



**Application to Drill Exploration Well**

**52/4-A ('Iolar')**

by

**CNOOC Petroleum Europe Limited**

**PAD Technical Review and Recommendations**

**CONTAINS COMMERCIALY CONFIDENTIAL INFORMATION**



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Petroleum Affairs Division

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29 April 2019

## **CNOOC Petroleum Europe Limited**

### **Application to Drill Exploration Well 52/4-A ('Iolar')**

#### **PAD Technical Review and Recommendations**

The documents reviewed and assessed are:

- The 52/4-A Final Well Proposal (Rev 2.0) (Doc. No. IE-EXP-52/04-IOLAR-DR-00002-WE-01) submitted by CNOOC Petroleum Europe Limited ('CNOOC') in relation to drilling operations on their 'Iolar' Prospect in the Porcupine Basin, dated 15 March 2019.
- Correspondence containing clarifications sought by the Department and provided by CNOOC in relation to the 52/4-A well proposal.

The Generic Well Proposal for the operations was received in this Department on 14 November 2018 and notifications of proposed operations were also sent by CNOOC to the other relevant regulatory bodies on 25 January 2019 and 28 February 2019.

#### **Overview**

This well will be located in Block 52/4 of Frontier Exploration Licence FEL 3/18, which is operated by CNOOC with ExxonMobil Exploration and Production Ireland (Offshore South) Limited as JV partners in the licence. The well will be located approximately 232km southwest of the Iveragh Peninsula, Co. Kerry and 29km northwest of the nearest well, which is the 'Druid/Drombeg' exploration well 53/6-1 (Figure 1). Data from well 53/6-1 is currently unreleased so the nearest released well is 43/13-1, approximately 68km to the north of the proposed well location. Water depth at the location is approximately 2,162m. Since it will be the first well to be drilled on Block 52/4 it will be assigned the well number 52/4-1 once it is spudded.

The primary geological objective of the well is to verify and evaluate the hydrocarbon potential, fluid properties and reservoir quality of the interpreted Middle Jurassic formation of the 'Iolar' prospect. The secondary objective is to verify and evaluate the hydrocarbon potential, fluid properties and reservoir quality of the interpreted Upper Jurassic (Oxfordian) J3K reservoir formation of the 'Iolar' prospect. The tertiary objective is to evaluate the hydrocarbon potential, fluid properties and reservoir potential within the Cretaceous succession [REDACTED]

In 2018 CNOOC carried out a site survey over an area encompassing the well location, re-spud location (should it be required), and relief well locations (Figure 2).

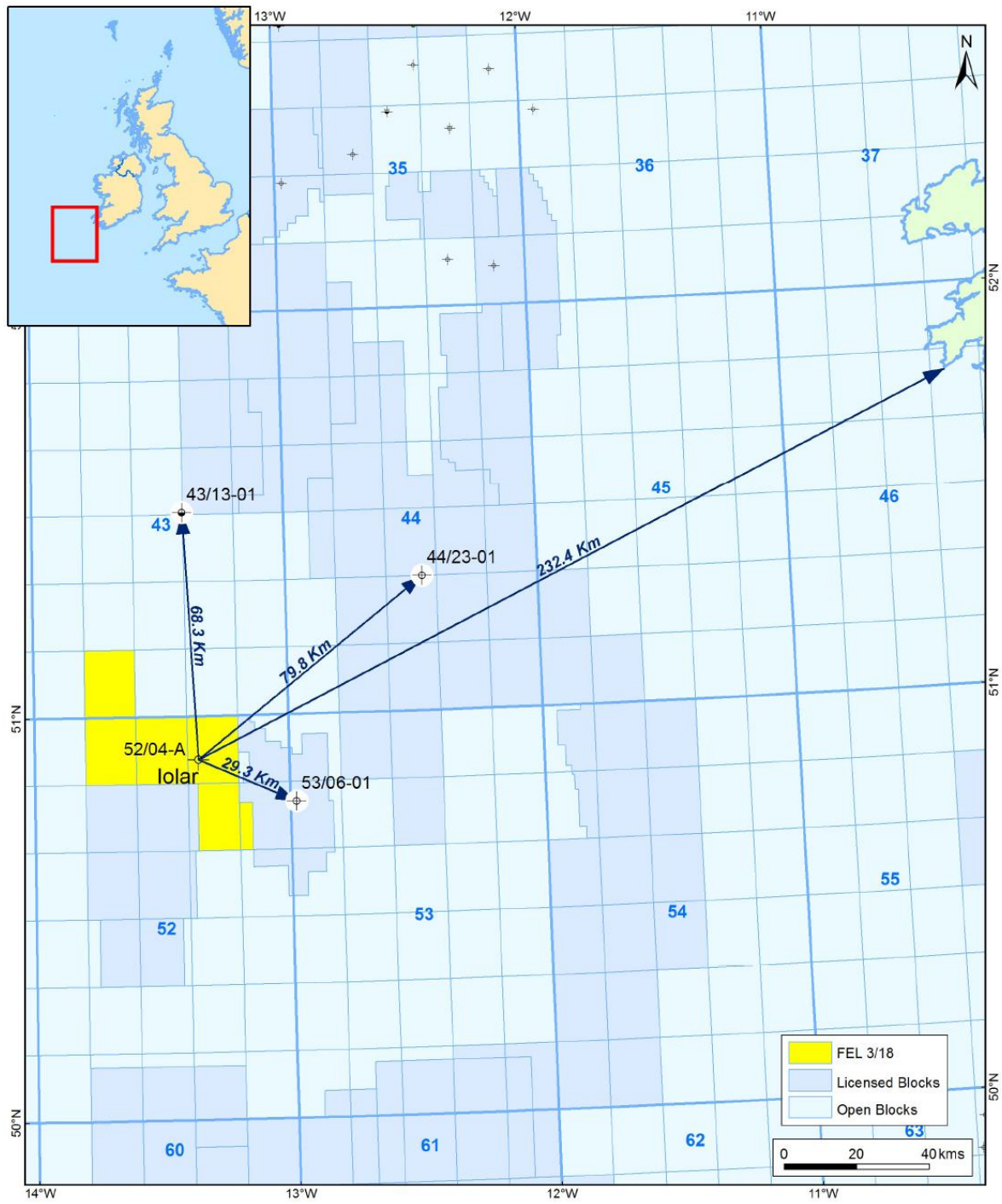


Figure 1: Planned location of Well 52/4-A

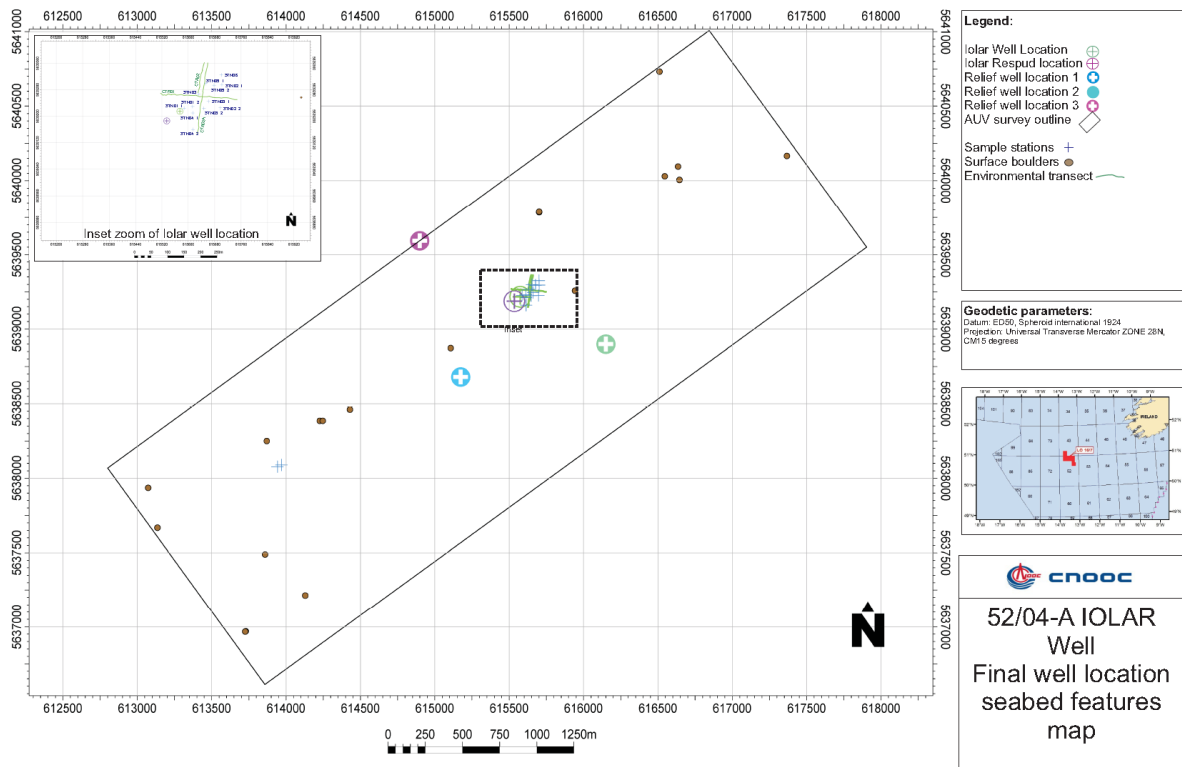


Figure 2: Iolar Well Site Survey Area covering 52/4-A, re-spud and relief well locations

## Operations

The well operations will be carried out using the Stena IceMAX, a Dynamically Positioned (DP) drill ship (Figure 3), which successfully drilled the ‘Druid/Drombeg’ exploration well 53/6-1 in 2017. The expected duration of operations, excluding rig move to and from the location, is approximately 100 days in the dry hole case. In the success case, which will be determined on the basis of indications of oil or gas payzone from Logging While Drilling (LWD) data, gas logs and cuttings, the duration of operations is expected to be approximately 150 days.

Well operations will be supported from a shorebase in Peterhead, UK and from a shorebase in Foynes. Helicopter flights to and from the well site will be operated from Kerry Airport.



Figure 3: Offshore Drilling Unit Stena ICEMAX (image source: Marine Traffic)

### **PAD Technical Assessment**

PAD Technical have reviewed the technical elements of the proposed drilling operations, in particular the well location and trajectory, the formation evaluation programme and the Total Depth (TD) criteria.

#### **Well Location and Trajectory**

The well location has been selected by CNOOC in order to penetrate and test the Jurassic objectives and an interpreted shallower Cretaceous [REDACTED].

The well is planned as a deviated hole in order to:

- 1) Avoid minor faults near the crest of the structure.
- 2) Penetrate a seismically unfaulted section of [REDACTED] so as to provide a better understanding of the main reservoir target.
- 3) Penetrate the flank of the structure to allow for evaluation of the secondary (J3K Oxfordian) reservoir target.
- 4) Allow for updip penetration of the interpreted [REDACTED] section in order to provide for a better chance of encountering hydrocarbons in deeper sands.

**PAD Technical have reviewed the well location and trajectory and is satisfied that the well is optimally placed and that the well trajectory is appropriate in order to test the main objectives of the well.**

Formation Evaluation Programme

1) Logging While Drilling (LWD) and Wireline Logging Programme

CNOOC will run a comprehensive suite of LWD and wireline petrophysical logs over the entire primary, secondary and tertiary geological objective well sections (17 ½", 12 ¼" and 8 ½" hole sections) (Figure 4). [REDACTED]

[REDACTED]. In the shallower sections the [REDACTED] logging programme will comprise Logging While Drilling (LWD) [REDACTED], while the [REDACTED] section logging programme will comprise LWD [REDACTED]. PAD Technical sought clarification as to why additional logs were not planned to be run in both the [REDACTED] and [REDACTED] hole sections and in their letter of 15 March 2019, CNOOC provided such clarification. Upon review of this clarification I am satisfied with the technical justifications provided by CNOOC for not including these additional logs in their formation evaluation programme.

While it is planned to acquire much of the petrophysical data using LWD, CNOOC plan (in the **dry hole case**) to run firm wireline logs in each hole section from [REDACTED] to TD in order to:

- 1) Acquire [REDACTED] in all sections from [REDACTED] to TD.
- 2) Re-acquire petrophysical data by wireline in the event of any missing or poor quality LWD data in all sections from [REDACTED] to TD.
- 3) Acquire [REDACTED] in the [REDACTED] section, which covers the tertiary (Cretaceous) objective section.
- 4) Acquire [REDACTED] in the [REDACTED] and [REDACTED] hole sections [REDACTED] and in the case of the [REDACTED] hole section if more detailed [REDACTED] is required.
- 5) Acquire [REDACTED] in the [REDACTED] hole, which covers the primary ([REDACTED] [REDACTED] objective if [REDACTED] is encountered.
- 6) Acquire rotary sidewall cores in the [REDACTED] hole sections, [REDACTED].
- 7) Run a rig source VSP at TD.

In the **success case** CNOOC will run additional wireline logs including [REDACTED] and [REDACTED] acquisition.

CNOOC plan to acquire [REDACTED] data in the [REDACTED] section, which covers the primary (Middle Jurassic) and the secondary (Oxfordian JK3) objectives. If more detailed [REDACTED] is required in the dry hole case additional [REDACTED] data will be acquired on wireline.

Annular Pressure While Drilling (PWD) data will be acquired throughout the entire well.

CNOOC have designed a very comprehensive LWD and Wireline logging programme for 'Iolar' exploration well 52/4-A. This will provide valuable information on lithology, porosity and water saturation throughout the well, particularly over the objective zones, and will also provide data to generate a well tie to seismic data. In addition, the extensive subsurface geological and geophysical data that will be acquired by this well will help improve the understanding of the subsurface not only at this location but also regionally in the Porcupine Basin. **The proposed LWD and Wireline logging programme is therefore acceptable to the Department.**

## 2) Cuttings and Sidewall Core Sampling Programme

Cuttings samples will be collected every 10m from first returns to [REDACTED]. From [REDACTED] to TD the sampling frequency will be increased to every 3m (Figure 4). As mentioned above, the wireline logging programme will include the acquisition of rotary sidewall cores in the [REDACTED] and [REDACTED] hole sections ([REDACTED]) in the dry hole case and in the [REDACTED] hole section ([REDACTED]) in the success case. A wide range of information can be derived from the cuttings and sidewall core samples and such data will also help improve the understanding of the subsurface not only at this location but also regionally in the Porcupine Basin. **The proposed cuttings sampling programme is acceptable.**

## 3) Coring

In the success case and [REDACTED] CNOOC plan to drill a geological sidetrack in order to acquire bypass core [REDACTED]. It is planned that up to [REDACTED] of core will be acquired in a maximum of [REDACTED] coring runs. This will only be done if the well data indicates that a [REDACTED] has been encountered or if it can be demonstrated that a [REDACTED] could exist across the Iolar structure. This would be very valuable data in order to characterise the reservoir and would aid any future appraisal planning. [REDACTED]. Additionally, the bypass core acquisition will be dependent on well progress and weather outlook. **The proposed coring programme is acceptable.**

## 4) Well Testing

CNOOC does not plan to test the well and at the end of operations the well will be plugged and abandoned. **This is not an unusual approach for an exploration well and, as such, is acceptable.**

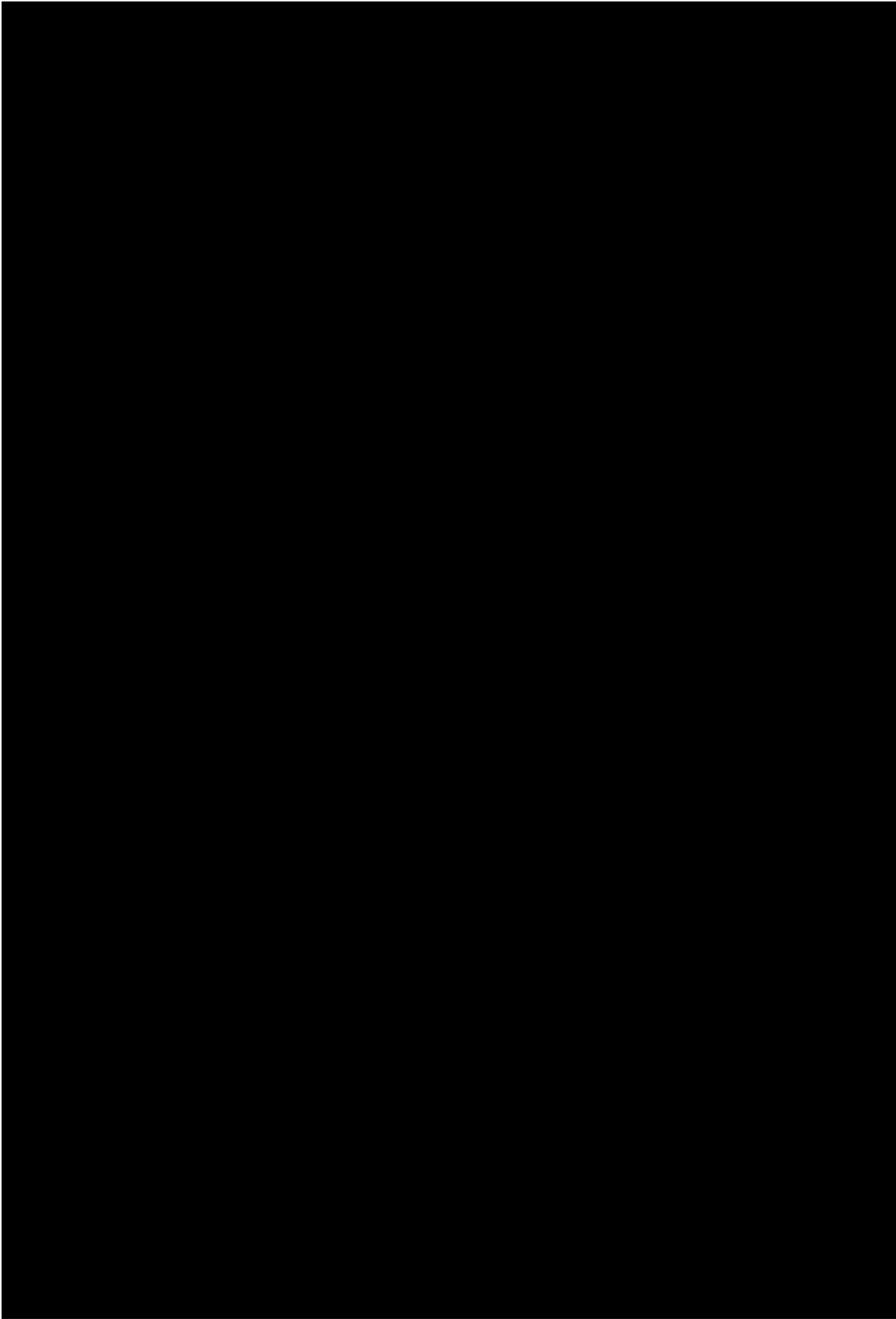
## Total Depth (TD)

CNOOC have set out the following three scenarios for TD:

- 1) Dry hole case. In the event that no hydrocarbons are encountered in the [REDACTED] succession it is planned to drill to a sufficient depth to allow full evaluation of any [REDACTED] within the structural closure while staying above the [REDACTED]. This TD is expected to be approximately 5810m TVDSS, approximately [REDACTED] than the identified [REDACTED] mid-section marker, and will ensure that in a case where the top reservoir is water bearing, deeper potentially isolated sandstones are still evaluated.
- 2) Success case. In the case where [REDACTED] shows are encountered within the interpreted [REDACTED] succession, the well will be drilled to a depth sufficient to penetrate the entire interpreted [REDACTED] succession to allow for full a geological and formation evaluation.
- 3) Shallow TD (older stratigraphy). Should [REDACTED] or older stratigraphy be encountered and in the absence of hydrocarbon shows it is planned to drill to a TD [REDACTED] deeper than the first confirmed indication of [REDACTED] or older stratigraphy from onboard biostratigraphic analysis. This may be at a depth shallower than the dry hole case TD.

The planned TD for each scenario is sufficient to fully penetrate and evaluate the overlying sections of interest and well objectives. **The criteria for TD are therefore acceptable.**





*Figure 4: 'Iolar' well 52/4-A, proposed well design and formation evaluation programme and prognosed stratigraphy..*

## **PAD Technical Conclusions and Recommendation**

I am satisfied that the TD criteria and formation evaluation programme are appropriate and sufficient to comprehensively evaluate the geological objectives of the well. The technical elements of the well proposal are acceptable and therefore, from a technical perspective, there are no reasons to withhold approval for the well operations subject to the following conditions:

1. The Minister consents to the carrying out of drilling operations at the approximate surface location Latitude 50° 53' 31.16" North; Longitude 13° 21' 24.38" West (ED50 datum) in accordance with the 52/4-A Final Well Proposal (Rev 2.0) (Doc. No. IE-EXP-52/04-IOLAR-DR-00002-WE-01) dated 15 March 2019, and the clarifications provided by CNOOC in relation to the 52/4-A well proposal. This well location is at Inline [REDACTED] and Crossline [REDACTED] on the MC1402- 3D seismic volume, acquired in 2014 (PAD Survey ID 2014/02).
2. Permission is granted subject to the well being drilled to a depth sufficient to penetrate and fully evaluate the interpreted Upper and Middle Jurassic formations of the 'Iolar' prospect at the well location. In the dry hole case the Total Depth [REDACTED] [REDACTED] and is anticipated to be at 5,810m TVDSS. In the success case the Total Depth will be in the order of [REDACTED] below the [REDACTED] Seismic Event and will be sufficient to penetrate the entire interpreted [REDACTED] succession to allow for a full geological and formation evaluation. The success case Total Depth is anticipated to be at 6,174m TVDSS. In the event that [REDACTED] or older stratigraphy is encountered a shallower Total Depth may apply, following approval from this Department.
3. Once the Total Depth (TD) has been reached confirmation shall be required from this Department that the TD criteria have been met.
4. During wireline logging operations CNOOC shall provide the proposed sidewall core and [REDACTED] programmes to this Department for its review and approval.
5. All operations shall be conducted in compliance with the provisions of the current Rules and Procedures Manual for Offshore Petroleum Exploration Operations (RPM).
6. Attention is drawn to the Reporting Procedures of the RPM. To ensure complete confidentiality, the daily drilling, daily geological reports and daily logs should be sent to this Department by posting to a designated secure website or by emailing (addresses advised separately). CNOOC is required to make the daily drilling and geological reports and daily logs available at the start of business each day if possible, but in any event not later than noon. Any significant event that occurs between the daily drilling and geological reports should be notified to this Department by telephone or email as soon as possible. Please ensure that copies of wireline log data are made available by secure website or email to this Department immediately after the completion of logging runs. The Department's lead contact point for these operations is [REDACTED].
7. These conditions shall also apply to any re-spud of well 52/4-A.

8. Daily reporting shall commence from the time the drilling unit enters Irish waters and shall continue until the drilling unit leaves Irish waters, after the completion of the drilling operations.



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29 April 2019