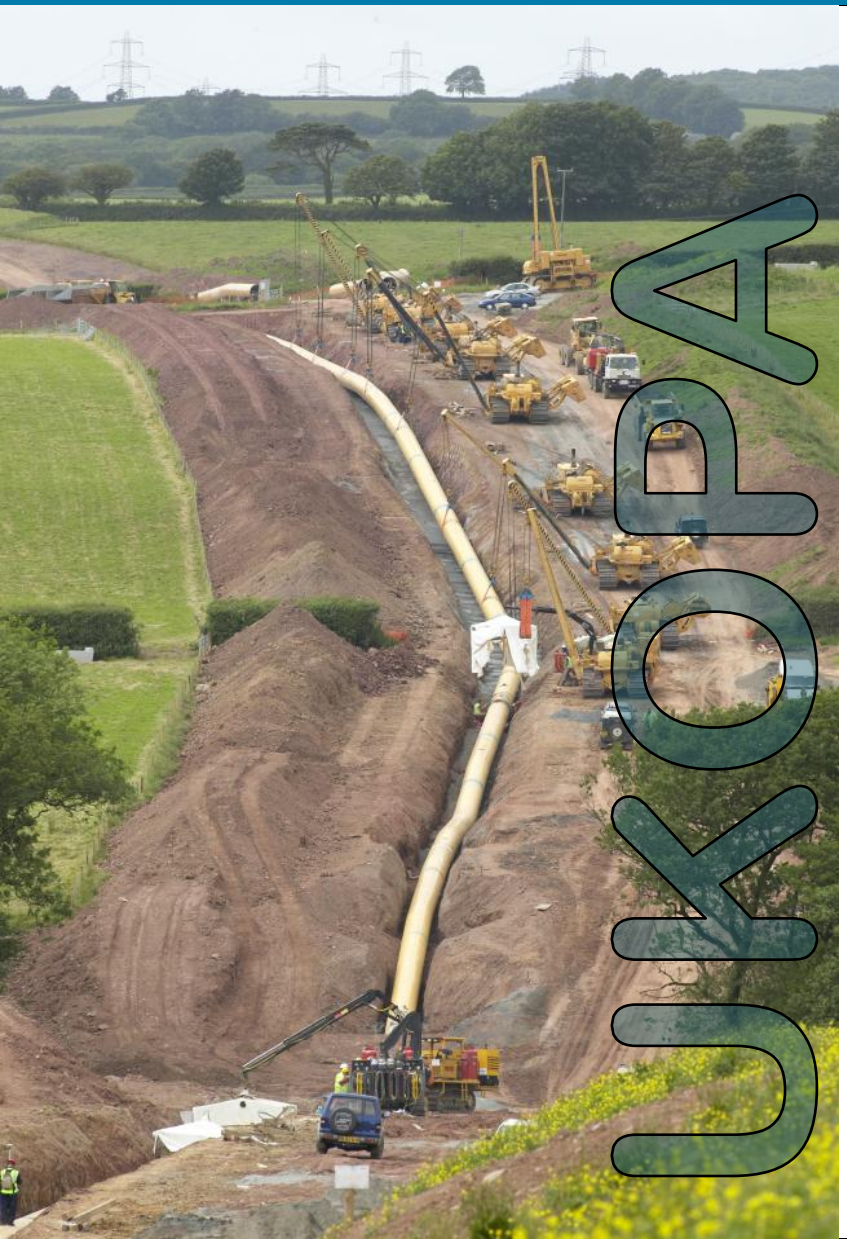


Managing Pipelines With Reduced Cover

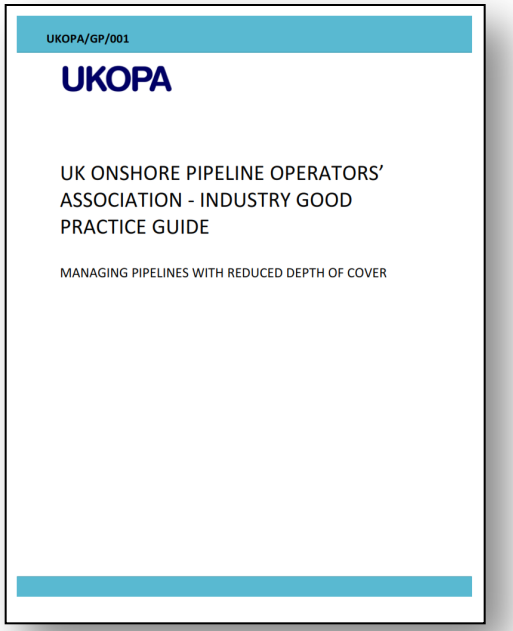
UKOPA/GP/01

Neil Jackson
Independent Consultant

Content

This presentation will:

- Provide you with the background w.r.t. why there was a need for a UKOPA Good Practice Guide for this area of activity
- Review potential causes of loss of cover
- Outline the risk based approach suggested in the document
- It will also provide a heads up on the new pipeline slab protection document that has recently been produced by UKOPA



Background to the Development of the Reduced Cover Document

- Over the past 10 years there have been an increasing numbers issues as a consequence of pipelines being below the standard depth of cover
- The HSE became aware of the issue and raised it at the UKOPA/HSE liaison meeting in 2013:

From Notes of UKOPA/HSE Meeting on the 5th Nov 2013:

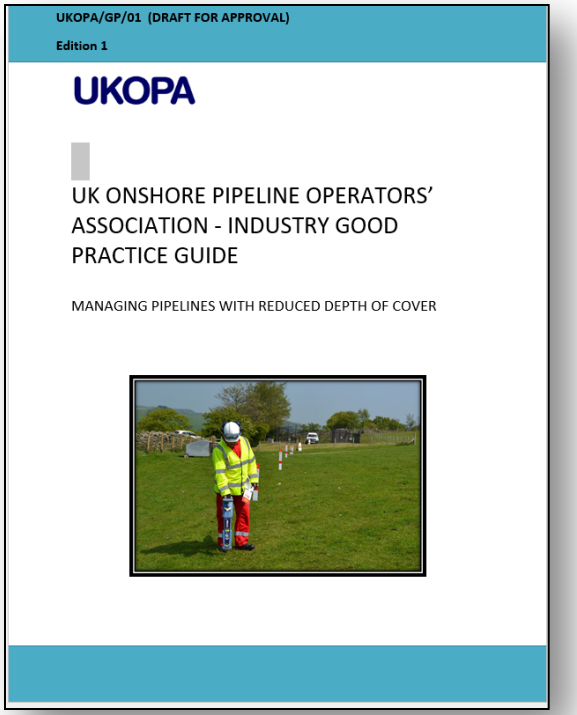
Jim Stancliffe (HSE) *noted that anecdotal evidence was being received from Inspectors that reduced pipeline depth of cover was being observed, possibly due to weather, farming, construction activities etc. HSE asked if UKOPA had experience of reducing pipeline cover depths, and if so, how was it being considered.*

HSE explained that their aspiration is good industry practice guidance for managing depth of cover, taking a risk-based approach and identifying what appropriate remedial action is available to the Operator. UKOPA agreed to conduct a review within the relevant work groups.

- At the time a number of operators had recognised reduced pipeline cover as an emerging issue and had already started taking steps to address the issue.

Background – cont'd

- The Reduced Cover document has been developed by UKOPA in order to:
  - Ensure a consistent approach was taken by the industry
  - Communicate good practice to UKOPA members
  - Address the HSE's concerns by demonstrating that the industry was aware of, and was responding appropriately to, this emerging issue

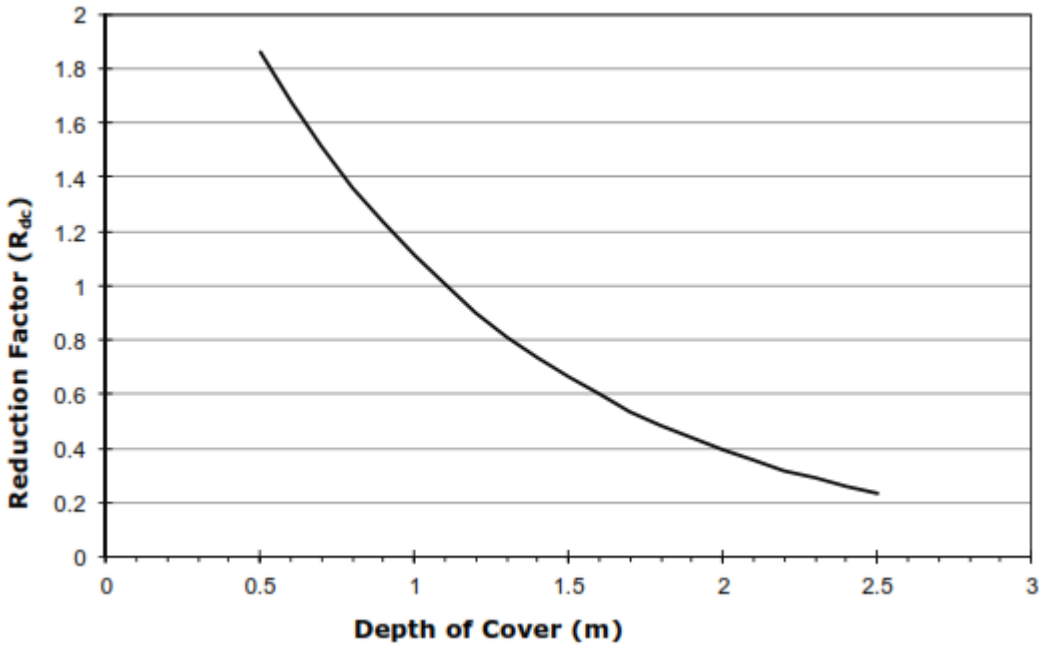


History of the Development of Document

- The document was drafted between 2014 and 2015
- A UKOPA sub group was formed in 2014 to review and comment on the document
- The sub group consisted of:
  - Neil Jackson, Independent Consultant
  - Dave Perry. National Grid Distribution,
  - Edward Timerick, National Grid Transmission
  - Geoff Glover, Sabic
  - Grant Rogers, Wales and the West Utilities
  - Dave Brown, Essar
  - Richard Price,BPA
- It was developed under the UKOPA RAIWG with input from the IWG
- Circulated to the UKOPA Board for review and comment
- Copy provided to the HSE for them to review and comment

Why do we need cover?

- Increasing the depth of cover is recognised by the pipeline codes as a means of reducing the likelihood of external interference damage by reducing the proportion of excavation activities reaching the depth at which they could interfere with the pipeline.



Depth of Cover Requirements In UK Pipeline Standards

	Historical Requirements		Current Requirements	
Location	**Pipelines constructed to earlier editions of IGE/TD/1 (m)**	**BS 8010-2: 1992 (m)**	**IGEM/TD/1 Edition 5 Requirements (m)**	**PD 8010 Requirement (m)**
Rural and Suburban Areas	0.91 (3 feet) this increased to 1.1.in Edition 2 (1984)	0.9 for areas of agricultural activity	1.1	1.1 for areas of agricultural or horticultural activity 0.9 for areas of limited or no human activity
Roads	See note 1	1.2	1.2	1.2
Water courses, canals, rivers	See note 1	Agreed in consultation with the water and waterways authorities	1.2	1.2
Railways	See note 1	1.4 for open cut pipelines 1.8 for bored pipelines	1.4	1.4 to 1.8 depending upon requirements of the relevant appropriate authorities

Note 1: There were no specific cover requirements for road, rail and water course crossings prior to Edition 5 of IGEM/TD/1 other than a requirement in Edition 2 and later editions for greater than 300 mm above the concrete slab that was required when crossing under a ditch.

Causes of Reduced Cover

Reduced cover over pipelines can occur as a result of:

- Natural erosion of the soil, natural shrinkage for soils such as peat containing a high level of organic matter;
- As a result of human activity;
- As a consequence of the pipeline being constructed to older pipeline standards which had less onerous requirements in terms of cover of the pipeline;
- Loss or failure of the anti-buoyancy system, in marsh land or peat land bogs E.g. loss of the pipeline concrete cladding, anchors or saddles.

Causes of Reduced Cover – Cont'd

Natural erosion due to:

- Water erosion

Causes of Reduced Cover – Cont'd

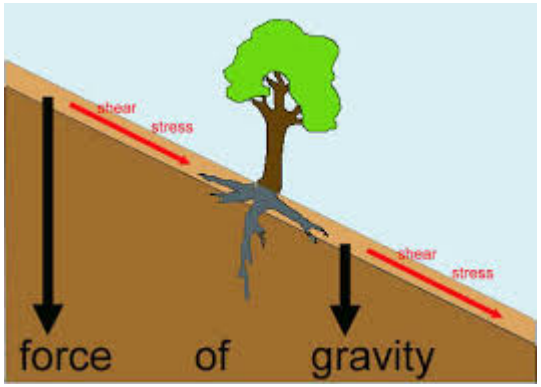
Natural erosion due to:

- Wind erosion

Causes of Reduced Cover – Cont'd

Natural erosion due to:

- Gravity



- Organic soils such as peat also shrink over a period of time as they dry out

Causes of Reduced Cover – Cont'd

Man Made:

- Farming activities including tillage of the soil or as a result of construction or drainage activities

- Laser levelling of the land i.e. smoothing the land surface from its average elevation using laser-equipped drag buckets.
  - Uses large horsepower tractors and soil movers that are equipped with global positioning systems (GPS) and/or laser-guided instrumentation so that the soil can be moved either by cutting or filling to create the desired slope/level.

- Planned development is also having an impact on soil erosion. As a result, buildings are being located on flood plains and increased areas of land with hard surfaces (e.g. tarmac or concrete) with water subsequently running off into water courses through man-made channels and drains.

Addressing Reduced Cover

The document suggests a 3 step approach:

- **Identification**: identifying the locations and extent of pipelines with reduced cover on an operator's pipeline network;
- **Risk assessment**: assessing the likelihood and consequences of pipeline damage in order to understand whether mitigating measures are considered to be reasonably practicable;
- **Response**: managing the risks which may include identifying and implementing remedial measures.

Step 1: Identification

Make Maximum Use of Existing Information where available, e.g:

- Depth data taken and recorded during digs to repair In-line or Over-line inspection features
- Locations on the network where pipelines are known to have reduced cover
- Locations of incidents or near misses that have occurred as a result of reduced cover
- Construction information which can include strip map data
- Known locations in soils with very high organic content, e.g. laid in or near to peat
- Data from historical risks assessments that have been undertaken in the past which may have identified pipeline lengths with reduced cover

Step 1: Identification cont'd

Alternatively or additionally undertake specific pipeline over-line surveys to measure depth of cover:

- This could be done as part of an existing pipeline maintenance or inspection related activity e.g. linewalking or other existing planned over-line inspection survey.
- Depth measurements should ideally be taken with a suitable pipeline detection device.
- The selected pipeline detection device should have an appropriate level of accuracy.

At the chosen locations, pipeline depth measurements should be taken at sufficiently regular intervals that an accurate picture of pipeline depth can be built up along the length of the pipeline section being surveyed.

This could be typically one measurement every 50 m, but it may be appropriate to modify this distance depending on the topography of the land and any known local issues such as a high potential for ground erosion or ground features such as river crossings.

Step 2: Risk Assessment

The risk assessment should take account of :

- **The vulnerability of the pipeline** to third party damage this could depend upon:
  - The nature of the land use
  - The depth at which the pipeline is known to be located
  - The rate at which the cover over the pipeline is reducing, for example if the soil is subjected to natural shrinkage
  - Data collected during the regular pipeline surveillance (aerial or vantage point) can also give an indication of the level of activity that has taken place in the vicinity of the pipeline which might result in third party damage
- **The susceptibility of the pipeline to third party damage**, i.e. likelihood of pipeline failure occurring when it is subjected to third party damage, this could depend upon:
  - The design of the pipeline i.e. its specified minimum yield strength (SMYS) and wall thickness
  - The existence of any current protective measures that might already be in place (e.g. concrete slabs) at vulnerable locations

Step 2: Risk Assessment

Vulnerability - Higher risk locations are suggested in the document

Nature of Land Use	Potential Risk Level
Farmland with high potential for deep cultivation or ditching activities	**High risk**
Road Crossing	**High risk**
Roadway	**High risk**
Road Verge	**High risk**
Construction Site	**High risk**
Development Land	**High risk**
Residential Property	**Medium risk**
Farmland – grazing land or land with low potential for deep cultivation or ditching activities	**Medium risk**
Amenity Land	**Medium risk**
Airport	**Medium risk**
Business Land	**Medium risk**
Moorland	**Medium risk**
Private Land	**Medium risk**
Public right of way, e.g. footpath or bridleway	**Medium risk**
Golf Course	**Medium risk**
Waterway	**Medium risk**
Canal tow path	**Low risk**
Woodland	**Low risk**

Step 3: Response

- More frequent and/or improved liaison
- Improved pipeline marking
- More frequent monitoring/surveillance of the pipeline
- Install additional physical protection
  - either along the whole pipeline section with reduced cover
  - or just at particularly vulnerable locations (e.g. ditches or the pipeline sections close to roads) if not already protected.
- Agree restrictions on land use with the landowner
- As above but also physically restrict access above the pipeline with fencing
- Increase cover over the pipeline
- Relay the pipeline deeper
- Lift the pipeline and relay at another location

Under the Health and Safety at Work Act and the Pipelines Safety Regulations, pipeline operators are required to demonstrate that the risks have been made As Low As Reasonably Practicable (ALARP).

Step 3: Response Cont'd

Also:

- It may be appropriate to amend the standard advice regarding the activities the operator needs to be notified about, e.g. any ploughing activities, not just deep ploughing.
- It should also be ensured that the location of the pipeline is adequately indicated by marker posts, i.e. at field boundaries, crossing points and where possible changes in pipeline direction.
- Consideration should be given to installing additional marker posts, dependent on the additional measures (on previous slide) that are being implemented.

Other Considerations

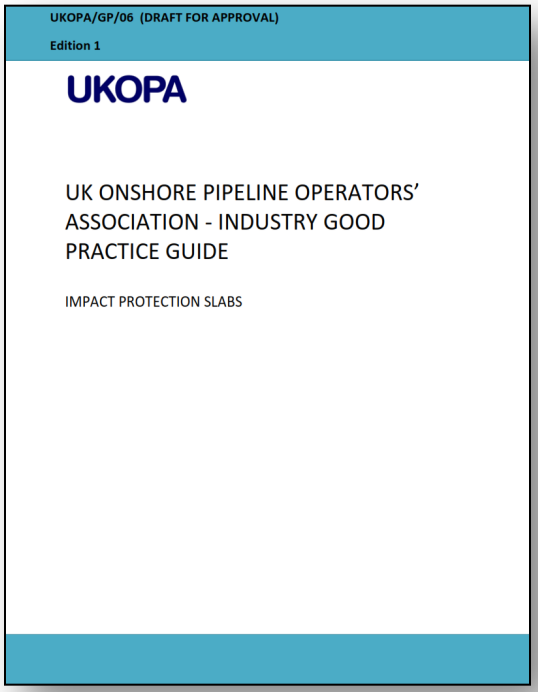
- Recommended that internal pipeline records are updated.
- Ensure that if any work is going to be carried out on, or in the vicinity, of the pipeline, either by third parties or the company's employees, then the relevant individuals are made aware that the pipeline section is less than the standard depth of cover
- Reduced cover is taken into account when providing plant protection advice, i.e. working methods, both those of third parties and employees, should take account of these sections of pipeline with reduced cover.
- The landowner and/or tenant as appropriate should be made aware of any sections of pipeline with reduced cover and any restrictions on work/activities in the vicinity of the pipeline.
- It is considered prudent, from a commercial perspective when discussing any new requirements with the landowner/or tenant, that the pipeline operator reviews the original agreements that were put in place when the pipeline was first installed and any relevant subsequent amendments to these agreements.

Conclusions

- Reduced cover for pipelines is an emerging issue
- UKOPA has developed some suggested good practice to help pipeline operators address this issue
- The guidance suggests a risk based approach
- The document has been reviewed by the HSE and amended to reflect their comments and feedback
- This is issue 1 of the document, please provide feedback and comments these can be fed into further updates of the document

And Finally – Impact Protection Slabs

- Also a new UKOPA Good Practice Guide Covering Impact Protection
- This was developed by UKOPA as a condition of the HSE accepting risk reduction factors for concrete slab protection over pipelines
- Gas pipeline operators have an existing specification T/SP/CE/12
- The HSE response to UKOPA stated that: '***In conclusion, if the issues outlined in the SI3 review can be resolved, and a document of a similar scope similar to T/SP/CE/12 can be published and adopted as an "industry standard" by all major accident hazard pipeline operators (including those operating pipelines conveying substances other than natural gas), then HSE would change its current policy and accept that slabbing can be used to reduce pipeline failure rates (and therefore risks) due to third party activity in its land use planning risk assessments.'***
- *For LUP the HSE will use:*
  - *A risk reduction factor of 0.15 for concrete slabs only*
  - *A risk reduction factor of 0.125 for concrete slabs and marker tape*



Slab Document Contents

Any Questions?