

From: Baker, Kate H  
 Sent: Tue Aug 25 15:35:08 2009  
 To: Sauf, David C (D&C Aberdeen)  
 Cc: Mason, Mike C; Bowman, Mike BJ; Frisby, Douglas J; Anders, Joe L  
 Subject: FW: BP Global Well Integrity Review  
 Importance: Normal  
 Attachments: Well Integrity Management Review Terms of Reference vs 2.doc; Well Integrity Strategy White Paper V1.doc

David, It's great to see this finally getting some traction. Not surprised to see you in the thick of it. Let Douglas know if you need any Subsurface help as you tackle the well integrity management issue. We are interested in providing any necessary assistance for BP to achieve Life-of-Well no drilling surprises. Kate

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From: Anders, Joe L  
 Sent: Monday, August 24, 2009 10:59 AM  
 To: Zanghi, Mike; Lockyear, Chris F; Baker, Kate H; Frisby, Douglas J  
 Subject: FW: BP Global Well Integrity Review

Hi Folks.  
 FYI, not sure if you have heard about this initiative or not. I'm pretty hopeful it will have a positive impact on how we manage well integrity.

Later,  
 Joc

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From: Anders, Joe L  
 Sent: Friday, August 21, 2009 3:35 PM  
 To: Rossberg, R Steven; Kara, Danny T; Cismoski, Doug A; Engel, Harry R; Robinson, Steve W (Alaska); Shepard, Samantha F  
 Cc: NSU, ADW Well Integrity Engineer; Dube, Anna T; Andrews, David; Saul, David C (D&C Aberdeen); Anders, Joe L  
 Subject: FYI: BP Global Well Integrity Review

Hi Folks.  
 FYI, assembled below are two emails discussing the project to review the "Well Integrity situation in BP". I've been asked to participate on the team and we've had one teleconference to review the ToR and start identifying action items.  
 I'll keep you informed of project status as it progresses.  
 Please let me know of any questions.

Later,  
 Joe  
 943-0044 (cell)

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From: Saul, David C (D&C Aberdeen)  
 Sent: Thursday, July 16, 2009 7:39 AM  
 To: Porter, David A; Andrews, David; Anders, Joe L; Skjerven, Tommy; Houghton, Chris; Weiss, Janet L  
 Cc: Braunston, Dick; Haden, Steven K; O'Bryan, Patrick L; Christman, Gary E; Rich, David A  
 Subject: Well Integrity Management Review

All,  
 As you know we have been asked to take a good look at the Well Integrity situation



in BP with some clear deliverables requested. This will be quite a challenging project, but I'm confident we can achieve the stated objectives in the time frame. If you haven't seen them, here are the Terms of Reference:

<<...>>

Much work has already been done in a number of areas by some of you and others. I see our task is to pull the whole story together from a global perspective and close some of the gaps.

This note is mainly to announce that together, we will be commencing on this journey shortly and to let you know the outline of what I have in mind. Dave Andrews and I will be getting together tomorrow, 17th July to develop this plan further. I will be heading off on vacation this weekend, but I have asked Dave to start to make some arrangements while I am away so that we can start to make some solid progress through August.

I see the outline plan as follows:

- Convene a half day kick off telecon in early August. This will help us to get clear on objectives, develop the plan, understand what already exists and what needs to be created. Decide who will take the lead in each area. Start to collect existing information
- From early August we will set up a weekly one hour call to check in on progress.
- In mid August I will convene a Steering Group Meeting to agree/refine the plan
- In early September we will arrange to meet face to face for a whole week somewhere, probably **Aberdeen** to work the problem in detail. Please think about dates that work best for you.
- September and October will be about getting complete on deliverables
- End October I will convene another Steering Group meeting to check in with a progress report
- November - project completion - celebrate success!!

That's all for now. Please let me know if you have any issues, concerns or improvements you would like to make to the way forward.

Regards

**David Saul**

Manager STS Integrity Management - EPT

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Registered in England and Wales, number 00305943.

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From: **Andrews, David**

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BP-HZN-2179MDL017817

Sent: 20 April 2009 10:42

To: O'Bryan, Patrick L; Haden, Steven K; Bowman, Mike BJ; Braunston, Dick

Cc: Mason, Mike C; Hey, Michael-James; Adair, Paul; Cameron, Paul (ABZ); Saul, David C (D&C Aberdeen); Peacock, Ralph; Sweeney, Frank M

Subject: Well Integrity

I have attached a DRAFT white paper for your review. I have titled this paper "Strategy for Well Integrity" but it could just as easily been titled "Strategy for Wells". I'm sure that this will come as no surprise to you as you will have often heard me saying that well integrity is nothing more than an outcome of good wells practice.

I have to admit that the paper still requires a lot of work in terms of crossing the t's and dotting the i's but I see little point of spending more time on it if the proposal is deemed as "too difficult". Much more work will be required if any merit is seen within the proposal. I believe we have a great opportunity to grasp this nettle and, if we do, steal a march on the competition.

The proposal ignores personal issues. The paper is based purely on what I consider to be in the best interest of our wells. Our wells are important. Arguably, after the reservoir, our wells are our biggest single assets yet they are treated with so much indifference at a corporate level. No other asset, piece of kit or reservoir, is passed from pillar to post across the complete range of disciplines in the same way as our wells. The reservoir and its management, for example, moves from one group to another but each of those groups is made up of like minded reservoir specialists using the same metrics and drivers.

At the other end of the spectrum we have the well. Each and every one of our Functions has a finger in the well pie. Project and Engineering has an input at the early stage and this input can have a major impact on our wells life cycle. I'm sure that we can all think of instances where well performance has suffered from poor early input. The well is then handed off to Drilling and Completions who, with input from Subsurface and Wells, drill and complete the well. The construction phase is critical and our well stock has suffered from poor construction practise but at least accountability for this phase in a wells life is completely clear and there is great benefit in this. Finally a well is handed off to Operations and HSE where it will remain for the bulk of its life, with input from Subsurface and Wells, yet many who operate our well stock have little deep knowledge of our wells.

I believe that the present management structure of our wells raises two issues. 1) there is no single continuity/accountability as a well moves from inception to abandonment. Considering the immense value these wells deliver is this acceptable? And 2) each of these Functions has its own set of metrics and drivers, in relation to the well, which in some cases conflict. One could argue that it is a measure of our ingenuity that we deliver operational wells of any sort given this adversarial backdrop. Imagine what could be achieved.

<<...>>

I have recently heard it suggested that SPUs are motivated by greed and fear. I believe that this assertion is not without merit and to some extent these primeval instincts are healthy provided there is a conscience. I believe that the Functions within EPT, to a great extent, should act as the SPU conscience. We should be allowed to intervene far more than we are allowed to at the moment.

Thanks for your time,

David.

David Andrews

Advisor

Global Well Integrity Lead

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**E & P Segment**

**Strategy for Well Integrity**

**Doc Number : to be confirmed**

Rev No	Date	Description	Issued	Checked	Approved	Signature
A5						
A4						
A3						
A2	20/04/09	Second Draft Issued				
A1	19/03/09	First Draft Issued				

## **Executive Summary**

### **Objective**

The objective of this paper is to present a strategy that will allow BP global wellstock integrity to be known and properly managed. We need to recognise that well integrity is not a science. There is nothing complicated in maintaining well integrity. All our major well integrity incidents have been due to simple bad practice. Well integrity is no more than an output of competent basic operating practice. Complexity and cost is a product of having to repair failed wells.

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### **Context**

As we move to the new governance documentation, within the Group IM Standard, it is deemed appropriate to develop a strategy to prevent and mitigate integrity related losses associated with the BP global wellstock.

### **Recommendation**

The cornerstone of this strategy requires that the accountability, for the BP wellstock, within each SPU/Asset, is clearly articulated and known. Nothing will be achieved till this fundamental requirement has been landed and agreed. To assist in this strategy it is proposed that an individual be appointed as SPA to ensure that there is continuity and accountability across all areas in a wells life cycle (Appendix 1 Proposal).

We need to ensure that conversations between Functions and SPU leadership include Wells and this well conversation includes well integrity. The desire to improve well integrity needs to be a pull from the top not a push from below.

Further the paper proposes that each well needs to be considered as nothing more than just another piece of plant and treated in the same way as a separator, a gas compressor, a generator, etc. Wells have been left in a no man's land for too long. We need to ensure that those who control BP wells, day to day, are competent, and the wells are managed to the same high standard as any other piece of BP production plant. We need to think of integrity within the Group IM Standard in terms of integrity "from sandface to export".

Wells and well operations have always suffered because of the many functions and disciplines involved in their inception, design, construction, operation and finally their abandonment. Traditionally each of these activities has tended to be carried out in isolation and once each stage is completed the end product has been left for others to pick up the pieces. We need to recognise this and change the way we treat our wells across the Functions. We cannot expect the outcome to change if we carry on as acting as we do.

David Andrews

### **Overview of this Document**

This paper should be considered in two parts;

#### **Section 1**

This section is description of where we are at this time. A description that details the gaps in the organisation that need to be overcome. Many Functions are involved in the inception, design, construction, operation and finally abandonment of our wells but I would argue that time and time again we see no meaningful communication across these Functions. Unfortunately these gaps are also present between disciplines within the functions. Why is it that we have a Senior Vice President of Subsurface and Wells that filters down to a Vice President who is accountable for Base Management and Completions? Where does the accountability for our Wells disappear to?

#### **Section 2**

This section describes a possible solution where accountability for "operating" wells has the same level of rigour as any well in its construction phase and Petroleum Engineers are brought together as a discipline within the D&C Function. This model unites PEs with CEs under the D&C Function that could become D&Well Engineering. In conjunction with this move consideration should be given to having a major "wells" presence within the Operations & HSE to become Operations, HSE & Wells to work as "production engineers" accountable for ensuring that wells are handed over with proper operating manuals to competent individuals and work to engrain wells, as just another piece of plant, within the operations Function. Further this proposal shows how these direct links from "wells", into the SPU/Assets, could promote real accountability and ownership for our operating wellstock. These production or operations engineers within the Operations, HSE & Wells function, in the line, would be the embedded link between Subsurface and Operations delivering the base management agenda and ensuring that the water injection agenda is being given the correct attention.

The Subsurface Function would continue concentrate on the reservoir and reserves. This I believe would remove the need for the existing SS&W interface that tends to dilute the interface between D&C and Operations and has no real wells links and influence within the SPU/Assets in relation to day to day well operations.

## Section 1

### **Overview**

#### Current Status

Presently there are many "points of engagement" in the life of a well (Appendix 2). Many functions and disciplines are involved. This may even involve different disciplines within a single function. Unfortunately the present status provides the cracks through which efficiency, understanding, learning and improvements fall. The lack of communication across the disciplines and functions makes the **Plan Do Measure Learn** cycle extremely difficult if not impossible in relation to our wellstock. Presently the cycle revolves well within each silo but very little happens that can make a big impact in a wells full life cycle.

It is worth reminding ourselves how we would deal with the installation of a new compressor as part of a facility production plant. A great deal of planning would be involved, installation risk assessments made, operating risk assessments made, reams of operating documentation provided (how to start up, how to shut down), maintenance training provided, special vendor visits (possibly for weeks at a time) for both maintenance and operations personnel. This is all for a piece of plant that may cost in the region of US\$20mm.

In contrast when we hand over a US\$100mm well we fill out a form listing pressures and tests hoping the individual who receives this form understands all the information presented.

There is no doubt that much planning and risk assessment goes into the construction of the well but traditionally each function/discipline has tended to walk away once their construction role has been completed.

As alluded to earlier all our well integrity train wrecks have been down to simple bad practice. Alaska A22, procedures not followed and little or no understanding of the effect of a cement retainer; Ula A5, poor handover and bad practice; Colombian blow out, poor practice and risk assessment. 6

## Gaps

### Accountability/Ownership

I believe that the greatest obstacle in delivering appropriate levels of integrity across BP wellstock is a lack of clear accountability for that wellstock. When this is coupled to a complete lack of continuity as each Function delivers their individual piece using their own metrics and drivers it is a credit to all involved that we do deliver operational wells at all. As previously discussed there are many points of engagement in the life of a well but only during the well construction phase do we get anywhere near an SPA for the integrity of that well. ④

BP history is littered with inappropriate actions and decisions, pertaining to wells, with little or no accountability. Projects and Engineering specifying horizontal trees for platform use, D&C handing wells over to operations with little or no operating information, operations handing wells back to D&C for repair with little or no service history. ①

It is somewhat ironic that the only EPT Function with **Wells** in its title (Appendix 5) has no functional link into the SPU/Assets in relation to **day to day well activity** (base management) and **accountability**. Further the Function that arguably controls and manages our well stock on a day to day basis for the bulk of its life has little or no **Wells** element in its Function (Appendix 6) and even less input into the **Plan Do Measure Learn** life cycle of a well.

It could be argued that Base Management, at the coal face, is made up of two basic activities, well work and well operations, and neither have any real empathy within Subsurface. The practical day to day aspects of base management are all about mechanical interventions be it well intervention or optimising well parameters. One could argue that these two critical aspects of base management sit better in the line.

D&C have really strong links into each SPU/Asset and use these links to great effect in relation to **Plan Do Measure Learn** as part of well construction activity but how do Major Projects fit in the cycle? Further how do Operations fit and influence this cycle. Operations operate our wellstock but is there any real ownership? With no functional link into the SPU/Assets how does SS&W really participate effectively in a wells life? Reservoir performance, option generation/progression, well performance and optimisation in a reservoir sense yes but day to day well activity and accountability no.

For too long wells have been treated as one would treat a hire car. There is little or no ownership of our wells outside the D&C construction phase. How often do we check the tyre pressure, oil level and coolant level on a hire car? It is not our car, there is no ownership, why bother? ②

Despite the lack of ownership the hire car has two big advantages over a typical BP well. First off each hire car is supplied with a full set of operating manuals. This allows the driver, should he so wish, to understand and operate the vehicle as it was designed. The second advantage and arguably of greater importance,

before a hire car is handed over, the supplier wants to assure himself that the individual hiring the car is competent to operate/drive it. The supplier does this by insisting on seeing a valid driving licence. We hand over US\$100mm wells with no consideration of operating competence..... Who is accountable for checking proper well operating manuals are in place or operator competence prior to handing over a US\$100mm well?

#### Lessons Learnt

How do Operations link back into Major Projects in terms of wells, wellbay, wellhead and tree design? How do SubSurface & Wells link back into Major Projects in terms of wells, wellbay, wellhead and tree design? How do Operations link back into D&C in terms of wellhead, tree and completion design? All of these are fundamental to continuous improvement but how much of this has been carried out?

#### Knowledge

As previously discussed what rigour is employed when a brand new well that may have cost US\$100mm to construct is handed over? Who is accountable to ensure that proper operating procedures are in place? Who is accountable to ensure those that will be operating that well have the knowledge and experience to operate that well? How do these procedures stack up against those used when a new piece of plant is installed?

### Section 2

#### Overview

##### Future Status

We must ensure that our organisation is aligned to the needs of the SPU/Assets eliminating the self imposed barriers to communication and learning. To assist in this strategy it is proposed that an individual be appointed as SPA to ensure that there is continuity and accountability across all areas in a wells life cycle (Appendix 1 Proposal).

This individual would be charged with ensuring that continuity and accountability are properly discharged during the full life cycle of our wells. The life cycle being defined as inception, design, construction, operation and finally abandonment of our wells. Particular care and attention being given to critical stages to ensure that wells are properly handed over to competent staff who would have the correct operating procedures and wherewithal to operate their wellstock in line with both company and good operating practice. Further this individual would require to ensure that the **Plan Do Measure Learn** cycle was in place to facilitate full life of well learning back into the CEs.

This position would be assisted by "Production Engineers" appointed within SPUs charged with raising the profile of the wells status within Operations, HSE and Wells by preaching the vision that wells are just another piece of plant. This

role would also be the link to the depletion plan and wellwork. Whilst working within Operations, HSE and Wells these individuals would still be parented to Well Engineering within D&Well Engineering.

(It could be argued that after the reservoir wells are our biggest single asset and yet within the Operations & HSE Function, a Function that operates the wells for the bulk of their life cycle, wells have no representation. I believe this to be a major gap.)

The vision is that wells will be considered as just another piece of production plant and those operating BP wellstock are deemed competent to operate and have a proper understanding of their respective SPU/Asset wellstock risk. Production or Operations Engineers would be embedded within the Operations, HSE & Wells function as the guardians of base management within the function that operates our base ensuring that our wells best interest are looked after as the link between Subsurface and Operations.

The silos imposed by the organisation will have been broken down to provide projects, well construction, well management and well operations as seamless functions dealing with wells.

The best example I have ever seen of a seamless wells organisation working with operations was in an organisation called WEO (Well Engineering and Operations). This was a model used in the North Sea for a number of years and to the best of my knowledge was very effective in terms of having the complete well construction, well completion, well intervention and well integrity disciplines under one umbrella.

Admittedly links between WEO and Operations & HSE still left a bit to be desired but at least there was only one silo to bridge. With the proposed Wells SPA bridging the Drilling & Well Engineering to Operations, HSE and Wells silos there would be a real drive to work the plan.

#### Accountability

Accountability, or the lack of it, is the thread that runs right through this paper. I repeat that the only time accountability, for all that goes on in a well, is crystal clear is in the construction phase. We must strive for that sort of clarity throughout the life cycle of a well. I include the Project and Engineering stage in this assertion. We have seen and keep seeing decisions being made about wells and wellbays at project stage by nameless bodies with no links and rigour into the experience of the greater body.

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#### Base Management

Base management in its truest sense is all about maintaining the base and the largest part of that base is our wellstock. I would respectfully suggest that managing, recording, reporting, maintaining and operating our well stock in line with the depletion plan sits better within Operations, HSE and Wells rather than in Subsurface where wells are nowhere near the functional line. It makes much

greater sense to strengthen the day to day management and operation of our wellstock and be proactive from within an Operation, HSE and Wells function than be reactive from a Function outside the line.

I believe that this proposal, in terms of being proactive within the line rather than reactive outside the line, applies equally to well intervention activity where, once again, the Function that presently champions wellwork, from a Functional standpoint is outside the line with no clear functional line into the SPUs.

#### Risk Assessments

Risk assessments are a well established tool used by Projects and Engineering, D&C and Operations & HSE but the operational well risks often slips through the handover cracks. There is a high value well risk assessment tool but there is no formal process which may be used to assess and then add the day to day well operational risks to the SPU/Asset's formal Risk Register.

#### Well - a vertical separator

Wells have been ignored for too long. We must share a vision that wells are just another piece of plant. There is nothing complicated about a well. It is made up of nothing more than different sized pipes and valves.

## **Implementation Plan**

### **Phase I – Appraise / Select**

- Produce 'White Paper' for VP approval by end Q1 06
- Organise the Function substructure to better suit the business needs
  - Change the focus to have a VP that bridges across from Drilling to Operations
  - ensure that effective and meaningful links into the SPUs exist
  - consider developing Drilling & Well Engineering
  - consider developing Operations, HSE & Wells
- Appoint a **wells** Individual within Operations & HSE to:
  - be well operations SPA within Operations & HSE
  - oversee well operating documentation
  - oversee the correct level of competence
  - develop OMS practice if deemed necessary
- Set-up Steering Group consisting of Projects and Engineering, Operations and D&C,
- Identify gaps in how wells are managed - from Project to Abandonment
  - set up links and communication across the silos
  - identify gaps in well operational procedures
- Identify & formalise cross-discipline interfaces

### **Phase II – Define**

- Prepare draft well operational procedure documents where none exist
- Link into well operational training for to develop competency from "sandface to export"
- Communication & Implementation plan for Functions and links to SPU/Assets
- Develop L&OD offer to underpin discipline understanding Integrity from "sandface to export"

### **Phase III Execute / Operate**

- Execute - Clear Accountability of every well at every stage in its life cycle
- Operate & Audit Plan in place for 20??

**Wells SPA - Accountabilities (at a Global Level)**

- Acts as the link across the various stages in our wells' life to ensure there is proper accountability as the well moves from one phase to another.
- Ensure that well losses (shut in wells) are flagged and understood
- Ensure wells are included in the IPC and well losses are recorded in ops efficiency figures
- Ensure that WI KPIs are regularly reported and understood
- Ensure that there are systems in place that identifies the required level of competence needed to operate an SPUs/Asset's wells
- Ensure that there is a system in place that provides the required level of training to operate an SPUs/Asset's wells
- Ensure that there is a system in place to certify that those who operate an SPU/Asset's wells are competent to do so.
- Ensure that proper Well Procedures in line with ETP/STPs are prepared and available
- Ensure that the process for design and construction of new facilities, or the modification of existing facilities, includes the involvement of those that will operate the those wells
- Ensure that risks associated with well operations are risk assessed, managed and added to the Asset Risk Register
- Establish the process to be employed to capture knowledge relevant to technical practices and fed back into the **Plan Do Measure Learn** cycle.

**Production Engineer - Accountabilities (at an Asset level)**

- Ensures that the dynamic nature of the wells are taken into account so as to be proactive in dealing a variety of issues such as scale, asphaltines, oil / water continuous systems, cement breakdown leading to annuli pressure leak off, changing H<sub>2</sub>S and CO<sub>2</sub> levels with varying waterflood practices, varying reservoir and well pressure, a changing need for artificial lift (which is always run sub optimally), re-completion in new zones / architecture changes with plug and tubing changes, corrosion impacts
- Delivers the depletion plan in respect of Operations, HSE and Wells
- Ensure Water Injection strategy is understood and adhered to with correct water quality being injected

Strategy for Well Integrity

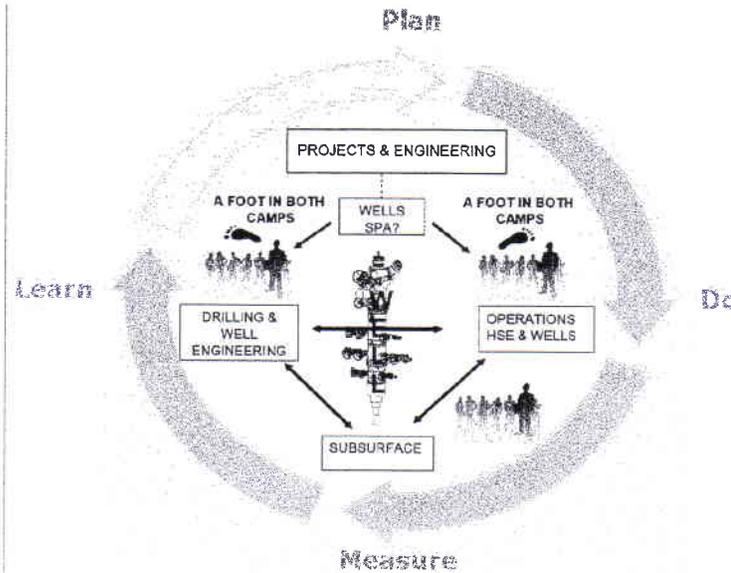
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- Ensure that there is a system in place to certify that those who operate an SPU/Asset's wells are competent to do so.
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- Ensure that risks associated with well operations are risk assessed, managed and added to the Asset Risk Register
- Establish the process to be employed to capture knowledge relevant to technical practices and fed back into the Plan **Do Measure Learn** cycle.

## Appendices

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Strategy for Well Integrity

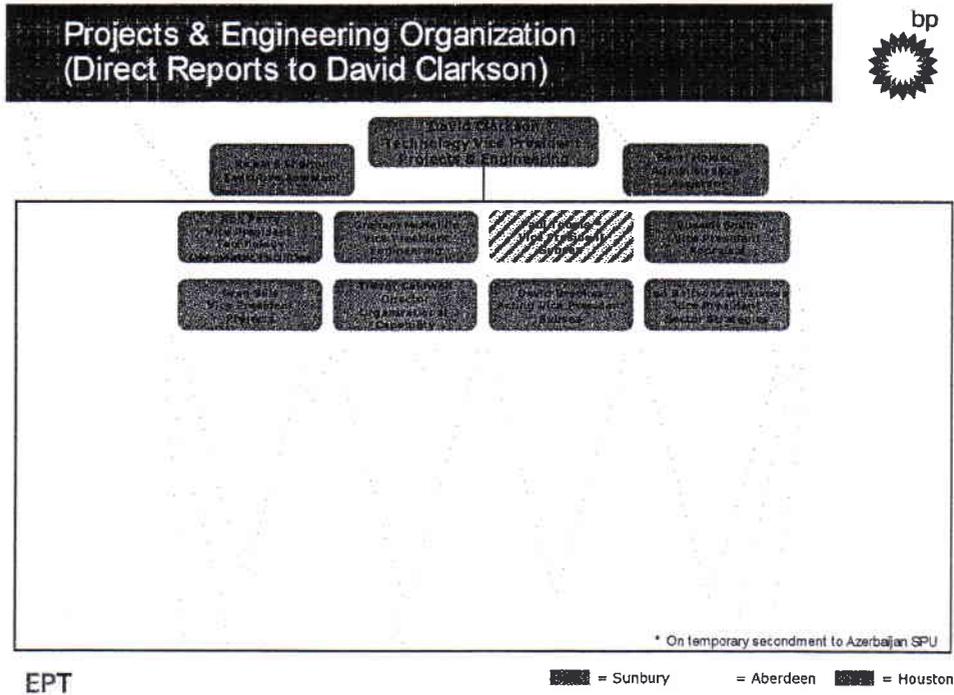
Appendix 1) Proposal



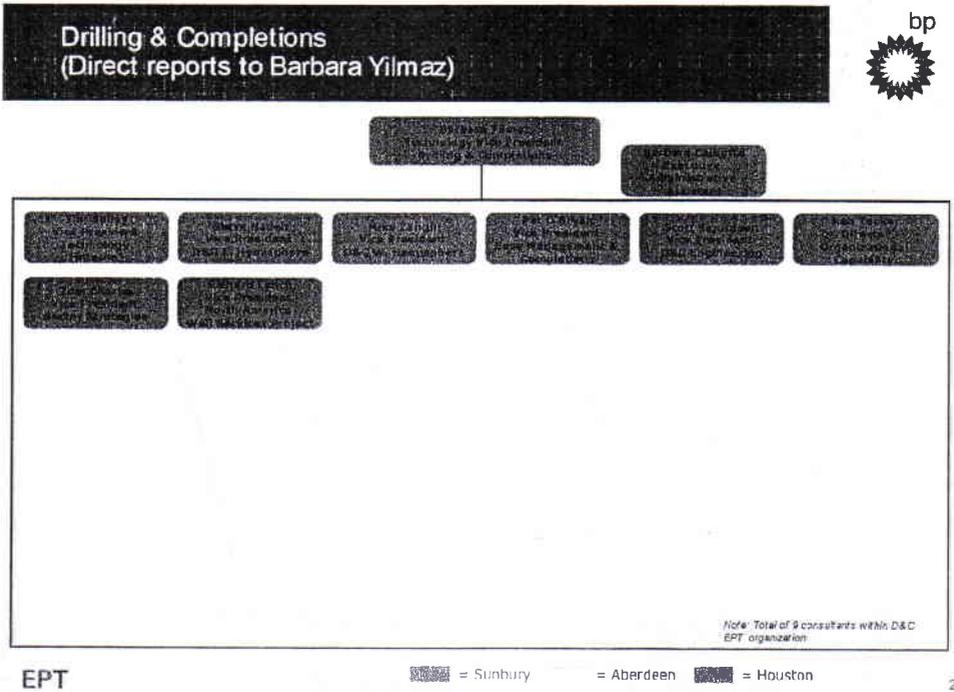
Appendix 2) Well Integrity Points of Engagement

Well Integrity - Functional Points of Engagement 				
Points of Engagement	MP	D&C	Ops	SS&W
Right Design	<i>Facility/Well Design</i> Wellhead specification Tree specification Wellbay design Well intervention consideration Safety shut downs	<i>Well Design</i> Well specification Tubular specification Wellhead specification Tree specification Well Intervention consideration	<i>Facility/Well Design</i> Well operability Safety shut downs Chemical injection Other operating considerations	<i>Depletion Plan</i> Well & Op strategy Long term fluids forecast Recovery factors, resources Reservoir description Production & injection rates Marginal water value
Right Construction	<i>Well Interfaces</i> Wellbay design Wellbay services	<i>Well Construction</i> Well hits target Well meets integrity standard Well in the best shape that it will ever be	<i>Operating Procedures</i> Well operating procedures developed Well Maintenance procedures developed	<i>Operating Procedures</i> Well operating procedures developed Well Maintenance procedures Surveillance Strategy Chemical injection/treatments
Right Skills (Ownership)	<i>Training</i> What training is required Schedule training	<i>Well Handover</i> Does well meet specification Provide as built spec Has Driving Licence been viewed prior to handover	<i>Well Handover</i> As built specification Driving Licence obtained Well ops procedures in place Correct skills in place Well Ops risk assessment	<i>Communication</i> Continuous communication with front line operators Constant and ongoing training
Right Maintenance	<i>Well Bay Maintenance</i> Learn from previous MPs	<i>Communication</i> Q&C in communication with Ops	<i>Scheduled Maintenance</i> Tree & Wellhead testing DHSV Testing	<i>Depletion Plan</i> Internal reservoir pressure Surveillance Strategy Field Life injector schedules Secondary & Tertiary Schedules RPL™ - how to improve RE

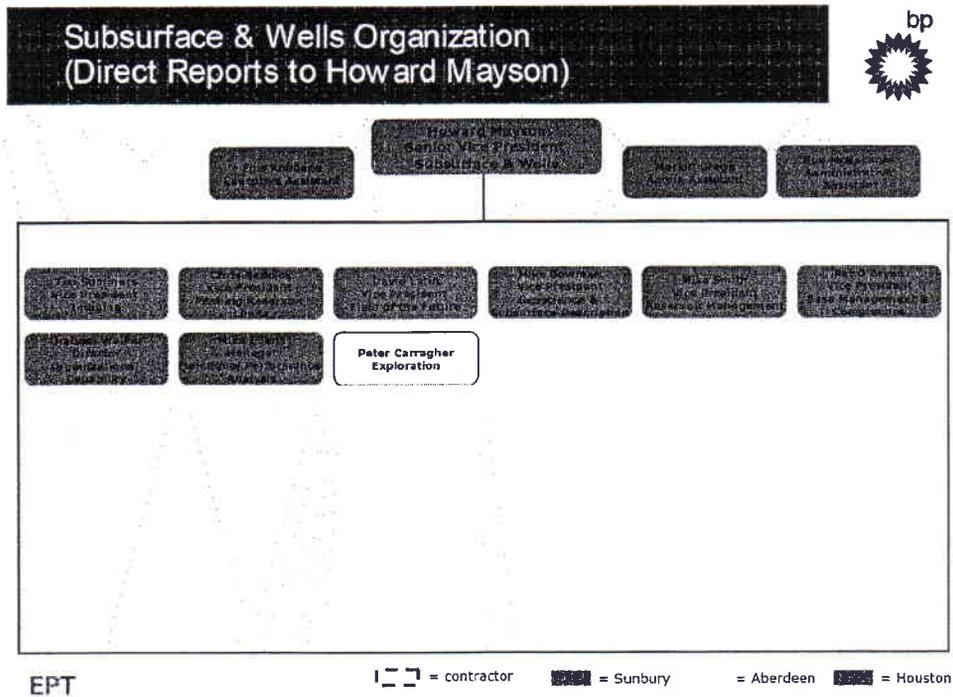
Appendix 3) Projects and Engineering Organisation



Appendix 4) Drilling and Completions Organisation



Appendix 5) Subsurface and Wells Organisation



Appendix 6) Operations and HSE Organisation

