taken to initially troubleshoot and identify the source of the system failure.</p> <p>Infrastructure includes:</p> <p>Networks and networking appliances</p> <p>Databases</p> <p>Server and other computing devices</p>	The time taken from when infrastructure failure is identified to CONTRACTOR resolving the failure or restoring full service through application of failover procedures	2 hours