OGP Guidelines for the conduct of offshore drilling hazard site surveys

Presenter: Palle J. Jensen, Maersk Oil
Organisation: The OGP Geomatics Committee
Summary of presentation

• Brief history of the OGP Guidelines for the conduct of offshore drilling hazard site surveys
• Objective of the Guidelines
• Most significant updates from the original UKOOA Guidelines
• The main recommendations of the Guidelines
• Planned updates & planned additional volume - Technical Notes
• Q & A
A brief history

- 1990 - "Technical Notes for the Conduct of Mobile Drilling Rig Site Surveys“, issued by UKOOA
- 1997 - Guidelines for the Conduct of Mobile Drilling Rig Site Surveys, Volumes 1 and 2, published by UKOOA
- 2000 - Addendum: Guidelines for the Conduct of Mobile Drilling Rig Site Investigations In Deep Water, published by UKOOA
- 2006 - UKOOA Guidelines adopted by the OGP Geomatics Committee
- 2011 – New Guidelines for the conduct of offshore drilling hazard site surveys published by OGP
OGP Task Force – current and previous members

- Andy Hill, BP (Initial Chair)
- Palle J. Jensen, Maersk Oil (Current Chair)
- Gareth Wood, BP
- Dag Lundquist, Statoil
- Thierry des Vallieres, TOTAL
- Oyvind Ruden, Shell
- Eric Cauquil, TOTAL
- Ken Games, Gardline Geosurvey
- Richard Salisbury, Fugro Geoconsulting
- Karen Dalton, RPS Energy
- Mick Cook, formerly RPS Energy
- Abby Findlay, OGP Secretary
Most significant updates

- General technology update
- Global application
- Wider target audience
- Improved usability
- Use of 3D exploration seismic data
- Exhaustive list of potential drilling hazards
- Data validity
Glossary

2D multi-channel high resolution seismic
Seismic reflection data designed to image the shallow section and detect drilling hazards such as shallow gas.

3D migrated volume
The end product of a fully processed 3D seismic survey.

Acoustic seabed imagery
Images derived from acoustic reflection data processed to illustrate seabed: topography, features, and changes in texture.

Acquisition artefacts
Noise on seismic data that is a function of the data acquisition process rather than geology.

Anchor radius of a semi-submersible rig
The radius of the smallest circle that includes all the seabed anchor positions for a semi-submersible rig.

Archaeological remains
Objects that are of historical interest. These may be man-made, for example shipwrecks, or human or animal remains of any age.

Auto-tracking
The process by which seismic horizons are automatically tracked in a seismic dataset by an interactive seismic interpretation system.

AUV
Autonomous Underwater Vehicle. A self-propelled, untethered underwater vehicle that is able to be programmed to fly along a predefined survey track at a predefined height above the seabed to collect data from sensors installed on it.

Backscatter
The amplitude of the acoustic echo sounder energy reflected by the seabed that may be processed into maps that provide information about seabed features and texture.

Benthic samples
Seabed samples recovered by grabs, or corers, that are normally taken for environmental investigations.

Bottom founded rig
Mobile drilling rig such as a jack-up rig or a drilling barge that relies on a seabed foundation for stability during drilling.

Boulder beds
Accumulations of boulder sized material, greater than 10cm across, buried in sediment. Typically found in the base of buried channels or within glacial sediments.

Box corer
Seabed sampling system designed to recover a cube of seabed sediment. Generally used for soft seabed sediments.

Buried infilled channels
Ancient eroded channels that have subsequently been infilled and buried by sediment.

Buried slumps
Ancient submarine landslides that have been buried by sediment.

Chemosynthetic communities
Discrete life forms normally in the vicinity of the seabed that exist only because of specific, localized chemical conditions.

Clock and orbit corrected GPS
Corrections applied to the clock and orbit ephemerides data that has been uploaded to each GPS satellite. Corrections are broadcast at 1 Hz to the NASA GDGPS system.

Communications cables
Cables on or beneath the seabed laid either between continents and islands or to offshore installations.

Global Navigation Satellite Systems (GNSS)
Generic term for satellite based navigation systems like GPS, Glonass and others that provide autonomous global positioning of GNSS receivers.

CPT
Cone Penetration Test. In-situ soil strength testing device that makes real time measurements as it is pushed into the seabed by mechanical means.

Crossline direction
Azimuth bearing of subordinate lines in a marine survey.

CTD
Conductivity, Temperature and Depth meter. Device for making real time measurements of conductivity, temperature against depth over the full water column to derive the speed of sound in water to calibrate e.g. echo sounder and USBL observations.

Desk study
Exercise to derive as much information as possible about the site conditions in an area from existing data and public domain information.

Diapiric structures
Positive geological structures formed by the deformation of plastic material, for example salt or clays. They can be associated with hydrocarbon accumulations and may also have a surface expression that in the marine case would result in a bathymetric high.

Diatreme
A volcanic, or injective, feature piercing sedimentary strata.
Figure 2 – Site Survey Decision Tree

Carry out desk study and ascertain proposed rig type:
- Identify local legal and insurance requirements for site survey delivery (see Section 1)
- Ascertain rig type to be used (see Section 2.3 and 2.5)
- Evaluate extent and quality of existing relevant data and identify all significant relevant site constraints (see Section 3.1 and 4)

- Bottom founded rig
- Anchored rig
- DP rig

Is existing site survey coverage suitable for use?

- No

Water depth at well location > 750 m?

- Yes
  - Exploration 3D data suitable for use?
    - Yes
    - Acquire full new site survey (see Section 5.5) — or —
    - Acquire supplemental data coverage (see Sections 5.5 or 5.7)
  - No

- No

Are the shallow geology and geohazards well understood?

- Yes

Is a seabed clearance survey required?

- Yes
  - Complete integrated interpretation of all available data and issue proposed drilling location site survey report (see Section 6)
  - No
- No

- No
## Hazard Impact Tables

<table>
<thead>
<tr>
<th>Constraint, hazard or concern</th>
<th>Bottom founded rig or platform</th>
<th>Impact on operations</th>
<th>Dynamically positioned rig</th>
<th>Investigatory data requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water depth</strong></td>
<td><strong>Suitability of Rig:</strong>&lt;br&gt;- Large draught&lt;br&gt;- Large freeboard&lt;br&gt;- Leg length&lt;br&gt;- Expected seabed penetration — relative to vessel draught or leg length&lt;br&gt;- Achievable air gap</td>
<td><strong>Suitability of Rig:</strong>&lt;br&gt;- Maximum permissible draught (coastal waters)&lt;br&gt;- Anchor system limitations (limb length and wind capacity)&lt;br&gt;- Best support needed for anchoring&lt;br&gt;- Rise length available&lt;br&gt;- Maximum usable mast weight (in deep water)&lt;br&gt;- Amount of towing loading on riser</td>
<td><strong>Suitability of Rig:</strong>&lt;br&gt;- Rise length suitable&lt;br&gt;- Maximum allowable mast weight&lt;br&gt;- Direction of departure in event of emergency disconnect, heaving off with riser fully deployed or approaching back on to location to latch on to BOP.</td>
<td>Derived from results from a precise bathymetric survey using Swathe Bathymetry and single channel echo sounder systems (see section 5.5.1). For individual well locations in water depths greater than 750m, that are not related to a field development, use of a properly depth converted exploration 3D seabed event may be an adequate replacement (see sections 5.5.2 and 5.6).</td>
</tr>
<tr>
<td><strong>Natural seabed features</strong></td>
<td><strong>Choice of:</strong>&lt;br&gt;- Rig type (large, mid or multi-leg jack-up)&lt;br&gt;- Well location&lt;br&gt;- Impacts on:&lt;br&gt;- Risk of scour&lt;br&gt;- Rig stability&lt;br&gt;- Spud can damage</td>
<td><strong>Choice of:</strong>&lt;br&gt;- Well location&lt;br&gt;- Anchor location&lt;br&gt;- Catenary touchdown points&lt;br&gt;- Impacts on:&lt;br&gt;- Anchor deployment and slippage&lt;br&gt;- Requirement for piggy back anchors&lt;br&gt;- Difficulty of spudding the well&lt;br&gt;- Leveling of wellhead&lt;br&gt;- Wellhead scar caused by current focusing.</td>
<td><strong>Choice of:</strong>&lt;br&gt;- Well location&lt;br&gt;- Direction of departure in event of emergency disconnect; heaving off with riser fully deployed or approaching back on to location to latch on to BOP.</td>
<td>Mapped on the basis of an integrated use of:&lt;br&gt;- Bathymetric data&lt;br&gt;- Side scan sonar data&lt;br&gt;- Pile butt data&lt;br&gt;See section 5.5.1. In some cases in shelf waters, where bottom founded rigs would operate, exploration 3D seismic imagery might assist an integrated study depending on 3D data quality. In water depths over 750m exploration 3D data can replace the need for bathymetry or side scan sonar data (see sections 5.5.2 and 5.6).</td>
</tr>
<tr>
<td><strong>Man made features</strong></td>
<td><strong>Choice of:</strong>&lt;br&gt;- Well location&lt;br&gt;- Emergency transit locations&lt;br&gt;- Direction of approach and departure from location&lt;br&gt;- Positional tolerances&lt;br&gt;- Anchor locations to be used in bringing rig onto location.&lt;br&gt;- Impacts on:&lt;br&gt;- Structural damage to rig or seabed facilities.&lt;br&gt;- Spud can damage.&lt;br&gt;- Spill and emissions.&lt;br&gt;- Loss of Operator reputation.</td>
<td><strong>Choice of:</strong>&lt;br&gt;- Well location&lt;br&gt;- Anchor locations and appropriate offsets to identified features&lt;br&gt;- Design of anchor catenary profile&lt;br&gt;- Requirement for multiple anchor lines.</td>
<td><strong>Choice of:</strong>&lt;br&gt;- Well location&lt;br&gt;- Direction to leave location where heaving off with riser fully deployed, or approaching back on to location to latch on to BOP.</td>
<td>Presence identified from a desk study review of:&lt;br&gt;- Nautical charts for the area&lt;br&gt;- Communication cable databases&lt;br&gt;- Published Pipeline and Cable route charts&lt;br&gt;See Section 4.</td>
</tr>
<tr>
<td></td>
<td><strong>Can result in:</strong>&lt;br&gt;- Damage to seabed facilities.&lt;br&gt;- Spill and emissions.&lt;br&gt;- Loss of Operator reputation.</td>
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<td>Mapped from the integrated use of:&lt;br&gt;- Side scan sonar data&lt;br&gt;- Towed magneto-</td>
</tr>
</tbody>
</table>
## Data Validity

### Table 2: pre-existing data validity guidance

<table>
<thead>
<tr>
<th>Activity Condition</th>
<th>Seabed Data</th>
<th>Subsurface Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Activity</td>
<td>5 years</td>
<td>10 years</td>
</tr>
<tr>
<td>Engineering Activity</td>
<td>1 year</td>
<td>10 years</td>
</tr>
<tr>
<td>Well Control Incident</td>
<td>Invalid</td>
<td>Invalid</td>
</tr>
</tbody>
</table>
The main recommendations

• Project Schedule
• Site Survey Decision tree
• Data validity
• Use of 3D exploration seismic data
Figure 1: Site clearance – timing guidance

Elapsed time in weeks

0 4 8 12 16 20 24 26

Preparation
- Desk study and project planning
- Contractor procurement

Acquisition & reporting
- Acquisition
- Processing
- Interpretation and reporting
  - Internal operator review
  - Integration of results into well design and final operation planning
  - Permit document production
  - Permit submission and regulatory review

Completion & implementation
- Start depends on vessel availability
- Can be performed on the vessel in parallel with acquisition; could save up to 4 weeks
- Can be performed in parallel with processing
- Timing dependent on local regulatory requirements

Key events
- Location short-listed for drilling
- Location available for spud
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Acquire supplemental data coverage (see Sections 5.5 or 5.7)

Is a seabed clearance survey required?

Complete integrated interpretation of all available data and issue proposed drilling location site survey report
(see Section 6)
### Table 3: Main line spacing guidance

<table>
<thead>
<tr>
<th>Data type</th>
<th>&lt;25m</th>
<th>25m to 150m</th>
<th>150m to 750m</th>
<th>&gt;750m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swathe bathymetry</td>
<td>≤50m</td>
<td>50m – 150m</td>
<td>200m</td>
<td>150m (AUV)</td>
</tr>
<tr>
<td>Side scan sonar/profiler</td>
<td>50m</td>
<td>100m</td>
<td>200m</td>
<td>150m (AUV)</td>
</tr>
<tr>
<td>2D HR seismic</td>
<td>25m – 50m</td>
<td>50m</td>
<td>50m – 100m</td>
<td>≥150m</td>
</tr>
</tbody>
</table>
3D seismic data acceptability criteria

- Spatial, temporal, bit resolution and sampling interval
- Data loading criteria and data resolution
- Recommended minimum requirements to:
  - Frequency content
  - Seafloor reflection
  - Acquisition artifacts
  - Merge points
  - Bin sizes
  - Sample interval
  - Imaging: velocity model and migration.
  - Multiple energy
  - Data coverage
  - Minimum water depth
Planned updates and publications

- Planning of relief well locations (Guidelines update 2012)
- Technical Notes (to be published 2012)

Download the Guidelines from www.ogp.org.uk

(limited number of) prints available from presenter