



International
Association
of Oil & Gas
Producers

Surveying & Positioning Guidance note 16

Guidelines for the Quality Control of Proposed Well Coordinates

Revision history

Version	Date	Amendments
1.0	January 2006	First release

1 Introduction

This Guidance Note describes the recommended practice for quality control (QC) of the position of proposed well locations when derived from seismic data interpretation.

Typically, the position of a proposed well is extracted from the screen of a seismic interpretation workstation in terms of grid coordinates (Easting and Northing). This position is associated with a corresponding inline and/or crossline location from a 3D seismic data set, or shotpoint and common depth point from one or more (intersecting) lines from a 2D seismic data set. An offset may also be involved.

There are several potential error sources that can impact adversely on these well coordinates, for example:

- use of incorrect coordinate reference system (CRS) during data loading,
- use of incorrect 3D bin grid definition, or SP/CDP relationships for 2D surveys,
- mismatch between navigation data in SEG Y headers and UKOOA P1 files,
- inadequate data sets, for example:
 - seismic trace headers without coordinates,
 - incomplete navigation data (line ends only, bends omitted),
 - navigation data without point/event definition (whether SP, Receiver or CMP).
- typographical (human) errors.

If these errors are not identified the well may be drilled in the wrong location.

2 General Comments

The quality control of navigation and positioning during the acquisition of seismic surveys is outside the scope of this Guidance Note. The quality and reliability of the seismic navigation data will however directly impact on the ability to accurately relate the physical position of a well location to the geophysical interpretation. Surveys that have been poorly specified, inadequately quality controlled or where there is insufficient information available to quantify the accuracy of the data, are all potential error sources and may not be suitable to support detailed well planning.

The verification of CRS, geodetic parameters, bin grid definition and so on, should always be by comparison to original source material, for example: acquisition, QC and processing reports; UKOOA P1, P2 and P6 format files.

Positioning data may have been transformed from the acquisition CRS to a local CRS. This may have been carried out during acquisition of the seismic data, or at a later date. Depending on the vintage of the data and its source (own acquisition, traded, purchased, etc.), there may not be a well-documented audit trail.

3 QC of Proposed Well Coordinates

3.1 Workstation CRS and Data Loading

Prior to loading seismic data to a workstation, the following checks should be made:

- verify the CRS of the data to be loaded against the acquisition parameters, and ensure that this is identical to the project, licence or country data that the data relates to,
- verify that the CRS definition in the input project database is correct,
- for 3D surveys; verify the bin grid definition against the acquisition parameters,
- if transformation of geodetic datum is required; verify the transformation parameters and verify that the coordinates have been correctly transformed,
- if the positioning data is to be loaded from the SEG Y header; verify that the positions and extent of the lines correspond exactly to the UKOOA P1[†] data,
- verify the geographic location and inter-relationships of the seismic data after loading (e.g. by comparison with SP base maps, remote sensing images, etc.)

3.2 Proposed Well Location

Prior to approving the proposed well location, the following checks should be made:

- for 3D data;
 - extract the corresponding inline and crossline (i, x) locations and verify these against the seismic positioning data in the UKOOA P1 file,
 - extract the survey corner points and verify against the P1 data (on larger surveys errors may show up at the edges that are not apparent at the well location).
- for 2D data; extract the SP/CDP identifier and verify against the UKOOA P1 file.

Some detective work may be necessary. Limitations to be aware of:

- CDP numbers are not available from the UKOOA P1 file; they are generally available from the SEG Y trace headers,
- 2D trace headers often lack SP numbers, the SP/CDP relationship must then be determined from available evidence, e.g. from paper sections or relationship tables from the processing contractor,
- SPs may have been renumbered (relative to the UKOOA P1 data) due to seismic interpretation software limitations,
- the non full-fold sections of 2D lines may have been extrapolated, from the last known SP coordinates in the UKOOA P1 file, by the interpretation software,
- 3D data (trace or coordinate data, or both) may have been re-processed using different grid origin, spacing or even CRS. This data may then have been loaded to an existing project,
- the terms *inline* and *crossline* are ambiguous, and may have been used differently by different parties during the acquisition, processing, interpretation phases.

3.3 Proposed Target Location(s)

For well locations based on 2D survey data, the coordinates of the sub-surface target(s) should also be thoroughly checked. 2D lines may comprise several segments, each with different SP/CDP relationships – the fact that the well location passes the QC tests does not automatically imply that the target coordinates are correct.

The seismic reference datum should be verified prior to time/depth conversion of target position(s).

[†] Other positioning data exchange formats may have been used, for example; Shell Processing Support (SPS), SEG P1, or contractor-specific).

4 Recommendations

Seismic positioning data should be subject to rigorous QC from acquisition phase through processing to loading into seismic workstation databases.

The quality control of the coordinates of proposed exploration well locations should be a closed loop, where the position extracted from the interpreted data is back-verified against the original seismic positioning data. If, for example, the coordinate data has been loaded directly from the SEG Y header and there is no corresponding UKOOA P1 file available for comparison, then the quality control process is incomplete.

All the quality control activities should be documented in a standard format to ensure a standardised, complete and auditable QC process.

5 Follow-up Actions

The quality control process described above is only one element in a chain of inter-dependent activities prior to spudding the well. Similar attention must be paid to the verification of the coordinates, CRS and geodetic parameters in connection with pre-drilling activities (for example, offshore: site survey acquisition, rig foundation soil investigations, debris and entrance surveys and rig move, and onshore: well location setting-out, civil engineering works and as-built surveys). Errors at this stage may have profound safety as well as business implications.

6 Related OGP Surveying and Positioning Committee Guidelines

- Guidance Note 2: Use of Bin Grids and Coordinate Reference Systems in Workstations.
- Guidance Note 5: Coordinate Reference System Definition - Recommended Practice.

Abbreviations

CDP

Common Depth Point

CMP

Common Mid Point

CRS

Coordinate Reference System

i

inline

QC

Quality Control

SEG

Society of Exploration Geophysicists

SP

Shot Point

SPS

Shell Positioning Summary

UKOOA

United Kingdom Offshore Operators Association

x

crossline

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