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Deepwater Horizon
Technical Rig Audit
January 2005

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24 January 2005

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29 January 2005

Introduction

At the request of George Coltrin, Drilling Operations Team Leader, NAX deepwater GoM a technical rig audit was undertaken of the Deepwater Horizon semi submersible drilling rig. The Deepwater Horizon will undertake deepwater exploration wells, the initial two NAX exploration wells, Stones and Kaskida, represent significant challenges. The Stones well will be drilled in 9600' of water, representing the deepest water depth the rig has worked in. The Kaskida well will be drilled through 15,000' of salt to a total depth of 33,000' MD, representing a record depth well.

To mitigate a number of potential risks an assurance plan was formulated. The plan includes a set of audits and inspections that focus on equipment and systems that will be rigorously tested and/or subject to greater loads than previously experienced, during the Stones and Kaskia wells.

The vessel was on location at Walker's Ridge 508, Stones #1 well in 9,600 feet water depth. Operations during the audit included running the 16" casing string. The audit was undertaken between 17 and 21 January 2005 with a three man team. The team consisted of:

Kevan Davies	Drilling Equipment &Technical Services
John Wickham	Mechanical Handling
Richard Cox	Marine Systems

The primary focus of the Rig Audit Group was to execute the following areas of the assurance plan:

- Audit inspection criteria applied to the following critical equipment in an effort to eliminate failures.
    - Subsea BOP system; incorporating the test ram into the BOP operating system.
- Audit the preventative maintenance program applied to the subsea BOP and riser tensioning systems. Verify that maintenance is compatible with recommendations from the vendor / OEM.
- Audit Transocean's preventative maintenance program applied to the rigs main drilling systems. Verify that the work is being properly implemented and documented. Also verify that maintenance is compatible with recommendations from the vendor / OEM.
- Audit the results of an audit conducted by Transocean (3Q 2003) on the rig's dynamic positioning system. Verify that the outcomes of the audit are now in place and working effectively. Make recommendations on additional opportunities for improvement.
- Review the inspection protocol Transocean uses for preparation of heavy lifts. Make recommendations for improvements to the program that may provide additional risk reduction for heavy lifts in the future.

The first two items of the assurance plan were undertaken by a representative of BP's Rig Audit Group between 21 and 29 December 2004. The summary and recommendations resulting from the well control audit are imbedded into this audit report.

The week prior to the audit an incident involving a dropped claw from a PRS was designated as a HiPo. During the 5 days that we were present onboard the rig another incident involving a dropped object from an Offshore Energy Services casing fill up tool was also classed as a HiPo. In addition to these incidents a near miss occurred on the drill floor due to a dropped object from the travelling block dolly and a serious fire occurred on the Starboard crane. When the audit team left the rig the top drive dolly had not been 100% repaired and the crane fire was under investigation.

As time permitted other areas of the rig were inspected to access the current state of maintenance and operational condition of primary equipment and systems. This included an inspection of the derrick.

The asset must review the Audit Report Action Sheet (ARAS) to accept, change or reject the recommendations. If a recommendation is not accepted the reason for the decision should be documented and filed. Rig Audit Group consider that implementation of all recommendations will; improve safety/environmental performance, comply with industry standards and best practice, and enhance operational integrity.

This report incorporates the audit findings and recommendations and will be placed on the Rig Audit web site at http://upstream.bpweb.bp.com/rigaudit/content/default.asp. The asset is responsible for completing the ARAS and placing the updated version on the web site. Further advice on the functioning of the web site can be obtained from the author of this report.

Way Forward

With respect to the terms of reference and primary focus areas of the audit the following items should be considered as the minimum requirement for gaining satisfactory assurance as to the condition and integrity of equipment that will be rigorously tested during the upcoming operations.

- Verify status of dead line anchor bolts. The bolts were condemned 6 October 2004 and records could not demonstrate that bolts have been renewed.
- Conduct NDT inspection of drilling load path including missed items on the crown block, top drive and dolly and the critical load bearing areas of the drawworks brakes.
- Conduct overdue annual inspection of the crown block.
- Conduct overdue inspections of the top drive i.e. 90 day mechanical and 365 day driller's maintenance work orders.
- Verify condition of the forward PRS upper carriage drive assembly.
- Remove all defeats and bypasses from PRS.
- Ensure all relevant equipment is included in the anti-collision system. The iron roughneck and RBS were found in the ignore position on the bypass key switch panel.
- Remove all loose equipment/trash from the derrick and ensure secondary retention is in place.
- Identify cause of travelling block dolly carriage bolt failures and implement measures to prevent further occurrence.

- Replace damaged whip line wire rope on starboard crane. Crane will potentially need significant remedial work following the fire.
- In order to provide contingency in the event that riser has to be pulled the repairs to the riser gantry crane should be accelerated. The crane will require a load test and re-certification prior to use.

Summary of Observations and Recommendations

Safety
The implementation of lock out / tag out although generally satisfactory unacceptable practices were noted. These included failure to effectively isolate mechanical and electrical energy sources and not displaying the isolation certificate at the job site.

Improvement in the execution of the permit to work (PTW) system is required. An open permit was found in the driller's cabin dating from September 2004; in addition the permit in question had not been logged in the permit register. Several people including the BP Well Site Team Leaders appeared unfamiliar with the requirements of the PTW policy for issuance of camera permits.

Following a fatality on the Deepwater Nautilus safety gates were installed between the rig floor windwalls and the riser skate. The safety gates on Horizon were found inoperable due to significant mechanical damage.

Safety Performance
Exemplary participation in the START process was demonstrated. All cards are reviewed for content and key themes are raised during pre-tour meetings and safety meetings. START is used primarily to identify safety behaviours, both good and bad. The rig benefits from both an RSTC and an OSA. The RSTC focuses primarily on safety and training while the OSA is more hands on and focuses on safety and the environment. A number of omissions were noted from the Think Plans involving lifting operations and use of the personnel basket.

Well Control
One major concern is LMRP connector did not unlatch at 1500 psi and would not until a pressure of 4000 psi was reached. The competency levels of all the personnel were satisfactory, and an active system of communication and passing of knowledge was witnessed.

The planning, and riser analysis for the rig to drill the well has been completed using Transocean in house engineering and cross referenced by Stress Engineering. The information contained in the analysis has been circulated to the rig. The extent of the limitations and possible implications of the riser configuration are understood by the operational personnel on the rig, and management both on the vessel and in Houston.

The scope of work that Transocean is performing is extensive and includes
- Wellhead connector change out
- Pod upgrades and swap out
- All rubber goods changed out
- MUX cable subsea plug upgrade and integration of safety equipment to reduce the possibility of SEM flooding

- Installation of test rams in the lower BOP cavity.

The latest lubrication and torque requirements have been circulated regarding riser bolts. Transocean are making up new BOP test procedures utilising the installed test rams. Most of the inspection work has been completed and most of the work scope is on the way to being successfully completed. There have been delays due to weather, failure of personnel appearing at the rig and Port crane repair time.

It is important and understood by the personnel that all tasks must be accomplished and that the testing is 100% with no deficiencies in the system before running BOP.

The greatest risk to the safety and operations will be from the BOP control system as the greater depths increase the chances of water intrusion. The overall impression is that the rig and the personnel are motivated, experienced and knowledgeable. The equipment is generally well maintained and understood.

We would classify the risk with the BOP as low, the risk of problems with the riser as low to medium and the risk of problems with the BOP control system as medium.

The observation and recommendations identified during the well control audit can be found following this summary.

Maintenance Management
EMPAC light is the maintenance management system used on the rig. The maintenance system server is maintained onboard the vessel and regularly backed up. The maintenance management system was rigorously interrogated with focus on maintenance of the primary drilling equipment and systems. The size of the maintenance crew is reasonable considering the size of the vessel and the nature of the equipment although the First Engineer position has recently been discontinued. A relatively high staff turnover has also recently been experienced due to the migration of personnel leaving. This has resulted in premature promotion for some personnel.

The audit has identified a number of deficiencies within EMPAC that have potential to cause an incident or equipment downtime.

There is a practice by maintenance personnel to close out maintenance work orders even though not all tasks are completed. Critical checks and inspections are consequently being missed. This was noted on numerous occasions during review of the maintenance history files. Maintenance work orders assigned to the incorrect craft has also resulted in critical maintenance tasks including NDT inspection of the drilling load path being missed.

Maintenance history files were generally found to be unsatisfactory although a few were exemplary. Work undertaken and measurements requested in the maintenance procedure were frequently omitted from the history files. An auditable trail of maintenance performed on equipment was often not possible from interrogation of the maintenance history. For example the dead line anchor bolts were recommended for replacement following unsatisfactory NDT inspection during October 2004. The status of these bolts is presently unknown.

With the implementation to EMPAC light the rig's old equipment specific maintenance procedures have been replaced by generic company standard preventative maintenance procedures. Consequently some maintenance tasks are irrelevant but more importantly there is potential for equipment critical maintenance tasks to be omitted.

Annual inspection of the crown block and travelling block for some reason were not scheduled during 2003. The crown block and top drive annual inspections although generated during November 2004 have not yet been completed. Consequently the annual inspection of the crown block has not been undertaken since 2002.

Several equipment failures recorded in the GRS tracking system have not been satisfactorily closed out. Often the text box "Changes made to prevent re-occurrence" on the Operation Event Report were left blank. Consequently lessons learned from equipment failures were not being processed or implemented. On other occasions where it was recommended to implement maintenance procedures to prevent re-occurrence the maintenance procedure had not been included in EMPAC.

Derrick and Drilling Equipment

Two HiPo's and one near miss due to dropped objects have recently been experienced on the drill floor, two of these incidents occurred during the short time the team were onboard. The first HiPo involved a dropped claw from the PRS. A revised operating procedure and equipment modification has been recommended by the equipment vendor. Although the revised procedure was in place the equipment modification had not been undertaken. The second HiPo occurred when the ball valve actuator arm from an Offshore Energy Services casing fill up tool failed resulting in the ball valve falling from height to the rig floor. The conclusion from the incident investigation has not been released at this time. The near miss occurred when a washer fell from the travelling block dolly. Again at this time the cause is unknown and repairs are ongoing.

Three proximity sensors for the fwd PRS had been placed inside the PRS control cabinet located in the Assistant Driller's Cabin and jumped out. The iron roughneck, RBS and casing tong had been switched to ignore on the anti-collision system (ACS) bypass switch panel. A formal written procedure posted on the ACS panel was clearly not being followed.

The drawworks is an active heave type rated at 1000 tonnes. Prior to any job where the drawworks will be exposed to loads approaching 50% of its rated capacity a brake performance test is conducted. If the results of the brake performance test are unsatisfactory remedial work will be undertaken prior to proceeding with operations. Although scheduled on a yearly basis the high load carrying areas of the drawworks have not been subject to NDT inspection in line with the maintenance schedule.

An inspection of the derrick was conducted. Trash and loose items were both recovered and identified during the derrick inspection. These were highlighted to the OIM and Driller and photos were left for training purposes. A potential fall through hazard was identified on the Port fwd access platform in way of the PRS bridge and the fast line and sheaves were exposed at the crown. Toe boards were missing on the edges of a number of the derrick walkways, access platforms and walkway

penetrations. Numerous two part non-safety shackles, some un-moused, were in use and loose lifting gear in the derrick was predominantly not marked with the current lifting gear colour code. Significant deficiencies regarding secondary retention of derrick mounted equipment were noted.

The DROPS inspections are scheduled within the EMPAC maintenance system. The derrick is split into different areas for which work orders are generated. The maintenance procedures for each area identify the equipment and components to inspect. Given the findings from our inspection greater vigilance is required by personnel performing the derrick inspections. Furthermore personnel should be trained to look beyond the checklist for other deficiencies such as loose objects and trash.

The aft PRS upper drive carriage has undergone modification and the lower drive bearing has been renewed. The drive shaft modifications and the parking brake modifications however have not been completed at this time. When inspected prior to modification significant wear was found on the drive shaft splines and the upper shaft coupling. The drive shaft has consequently been subject to a welded repair. The condition of the drive shaft splines and upper shaft coupling on the forward PRS has not been verified. No repairs or modifications have been carried out on the fwd PRS.

Due to poor lube oil analysis results of the top drive lube oil samples the unit has been subject to a main shaft upper seal modification. This involves pressurizing the seal. The maintenance system has not been updated to reflect the maintenance requirements of the modified seal. The 90 day mechanical and 365 day drillers maintenance work orders for the top drive although generated in December 2004 had not been completed.

The iron roughneck although configured to be operated remotely is used manually. This places additional personnel on the rig floor.

Class and Flag State
The vessel has recently undergone a Flag change from the original Panamanian Flag to the Marshall Islands.

The Classification society has been maintained as ABS and the Class notation is +A1, Column Stabilised Drilling Unit, AMS, ACCU, CDS, DPS-3 with unrestricted service. There are no reported Class conditions for this unit although a number of surveys will be due in the next 30 days including, IOPP, Annual load line etc.

At present some flag state certification is only short term and will be issued as full term once the ABS surveyor has attended the unit. On reviewing the Safe Manning Certificate issued by the Marshall Islands it has differences in the manning that were required by the Panamanian Flag State.

Dynamic Positioning
The rig has recently upgraded its Multifix 3 unit to a Multifix 4 unit in the central control room. The unit has operated with a closed tie system (common HV switchboard) and operates in Class 3 mode with consequence class analysis running. During the review period there were typically 2 diesel generators on load with 4

thrusters on line, this is of course dependent on load conditions. It was noted that during casing running the thrusters underwent phase back based on power management load signals.

The rig is equipped with a DP vessel drift off and watch circle programme which is rig specific and is used to manage watch circle distances and disconnect timings. Standing orders are in place to regularly update this programme and modify the operational envelopes based on the analysis results.

DP Manning

The rig is manned with 4 DP Operators with two being senior Operators. Additionally both the Chief Officer and Master are DP qualified. Watches are split such that operational integrity is maintained.

The marine department has had significant changes in the last two years. A new Chief Officer and DP Operator have joined the team in the last six months. One DP operator does not have STCW qualifications.

There is a positive attitude within the marine department currently onboard. On discussion with the DP Operators a number of positives were noted. The recording of anomalies was of a good standard although feedback regarding status was not implemented. There were also initiatives relating to the application of lessons learnt with a case study database being developed for training purposes.

Within the induction modules there were rig specific questionnaires. An enhancement would be to include training on activities when helicopter operations were being undertaken. A marine staff member was unaware of the IMCA guidance based on lessons learnt concerning another BP helicopter operations on dynamically positioned vessels.

From discussions with various staff on the rig the impression given is that the vessel's systems are such that black out will not occur. Hence issues such as black start recovery tests are only conducted yearly. Although it is noted that the unit has a robust power management system a number of other Class III DP units have had complete black outs. On that basis the contingency and recovery plans should be frequently practised

A recent change in the DP Operators duties has included the monitoring of the Simrad vessel control system whilst the on-duty engineer leaves the engine control room and carries out maintenance duties. No documentation could be located with reference to onboard training for these additional duties or a management of change undertaken. Additionally there is a risk that if the engineer is working in a remote part of the rig then there will be a delay in his response, as the central control room would have to communicate content of alarm and the duty engineer would have to return to the engine control room. It is noted that two problems have occurred with the vessel management system. One problem was that communication of a bilge alarm was misinterpreted by both parties and a compartment suffered water ingress due to a leaking hose. Additionally a ballast pump was run with both suction and discharge valves closed for over two hours. This caused significant pump damage and activation

of the fire detection system. This was due to a status indicator at the Simrad vessel control panel showing incorrect pump status.

Cranes and Lifting Equipment
Formal procedures regarding the identification, management and control of heavy lifts were not available. Discussions with the crane and deck crews identified that no procedures are in place to recognise a heavy lift from a normal lift and consequently no special precautions are taken during a heavy lift.

Audit of the main deck cranes and associated documentation identified that follow up of critical inspections are not carried out. It is Transocean's policy to engage a third party to carry out the annual crane inspections. During the third party inspection in March 2004, the inspection report highlighted that the boom head sheaves were worn on the Port and Stbd cranes. To date this had not been recognised by the maintenance department and therefore no action had been taken to rectify the defects. The inspection report had been filed away and no details had been entered into the planned maintenance system.

On inspection of the boom head sheaves excessive spiralling of the grooves and wear was noted. The sheaves are outside of API requirements. The Stbd crane inspection revealed that the whip line wire rope had severe damage, including broken strands, in a number of areas and requires immediate replacement. Also on the Stbd crane, the boom tip whip line guide roller is worn through to the retaining pin. The pin is also bent as a result of being struck by the whip line anchor weight. The findings would suggest that the crane operators or the maintenance personnel do not carry out regular crane inspections in accordance with the maintenance management system. The crane operator's daily logbook states that all cranes are in good condition with no major defects.

The ABS annual cargo gear survey was scheduled for December 2004. This has not yet been completed.

A significant fire occurred in the Stbd crane just prior to our departure from the rig. Early investigation leads to incorrect application of the refuelling procedures as being the primary cause of the fire. The investigation and nature of damage was still being investigated when we departed the rig.

There are a number of stop gaps in the deck and crane crew's ability to identify all of the risks associated with crane handling operations. The review of Task Risk Assessments (Think Plans) identified that critical items are omitted from the Think Plans. These included the identification of risks associated with Billy Pugh transfers to and from boats and handling risks during the use of personnel baskets. The failure to assess personnel basket handling risks were demonstrated during the course of the audit, when it was required to access the crane head boom sheaves. The hang off safety lines were attached to the basket directly, they should have been independently hung below the crane hook so that personnel are still tied off in the event of a basket failure. This risk was not recognised by the crew.

Damage to the Riser gantry crane fwd boom box sections had occurred due to operator error. At the time of the audit the boom section was ashore for repair. The

crane is presently unable to function for riser handling operations if the need to pull riser should occur. The Port and Stbd deck cranes are unable to handle the riser sections due to the boom restrictions and limitations and load capacity at the required radius. The crane will require an onboard load test and re-certification following these repairs.

We were informed that the current lifting gear colour code was black. Inspection of the loose lifting equipment identified that the colour code scheme is not rigorously applied. All of the monorails throughout the rig were not colour coded. The derrick pad eyes and shackles and the pad eyes around the rig were not marked with any colour coding or safe working load. All lifting gear must comply with the present colour code to enable correct verification prior to any lifting operation. The colour coding was evident on the wire rope slings only.

Well Control Observations and Recommendations & Opportunities for Improvement

LMRP connector
The LMRP connector would not unlatch at 1500 psi. The regulator was adjusted to 2000 psi but the connector still would not unlatch. Further regulator adjustments to 2500 psi and 2900 produced the same result. Function tested the primary LMRP connector unlatch. The system was pressure soaked for two minutes and still not unlatching on primary unlatch. Vented the primary unlatch and used secondary unlatch at 2900 psi the connector unlatched successfully. We suspect the surface finish or lack of correct lubrication on the connector taper is to blame. The connector has not been functioned for three wells. When LMRP was split an attempt to unlock the connector was made, with the connector at 3000 psi on either primary or secondary it would not unlatch. The BOP test pump was hooked up to the hot line and the hot line attached to primary unlatch with both the secondary unlatch and latch hoses removed at the connector. While pumping slowly the connector unlatched at 4000 psi. Connector has to be changed for an OEM certified and overhauled connector. Transocean have a connector in a machine shop, which will be utilised to replace the rig connector.

Riser tensioners
The riser tensioning system has six cylinders with a maximum pulling capacity of 4.8 million pounds. This is a maximum figure at the rated air pressure of 2700 psi. Should one cylinder require maintenance, or be out of action, it is recommended that the opposite cylinder be taken off line until repairs are made. It was stated however that the system can operate safely and balanced on five cylinders. The maximum pull is reduced to 4 million pounds and affects the amount of available redundancy. Consideration should be given to pressure testing the tensioning system to its maximum working pressure to verify the system.

Swedglock tubing
There is Swedglock tubing used for various control system piping on the BOP and LMRP. The use of Swedglock tubing subsea has lead to 'non productive' time on other BP contracted rigs. Consideration should be given to replacing the larger sizes that is greater than 1" of tubing on the BOP with welded and flanged type connections.

Cylinders on cable reels
The pressure booster cylinders for the motor brake on both MUX cable reels are corroded. These cylinders require better protection or replacing with a cylinder made from a material that better suits the location and use.

Yellow Pod runaway after pulling BOP
The Stack accumulator charge slide valve on the Yellow Pod is leaking. There may also be a shuttle valve problem.

Ram change problems
The simplicity of changing ram rubbers is not so simple when the bonnets cannot be closed after opening the bonnets and servicing the rams. The middle pipe ram bonnets would not close using normal procedures during the rig move. After applying

maximum pressure, 3000 psi, to the ram open - bonnet close and applying external pull on the bonnet using chain pulls the bonnets still would not close. The movement of the bonnet when operator pressure was applied to the ram open - bonnet close circuit confirmed that the close side moved slightly towards the bonnet whereas the open side did not move. A chain pull was rigged up and pull exerted only on the open side, applied operator pressure to the ram open – bonnet close and the bonnet began to close. This problem should be addressed by Cameron.

Subsea accumulator pre-charge
The pre-charge required on the subsea accumulators is 6800 psi while the maximum working gas pressure for subsea bottles is 6000 psi. This will mean different fluid volumes than are normal on the BOP Control system. The dead man accumulators have now become part of the subsea accumulators since the dead man system has been modified. Transocean should be able to supply the corrected figures, calculations and analysis for the system as it will be configured. There will be little appreciable differences in the system operability but it is important to know how the reduced pre-charge and extra accumulators work on the system.

Torque on flanges after well bore testing
In the past there have been problems with flanges when running BOP (Conduit) and (Coflexip hoses). It is important that all flanges are re-checked after testing.

Subsea MUX Pod upgrades and Pod change out.
The spare (white) Pod is to be changed out for the yellow Pod. There are a number of upgrades on the white and blue Pods that have to be verified as correct. A Cameron Electronics Technician is onboard assisting in the work scope. There are also a number of hydraulic modifications that have been initiated and installed, which still need to be proven and functioned. These upgrades and modifications need extensive testing and the time needs to be taken to prove that all systems are correct before running BOP.

Leak on MPR ram hose blue Pod on investigation the hose was found loose at one end.

There is a problem with flow indication on the upper inner kill valve. The valve opens and closes but the flow on the surface flow meter is slow and the subsea flow meter registers no flow.

Subsea Personnel
The personnel in the subsea department have had changes in the last three months. This means that it is even more important that the Subsea Superintendents are utilised and kept informed. There are reportedly more changes to come with personnel so the chain of command has to be used correctly with regular communication

Dynamic Positioning Recommendations & Areas for Improvement

In accordance with the objectives set out by the Business Unit we were asked to make recommendations on additional opportunities for improvement based on an audit conducted by Transocean (3Q 2003) on the rig's dynamic positioning system.

The DP field arrival checklist has been divided into four sections to be completed over a twelve month period. Within this divided test programme the tests for emergency thruster stops are conducted only once a year and not prior to each drilling well. It is recommended that the testing of thruster emergency stops should be conducted more frequently than once per year.

On reviewing the field arrival DP checklist a number of items were identified that had not been completed but were required to be completed for the check list. The check list philosophy and application requires review such that critical functional checks are not omitted prior to the commencement of drilling operations

The rig has not conducted annual DP trials since the initial FMEA proving trials in 2001. It would be recommended to schedule these trials at a suitable time when operations allow such as when moving location. This would provide both system assurance to be demonstrated and give the opportunity for the DP operations team to enhance its understanding through learning based on trials execution

The FMEA identifies only one single common failure mode based on common supplies to three diesel generators fire dampers which could lead to the loss of up to three generators. The FMEA identified this failure mode and in addition it is made reference to in the 3rd Quarter report of 2003. Although the planning stage has been instigated no action plan or close out date was available. It is recommended that the modification required is submitted to Transocean rig support group and action taken as appropriate to remove the single point failure.

Within the context of the report the DP capability plots contained within the rig's Operations Manual were reviewed. It was noted that Thruster #7 and diesel generator #3 have been considered as the worse case failure. One issue is that based on the relative location of Thruster #7 it would appear that the selection of this thruster as the worst case failure mode requires clarification based on DP capability requirements. It is also noted that the power usage of thrusters is controlled by available power. However when reviewing the DP capability plots drilling loads have not been considered. DP capability plots should include allowance for expected drilling loads.

Within the third quarter report a number of documentation changes were recommended to improve the clarity of the existing supporting document packs. This includes modifications to the Emergency Response Manual, schematic drawings relating to Seatex DGPS et al. The majority of these changes recommended have not been undertaken

The DP anomaly book is well populated and staff should be recognised as trying to learn from previous anomalies. One issue that is clear is that the close out and resolution of anomalies is not recorded and so it is difficult to track the technical

resolution. It is recommended to initiate a feedback loop such that this recording of these events includes feedback.

Review of the anomaly book also identified that two anomalies were as a result of maintenance of a thruster and a UPS unit. This emphasises the implications of routine maintenance and its potential impact on the DP system. These issues should be high lighted to maintenance and DP staff such that sufficient risk assessment with regards to intended task and adequate cause and effect analysis has been undertaken for the proposed operation.

The Floating Operations Manual requires that an hourly DP desk log is to be utilised. The current DP desk log is undertaken every 6 hours which is not in conformance with Transocean guidelines. Verification by the Rig Manager as to this departure is required.

A major concern is the software tracking currently onboard. No register or formalised tracking system is in place. Difficulty was found in trying to locate specific software as well as superseded software being left in locations where it may be inadvertently used. There are IMCA guidelines on software management as well as Transocean's own policy and procedure documents. The IMCA document relating to Quality control of software (IMCA M163) has now been obtained from the IMCA website and bridge staff is reviewing the document

The Well Specific Operating Guidelines utilise an escape direction of South East, Bathymetric charts indicate the better direction would be a Southerly route. Additionally items such as thruster loads and heading stability have not been considered. The current Well Specific Operating Guidelines should be reviewed and updated as necessary

On reviewing the endurance test on each UPS unit it was noted that this was carried out annually as required by the planned maintenance system and utilised a twenty minute endurance test. Recommended that the endurance test is increased to thirty minutes

The current acoustic array consists of five beacons deployed subsea. An improvement would be to deploy at least one other beacon, which if accuracy levels are sufficient would enable further acoustic system redundancy. This would be on the basis that the additional beacon(s) could be used in Super Short base line mode

There are schematics included in the DP Operations Manual, which do not represent the as built status of the DP system layout. All drawings held onboard should represent the as built status or as a minimum have red line controls in place through change management to represent the current status.

Update DGPS display configuration such that all as fitted DGPS display screens can be utilised for the display of DGPS information

There are no alarm and event recorders fitted to the back up DP system and consideration should be given to fitting a printer at this location. The current alarm

and event printer in the central control room has poor print quality and should be repaired or replaced.

Where maintenance of DP associated equipment is undertaken or is not fully functional then the engine/electrical departments require to inform the bridge as to equipment status. This did not happen in the case of UPS #14 which may be linked to inter department communications on the bridge or in other departments and hence this needs improvement.

Audit Report Action Sheet (ARAS)

The observations and recommendations are laid out in tabular format that allows tracking of audit recommendations. The first digit in the numbering system indicates the criticality and by reflection of the criticality, timing for reaction to the findings.

1. These are items that are outside BP policies, API, and legislation, have high safety or environmental impact potential.

2. These are items that one would expect to find in place from a combination of competent contractor and competent operator.

3. These are items that can be used by the drilling contractor and/or BP to build on the project, though they are not considered as essential.

The second digit in the numbering system indicates the functional area the issue is based within and is mainly used to recognise the contribute

1. HSE and Process
2. Drilling and Well Control
3. Technical Services
4. Marine
5. Environmental
6. Mechanical Handling

The final digit is the recognition number for that particular section bearing in mind the items are not set out by priority.

Audit Team Advised Completion is based on what was understood as the criticality of the issue in relation to project timing.

The asset must review the ARAS to accept, change or reject the recommendations. If a recommendation is not accepted the reason for the decision should be documented and filed. It is the view of the Rig Audit Group that implementation of all recommendations will improve safety/environmental performance, comply with industry standards and best practice, and enhance operational integrity.

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 17 to 21 January 2005

RIG STATUS: On Location Running Casing

REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
1.1	***HSE and Process***	***These are items that are outside BP policies, API, and legislation, have high safety or environmental impact potential.***				
1.1.1	The maintenance activities need to be transparent and at this time this is not the case. Transocean have no formal process to inform BP of any overdue or upcoming critical maintenance.	Transocean offshore maintenance supervisors to produce a weekly report of all overdue and upcoming critical maintenance and distribute to BP.	Within one month			
1.1.2	Although generally satisfactory a number of unacceptable examples of both electrical and mechanical lock out / tag out were noted. Deficiencies included not displaying the isolation permit at the job, the lock out of #3 purifier was unacceptable, power was still available to the unit, and the seawater valves on #3 seawater pump although isolated had not been locked out. This is out with both Transocean policy and Golden Rules of Safety.	Ensure 100% compliance with lock out tag out procedures for both mechanical and electrical equipment.	Immediately			
1.1.3	Exposed or inadequately guarded rotating equipment was noted on the following machinery; cement unit main drive shafts and centrifugal pump couplings and the emergency generator fan belts.	Ensure all rotating equipment is adequately guarded such that personnel cannot unintentionally come into contact with rotating machinery.	Within one month			

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DATES OF AUDIT: 17 to 21 January 2005

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REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
1.1.4	It could not be demonstrated that formal procedures for maintaining safety critical software was being followed and implemented. Safety critical software includes; integrated pipe handling systems, deepwater BOP control systems, dynamic positioning systems, vessel management systems and ballast control systems. Problems are recorded in GRS when different versions of software impaired the restoration of the vertical pipe handling system following a system crash.	Produce and implement formal procedures for managing all safety critical software. The procedures should include but not be limited to, installation, operation, modifications, maintenance and disaster recovery.	Within two months			
1.1.5	Numerous loose and raised deck gratings were identified in the mud pit room. These were potential trip hazards.	Secure all mud pit room gratings into the grating recesses provided.	Within two weeks			
1.1.6	Significant damage has occurred to the riser skate safety gates such that they are no longer operable. These safety gates were installed following a fatality on the Deepwater Nautilus.	Repair defective riser skate safety gates.	Immediately			
1.1.7	A permit to work #53808 generated on 22 Sept 04 was still open. The permit was posted in the driller's cabin. In addition the permit was not logged in the permit register.	Ensure all personnel are familiar with Transocean's permit to work system	Immediately			

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1.1.8	When transferring riser from the boat onto the rig, the THINK Plan did not include that the banksman has to be lowered down to the boat. The risks involved with personnel transfer were not recognised by the crane and deck crew.	Ensure all deck crews and crane operators are aware of the potential risks involved regarding personnel transfers using the Billy Pugh. The task risk assessment must identify this risk.	Immediately			
1.1.9	During handling of a drill pipe bundle from the main deck to the riser skate, the rigging crew were observed handling the load and giving crane signals. The dedicated banksman was not in the immediate area.	Ensure riggers who are handling a load do not give signals to the crane operator. Only recognised and trained banksman shall signal the crane operator. All banksman must be visible at all times during movement of the crane load and shall wear high visible work vests at all times.	Immediately			
1.1.10	The welder's workshop gas bottle supply hoses were not equipped with flashback arrestors. Although it is recognised that flashback arrestors have been installed at the gas bottles on the main deck; the hoses are unprotected from the regulator mounted in the workshop.	Install flashback arrestors to the welder's gas bottle hoses located in the welder's workshop.	Within one week			

AUDIT REPORT ACTION SHEET

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1.1.11	During the inspection of the Port and Stbd cranes boom head sheaves a task risk assessment was carried out by the deck crew. The task required the use of a workbasket. No risk was assessed regarding the workbasket or its condition. The auditor intervened and explained the potential risks. It was noted that the hang off safety wires for the harness lanyards were not separately attached to the hook but the lanyards were going to be attached directly to the basket framework. The work was stopped until the safety wires were separately attached at the hook and secondary lanyards attached to the workbasket. It was noted that the deck crews were new hands onboard the rig.	During a task risk assessment, the deck crew must identify and assess all potential risks involved with the operation including equipment to be used. The deck crew require further training in the task risk assessment program. An experienced hand must be with the team during such assessments.	Immediately			
1.1.12	A formal written procedure for identifying, planning and conducting heavy lifts could not be provided.	Produce and implement formal written procedures for identifying, planning and conducting heavy lifts. Ensure personnel have the necessary training in place for carrying out such lifting operations.	Within two months			

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1.1.13	The auger motor drive pulley guard was secured using an elastic cord.	Permanently install auger motor pulley belt guard.	Within one month			
1.1.14	An unsecured breaker handling trolley was found in one of the thruster drive rooms. Heavy seas could result in the trolley colliding and damaging with high voltage switchgear.	Secure the breaker handling trolley in the thruster drive room.	Immediately			
1.1.15	Toe boards are not installed at the edges of a number of derrick walkways. Areas include at the crown in way of the block and fast line, at the fingerboard level at the dead line grating penetration, in way of the aft PRS control cabinets and at the access walkway in way of the forward PRS bridge.	Toe boards to be provided on open sided floors, platforms, walkways in accordance with API RP 54	Within one month			
1.1.15	A potential fall through hazard was identified during the derrick inspection at the access walkway in way of the forward PRS bridge.	Guard rails consisting of 42" high top rail, intermediate rail and posts shall be installed on the outer edge of any floor, platform, or walkway that is 4ft or more above ground in accordance with API RP 54.	Within one month			

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1.2	***Drilling and Basic Well Control***	***These are items that are outside BP policies, API, and legislation, have high safety or environmental impact potential.***				
1.2.1	Items of trash and loose objects were recovered/identified during the derrick inspection. These included fixings, split pins, plastic from drill line, lock wire, rags, soft rope, grease fittings and wire.	Full sweep of derrick to be conducted. All trash and loose items to be removed. This includes loose items stored in the telephone booth at the crown.	Within one week			
1.2.2	The majority of shackles installed in the derrick consisted of 2-part non safety shackles. A number of these were inadequately moused.	All 2-part non safety shackles to be replaced with 4-part safety shackles that have means for positively locking the shackle pin nut.	Within three months			
1.2.3	Protective barriers or guards were not installed at the crown in way of the crown block and fast line. Accidental contact with the moving drill line and sheaves is possible.	Install suitable guards or barriers at the crown in way of the crown block and fast line.	Within three months			
1.2.4	A number of items in the derrick lacked secondary retention devices. These included; all CCTV cameras, forward crown block jumper bar fixings – stbd side, racking board finger latch interface panel screws and the aft PRS junction boxes installed on the upper tub.	All equipment installed in the derrick to be equipped with suitable means of secondary retention. These may include, safety slings, lock wire, lock washers, lock nuts or split pins etc.	Within two months			

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1.2.5	The secondary retention wires on numerous fingerboard latches are either wasted due to corrosion or have been severed due to mechanical damage.	Replace all corroded or damaged secondary retention wires on the various fingerboard latches.	Within one month			
1.2.6	The pipe racking fingers were not subject to periodic NDT inspection.	An NDT inspection programme should be instigated for the welded finger board.	Within three months			
1.2.7	A number of latches were found missing from the forward intermediate fingerboard. Judging by the condition of the latch clevises in way of the missing latches it would appear that the latches have failed due to sustaining mechanical damage.	Repair damaged latch clevises and replace the missing latches. Ensure latches are provided with robust safety wires.	Within three months			
1.2.8	A process to control personnel and tools going up the derrick was in place. Transocean personnel however were noted going up the derrick without first completing the derrick register. The register also recorded that personnel who had gone up the derrick on the 16 January had not signed off on coming down.	Transocean to enforce use of the derrick register	Immediately			
1.2.9	It was not demonstrated that a formal test procedure is implemented for periodically testing each and every clash scenario programmed in the anti collision system.	Produce and implement a formal test procedure for periodically testing every potential anti collision system clash scenario.	Within one month			

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1.2.10	Stauff clamps have been employed for securing control piping in the derrick. Although some Stauff clamps are provided with means of secondary retention some are not. A Stauff clamp located in way of the aft intermediate fingerboard control cabinet had one loose set screw nut and the nut on the other setscrew was missing – probably dropped from height. Due to slackening off a set screw a Stauff clamp fell out of the derrick on a MODU while working for BP Angola.	Replace and tighten fixings as required on Stauff clamp in way of aft intermediate fingerboard control cabinet. Inspect all Stauff clamps located overhead and in the derrick. Ensure the fixings are provided with means of secondary retention to reduce the potential for dropped objects.	Immediately Within one month			
1.2.11	Significant gouging of the travelling block guide dolly frame has occurred due to clashing with the top drive hang off wire. The gouging is located in way of the aft upper brace. The condition of the hang off wire could not be established.	Inspect gouging of the travelling block. Use both dimensional and NDT inspection techniques to provide assurance that the dolly is fit for purpose.	Within one week.			
1.2.12	The following equipment was found in anti collision system Override: iron roughneck, casing tong and the RBS. The procedure for overriding equipment from anti collision system was not being followed.	Re-instate all equipment to "normal" on the anti collision system override panel. Ensure procedure for implementing anti collision system override is rigorously applied.	Immediately			

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1.2.13	An unguarded access platform was identified underneath the crown during the auxiliary derrick inspection.	Install guard rails or a self closing safety gate in way of the access platform underneath the crown on the auxiliary derrick.	Within one month			
1.2.14	Redundant loose lifting equipment was identified under the crown on the auxiliary derrick.	Remove redundant loose lifting equipment under the crown on the auxiliary derrick.	Within two months			
1.2.15	None of the loose lifting equipment installed underneath the crown on the auxiliary derrick was colour coded in accordance with the rig's current lifting gear colour code.	Inspect and re-certify loose lifting equipment installed under the crown on the auxiliary derrick.	Within two months			
1.2.16	The safety sling installed on the fwd turn down sheave under the crown on the auxiliary derrick is fouling the sheave. This can result in hang-up of the wire rope resulting in damage to both sheave and wire rope.	Modify installation of the safety sling such on the fwd turn down sheave under the crown on the auxiliary derrick such that it does not foul the sheave.	Within two months			
1.2.17	Recent calibration records for the critical drilling and well control gauges and instrumentation could not be produced.	Recalibrate critical drilling and well control gauges and instrumentation and ensure calibration certification is maintained onboard the rig.	Within two months			

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1.2.18	The last NDT inspection of the drilling load path omitted critical tasks from the crown block, top drive and drawworks.	Mobilise competent third party to undertake NDT inspection of the drilling load path. Ensure all load bearing areas as identified by the manufacturers are included in the inspection. The inspection should include the crown support beams.	Prior to running next "heavy" casing string.			
1.2.19	The mud pump pop-off valve discharge pipelines follow a tortuous route for discharge into the mud pits.	Verify procedures are in place for regular flushing of the pop-off valve discharge pipe lines.	Within one month			
1.2.20	During the NDT inspection conducted during October 2004 defects were found on the dead line anchor bolts. The report recommended that they be replaced. Maintenance records could not demonstrate that the bolts have been replaced.	Replace defective bolts in the deadline anchor. Other wise provide robust documentary evidence that the bolts have been replaced.	Immediately			
1.2.21	The iron roughneck although programmed to be operated remotely was being operated manually. This defeats one of the primary objectives of utilising remotely operated equipment – that is removing people from the drill floor.	Operate iron roughneck in remote mode as per the original drill floor design.	Within one month			
1.2.22	Derrick monkey board level, there is an unsecured portable welders gas bottle set left on the walkway.	Remove the welder's gas bottle set from the monkey board walkway in the derrick.	Immediately			

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1.2.23	Snatch blocks were in use both in the derrick and auxiliary derrick. The majority of snatch blocks were suspended from two part non-safety shackles and were not provided with safety slings. The split pins installed on the snatch blocks in the auxiliary derrick were wasted due to corrosion.	Consider replacing snatch blocks with purpose built marine sheaves. BP promotes the use of purpose built marine sheaves overhead. These have minimal bolted components and are provided with means of connecting the safety sling such that both the load and the sheave will be caught in the event of sheave failure.	Within two months			
1.2.24	Derrick structure under the crown, the wire line sheave has no secondary safety hang off wire attached. It is a potential dropped object.	Install a safety hang off pennant wire on the wire line sheave installed under the crown.	Within one week			
1.2.25	Derrick structure at the top of the PRS, there are a number of bolt fixings that have not been lock wired out. The bolt heads are drilled to accommodate lock wire.	Carry out an inspection of the PRS retaining bolts in the derrick structure. Lock wire all bolts as a means of secondary dropped object prevention.	Within two weeks			

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1.3	***Technical Services***	***These are items that are outside BP policies, API, and legislation, have high safety or environmental impact potential.***				
1.3.1	Maintenance work orders were closed out even though all of the specified maintenance tasks listed in the procedure had not been completed. Examples included the 90 day inspection of the crown block, 90 day inspection of travelling block and the 365 day electrical inspection of the top drive.	The practice of closing incomplete maintenance work orders must cease immediately. Transocean to issue an instruction to maintenance personnel.	Immediately			
1.3.2	It was evident that some maintenance routines are not being diligently followed or rigorously applied. These included 90 day inspection of the crown block, the 180 day inspection of the top drive, and the 365 day inspection of the mud pumps. Critical tasks were not performed on these work orders.	Maintenance work orders to be carried out in accordance with the maintenance procedures. Standing order to be issued concerning this matter	Immediately			
1.3.3	Lessons learned from events detailed in the GRS tracking system are not being incorporated in the maintenance system. For example top drive blower motor failure, Hi-Tech UPS battery failure, deadline anchor bolt inspections, rig floor emergency stops, snatch block failure.	Develop procedure to capture and implement within the maintenance system lessons learned regarding equipment failures and service bulletins etc. These may include new maintenance tasks and revised schedules.	Within one month			

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1.3.4	The maintenance history files recorded in Empac were unsatisfactory for most disciplines. The files were deficient in content describing work carried out and many of the readings required in the maintenance routine had not been recorded. It was frequently not possible to determine if the required maintenance tasks had been performed.	Train personnel on the correct use of the Empac maintenance management system. Ensure personnel are aware of the importance of populating maintenance history files and Transocean's expectations of them.	Within one month			
1.3.5	The maintenance procedures have been changed to company standard preventative maintenance procedures. These are no longer rig specific but rather generic and do not therefore apply to some of the equipment on Deepwater Horizon. The generic maintenance procedures include irrelevant checks but more importantly omit critical maintenance tasks.	Modify company standard preventative maintenance procedures such that they are rig specific. Notable discrepancies were noted on the drawworks maintenance procedure, the 5-yearly crown block procedure, the top drive maintenance procedure and the yearly thermographic survey of the Hitec control panels etc.	Within six months			
1.3.6	A formal inspection programme regarding the derrick bolts is not included in the planned maintenance system. A simple statement instructing personnel to check bolts during routine derrick inspections is insufficient.	Produce and implement a maintenance routine for periodic inspection of the derrick bolts. The routine should include tasks for checking bolt torque and bolt condition (thread damage, corrosion and elongation). All derrick bolts should be inspected over a 5-year cycle.	Within two months			

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1.3.7	The 365 day crown block inspection maintenance work order was generated on 17 November 2004. The work order has not yet been completed. Maintenance history indicates that this yearly work order was not generated during 2003 and consequently was last performed in 2002.	Complete the 365 day crown block inspection work order.	Within one week			
1.3.8	Defeats and bypasses were evident in the PLC cabinet and the PLC section cabinet for the fwd PRS, both located in the assistant drillers cabin. In the latter numerous jumper leads had been connected to three proximity sensors inside the cabinet. The proximity sensors should have been installed on the forward PRS.	Remove all defeats and bypasses and return the equipment to OEM operating status.	Immediately			
1.3.9	The 90 day mechanics and the 365 day drillers planned maintenance work orders for the top drive were generated in November 2004. The work orders are still open.	Complete the 90 day mechanics and the 365 day drillers planned maintenance work orders on the top drive.	Immediately			
1.3.10	The 365 day mechanical planned maintenance work order regarding the top drive was incorrectly assigned to the driller. Critical tasks were therefore omitted from the maintenance procedure.	Ensure 365 day mechanical planned maintenance work is correctly assigned to the mechanics.	Immediately			

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1.3.11	The aft PRS has undergone part of an upper drive carriage modification and refurbishment. The original bearing was found to be excessively worn and the upper coupling splines severely damaged. The condition of the upper carriage drive assembly on the forward PRS is not currently known.	Complete remaining modifications to the aft PRS. These include out of alignment brake upgrade and main drive shaft upgrade. Inspect the upper carriage drive assembly of the forward PRS and report on its condition. Defective and worn components should be replaced.	Within three months Immediately			
1.3.12	The NDT inspection of the load bearing areas of the drawworks brakes is scheduled on an annual basis. The brakes were not included in the last NDT inspection and consequently have not been conducted since 2002.	Conduct NDT inspection of the load bearing areas of the drawworks brakes.	Prior to running next "heavy" casing string.			
1.3.13	Following a recent HIPO involving a dropped claw from the PRS a revised operating procedure and modification has been recommended. Although the revised operating procedure has been implemented the modification to the claw has not.	Carry out modification to the PRS claws to reduce potential for re-occurrence of dropped objects.	Immediately			
1.3.14	The fire and gas panel located in the driller's cabin was in fault condition.	Investigate and rectify fault condition with gas panel located in driller's cabin.	Immediately			

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1.3.15	The 365 day maintenance work order for the PRS includes NDT inspection of all load carrying parts. This work however is not being performed. The procedure would appear excessive when compared to the OEM 5-yearly requirements for NDT inspection of this nature.	Carry out NDT inspection of all PRS load carrying parts in accordance with 365 day scheduled work order or realign work order to reflect OEM recommendations	Within one month			
1.3.16	A crankshaft failure has been experienced on one main mud pump. However, a maintenance work order regarding NDT inspection of the mud pump crankshafts has not been implemented in the maintenance system.	Produce and implement a maintenance work order for periodic NDT inspection of the mud pump crankshafts.	Within three months			
1.3.17	A 21 day planned maintenance work order is generated to cover the weekly and daily drill floor equipment checks. At the time of the audit three of these 21 day work orders were still open.	Investigate reason for non-closure of successive 21 day maintenance work orders regarding daily and weekly drill floor equipment checks	Within two weeks			
1.3.18	Product and service bulletins were not sent to the Deepwater Horizon from approximately 22 July 2004 to just recently.	Ensure procedure is in place for managing equipment service bulletins and safety alerts.	Immediately			

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1.3.19	During the audit a bolt failed on the travelling block dolly resulting in a washer falling. During incident investigation a number of the other bolts sheared.	Contact the vendor to report incident. Implement remedial measures to reduce the potential for re-occurrence of this incident.	Immediately			
1.3.20	During the audit the main bus frequency dropped below 56.5Hz for a brief period. This caused the thrusters to phase back to 50% of their current operating power. The cause was attributed to the slow response of the main engines at light loads (turbo charger lag) when a large drilling load (drawworks) is required. Hitec have produced a software modification that may go some way to alleviate this condition.	Carry out a Management of Change study to identify cost and operational benefits of implementing Hitec software modification to smooth out drawworks power distribution.	Within three months			
1.3.21	Engine rooms and switch rooms are CO2 protected. The effectiveness of CO2 release into these spaces may be adversely affected due to discharge of CO2 out of the space through the various permanently open water tight doors etc.	Engine room and switch room water tight doors and other access ways to be maintained closed at all times.	Immediately			
1.3.22	The fire monitoring system on the vessel control system indicated fault conditions existed. Typical examples, sprinkler tank low pressure, smoke detector sack room, smoke detector auxiliary machinery Stbd	Replace faulty sensors and detector heads relating to the fire control system such that all fault conditions are removed and the Fire and Gas system is fully operational	Within two weeks			

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1.4	***Marine***	***These are items that are outside BP policies, API, and legislation, have high safety or environmental impact potential.***				
1.4.1	The DP field arrival checks have not been fully completed in line with Transocean rig specific requirements. Section 4 Pts 15 to 25 and Section 6 Pts 1 to 7	Review the deficiencies in the management of DP trials verification programme and address such that DP assurance is maintained.	Prior to next rig move			
1.4.2	There is currently no centralised safety critical software tracking and storage system implemented on the rig	Implement safety critical software tracking and storage system in line with typical Industry Guidelines (IMCA 163)	Within one month			
1.4.3	Aft liferaft hydrostatic release mechanism for the liferaft has been rigged incorrectly	Refit release mechanism such that painter both activates the liferaft inflation system and allows float free operation to take place on the aft liferaft.	Immediately			
1.4.4	On inspection of cabin #318 escape equipment it was noted that the supplied light sticks had an expiry date of August 2004	Conduct inspection of cabin escape equipment and replace any time expired equipment such as light sticks.	Within one week			
1.4.5	On checking last records of monthly void space and ballast tank soundings it was noted that the last recorded soundings were 21-08-04 which did not include a full set of soundings	The monthly sounding log of voids and tanks indicates that the soundings have not been carried out for at least 4 months and hence the monthly sounding checks should be reinitiated and recorded in line with Transocean policy and 46 CFR 56-50-75	Within two weeks			

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1.4.6	On requesting a safety harness to carry out inspection of the helideck foam system it was noted that the harness supplied had no tag number and was hence uncontrolled. This harness was quarantined	All safety harnesses should be regularly checked and inspected and have clear identification marks such that they can be adequately tracked. The current rig safety harnesses should be checked to ensure satisfactory condition and appropriate tagging is in place	Within two weeks			

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1.6	***Mechanical Handling***	***These are items that are outside BP policies, API, and legislation, have high safety or environmental impact potential.***				
1.6.1	Damaged lifting gear was found in use. A chain block with missing hook latch was used to lift the centrifuge motor.	All damaged lifting gear to be placed in quarantine and destroyed. Personnel to be informed to inspect all lifting gear prior to use.	Immediately			
1.6.2	Riser gantry crane forward boom box section has been damaged and sent ashore for major repairs. It is understood that the fwd twin box section had been left in the extended position and the crane traversed across the decks colliding a diagonal stanchion support brace.	Carry out immediate repairs to the fwd boom box sections on the riser crane. The crane will require onboard load testing following completion of all repairs. Ensure written operating procedures are in place to reduce the potential for future damage.	Immediately			
1.6.3	Port aft and Stbd aft engine room overhead monorails are not colour coded to verify that they have been inspected as part of the annual lifting survey.	The annual inspection of the loose lifting equipment must include all of the monorails through out the rig. They should be painted with the current lift colour code – Black, following inspection.	Within one month			
1.6.4	It is noted that the annual ABS crane surveys on the Port and Stbd cranes together with the BOP and riser-handling crane have not been carried out. They were due for re-certification on 14th Dec 2004.	ABS surveyor to be mobilised and carry out the annual crane survey on the Port, Stbd, BOP and riser gantry cranes. The cargo registry to be signed and stamped.	Within one month			

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1.6.5	Stbd crane safe load indicator system is noted in the crane operator's daily log book as being out of order and not working on the main hoist. Although the logbook records show that this has been recorded over a five-day period no action has been taken to investigate the problem.	Verify condition and carry out immediate repairs to the safe load indicator on the Stbd crane.	Immediately			
1.6.6	It was noted that un-certified lifting equipment had been installed in the rig air compressor room. A rig made I beam clamp had been installed above #1 compressor.	Remove the rig made I beam clamp above #1 rig air compressor. Ensure all uncertified lifting equipment is removed from the rig.	Immediately			
1.6.7	Drill floor utility winch, Stbd fwd, the band brake linings are worn, the upper band section has approximately 6" of pad missing, the rest of the section has broken retaining rivets.	Replace the worn and damaged brake bands on the Stbd fwd drill floor utility winch.	Immediately			
1.6.8	Stbd crane boom head sheaves are worn and show spiralling in the groves on the second line sheave. This is outside of API requirements.	Replace the second line boom hoist sheave on the Stbd crane. Monitor the wear on all other sheaves. Enter results of all sheave wear into the maintenance management system.	Within one month			

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REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
1.6.9	Stbd crane whip line wire has been damaged in a number of places; it is spiralled and has broken strands. This would appear to have been caused as a result of a block-to-block contact occurring at the boom tip.	Change out the stbd crane whip line. Investigate the reason for the damage to the wire rope. Verify that the anti-two block system is fully functioning on the whip line.	Immediately			
1.6.10	Port crane boom head sheaves are worn and show spiralling in the groves on the first and second line sheaves. Wear is also noted on the third, four and fifth sheaves. This is outside of the API requirements.	Replace the first and second line boom hoist sheaves on the Port crane. Monitor the wear on all other sheaves. Enter results of all sheave wear into the maintenance management system.	Within one month			
1.6.11	In the Stbd crane column rigging equipment is stored. There are a number of chain hoist blocks that have the safety catches missing from the hooks.	Chain hoists stowed in the Stbd crane column that have missing safety clasps on the hooks to be removed from service. Missing hook latches to be replaced.	Immediately Within two weeks			
1.6.12	Port crane has significant hydraulic oil leaks from the pipework joints in the prime mover gearbox area located in the pedestal. This is contaminating the floor space and also dropping to the level below. It is a fire risk.	Rectify all hydraulic leaks from the gearbox on the prime mover in the Stbd crane pedestal. Clean up contaminated floor space.	Within one week			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 17 to 21 January 2005

RIG STATUS: On Location Running Casing

REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
1.6.13	The third party annual crane inspection carried out by Sparrows in March 2004 identified that the Port and Stbd cranes have worn boom head sheaves and worn sockets on the hoist winch drum. At the time of audit, the sheave wear was not acknowledged by maintenance personnel and no remedial action has been taken. The crane operators and mechanics have not identified these problems during their regular inspections.	The 365 day crane inspection is an annual requirement. Identify why findings from third party inspection were not acknowledged or acted on. Identify why defects have not been noted or recorded during the regular crane inspections and routine maintenance. Provide training to crane operators and mechanics to ensure that they are competent to perform crane inspection and maintenance tasks.	Immediately			
1.6.14	Stbd crane boom head sheaves have an excessive build up of rope tar. There is a potential for this to become a dropped object	Remove the rope tar build up on the Stbd crane boom head sheaves.	Within one week			
1.6.15	Throughout the derrick structure the pad eyes are not colour coded. The pad eyes have no safe working load displayed.	All pad eyes to be correctly identified and the safe working load displayed. The pad eyes should be colour coded Black in accordance with the current lifting gear colour code.	One month.			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

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REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
1.6.16	Moonpool man riding tuggers. The units do not comply with the BP recommended practices regarding operation. There is no emergency back up system to enable the unit to be lowered in the event of a main supply failure during man riding operations. In addition the signage to state suitable for man riding operations is not clearly displayed on either winch. It is noted that the winches have a two-ton capacity.	Provide a means to allow emergency lowering of personnel in the event of a power failure to the winch. All man riding winches to have clear signage noting "suitable for man riding operations". The winches should be restricted in lifting capacity to one hundred and fifty kilos safe working load when used for man riding operations.	Within two months			

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RIG NAME: Deepwater Horizon

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RIG STATUS: On Location Running Casing

REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
2.2	***Drilling and Basic Well Control***	***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator***				
2.2.1	Two proximity sensors were incorrectly installed on the aft PRS. The sensors were suspended from the PRS upper tub using ty wraps. It is believed the sensors are for a future upgrade to the braking system.	Ensure all proximity sensors on PRS are installed and operational. Carry out upgrade to PRS braking system in line with Varco service bulletin.	Within one week Within three months			
2.2.2	The rig floor CCTV cameras all have dirty lenses. This was reflected in the quality of the picture on the CCTV monitor.	Develop a procedure for periodic cleaning of the CCTV camera lenses.	Within one month			
2.2.3	Damaged and missing links were noted on the auxiliary pipe conveyor belt.	Repair damaged/missing link pins on the auxiliary pipe conveyor belt.	Prior to next use			
2.2.4	The upper sheave guide rollers were seized on the aft PRS.	Lubricate and free-up upper sheave guide rollers on the aft PRS.	Within two weeks			
2.2.5	The wooden end stop on the riser skate is damaged beyond repair.	Replace the wooden end stop on the riser skate.	Prior to pulling riser			
2.2.6	The rotary hose and service loops had sustained significant damage of the outer sheathing. Corrosion of the internal braiding was not apparent.	Inspect rotary hose and service loops and verify integrity for continued operations.	Within two weeks			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

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2.2.7	The warning light on the forward PRS is loose on the securing bracket. The light was consequently laying on its side.	Re-position and secure warning light on forward PRS.	Within one week			
2.2.8	The end roller on the pipe conveyor is worn.	Replace the end roller on the pipe conveyor.	Within one month			
2.2.9	The iron roughneck spinner rollers appear to be approaching maximum wear limits.	Plan to replace the worn spinner rollers on the iron roughneck.	Within two months.			
2.2.10	Although we were verbally informed that personnel are prohibited from walking between the driller's cabin and the riser skate, when deployed, no warning notices were posted.	Post prominent warning notices prohibiting movement of personnel between the driller's cabin and the riser skate.	Within one week			
2.2.11	Significant corrosion was noted on the aft pressure vessel on the auxiliary drawworks. In addition the pressure vessel did not appear to be fitted with a pressure relief valve.	Attend to corrosion on the aft pressure vessel on the auxiliary drawworks. Ensure that the vessel is equipped with a pressure relief valve or has means of pressure relief.	Within two weeks			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

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RIG STATUS: On Location Running Casing

REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
2.3	***Technical Services***	***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator***				
2.3.1	A modified main shaft sealing arrangement has been installed on the top drive. The maintenance procedures to reflect this change have not yet been updated.	Modify top drive maintenance procedures to reflect new main shaft seal arrangements.	Within two months			
2.3.2	A non Ex certified cable gland has been installed on the auger motor terminal box.	Install Ex certified cable gland on auger motor terminal box.	Within one month			
2.3.3	One of the two mud pit room supply ventilation dampers was closed.	Verify mud pit room ventilation meets design specification with respect to air changes per hour and maintaining relative air pressure between less hazardous spaces when one supply damper is closed. Damper to be opened if design specification not met.	Within one week			
2.3.4	A significant oil leak was noted on the power end of #1mud pump.	Identify source and rectify oil leak on #1 mud pump power end.	Within one month			
2.3.5	The integral monitor on the Port UPS is defective.	Replace defective monitor on the Port UPS.	Within two months			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

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2.3.6	Silicon sealant is used to seal the mud pump power end covers. When the cover is tightened down the silicon is compressed and can find its way into the lube oil system. The silicon can block oil galleries and filters leading to catastrophic bearing failure.	Use OEM gaskets to seal mud pump covers etc.	At next inspection			
2.3.7	A number of emergency lights were found defective in all areas of the rig.	Ensure emergency lights are maintained in operational condition.	Within one month			
2.3.8	Seawater leaks were identified on the #3 main engine fresh water cooler.	Repair seawater leaks on #3 main engine fresh water cooler.	Within one month			
2.3.9	#5 main engine fresh water maker was out of service.	Make necessary repairs and return #5 main engine fresh water maker to operational status.	Within two months			
2.3.10	#4 main engine alternator fresh water circulation pump was found leaking.	Repair leaks on #4 main engine alternator fresh water circulation pump.	Within one month			
2.3.11	A leak was noted on #4 main engine jacket water header pipe in way of the pipe coupling.	Repair leak on #4 main engine jacket water header pipe.	Within one month			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

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2.3.12	Several deficient gauges were identified on the Simrad engine control panels. These included: #3 main engine turbo charger inlet temperature and #3 main engine LTCW inlet pressure.	Repair all defective instrumentation regarding the Simrad engine control panels.	Within one month			
2.3.13	Rig downtime is being incorrectly recorded. Personnel are using the wrong action/field to report equipment that has broken down versus equipment that has caused downtime.	Ensure personnel are familiar with Transocean maintenance management system – in particular codes for classifying equipment status.	Within one month			

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

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RIG STATUS: On Location Running Casing

REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
2.4	*Marine*	***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator***				
2.4.1	The gauge glasses on numerous thruster fresh water expansion tanks have been gagged open. Failure of the gauge glass would result in loss of contents of the expansion tank.	Gags to be removed from thruster fresh water expansion tanks.	Within two weeks			
2.4.2	Significant oil leaks were noted on #8 thruster.	Identify and rectify oil leaks on #8 thruster.	Within two months			
2.4.3	#1 Stbd ballast tank level gauge is not functional thus #1 wings ballast tanks cannot be used for list/trim or weight control.	Repair and or replace faulty ballast tank level in #1 Stbd ballast tank to allow ballast system to be fully operational	Within one month			
2.4.4	An in line valve is utilised in Stbd side bulk loading hose for brine. The valve handle is orthogonal to the hose axis. There is potential for accidental release of brine if the valve handle clashes with an obstruction.	Remove or redesign valve closing system for brine bulk loading hose on the Stbd side to avoid inadvertent operation of in line valve.	Within one month			
2.4.5	Stbd side bulk transfer mud hose end fitting has damaged Avery Hardoll (Todo) type seal face which may lead to leak path	Repair or replace Avery Hardoll type bulk loading hose seal face for Stbd side mud hose	Within one month			

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2.4.6	A number of end caps or protective measures are missing from bulk transfer hoses end fittings. This may lead to contamination/corrosion issues. Typical examples include potable water hoses and fuel hose	Refit end cap protection on all bulk loading hoses to avoid contamination or corrosion issues occurring	Within one month			
2.4.7	A number of hand rail quick release hooks were frozen or in non functional condition in way of lifeboat/liferaft access chains.	Repair or replace non functional chain hooks such that personnel can easily remove access chains to life saving equipment in an emergency	Within one week			
2.4.8	Pot water bulk transfer hose on the Port side shows evidence of outer barrier degradation	Replace hose length such that pot water bulk transfer hoses retain fluid integrity when utilised for operations	Within one month			
2.4.9	Within main deck internal accommodation it is noted that tie backs are used to hold open, watertight doors.	The use of tie backs for water tight doors should be stopped and these doors should be opened only for personnel to gain access and then shut immediately after use	Immediately			
2.4.10	There has been a change of operational practice requiring on watch DP Operators to monitor the Simrad vessel control system whilst the on duty engine room watch keeper carries out maintenance tasks. The DP Operators have not been trained in the use of this system.	The DP Operators should receive formal onboard training regarding the Simrad vessel control system functions. This should also be included in the induction programme for new DP Operators	Within one month			

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2.4.11	On random checking the weight indicators on dry bulk tanks #1 and #6 have erroneous readings on the Simrad vessel control system or do not report correct status of bulk contained in tanks	Recalibrate weight gauges on all bulk transfer tanks and verify that the Simrad Vessel control system matches the calibrated readings	Within one month			
2.4.12	Seawater service pump #3 is not functional and is electrically isolated from the salt water main. This unit is also used as a fire fighting pump	Reinstate seawater service pump #3 such that fire fighting system sea water supply is fully functional	Within two months			
2.4.13	A potable water management programme is currently being undertaken with sampling points taken at day tanks and transfer pump stations. This is not in line with Transocean policy.	Increase number of pot water sampling points to ensure that present potable water testing programme meets with the current Transocean testing policy, Typically galley, accommodation, water fountains etc	Within one month			
2.4.14	Ballast pump #4 has leaking glands and is restricted to essential use only. A temporary splash guard has been fitted to the pump.	Repair ballast pump #4 such that integrity of ballast system is maintained and pumping capability conforms to MODU 89 requirements	Within two months			
2.4.15	During the period of the audit there were at least nine ballast valve indicators that had drifted and were not indicating actual status of ballast valves.	Calibrate the defective ballast valve indicators that have drifted such that Simrad vessel control system indicates true status of valve position (Open/closed) on the ballast system control panel.	Within one month			

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2.4.16	Fwd lifeboat station has donning instructions displayed for the Safeguard life preserver model #8225 but the lifejacket boxes also contain a number of offshore lifejackets Type 1 style #198	Display additional donning instructions based on lifejackets stored at the fwd lifeboats, namely offshore lifejackets Type 1 style #198 in line with the aft lifeboat station	Within 2 weeks			
2.4.17	On inspection of the environmentally sensitive bulk loading hoses it was noted that these hoses were not fitted with any flotation collars	Fit floatation collars at appropriate positions with sufficient buoyancy on all hoses carrying environmentally sensitive fluids at both Port and Stbd bulk loading stations	Within one month			
2.4.18	Bulk loading hose tracking is taking place with a central register maintained of mud/fuel and base oil hose strings only.	Expand the current bulk loading transfer hose register to include all bulk loading hoses such as dry bulk ,brine and pot water to allow adequate tracking of working pressures and installation dates	Within two months			
2.4.19	On requesting certification regarding the as fitted towing bridle system it was reported that no certification could be located for this equipment.	Although the unit is a DP unit the fact that the tow bridle is deployed indicates that the associated certification should be in place. The tow bridle equipment should be provided with certification for the equipment and jewellery or otherwise quarantined and removed from service	Within two months			

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2.4.20	The UPS endurance testing reported in the maintenance system is currently listed as 20 minutes duration annually.	The endurance programmed tests for the rig UPS are currently 20 minutes but should be expanded to 30 minutes in line with typical industry expectations	Within two months			
2.4.21	The UPS battery change out programme was unclear with reference to the current status of UPS # 9	Instigate a battery change out programme based on either test results or manufacturers recommendations based on service life expectations and verify integrity of UPS # 9 batteries	Within two months			
2.4.22	Sounding pipes #8Stbd and # 9Port are currently blocked	All sounding pipes should be maintained in a useable condition and the blocked sounding pipes #8Stbd and #9Port should be cleared	Within one month			
2.4.23	No documentation could be found at the central control room relating to the maximum wind up angle for the MUX hoses with the BOP connected	Document maximum wind up angle such that the rig heading management avoids exceeding the wind up limits for the connected BOP case	Within one month			
2.4.24	The current Well Specific Operating Guidelines identify escape route direction which may not be optimal and do not consider thruster loads and heading stability.	Review the Well Specific Operating Guidelines to ensure optimal escape routes and issues such as heading stability /thruster loads are considered.	Within two weeks			

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2.4.25	The current DP capability plots contained within the Operations Manual have selected Thruster #7 as the worst case failure.	Review DP capability plots and verify that the selection of Thruster #7 as the worst case failure in the damaged case is valid	Within two months			
2.4.26	UPS #14 is currently non functional and DP operators were unaware of this issue	Repair UPS #14 and instigate formal communication protocol based around non functional DP equipment status	Within one month			
2.4.27	The original Failure Modes and Effects Analysis (FMEA) identified single point failure with regards to diesel generator fire dampers, which could result in failure of 3 on line diesel generators.	Instigate programme of enhancement to remove the single point failure identified in the FMEA relating to the diesel generator fire dampers	Within three months			
2.4.28	The current Marshall Islands Safe Manning Certificate has recently been issued to the rig	Review the recently issued Safe Manning Certificate to ensure that current manning and competence levels meet the requirements of the newly issued Safe Manning Certificate	Within one month			
2.4.29	There are a number of outstanding activities relating to the DP audit report of 3rd Quarter 2003	The activities relating to the DP audit of the third quarter 2003 should be closed out.	Within three months			

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2.4.30	There are no records of annual DP FMEA proving trials in line with IMCA guidelines	Consideration should be given at the next operational opportunity to conducting FMEA DP annual trials in line with IMCA guidelines	Within six months			
2.4.31	The current acoustic array uses 5 deployed transponders.	An improvement based on redundancy would be to deploy at least one other beacon capable as being used for super short base line positioning in addition to the currently deployed 5 transponders.	Within six months			
2.4.32	The current aft DGPS display screen in central control room is non functional due to display configuration issues	Reconfigure DGPS display system such that all DGPS screens in the central control room can be viewed by the DP Operator and are fully functional	Within four months			

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2.6	***Mechanical Handling***	***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator***				
2.6.1	BOP gantry crane aft auxiliary wire rope has been changed out four times in the last six months due to the wire bird caging on the head sheaves as a result of clashes with the roller shutter doors. The wire is being used to pull a sideways load through the doorway. The winch is being used out with its intended design. The aft winch must not be used to pull a side load in its current position.	An engineering study should be carried out assessing the possibility of rotating the winch 90 degrees on its mounting to permit greater flexibility of use.	Within two months			
2.6.2	The safe load indicator systems on the Port and Stbd cranes are subject to an annual calibration check only. There is no intermediate calibration checks carried out.	The safe load indicator systems on the Port and Stbd cranes should be verified as accurate. As best practice, the calibration should be verified at least every quarter; tracking of the calibration should be included in the maintenance management system.	Within three months			
2.6.3	Stbd crane boom tip whip line guide roller is worn through to the retaining pin. The pin is also bent as a result of being struck by the whip line anchor weight.	Replace the boom tip whip line head sheave guide roller and retaining pin on the Stbd crane.	Within two weeks			
2.6.4	The sack room forklift truck rotary warning lamp is damaged and inoperable.	Carry out repairs to the forklift rotary warning lamp.	Within two weeks			

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2.6.5	BOP gantry crane maintenance records show that electrical repairs were carried out on the safe load indicator system. The work was closed out as tested and completed. Further maintenance records relate to the need to repair the system again as it was not functioning. It was stated that the connection cables had been incorrectly installed; the system could not have therefore been tested and closed out during the first repair as stated in the maintenance history records.	Implement measures to provide assurances that maintenance tasks and repairs are fully validated prior to closing out maintenance work orders.	Immediately			
2.6.6	Port and Stbd crane refuelling process has inherent risk to the operator due to the potential of tripping and falling during the operation. Access to the fuel tank requires the operator to climb onto an unsecured trestle ladder in order to reach the filler cap. The fuel tank is mounted above the engine grating inside the crane column.	Conduct a formal risk assessment to identify all potential risks involved during re-fuelling the cranes. In addition carry out an engineering study to identify improvements to the current re-fuelling system. These may include extending the filling nozzle and providing remote display of the fuel tank level.	Within two weeks			

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 17 to 21 January 2005

RIG STATUS: On Location Running Casing

REF	OBSERVATION	RECOMMENDATION	AUDIT TEAM ADVISED COMPLETION	ASSET ACCEPTANCE OR CHANGE	ACTUAL COMPLETION DATE	SIGNED OFF BY
3.4	***Marine***	***These are items that can be used by the drilling contractor and/or operator to build on the project, though they are not classed as essential.***				
3.4.1	The back up DP system has no alarm and event printer fitted to the system,	Fit alarm and event printer to the back up DP system to enhance recording capabilities	Within six months			

Appendices:

Comment on Review of Transocean Internal Dynamic Positioning Audit

In accordance with the objectives set out by the Business Unit documentation concerning an audit performed by Transocean from 5 to 11 September 2003 was reviewed. This related to audit findings based on an evaluation of operational policies and procedures and DP operator skills. There are elements such as the quantifying of DP operator skills which are in the main subjective without quantative analysis tools and hence were not commented on in this review. For the purpose of this review the action items arising from the 2003 audit were considered and current status ascertained. Where report findings are not auditable then no comment is made.

The review of the internal audit highlighted that at this time the number of items closed out is only approximately 20%. The individual audit items are discussed in detail in the section of the report following the summary. In addition recommendations – opportunities for improvement are also included in this section.

RAS 409.2.1
Item 1
FMEA, Common failure point of engine room dampers for #1, 2 and 3 and also #4, 5 and 6 diesel generators.
This has not been completed.

The design implications of this change will undoubtedly remove the single point failure but has impact on Simrad safety system design philosophy. The Chief Engineer reports that a solution is currently being worked on and that design modifications have been identified. There is no completion date available

RAS 409.2.3
DP Capability Plots
Item 2
Update controlled copies of SDP manual to reflect thruster prohibited zones.
Not completed

Document 170313/B sect 10 reviewed and found to be not updated
Document 163857/B Page 6 reviewed and found not to be updated
The DP Operators had access to report findings and were aware of the thruster prohibited zones.

Item 3
Supply of thruster zone algorithm from Kongsberg and added to Operations Manual
Not completed

Item 4
Graphic interface based on display of thruster prohibited zones. It is noted that a Kongsberg engineer has been in attendance since the initial 3Q 2003 audit was undertaken.
Not completed

It is noted that the DP Capability plots power capability is based on 3 MW hotel loads plus 0.2 MW per thruster. Worst case considered is loss of Thruster #7 and DG 3

At the time of the review hotel load was 2.5 MW, drilling load was 2.5 MW (no mud pumps running) and propulsion load was 0.8 MW. This gives 5.9 MW plus if seven thrusters were functional an additional 0.6 MW. This would require 6.5 MW. The operations manual DP plots do not consider drilling load and hence based on power restrictions then this could be argued as not being based on a realistic worst case load case.

Given that if Thruster #7 has the same output as other thrusters it is noted that the lever arm of this thruster and hence the moments based around the centre of rotation will be less than some other thrusters (typically thrusters #1, 4, 5 and 8). The reason for its selection in the worst-case failure mode is unclear

It is noted that the schematic layout drawings do not represent the vessels OS/SVC configuration based on as built status. Review drawings and update as per the as built status.

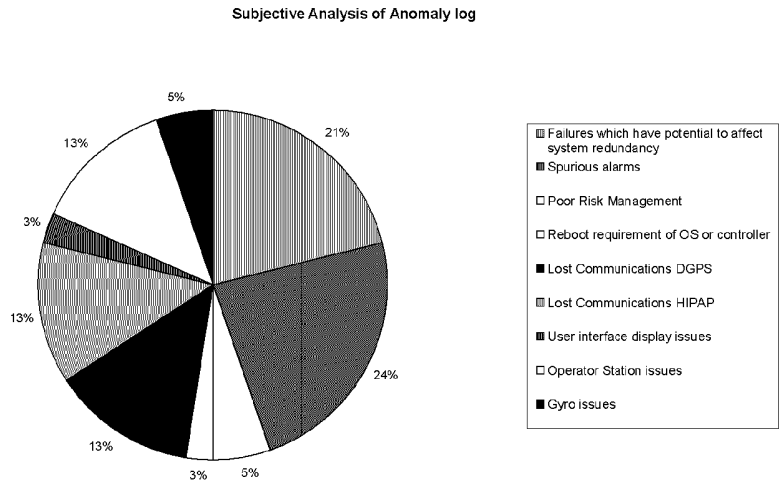
RAS 409.3.1
DP Log
System status board is updated regularly and the 6 hourly status checks are considered adequate. There is a DP rough log book maintained along with a DP anomaly book. Having reviewed the anomaly book a number of observations can be made.

From the anomaly log, which has been well populated, a subjective analysis has been undertaken to identify any trends in the data being recorded. Two events occurred which gave some concern. The first being on February 8 2004, this related to routine maintenance on the uninterruptible power supply that supplied gyro #1. Gyro #1 was deselected to the back up DP system while position reference(s) system was selected. The DP Operating station crashed (OS 2) when the gyro was enabled to the system. This operating station is in the central control room. Control measures and risk assessment should be in place when conducting any maintenance on the DP system-supporting infrastructure. This incident indicates that the risk assessment carried out did not consider the implications of the work. It is not clear from the report whether an advisory level was initiated.

The second incident occurred on the 29 March 2004 whilst Thruster #8 was undergoing maintenance. The thruster had been run locally in simulation mode. On taking Thruster #8 out of simulation mode the DP system received an alarm stating 'RPM out of limits'. The DP system reacted to this as its logic indicated a thruster run away. Hence the four thrusters already on line ramped up to counter Thruster #8 which was not in fact running. Again the running of maintenance simulations whilst connected requires risk assessment to assess all risks to the DP system. The impact is noted as a 2.8m position loss.

It is noted that although neither of these incidents caused major disruption they both relate to effects of maintenance whilst on DP. Neither of these was recorded as an incident/ DP event.

Spurious alarms feature as the largest percentage of anomaly reports. Realistically this would not be unexpected due to the complexity of the system. Lost communications to either HIPAP or DGPS figures highly and again this will always be difficult to manage. A number of the anomalies identified have direct affects on system redundancy and these account for approximately 21 percent of all recorded. The total populated data considered was thirty eight entries based on approximately 1 year's records.



RAS 409.3.3
DP Incident Reports
There has been one DP event report filed in the last 12 months.
This relates to a degraded status based on drift due to DGPS. The 4 systems were deselected and the vessel maintained position on single acoustic system. The cause was identified as solar activity. No other reports were located. There have been no yellow or red alerts since June 2003. From the viewpoint of single system references then this event should have been declared as a yellow alert.

A positive is noted that the organisation namely Transocean is making available reports from other drilling units and as such the culture of information sharing and lessons learnt is being incorporated in the current rigs management systems.

RAS 409.13
DP Operations
Pointing bow or stern into current whenever it exceeds 2 knots.
There is no current procedure concerning this recommendation. However the anecdotal evidence indicates that the unit lies to the optimum heading based on vessel motions, operations and thruster loads. This would be considered good practice and it is reported that the series of events based around the incident of June 2003 have been catered for. This includes greater awareness of the external environment and less focus on the view point that with current from abeam the rigs positional foot print is improved. A formal operational procedure could not be located but there is a generic high current procedure available (non rig specific).

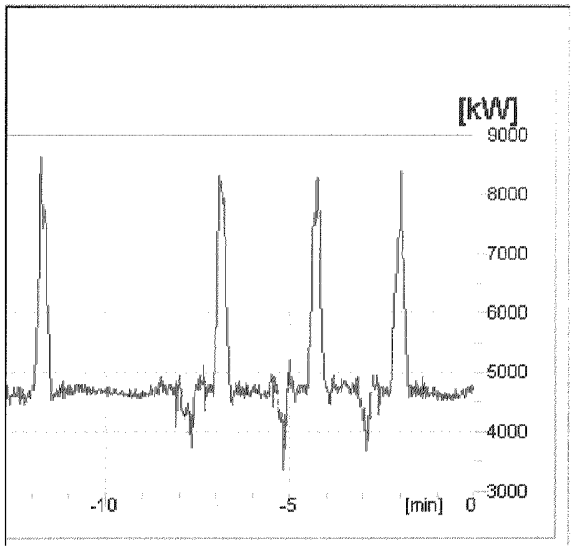
RAS 409.5.1, 2, 3
DP Software Management and Tracking
The DP department have maintained the Simrad Tech Log but it is noted that it is incomplete. The latest upgrade to the APOS software for the HIPAP was not recorded. It could not be considered a software tracking log in its current presentation. Service reports are appended to the book however the last service report is not available. References to the Floating Operations Manual are noted. The corporate software management of safety critical software has not been demonstrated based on the following:

No centralised software register was available
The software storage location was not centralised and hence no fireproof protection was afforded
On requesting APOS software it was noted that the latest upgrade disk could not be located

On checking DP Operator stations at the central control room, superseded software from 1999 was located. This indicates software controls such as quarantining of superseded software, is not in place.

The importance of software control on safety critical systems cannot be over emphasised and this issue requires urgent attention

RAS 409.7.1
Data Display
The screens that were displayed at the operator stations were suitable given the current rig work scope. The DP operators were monitoring real time variables and were conversant with the application of trends. Typically when running casing and tripping drill pipe their focus of attention was on available power and also frequency fluctuations. In one instance where casing was being run regenerative braking was causing short-term peak demands and fluctuations and a concurrent frequency drop occurred. As this dropped below 58.5 Hz for more than 2 seconds then a load limit signal is generated that caused the thrusters to phase back by 50%. Once frequency increased to acceptable limits the load limiting is disengaged and normal thruster load restored. This occurred whist onboard but demonstrates that the DP awareness with operational experience is increasing.



Schematic 1 Screen shot of total power demand whilst running casing, (14 MW available)

RAS 409.7.2 & 3
Data Logging
The data logging is well understood by the senior DP Operators. A process has been developed where the data is dumped from the buffer memory to the hard drive every 12 hours. On a 15 day cycle (the 1 and 15 of each month) the data is burned to a CD and stored for future reference.

RAS 409.8
Manning and Requirements
On discussing with DP Operators it was found that they were familiar with concept of the DP FMEA associated with this rig. The one issue that caused confusion was a request for the FMEA proving trials document. This was discussed in depth as to the scope of work and objective for each document.

DP log books are maintained by DP Operators and discussions were undertaken concerning competence assessment schemes,

Only one DP Operator did not have a Nautical Institute DP Certificate and has approximately 2 months more sea time to obtain prior to being able to submit the application

One DP Operator did not hold an STCW Officer of the watch licence. Both the Chief Mate and Master are also DP experienced and hence the current manning has flexibility at this time.

RAS 409.9
DP Fault Tolerance and Redundancy
Rig conducting drilling operations, unable to evaluate

RAS 409.10
Alarms
Rig conducting drilling operations, unable to evaluate

It was noted that alarm and event dot matrix printer forward central control room was not printing legibly on the left hand side of the feed paper. No alarm and event printer is connected to the aft engine control room DP operator station

The DP alerts are tested as part of a check list every 12 hours

RAS 409.11
DP Sensors
Doppler radar now functional.

Multifix 3 system has been updated to Multifix 4 system in the central control room

A Trimble receiver has recently been replaced but all systems are out putting reference information.

It was noted that the uninterruptible power supply for the port HIPAP was non functional at the time of the review. The DP Operators were unaware of this fault condition.

One DGPS monitor in the central control room is non functional.

On discussion with the Electrical Supervisor the proposed tests of the serial ports on the Seatex unit have not been carried out.

RAS Section 409.2.5
Field Arrival Trials
Item 1
Recommendation regarding the splitting of field arrival trials into section and completing over several wells has been completed.

Having reviewed the last field arrival check list it is noted that although this recommendation has been completed a number of tests required for each well have not been completed.

Section 4 of the Field arrival check list Parts 15-25 and Section 6 Parts 1 to 7 were not completed. It is also noted that the emergency stops for the thrusters are not required to be tested prior to each well.

Training
Item 1
Send DPO's for DP Drilling Rig simulator training
This has been partially completed.

Six members of the bridge team have attended this course. Feedback has indicated that the value was limited. Typically use of ERA's and acoustic array management was not covered. Based on this feedback from rig staff this item should be considered completed.

RAS Section 409.3
DP Records and Record Keeping
Reviewed Masters controlled Hard Copy of Emergency Response Manual
Item 1
Rewording of ERM ESDI and 2
Not completed

Item 2
Coordinate red and yellow watch circle radii listed in ERM and well specific disconnect criteria.
The rig utilises rig specific DP vessel drift off and watch circle programme. This is run every 12 hours or more frequently when the environment status is changing. The results of the analysis are updated on the central control room white board
Considered completed

Item 3
Define adverse weather in sect 12 sub sect 3.1.2
Not completed

Item 4
DP Operator Duties list, in ERM sect 12
Not completed

Item 5
Add the missing C denotation sect 12
Not completed

Item 6
Add missing third duty for subsea engineer
Not completed

Item 7
Correct the wording of ERM sect 12 sub sect 12
Not completed

Item 8
Correct the EDS timing sequences in ERM to agree with actual timing
Not completed

10-09-03
Item 1
Re-label different versions of Emergency Response Manual with correct issue numbers, dates and revisions
Not completed

Although a number of procedures have been revised since the document was initially distributed no control sheet documenting the current revision of procedures has been incorporated into the ERM manual

Item 2
Update coordinate red and yellow watch circle radii listed in ERN
Not completed

Item 3
Update labelling of EDS1 and 2 on operating panels
Completed

Item 4
List duties of DP operator when there is a red alert in all ERM sections
Not completed

RAS Section 409.13
DP Operations and Performance
Item 5
Consider development of guidelines to modify disconnect procedures during non normal operations.
Not completed

The rig utilises the DP Vessel Drift Off and Watch Circle Programme. The DP Operator practice has been modified since the high current incident. The requirement for an establishment of temporary guidelines for special circumstances like turning could be considered as difficult to manage and may hinder rather than improve operational responses to changing circumstances

RAS Section 409.10
Alarms
Item 1
Add warning device (disconnect alert) in moon pool area
Not completed

RAS Section 409.13
DP Operations and Performance
Re-examine well specific guidelines
Completed.

It is noted that the current Well Specific Operating Guidelines have some deficiencies. Typically the escape route is specified as a South Easterly direction. The bathymetric chart for this area was reviewed and an improved escape way would be in a southerly direction as the depth contours indicate an increasing depth in this direction. Additionally consideration should be given to stability of heading when considering alert levels. The current Well Specific Operating Guidelines has not considered thrust loads or power loads and a separate case for total HV black out has not been considered.

RAS Section 830
UPS
Item 3 Increase UPS battery endurance test to 30 minutes
Not completed

Reviewed Empac maintenance management system and reviewed task procedures. Annual endurance test for UPS is set at 20 minutes