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Guidance on Practice for Offshore Pipeline Surveys

GP 43-26

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 43-26. This Guidance on Practice (GP) is newly created and is not based on heritage documents from the merged BP companies. It is not a standalone document, and shall be used in accordance with the requirements of other ETP documents Series 43 for pipelines, which provide further detail necessary to undertake and execute a pipeline project.

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1. Scope and objectives

1.1. Scope

This GP provides guidance on geophysical and installation survey and positioning support for offshore pipeline construction. Much of the content is also applicable for bundle, umbilical, and electrical/ fibre optic cable installation and covers inshore, offshore shelf, and offshore deepwater operations. Figure 1 details the survey activities included in each phase of the project. Offshore pipeline geotechnical surveys are dealt with in GP 43-30. The document:

- a. Aims to facilitate common process across the organisation and to engender recommended practices in all involved or associated with pipeline survey activities.
- b. Is primarily for the Engineering and Technical Authorities (EA and TA), project and commercial managers, project developers and planners, survey and site investigation specialists, engineers, and pipeline operations staff.
- c. Identifies the key processes and working methods required to ensure each survey objective is successfully delivered.
- d. Provides guidance on geophysical and installation survey and positioning recommended practices and issues.

1.2. Objectives

- a. The principle objectives of survey support to pipeline activities are delivery of:
 1. Information required to plan and finalise an appropriate pipeline route or route corridor, including any pipelay anchor pattern.
 2. Positional support to ensure that the pipeline is installed safely and efficiently on the route, within pre-defined limits.
 3. Suitable risk mitigation with respect to protecting adjacent assets and facilities.
 4. Accurate record of the position and condition of the as-installed pipeline throughout its entire length, including tie-ins.
- b. Accurate and complete as-built positional and event data, at the time of installation, for the entire length of the pipeline are essential in order to facilitate:
 1. Safe and efficient ongoing management of the system throughout its life.
 2. Location awareness with other marine users, operators, and stakeholders, thereby significantly reducing the risk of pipeline damage, for example through fishing or anchoring activities.
 3. Efficient planning and delivery of future marine activities over or adjacent to the new pipeline facility, such as further seabed installations, rig moves, or pipeline inspection.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this GP. For all references subject to revision, the most recent amendment applies.

BP

BPA-D-005

Offshore Site Investigation Manual -
<http://dwo.bpweb.bp.com/documents/BPA-D-005>.



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TBC	Offshore Survey Operations Recommended Practice.
S&SI Network Website	http://ssi-network.bpweb.bp.com/ .
<u>OMS PRAC 001</u>	<u>Environmental Requirements for New Projects.</u>
GP 43-05	Guidance on Practice for Environmental and Social Impact Assessment of Pipelines.
GP 43-10	Guidance on Practice for Route Data Acquisition and Route Selection.
GP 43-24	Guidance on Practice for Geographic Information Systems and Mapping for Pipelines.
GP 43-28	Guidance on Practice for Crossings for Pipelines.
GP 43-30	Guidance on Practice for Offshore Pipeline Geotechnical Surveys.

International Association of Oil & Gas Producers - <http://www.ogp.org.uk>

OGP Guidance Note 373-05 Coordinate reference system definition – recommended practice.

OGP Guidance Note 373-13 Advisory note on derivation of geodetic datum transformations.

OGP European Petroleum Survey Group - <http://www.epsg.org/>

EPSG Geodetic Parameters global database.

United Kingdom Offshore Operators Association

UKOOA Data Exchange Format, P5/94, Pipeline Position Data.

Guidelines for the Use of Differential GPS in Offshore Surveying.

3. Terms and definitions

For the purpose of this GP, the following terms or definitions apply:

Position

Horizontal and vertical position (usually depth), in the project geodetic datum (horizontal and vertical), map projection and unit of measure.

Transponder

A survey unit that transmits and / or receives acoustic signals to determine distance, and from a series of such measurements between various units, position

4. Symbols and abbreviations

For the purpose of this GP, the following symbols or abbreviations apply:

AUV	Autonomous underwater vehicle
CRS	Coordinate reference system
DCC	Distance cross course
DGPS	Differential GPS
DHSS	Dual head scanning sonar
DOL	Depth of lowering



DTM	Digital terrain model
EPIC	Engineer, procure, install, and commission
FJ	Field joint
GIS	Geographic information system
GPS	Global positioning system
HDD	Horizontal directional drilling
HP	High pressure
HT	High temperature
INS	Inertial navigation system
KP	Kilometre point
KPI	Key performance indicator
LBL	Long baseline
MBES	Multi-beam echo sounder (or swathe bathymetry)
MSBL	Mean seabed level
MPcp	Major projects common process
rGPS	Relative GPS
ROTV	Remotely operated towed vehicle
ROV	Remotely operated vehicle
SBES	Single beam echo sounder
SBP	Sub-bottom profiler
S&SI	Survey & site investigation (BP internal specialist network)
SSS	Side scan sonar
TD	Touchdown
TMS	Tug management system
USBL	Ultra short baseline
WGS 84	World Geodetic System 1984 (the datum to which GPS measurements are referenced)
WLR	Water level recorder



5. Surveying within the MPcp

5.1. Planning

- a. Survey operations shall be planned, acquired, interpreted, and reported in a timely manner to deliver required results to the project to reduce risk of delay and thus additional cost.
- b. The MPcp framework shall be utilised to plan and manage survey support operations.

Survey timing is affected by many factors, including but not limited to:

- *Input requirements for Appraise, Select, Define.*
- *Opportunistic data acquisition piggybacked to other operations.*
- *Supply chain management timelines.*
- *Vessel/ contractor availability.*
- *Government approval processes.*
- *Climate, weather, and metocean effects.*
- *Vessel audits and transit times.*
- *Survey size and expected duration of acquisition phase.*
- *Third party operations.*
- *Data quality and processing requirements.*
- *Interpretation and reporting turnaround times.*
- *Clarification requests.*

5.2. Operations

- a. Survey support is input to a pipeline project at various stages. Figure 1 indicates the purpose of the surveys.



Figure 1 - Survey activities sets

Survey Type	Timing within MPcp	Activity set – on survey types 2 through 10 and often also on 11, accurate equipment calibration and operation, coupled with specialist Offshore Representation and QC of the data acquisition and processing is required.
1. Desk Study	(Access) Appraise	Collation, analysis, and generation of preliminary route options. The GIS Pipeline Planning Facilitation Tool (PPFT) may be utilised at this stage. Office based.
2. Preliminary	(Access) Appraise/ Select	Preliminary route survey(s) to scout out options for the detailed route survey. Not often required, but more common in frontier regions or in areas of known geo-hazard complexity. May be piggybacked on other ongoing surveys to save costs.
3. Geophysical Route	Select/ Define	Detailed geophysical data acquisition of route(s) to provide detailed bathymetry and to identify and describe seabed and sub-seabed features that may impact route selection, pipe laying, and pipeline operations. Additional route options surveyed as necessary to deliver approved final route. PPFT commonly utilised in conjunction.
4. Geotechnical Route	Select/ Define	See GP 43-30. Not covered in this document.
5. Environmental Baseline	Select/ Define	Environmental baseline acquisition against which to compare future conditions along the route. May be combined with reconnaissance, geophysical and/or geotechnical route survey operations to save costs.
6. Pre-lay	Execute	Confirmation that the condition of the selected route has not altered and that nothing was missed during the route survey. ROV investigation to confirm interpretation of critical targets noted during route survey and the condition of existing facilities.
7. Lay Support	Execute	Positioning during pipelay to ensure the pipeline is installed according to the design parameters, within the design corridor. Risk mitigation of adjacent facilities.
8. As-laid	Execute	Data acquisition to record the as-laid position and condition of the pipe and its features
9. Trench/ Rockdump Support	Execute	Positioning during route/ pipe trenching/ rock-dump to ensure design criteria are met
10. As-trenched/ As-rockdumped	Execute	Data acquisition to record depth of lowering/ cover and the as-built condition of the pipeline and protection. This may include interim surveys.
11. Tie-in	Execute	Detailed engineering survey to determine the required configuration of the tie-in hardware, and subsequent confirmation of as-built tie-in, including subsea assemblies and protection works.
12. As-built	Execute	Final as-built condition of whole pipeline system collated into a single comprehensive electronic report that includes pre-installation survey results, as-laid position, trenching, rock-dumping or other protection results, crossing, tie-in, and inshore/ landfall results, and remedial works, etc. as necessary. Office based.

- b. Figure 2 indicates how the surveys, objectives, and key support activities fit within the MPcp framework (red lines indicate potential additional activities). Survey operations are described in detail in clause 7.



Figure 2 - Survey support and the MPcp framework

MPcp	Appraise		Select	Define		Execute			Operate		
Pipeline Project stage	Concept			FEED		Detail Design	Fabricate	Lay	Commis sion	Operate & Maintain	
Contract Deliverables		Route Survey Contract				Pipelay Survey Contract (often EPIC)				Inspection Survey Contract	
Reporting Deliverables		Env Base	Route Survey					Interim Pre-lay, As-laid	As-built	Inspection	
Survey Activities											
Survey Specifications											
Survey Contractor Procedure Review											
Desk Studies											
Preliminary Surveys											
Env Baseline Surveys											
Geophys Route Survey(s) (& Geotech)											
Pre-lay Survey											
Lay Support & As-laid											
Trench/ Tie-ins/ As-built surveys											
Inspection Surveys											
Key objectives	Define prelim route, identify issues			Finalise route and pipelay databases/ route charts/ etc.		Define pipelay position procedure		Lay pipeline in corridor and record results		Insp'n position specs	Record results, repeat, and update db ad infinitum
Resources and Key Activities	Survey & Site Investigation specialists – tech input to route selection, survey specifications and procedure review. Manage data acquisition, QC, and interpretation/ results QC					Survey specialists – manage lay support and supervise survey operations. QC and distribute results. Update db				Integrity Management Team – possible support Survey specialists	

6. Health, safety, security, & environment (HSSE) and performance management

6.1. HSSE management

- Delivery of the project survey work scopes shall be the secondary consideration to conducting the work according to BP's HSSE policies and procedures, and the overarching philosophy of no accidents or harm to people, and no damage to the environment.
- HSSE performance of survey operations shall be managed either directly by the pipeline project team responsible for the installation or by the Contractor itself. In the latter case, appropriate management of HSSE performance shall be conducted by the project team.
- Activities shall be conducted under appropriate control of work policies.
- Many pipeline survey operations are conducted under a different regime from that associated with large globally-managed and conducted operational E&P activities. Any associated HSSE risks shall be carefully considered in this light, and comprehensive controls put in place to manage all HSSE risks.

The main HSSE factors that affect survey operations are as follows:

- Operations are often of short duration, with a subsequent higher percentage of time spent mobilising and demobilising, which are periods of statistically greater risk.*



- *Deployment and recovery of in-sea equipment, surface hazard close passes using towed equipment, and shallow water survey operations are survey activities that can carry significant HSSE risk exposure if not properly managed.*

6.2. Performance management

Survey support for pipeline installation operations is usually provided under an EPIC regime, through a principal installation contractor, who either employs in-house or out-sourced survey support. In the route survey domain, survey support is more commonly contracted directly to BP.

- An appropriate performance management system shall be in place for survey support, either directly or via the principal contractor.
- Figure 3 itemises the elements of support that typically should be monitored, with project-specific KPIs developed as necessary.
- The level of management shall be tailored to the criticality of the survey outcome and length of contracted support.
- Long term support contracts (e.g. route survey or pipeline inspection operations) shall be the subject of a detailed contract-accountable management system.

Figure 3 - Sample key performance indicators

Contractual Support Element	Key Performance Indicators (KPI's) – sample only
HSSE	Industry standard Input and Output measures.
Operational Efficiency	Mobilisation time, technical downtime, survey support under budget, cost-per-kilometre, no construction activity non-productive-time accountable to survey.
People	Training frequency, average years staff experience, quality of competency system and employee career and sustainable development plan in place.
Quality	Technical compromises, level of BP intervention required, adherence to procedures, reporting turn around time and quality, job satisfaction index.
Innovation/ Improvements	New techniques developed/ implemented, cost saving opportunities taken, investment in new hardware, software.

7. Survey types

This clause describes the various types of survey and what they are designed to deliver.

7.1. Desk study

- See also GP 43-10, GP 43-24, and GP 43-27. While not a survey as such, the desk study phase in Appraise facilitates preliminary route design options by collation and analysis of pre-existing data. The study shall confirm any data gaps, data quality shortfalls, or other areas of concern and thus shall assist in defining the detailed requirements of the route survey.

Existing data sources are wide and varied, and include, but are not limited to:

- *Internal geophysical or geotechnical reports of overlapping/ adjacent sites.*
- *3d seismic datasets (“regional quality” bathymetric is data extracted).*
- *Internal platform and pipeline as-built and inspection datasets.*
- *Partner or government provided or Third Party purchased data.*
- *Satellite imagery.*
- *Scouting forms, petro-data websites, cable and marine navigation charts.*
- *National oceanographic, meteorological, geological, or marine institutes.*



- *Commercial and research institutes, Environmental agencies.*

In some circumstances, a project-specific route survey may not be required – for example when installing a new pipeline alongside a recently installed existing pipeline that already has recent route survey data.

- b. The desk study shall include consideration of oceanographic/ meteorological factors that may affect the installation and operation of the system, principally wave, current, and wind conditions, and sea and air temperatures.
- c. An offshore data acquisition and analysis phase should normally be conducted during Appraise.

7.2. Geophysical route survey

- a. See also GP 43-10, GP 43-24, and GP 43-27. The route survey shall comprise a detailed investigation of seabed and shallow subsurface conditions along the preliminary route(s) or route corridor(s), including inshore and landfalls, as determined by the initial desk study.
- b. It shall be planned to provide detailed bathymetry and to identify and describe seabed and sub-seabed features that may impact final route design and selection, pipe laying, and pipeline operations. It shall specifically address any local regulatory stipulations and any gaps or concerns raised by the desk study including known hazards and third-party systems.

In areas where there is little understanding of seabed conditions along a proposed pipeline route or in extensive areas with known route selection issues, there may be a requirement to undertake a preliminary route survey.

Such a survey is undertaken to gather data from which a proposed route is selected. The subsequent detailed route survey may then be performed immediately or at a later date. In general, reconnaissance survey operations use the same or similar survey sensors as a route survey but cover larger areas faster, using lower density coverage and lower resolution data.

- c. The combination of desk study, preliminary and geophysical route survey results (in conjunction with environmental and geotechnical results) shall confirm a suitable route lay corridor, any anchor and subsea assembly sites as required, and the location and identity of any significant features along it.
- d. The offshore survey shall be conducted by completing sufficient survey lines to ensure adequate coverage, overlap, and quality management within the area of interest. It shall identify and accurately locate the following features with respect to the proposed route as appropriate:
 1. Existing seabed assets (e.g. wellheads, pipelines, cables, umbilicals, manifolds, spools, tees and wyes, platform jacket hardware, isolation valves, protection structures).
 2. Detailed seabed topography (e.g. flat, undulating, sloping, variable, extreme).
 3. Seabed composition (e.g. sand, gravel, clay, bedrock, coral reef outcrop or other marine communities, sites of environmental interest).
 4. Seabed geo-hazards (e.g. unstable slopes, gas and fluid expulsion features, fault escarpments, gullies, pock marks, moraines, boulders, sand waves, scouring).
 5. Man-made seabed features (e.g. trawl/ anchor scars, spud can holes, wrecks, wire, chain, chemical dumpsites, ordnance, other debris, sites of archaeological interest).
 6. Sub-seabed geo-hazards (e.g. shallow faulting, shallow gas, water or hydrate flow zones, slumps, unconsolidated sediments, channelling, and chemical instabilities).

