OPtimised well delivery process Yields optimal operational & productivity performance

This Paper has been Written for Planning, Operational and Production Personnel from a Well Delivery Process Perspective so that all areas are Maximised.

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Summary

In this era of awful oil prices ($39.51 on 3rd August 2016) and with no end in sight to the $40 mark, it is vital that Operators have an optimal well delivery process in place in order to reduce well costs and maximize productivity over the life of the well.

This paper shows both the rationale and processes behind such an Optimised Well Delivery Process.

The Well Delivery Process begins with reviewing the information contained within the typical PDDP (Pre-Drilling Data Package) information pack which the Drilling / Testing / Completion Group receives from the Sub-surface Group; and all relevant other sub-surface data / information supplied by the various Technical Experts which have an influence upon the Drilling / Testing / Completion Group. (In this latter regard, the Statement of Requirements pertaining to the well’s objectives and requirements is of crucial importance).

Thereafter, the Well Delivery Process goes through the sub-phases pertaining to the 8 phases of the Well Delivery Process in detail, so that decisions taken (and made) are directly relevant, objective, without bias and are 100% complimentary with the Operator’s/Company’s aims and objectives with regard to maximum hydrocarbon productivity, maximum safety, maximum environmental diligence, minimal intervention / work-over and minimal cost.

The phases – of which there are 8 – have been portrayed logically and objectively, as have the sub-phases of each of the 8 phases which vary in number with respect to each of the 8 phases.

Overview schematics of the sequential process relating to each phase are included within the text of this document as are the process-flow diagrams which ring the appropriate phase.

The text within this document supports the details contained within both the schematics and the process-flow diagrams and is under-pinned by the information / data contained within the References.

Introduction

This Well Delivery Process shows how wells should be delivered from concept through to completion in a phased format. The Well Delivery Process is logical and continually invites “risk assessment”.

The process relates specifically to the Duty Holder (whether this be in UK parlance or the Overseas Equivalent – in other words the company responsible for the well or wells). It may be that the Duty Holder (or Operator) is large enough to work by themselves or the Duty
Holder (or Operator) may be working with a sub-contracted “Well Management Company” which may be carrying out a large portion of the work due to lack of resources within their organisation. Work may also be carried out with a large group of service companies – who would work with either the Duty Holder (or Operator) or the “Well Management Company”. Examples of such “sub-contractors” are Testing & Completions Experts. If this is the case, then all companies Policies & Procedures must be referenced and cross-referenced.

[Note: - In this regard, the relationship between the Operator and the Drilling Contractor and Well Management Company defines the reporting relationship. For example, if the Operator holds the drilling rig contract and an incident occurs then the Incident Report will be sent to the Operator by the Drilling Contractor. If, however, the drilling rig contract is held by the Well Management Company then the Incident Report will be sent to the Operator by the Well Management Company. This is complex – and is typically subject to change. The correct procedures must be in place – checked - and agreed to – prior to spudding the well].

There are 8 phases to the Well Delivery Process:-

- Conceptual Well Design Phase
- Select Concept Phase
- Design Phase I
- Contracts & Materials Procurement Phase
- Design Phase II
- Approvals Phase
- Operations Phase
- Review Phase

To each of these phases there are several sub-phases which are clearly portrayed in both the schematic / figure relating to each phase and each flow-diagram relating to each phase. For example, as can be seen in Figure 1, Conceptual Well Design Phase - shows that there 11 sub-phases, i.e.

- Information Review
- Conceptual Designs
- Inputs
- Risk Analysis
- Challenge Peer Review
- Cross Reference / Screen
- Compile Register
- List Conceptual Options
- Rank Conceptual Options
- Scope AFE
- Compile Project Database

This format (i.e. sub-phases being a part of the main titled phase) follows throughout all of the 8 phases.
PHASE 1: CONCEPTUAL WELL DESIGN PHASE

This Phase involves taking the information from the PDDP / Well Data Package and Statement of Requirements and generating the necessary Conceptual Designs per the Process Diagram below.

The supporting text relating to each segment is contained within the appropriate areas below with respect to the phase diagram.

It is perhaps the most important phase of the Well Planning Process: it very often differentiates between a standard well and a creative multilateral well for example, as shown below:

![Fig 1: Creative Multi-lateral](image)

![Fig 2: Conceptual Well Design Phase](image)

Fig 2: Conceptual Well Design Phase showing the Conceptual Well Design Phase with the necessary 11 sub-phases
**PHASE 1: CONCEPTUAL WELL DESIGN PHASE**

**CONCEPTUAL WELL DESIGN PHASE**

- **Information Review**
  - Full review of data and the well’s objectives as received per the Well Data Pack (PDDP) for Drilling / Statement of Requirements for Drilling, Testing & Completion / (Currently Informal) BOD (Basis of Design) for Testing and Completion Design

- **Conceptual Designs per, for example:**
  - The data received (References 1)
  - The well's objectives (Reference 2)
  - Company Policies & Procedures (References 3)
  - Oil & Gas UK Recommended Practices / Guidelines (Reference 5)
  - DECC Regulations & Requirements
  - Energy Institute (formerly Institute of Petroleum) Guidelines
  - API Recommended Practices
  - Practices per other organisations (e.g. NACE – MR 175 for example)
  - Best Industry Practices

- **Input from:**
  - Well Data Pack / PDDP
  - Sub-surface Group Experts
  - Well Design / Well Management Consultancy Company
  - Specialised Service Providers / Authorities

- **Risk Analysis of each valid Conceptual Well Design**
  - HAZID
  - HAZAN
  - HAZOP
  - Compile Risk Register for each Conceptual Design
  - Probabilistic Cost Modelling (P10 / P50 / P90)

- **Challenge / Peer Review**

  Full challenge of the concepts selected in terms of:-
  - Data supplied (Well Data Pack / PDDP)
  - The well's objectives
  - Statements of Requirements

- **Cross-referencing / Screening**

  Cross-referencing the concepts selected with respect to the Well Data Pack / PDDP, risks, probabilistic costs and other data pertaining to fractured basement wells around the world which are considered to be suitable analogues.

- **Register Compilation**
- Compile register of challenges made / reviews carried out and any actions / further work / studies required.

- **List Conceptual Options**
  This is a consultative process and requires input from all departments. The key objective is to determine, following consultation, possible further studies and further work, which conceptual options (with their associated costs, risks and potential upsides), should be listed as being feasible and which should be deleted.

  Liaison is a possible sub-phase involving liaison with key players such as the Drilling Contractor, the Well Management Company, Specialised Service Companies (e.g. MPD, Under-balanced Drilling, Expandable Liners, Experts such as Fractured Basement Drillers, “Smart” Completions, Sub-sea / FPSO companies etc. The purpose here is to ensure that there is no untoward “show stopper” as regards to the Selected Concept(s) – which there sometimes can be at the last moment. (Note:- In some cases, for novel techniques for example, Operators have liaised with the Authorities to ensure that certain concepts are viable before committing large monetary sums to Design – e.g. maximum draw-down on HPHT wells for example).

- **Rank Conceptual Options**
  The concepts are ranked in terms of well objectives fulfilment, statements of requirements fulfilment, the risk of failure / most likely chance of success, most likely cost, well integrity issues over the life of the well and well delivery time. (Note1:- This phase may well have to wait for certain specialised studies to be carried out. Note 2: Sometimes it is not always possible to rank concepts easily, since they may carry very different sets of risk and have different criteria – but yet the “monetary outcome values” may be similar).

- **Scoping AFE**
  The ranked conceptual options are costed at the stage to circa +25% -15%.

- **Compile / Populate Well / Project Database**
  Thus sub-phase involves compilation of all data / information / decisions taken throughout the Conceptual Design Phase

**PHASE 2: SELECT CONCEPT PHASE**

This Phase involves selecting the most appropriate concept or concepts bearing in mind the company’s objectives, the PDDP / Well Design Pack and the Statement of Requirements.

The supporting text relating to each segment is contained within the appropriate areas below the phase diagram.
Fig 3: What’s Driving the Concepts? Seismic?

Fig 4: What’s Driving the Concepts? Pore Pressure?
SELECT CONCEPT PHASE

- **Select Concept(s)**
  The purpose of this phase is to select the concept(s) to be worked on during the next phase i.e. the Design Phase.
  - This is an absolutely essential – and crucial – phase, and typically involves many key decision-makers. Utilising risk / reward tools and thinking, the right scenario should be deduced to go into the next phase. It is essential to accurately note why the concept selected was actually selected. If there are any concerns, they should be addressed before the selection is “frozen”.
  - It should be noted that sometimes more than one concept follows into the Design Phase, either because one option simply cannot be selected or it is felt that there is value in doing so.
  - Select which option / options is/are to go forward to the design phase. All decisions to be fully recorded.

- **Compile / Populate Well / Project Database**
  This sub-phase involves compilation of all data / information / decisions taken throughout the Select Concept Phase, in particular the decisions taken and why the concept(s) selected were selected.
PHASE 3: DESIGN PHASE I

This Phase involves the initial design work pertaining to Design Phase I.

The supporting text relating to each segment is contained within the appropriate areas below the phase diagram.

Fig 6: Design Phase I

DESIGN PHASE 1

- **Preliminary Design Work**
  The purpose of this phase is to utilise the conceptual work which forms the basis of the concept(s) which has / have been selected and take this work into [more detailed] preliminary planning.

  - Depending upon the level of detail and amount of preliminary design work / planning undertaken much of this work could constitute input to the Design Rationale Document such that all Well Objectives / Statements of Requirements are adequately addressed.

  - Typical worked carried-out (and included in the Design Rationale Document) includes:

    Offset Well Analysis
    Surface Well Location / Site Survey Data Review
    Study of the sub-surface geology with regard to risks, data acquisition (e.g. logging, coring and testing)
    Well Design (trajectory, torque, drag, mud, casing, kick tolerance etc)
    Estimates re well duration and probabilistic costs

  - All designs per (leastways in the United Kingdom):-
The 1996 Design & Construction Regulations
Oil & Gas UK Recommended Practices
DECC Regulations & Requirements
Energy Institute (Institute of Petroleum) Guidelines
API Recommended Practices
Guidelines in accordance with other organisations (e.g. NACE)
Best Industry Practices
Company Policies & Procedures

- AFE (+/- 10%)
- External Specialised Studies (e.g. MPD, Fractured Basement Reservoir Completions etc)
- Risk Assessments (HAZIDS, HAZANS, HAZOPS, QRA / Probabilities)
- Contingency Plans
- Challenge & Peer Review
- Design Rationale Document Compilation
- Design Rationale Document Sign-Off

• Compile / Populate Well / Project Database
  Thus sub-phase involves compilation of all data / information / decisions taken throughout Design Phase 1 with particular regard to risk identification and mitigation and the logic behind the key points pertaining to the Design Rationale Document.

PHASE 4: CONTRACTS & MATERIALS PROCUREMENT PHASE

This Phase involves the deciding and placing of contracts with key vendors such as the Drilling Contractor, Key Service Providers (e.g. directional drilling, drilling fluids, cementing, etc.), Key Equipment Providers (e.g. wellheads, sub-sea production trees, well completions etc.) and the purchase / ordering of Key Materials.

The supporting text relating to each segment is contained within the appropriate areas below the phase diagram.
CONTRACTS & MATERIALS PROCUREMENT PHASE

- **Contracts & Materials Procurement**
  This phase involves contracts being placed with:

  - The Drilling Contractor (Note:- There are many types of contract available)
  - Key Service Providers (e.g. drilling fluids, directional drilling, wellbore stability etc.)
  - Equipment / Materials Suppliers (e.g. wellhead, casing, completion equipment etc.)

  Note: - Competency and track-record is extremely important here.

  See Reference 17.

- **Long-Lead Items**
  Note: - Long-lead items may already have been ordered when determined early-on in Design Phase 1. If they were not ordered earlier during the WDP, they should be ordered at this stage.

- **Materials Procurement**
  Materials procurement placed with Well Management Company (AGR) following expenditure authorisation from Hurricane Operations manager.

  See Reference 16
• **Compile / Populate Well / Project Database**
  Thus sub-phase involves compilation of all data and information pertaining to the Contracts & Materials Procurement Phase – in particular why the contracts awarded were awarded and why the equipment / materials ordered were ordered.

**PHASE 5: DESIGN PHASE II**

This Phase involves the detailed design of the well – whether it be with respect to the drilling phase, testing phase or the completion phase. A considerable amount of work goes into this phase – and, with respect to large Operators, a significant amount of liaison work is expected between offices, service companies and expert institutions so that the well’s design is both optimised and the associated costs minimised.

The supporting text relating to each segment is contained within the appropriate areas below the phase diagram.

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**DESIGN PHASE II**

• **Write Draft Drilling / Testing / Completion Programme (Rev 0) Programme**
  This phase involves the Drilling / Completion Programme being written by Well Engineering personnel with input from the Operations Group in accordance with (particularly in the United Kingdom):-

  - Company Policies, Procedures & Standards
  - The 1996 Design & Construction Regulations
  - UK Oil & Gas Recommended Practices / Guidelines
- DECC Regulations & Requirements
- Energy Institute (Institute of Petroleum) Guidelines
- API Recommended Practices and API Standards
- Practices per other organisations (e.g. NACE)
- Best Industry Practices
- The IADC Drilling Manual
- The Drilling Data Handbook
- The Design Rationale Document
- The Well Data Pack / PDDP / Well Objectives / Statements of Requirements Etc.

**Draft Programme (Rev 0) Issued for Comment**
Draft Programme issued to the following personnel for comment:-

- Operator Personnel
- Well Management Company (if utilised)
- Well Examiner (if in UK / USA)
- Drilling Contractor
- Service Company personnel
- Supply Company personnel
- Possibly the Authorities (such as the HSE in the United Kingdom)
- Peers (for Peer Review)

Once comments have been received, comments are then validated and if deemed appropriate incorporated into the Programme (Rev 1).

**DWOP / TWOP / CWOP**
The DWOP / TWOP / CWOP is an excellent forum for personnel from all disciplines and companies to have their say with regards to safety, risk mitigation, environmental issues and performance etc.

- Draft (Rev 1) programme issued in advance
- Appropriate wall charts on display
- All aspects of the programme to be appropriately discussed. Particular emphasis placed on safety of personnel, hazards, risks, risk mitigation and the environment.

All key pertinent points raised to be captured. Once points / comments have been received, comments are then validated and if deemed appropriate incorporated into the Programme (Rev 2).

**Finalised Programme**
All the validated points / comments raised during the DWOP / TWOP / CWOP and the results of any specialised studies are now incorporated into the Finalised Programme. Ideally, each section of the Finalised Programme should list:-

- Known or Possible Hazards
- Known or Possible Risks
- Known or Possible Uncertainties
- Remedial or Preventative Actions which will mitigate / eliminate hazards, risks and uncertainties
The final sub-phase of this particular phase is:

- Challenge & Peer Review (Note: - This sub-phase may possibly involve discussion with the Operator’s Well Examiner [if in the United Kingdom] to ensure that there are no “surprises” / no untoward aspects of design or operations).

![Image](image.png)

*Fig 9: Independent Well Examination is Crucial – And of Great Value*

- **Compile / Populate Well / Project Database**
  This sub-phase involves compilation of all data / information / decisions taken throughout this phase. Particularly important is the recording of why the Draft Programme was written as it was, the key points arising from the DWOP / TWOP / CWOP, a checklist to show that the points arising from the DWOP / TWOP / CWOP have been incorporated into the Final Programme, a clear listing of risks and mitigations and a clear listing of the outcomes of the Challenge / Peer Review sessions (and whether or not they have been incorporated into the Finalised Programme).

**PHASE 6: APPROVALS PHASE**

This Phase involves the detailed design of the well – whether it is with respect to the drilling phase, testing phase or the completion phase. A considerable amount of work goes into this phase – and, with respect to the Operator, a significant amount of liaison is expected between groups of expertise so that the well’s design is both optimised in terms of safety, productivity & longevity: and, of course, the associated costs are minimised.

The supporting text relating to each segment is contained within the appropriate areas below the phase diagram.
**APPROVALS PHASE**

- **Finalised Programme**
  Once the Finalised Programme has been approved by the Operator’s Operations Manager, the following documents can be submitted:-
  (See Reference 18)

- **HSE Notification (If Operator / Well Management Company is UK based)**
  - Summary (Management of Operations, Operator & Drilling Contractor Details, Design & Operational Controlling Standards)
  - Well Information
  - Location & Environment
  - Well Objectives
  - Geological & Data Acquisition
  - Target & Directional Information
  - Well Operations
  - Casing & Cementing Summary
  - Drilling Fluids Summary
  - Well Control Summary
  - Completion / Suspension / Abandonment
  - Additional Equipment
  - Well Operations (including Potential Drilling Risks)

- **Site Survey (If UK based)**
- Site Survey Plan
- PON 14A Notification / Application for Site Survey
- PON 14A Environmental Assessment for Site Survey
- Wildlife disturbance licence (part of PON 14A)
- MCAA / MCA Consent for Grab Sampling (part of PON 14A)
- PON 14A Close-out Report
- Site Survey Report to Marine Scotland
- MMO Report (after Site Survey)

- **Drilling Related Documentation (If UK based)**
  - Inform MOD if drilling in a PEXA (Practice & Exercise Area)
  - Environmental Statement
  - Oil Pollution Emergency Plan (OPEP)
  - Application for Consent to Drill (WONS) – Prior to PON 15B
  - Consent to Locate
  - PON 15B Environmental Assessment
  - PON 15B Chemical Permit
  - OPPC Permit
  - Wildlife Disturbance (as part of PON 15B)
  - FEPA Licence

- **VSP (If UK based)**
  - PON 14A for VSP (submitted as part of PON 15B)
  - MMO Report after VSP Survey
  - PON 14A Close-Out Report

- **Well Testing (If UK based)**
  - Standard Well Test / Extended Well Test Application (HSE Notification & DECC)
  - See Reference 3 – Sub-Contractors Documentation

- **Well Examiner (If UK based)**
  - Signed-off Well Programme sent to Well Examiner per 1996 Design & Construction Regulations
  - See Reference 12

- **Compile / Populate Well / Project Database**
  Thus sub-phase involves compilation of all the permits submitted and how long the process takes to gain approval.
PHASE 7: OPERATIONS PHASE

This Phase involves the oft difficult Operations Phase – difficult because many events happen simultaneously and, as there’s the cost of the rig plus service suppliers and operating costs etc. it can be difficult, sometimes, to carry out the Operations Phase in the most cost-effective manner possible. (However, every effort will be made by the Operations Office to ensure that the most cost-effective and “fit for purpose” decisions are taken).

Text relating to each segment is contained within the appropriate areas below the phase diagram.

**Finalised Well Programme Distribution**

Once the Finalised Well Programme has been approved by the Operator’s Operations Manager and the appropriate consents have been received, the Finalised Well Programme can be distributed to all concerned:

- Management (Operator, Management Company & Drilling Contractor)
- Drilling / Well Superintendents
- Drilling / Well Supervisors
- Well Examiner (Note Reference 6)
- Toolpushers / Performance Toolpushers
- Key Service & Supply Personnel
- Appropriate Authorities as necessary

**Programme & Policies Roll-out**
This sub-phase will cover the Operators and Well Management Company’s Policies in the areas of:-

- Safety
- Health
- Environment (Note: All Operators will have an Environmental Management System)

**Pre-Spud Meeting**
With the Finalised Well Programme distributed, a Pre-Spud Meeting will be held on the rig (typically by the Operator’s Drilling Engineer). Pre-Ops meetings in the office may also be held in the office too in certain areas – e.g. sub-sea completions as deemed necessary.

**Pre-Spud Specialised Training**
Appropriate here could be MPD for the Drill Crew and the Operator’s Drilling Supervisor.

**Pre-Spud Rig Inspection / Audit**
The rig may already have been inspected – for example at the Contract signing stage. However, with there typically being considerable time these days (2016) between Contract signing and moving-on to the Operator’s location, an inspection by various rig auditors and the MPD Company (if to be used) may very well be considered to be prudent. (Note: The rig will already have been classed as being suitable or “competent” for the Operator before the Contract signing stage). Even if the Well Management Company is organising the Acceptance Testing Criteria, the Operator will still check / review the QA / QC associated with the Acceptance Testing Criteria

See Reference 13

**Competency**
As observed with regard to the Macondo incident, having attended a course and received a certificate (e.g. Well Control) is no guarantee of competency. Competency is a demonstrable “process” and for Drilling / Well personnel is typically a matrix of “Proof of Knowledge” and “Demonstrable Proof of Skill” for the position with each task being signed-off by an Approved Assessor. Typically, for the Operators’ wells, apart from areas such as Well Control and Generic Tasks, MPD may be an area where the Drill Crew and Drilling Supervisors have to demonstrate competency.

There will be full compliance with References 7 – 9.

**Procedures / Policies / Standards**
All operations are to be carried out per the Operators / Well Management Company’s Approved Procedures, Policies & Standards (e.g. API STD 53)

See References 20 - 21

- **Bridging Document**
  Clear, unambiguous and signed-off Bridging Documentation will exist between the Operator, the Well Management Company and the Drilling Contractor. Of key importance are the areas of Safety, Health and the Environment, with particular emphasis being placed on Well Control and Safe Working Practices.

- **Communication**
  Pre-Job Safety Talks / “Toolbox” talks are to be carried out regularly – i.e. pre-tour / pre-specific job / task / operation. Morning and afternoon calls from the rig to the Operators / Well Management Company’s offices are required as is written details per recent operations carried out (24 hourly basis) and up-coming operations. Well details are also to be sent on a daily basis to the Well Examiner so that the “Well Construction” phase of the Design & Construction Regulations can be completed. Communication with the Authorities as appropriate.

  See Reference 14

- **Management of Change**
  If there are to be any changes to the well (e.g. casing shoe set high, LOT not as high as expected) then Management of Change procedures must apply. The key areas are:-

  - What the change is
  - Its impact on the well / the well’s Integrity
  - The associated risk
  - Approvals

  See Reference 15

- **Operations Accounting**
  Well costs to be tracked on a daily basis.

  See Reference 19

- **Decision-making**
  The final decision regarding offshore operations lies with the Operator’s Operations Manager.

- **Reservoir Data Acquisition**
  Reservoir Data Acquisition sub-phase will already be part of the Drilling / Well Programme. However, some changes may be necessary in the areas of:-

  - Samples / Sampling
- Wire-line Logging / LWD
- Coring
- Testing

Regular / constant inter-fac ing with the G & G / Sub-surface personnel is essential during this sub-phase

- **End of Well Status (If well drilled in UK)**
  The end-of-well status will, most likely, already be part of the Drilling / Well Programme. However, depending upon what’s found through the reservoir, the well’s final status may change from, for example, a potential keeper to an abandoned well – depending upon the well’s original design and the reservoir data acquisition results. In either case, the well would be suspended or abandoned in-line with Oil & Gas UK Guidelines (if well drilled in UK).

- **End of Operations Reporting (If well drilled in UK)**
  - EEMS Reporting for Chemicals Usage and Discharge, Drilling Fluids Used & Discharged; Cuttings Generated; Waste; Atmospheric Emissions
  - OPPC Reporting through EEMS
  - Post-Well Reporting to other Authorities

- **Compile / Populate Well / Project Database**
  Thus sub-phase involves compilation of all the data and information pertaining to all of the sub-phases contained within this phase.

**PHASE 8: REVIEW PHASE**

This Phase involves the complete compilation of all data, information, positive learning’s and negative learning’s with regard to the drilling / testing and completion of the well.

Text relating to each segment is contained within the appropriate areas below the phase diagram.

**PHASE 8: REVIEW PHASE**

Please see Schematic below
REVIEW PHASE

- **Data Storage**
  It is essential that all relevant data acquired during the drilling of the well be stored correctly for review and future use. Particularly important are the following:
  
  - General overview data / problems / successes
  - Drilling Data
  - Log Data
  - Core Data
  - Sample Data
  - Test Data

  This information is essential for the following 2 sub-phases:

- **Lessons Learnt**
  The successes and problems, when reviewed correctly, can better help with the planning and execution of future wells. All lessons learnt during all phases of the well will be appropriately captured.

- **Subsurface Modelling**
The sub-surface model can be updated to yield a more accurate / better understood model.

- **Compile / Populate Well / Project Database**
  Thus sub-phase involves compilation of all the data and information pertaining to the whole well. Of significant importance is that all responsibilities are carried out, all key lessons learned are recorded and that all necessary reports and submissions are duly recorded as being sent to the appropriate people.

**REFERENCES**

References 1: The PDDP – Pre-Drill Data Package for Drilling;

Reference 2: Statement of Requirements


Reference 5: Oil & Gas UK “Well Life Cycle Integrity Guidelines” which cover Duty Holders for well operations; Well integrity, barriers and well control; Well design & operations planning; Drilling; Well Testing; Completion; Commission; Operate and maintain; Intervention / work-over; Suspend and Abandon.

Reference 6: Oil & Gas UK “Guidelines for well operators on well examination” Issue 1 November 2011

Reference 7: Oil & Gas UK “Guidelines on competency for wells personnel” Issue 1 January 2012

Reference 8: Oil & Gas UK “Example competency profiles for wells personnel” January 2012

Reference 9: Oil & Gas UK “Guidelines for well operators on competency of well examiners” Issue 1 November 2011

Reference 10: Operator’s Environmental Management System (which should be fully certified to ISO 14001 EMS and compliant with OSPAR)

Reference 11: “Probabilistic Planning & Performance Management”; “Management of Risk & Control of Change” and “Risk Assessment and Control”

Reference 12: “Well Examination”

Reference 13: “Rig Audit”

Reference 14: “Communication”
APPENDIX 1: ENVIRONMENTAL PERMITS (IF WELL DRILLED IN UK)

<table>
<thead>
<tr>
<th>Environmental permit</th>
<th>Comments</th>
<th>Preparation time</th>
<th>Required submission deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental statement (ES)</td>
<td>It must be confirmed with DECC if an ES or a PON15B environment assessment (below) is required. This is very simple for a development, as an ES would always be required. This is a grey area for drilling, particularly WoS. DECC deemed a PON15B to be sufficient for ABC, but they may have changed this stance since Macondo. Therefore, would be need to contact DECC around 9 months before the well is drilled to check on this.</td>
<td>2 to 3 months for drilling only</td>
<td>6 months before (although with a good submission for drilling only can be reduced to 3 or 4 months)</td>
</tr>
<tr>
<td>PON15B environment assessment</td>
<td>See above.</td>
<td>1 to 2 months</td>
<td>28 days (although 2 months advised for WoS)</td>
</tr>
<tr>
<td>Permit Type</td>
<td>Description</td>
<td>Time Required</td>
<td>Deadline</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>PON15B chemical permit</td>
<td>Required to cover chemical use and discharge for all wells, regardless of ES submission or not.</td>
<td>2 weeks to 1 month</td>
<td>28 days</td>
</tr>
<tr>
<td>Oil pollution emergency plan (OPEP)</td>
<td></td>
<td>1 to 2 months</td>
<td>2 months</td>
</tr>
<tr>
<td>Consent to Locate (Ctl) 1</td>
<td>Covers placement of the drilling rig</td>
<td>Submitted within PON15B</td>
<td>28 days (PON15B deadline)</td>
</tr>
<tr>
<td>Consent to Locate (Ctl) 2</td>
<td>Covers a suspended well head being left behind.</td>
<td>Submitted within PON15B</td>
<td>28 days (PON15B deadline)</td>
</tr>
<tr>
<td>MCAA licence</td>
<td>This is a new requirement which is to do with disturbance of the seabed and installation of infrastructure. This has to be looked into further with regards to the requirements for development activities.</td>
<td>TBC</td>
<td>TBC</td>
</tr>
<tr>
<td>PON14A</td>
<td>To cover VSP operations</td>
<td>Submitted within PON15B</td>
<td>28 days (PON15B deadline)</td>
</tr>
<tr>
<td>Extended well test (EWT) application</td>
<td>Only required if an EWT is planned and not a conventional well test.</td>
<td>Submitted within PON15B (also additional application to the LED is required)</td>
<td>28 days (PON15B deadline)</td>
</tr>
<tr>
<td>Wildlife disturbance licence</td>
<td>May be required for certain activities such as VSP operations. Can be built into the environmental assessment and done at the same time.</td>
<td>Submitted within PON15B</td>
<td>28 days (PON15B deadline)</td>
</tr>
<tr>
<td>OPPC permit</td>
<td>To cover the discharge of oil from the reservoir, such as oiled cuttings, production water during flaring, etc.</td>
<td>2 weeks to 1 month</td>
<td>28 days</td>
</tr>
<tr>
<td>MoD notification</td>
<td>E-mail notification only.</td>
<td>N/A</td>
<td>1 year before (not observed)</td>
</tr>
</tbody>
</table>