

From: Franklin, Bob
Sent: Tue Apr 27 21:13:00 2010
To: Wellings, James S; Blome, Greg R.; Patteson, Mark R
Subject: RE: WWCi Project Memo-13 Capping Options Rev2
Importance: Normal
Attachments: Capping Stack Team.ppt

Here is the presentation from today's efforts...

Comments, questions or suggestions are welcome.

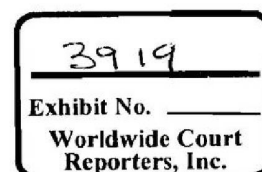
Regards,
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TREX-03919

BP-HZN-2179MDL01513949

TREX-003919.0001

TREX 003919.0001



Well Capping Team

27 Apr 2010

Rev 1

BP-HZN-2179MDL01513950

TREX 003919.0002

TREX-003919.0002

Major Areas of Operation



- Cutting of Riser to allow access to top of LMRP
- LMRP Release and Removal
- Capping Stack Design
- Capping Stack Deployment
- Capping Stack Installation
- Capping Stack Operation
- Snubbing Capping Stack Contingency
- Subsequent Intervention Operations

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TREX 003919.0003

TREX-003919.0003

Cutting Riser - access LMRP top



- Cutting procedure - Tools/ROV
- Lifting/securing procedures for cut-offs
- Equipment lists
- ROV Specification
- Subsea lighting –
- Hazard/Risks Identification
- Assumptions
- Resources
 - WWC Marine
 - ROV operations
 - ROV tooling
 - Surveying/positioning
 - Lifting specialist

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TREX 003919.0004

TREX-003919.0004

Risks



- Cutting Operations
 - Unconventional work for rig teams
 - Hydrocarbons to rig / vessel
 - Mechanical Cutting Blade Failure
 - Pressure trapped in riser
 - Riser movement while cutting operations
 - Recoil from Stored energy in riser

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TREX 003919.0005

TREX-003919.0005

LMRP Release and Removal



- Detailed Rigging and Lifting Procedure LMRP Weight - 300,000 lbs (air)
- Landing area (sea floor clearance)
- Release procedure
- Crane/Rig asset requirements
- Lifting & Rigging Gear – spreader beam
- Subsea Lighting
- Hazards/Risks Identification
- Assumptions
- Resources
 - Lifting specialists
 - TOI– Subsea
 - TOI Rig Manager or Crane Vessel Master
 - Cameron
 - WWC Marine
 - ROV Operations
 - ROV Tooling
 - Survey/positioning – set down point

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TREX 003919.0006

TREX-003919.0006

Risks



- LMRP release
 - Will not release
 - Sling Load Stability
 - Damage to HC Connector Pin
 - Damage to sealing area
 - Gasket stuck on Wellhead
 - Disturb BoP and increase flow
 - Drill Pipe Stub (3,000 feet in well bore)
 - Weight >300,000 lbs

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TREX 003919.0007

TREX-003919.0007

Capping Stack Design



- Capping Stack Basis of Design
 - Minimum Operation Objective
 - Functions (Rams)
 - Spacer spool
 - Side Outlets
 - Subsea Accumulator
 - Control System
 - ROV
 - R-WOCS
 - IWOCs
 - Pilot operated Hydraulic Control
 - Contingency Requirements i.e. install 2nd BOP
- ROV Panel Design
- Lifting / Deployment Frame Design
- Capping Stack Actual Design – Equipment Availability
- Stack up Testing
- Seal Area on Connector
- Ring Gasket Deployment
- Visual latch indicator
- 2H – Stress / Bending Moment Analysis
- Latch Verification Procedure (overpulls)
- Risks & Hazards
- Assumptions

Resource:
BP Wells Subsea
WWC Marine
WWC Ops
ROV Tooling
Cameron Equipment
Cameron Control
Vetco – upper connector
TOI Subsea
TOI Engineering
Lifting Specialist

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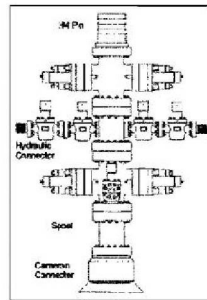
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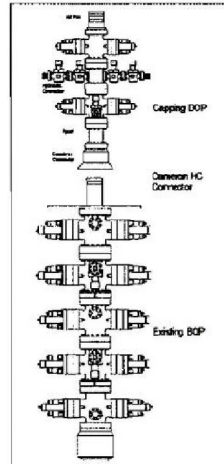
Cap Stack Design



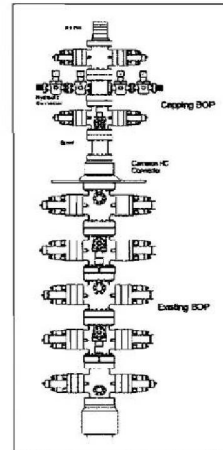
Design



Deploy



Operate



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Capping Stack Deployment



- Lifting/Deployment frame & lifting points
- Lifting gear & lifting plans for transport and deployment
- Stump preparation procedures/contingencies
- Seal Area preparation
 - Ring Gasket removal
- Rig or crane asset requirements
- Rig/Crane interface to rigging
- Hazard / Risk Identification
- Assumptions
- Resources
 - Lifting specialist
 - WWC Marine
 - TOI Subsea
 - TOI Rig Manager or Crane Vessel Master
 - TOI Engineering or Crane Vessel Engineering – Deployment interface design
 - Cameron
 - Vetco(for upper Connector considerations)
 - ROV operations
 - ROV Tools
 - WWC Snubbing – Simulations/Calculations

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TREX 003919.0010

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Capping Stack Installation



- Latch flag
- Stack-up in shop
- Pull test after latch?
- Slope indicator on BOP reading now?

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TREX 003919.0011

TREX-003919.0011

Capping Stack Operation



- Feasibility
- Necessity
- Snub line method / Equipment
- Surface asset requirements
- Hazards and Risk Identification
- Assumptions
- Resources
 - WWC

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TREX 003919.0012

TREX-003919.0012

Risks



- Capping Stack Operations
 - Controls
 - Direct
 - Accumulators
- Can not land out
- Turbulent Flow from well
- Ram failure
- Wash Out
- Foreign Objects / Debris

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TREX 003919.0013

TREX-003919.0013

Risks



- Deploy Capping Stack
 - Sling / Rigging Issue
 - Dynamic Loading issues
 - Weather related issues
 - Stab on Flowing well
 - Lifting points
 - Guidance onto hub / Alignment
 - Damage to HC connector
 - Failed Gasket
 - Damage to sealing areas
 - ROV Failure
 - Unconventional Work
- Cable failure
- Cable twisting / spin
- Novel Approach - New

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TREX 003919.0014

TREX-003919.0014

Snubbing Capping Stack



- Balance
- Flow
- Model flow/stability

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TREX 003919.0015

TREX-003919.0015

Subsequent Intervention Operations



- Outlet for well kill
- Accept another BOP on top
- Full Bore Access – 18 ¾"
- Returns Capability to Rig

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TREX 003919.0016

TREX-003919.0016

Basis of Design Assumptions



- Stack on top of Capping Stack
- Drilling Rig to perform work
- Access for Fluid Injection
- 15K Design
- Accumulators w/ minimum closure time – SBR's
- Bending Moment
- Watch Circles – DWOP
- Relief Well in Place or Well Not Flowing
- Alignment / Pin to funnel options
- Design Verification – API 16 w/ DNV Certification

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TREX 003919.0017

TREX-003919.0017

Risks



- Snubbing the Capping Stack
 - No location to Anchor
 - Loading of Anchor points

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TREX-003919.0018

Major Risks



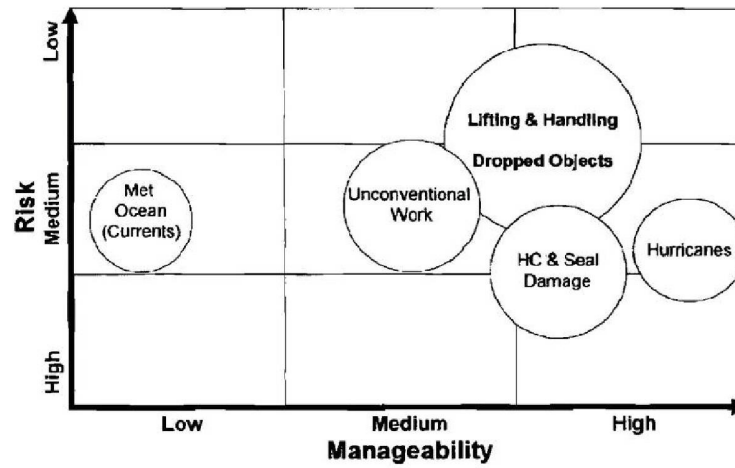
- Unconventional Work
- Novel Technology
- HC Connector Damage
- Gasket / Seal Area Damage
- Lifting, Handling & Deployment
- Dropped Objects
- Simops
- Clashing issues at Depth with installed equipment
 - Riser
 - BOP
- Met Ocean conditions
- Hurricane Season Approaching

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TREX 003919.0019

TREX-003919.0019

Risks



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TREX 003919.0020

TREX-003919.0020

Resource Issues



- Design & Fabricate

– BP Project Resources	4
– WWC Marine	1
– WWC Ops	1
– ROV Ops	2
– Cameron Equipment	4
– Cameron Control	4
– Vetco Hub Profile	1
– TOI Subsea	4
– TOI Engineering	2
– <u>Lifting Specialist</u>	<u>2</u>

• Total Resource 25

- Deployment & Operations

– BP Operations	3
– WWC Marine	4
– WWC Ops	4
– ROV Ops	2
– Cameron Equipment	2
– Cameron Control	2
– Vetco Hub Profile	1
– TOI Subsea	4
– TOI Engineering	2
– <u>Lifting Specialist</u>	<u>2</u>

• Total Resource 26

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TREX 003919.0021

TREX-003919.0021

Key Milestones



30 April 2010	Terms of Reference
7 May 2010	Basis of Design
7 May 2010	Equipment Lists
7 May 2010	Draft Operating Procedures
30 April 2010	Fabrication Schedule / Location
14 May 2010	Detailed Operating Procedures
15 June 2010	Fabrication Completed
18 June 2010	Stack up / Integration Testing Procedures
15 June 2010	HAZID / HAZOP
22 June 2010	Load out

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TREX 003919.0022

TREX-003919.0022