



Challenge

Aquaterra Energy was tasked with providing a well access solution to support jack-up subsea well drilling operations in the Northern North Sea, around 140 miles east of Aberdeen.

The campaign formed part of a **four-well subsea well development**, with this being the final well to be drilled, completed, and put onto production. The high pressure, high temperature (HPHT) gas field contained four production wells across two drill centres, each containing two 18-3/4" horizontal subsea production trees.

The jack-up contracted for the project **featured a suitable x / y skidding envelope and tension system**, allowing access to each well centre without the need to reposition the rig.

The operator had already drilled, completed and brought three HPHT gas wells into production and had installed the 18-3/4" high pressure wellhead housing (HPWHH), along with the 18-3/4" drill-through horizontal subsea trees. **For the fourth and final well, the customer required, at short notice, a subsea well access package to provide a seabed to surface interface between the 18-3/4" drill through horizontal subsea tree entry mandrel back to the 18-3/4" 15m surface dry BOP (Blowout Preventer).**

Due to the challenging HPHT conditions, the system also required a full NACE no-limit trim for sour service. **A large 20" ID bore was also essential to maintain full 18-3/4" access and to prevent swabbing or running difficulties** across the large span of the top-tensioned, dynamically loaded subsea drilling riser system.



Fast-Track HPHT Subsea Well Access: Delivering a Complete Jack-Up Subsea Drilling Solution in Just Two Weeks

Location

Northern North Sea

Client:

North Sea Operator

Project Number:

6336

Project Parameters:

- **Extreme Working Pressure:** Up to 12,200psi.
- **Minimum Bore Diameter:** 18.75" top and bottom with 20" nominal ID for greater clearance throughout the riser span to account for swabbing and dynamic bending.
- **Fully compliant with the requirements of NACE (National Association of Corrosion Engineers) MR0175 (ISO15156).**
- **Operating Temperature Range:** -10°C (14°F) to +121°C (250°F).
- **Water Depth:** Designed to meet and exceed the identified water depth of 95m and expected stack-up with airgap of 122m.
- **Design Duration:** To complete current well, 6 months maximum.
- **Interface with the jack-up rig's top tensioning and lateral support system:** (Aquaterra Energy OEM system, owned by jack-up drilling contractor).
- **Interface with a 3rd party subsea tree connector.**

Solution

Aquaterra Energy deployed its **Subsea Jack-Up Well Access Solution** to meet the demanding requirements of this HPHT project, delivering a **complete seabed-to-surface connection** from the 18-3/4" horizontal subsea tree entry mandrel to the 18-3/4" 15m surface drilling BOP. This fully integrated, jack-up deployed subsea solution incorporated **Aquaterra Energy's 20" ID AQC-SR NACE HPHT-ready riser system**, provided directly from stock to meet a fast-track schedule.

While the AQC-SR is an advanced system with a robust qualification specification, its defining feature is simplicity. With no loose parts, fine tolerances, or complex make-up tools, the connectors enable rapid inspection, mobilisation, and deployment using equipment already familiar to rig floor crews.

Scope of supply and support included:

- Drilling and completion offshore analysis
- Interface engineering and deployment procedures, tallies, and storyboards
- The 18-3/4" HP drilling riser system
- Top tensioning system (Aquaterra Energy OEM system, owned and operated by jack-up drilling contractor)
- Onshore and offshore engineering and operational technicians

At the start of mobilisation, Aquaterra Energy conducted a detailed engineering analysis using environmental, rig, and interface data to optimise system performance.

The analysis included:

- **Data review:** Collating and verifying all relevant parameters into a Basis of Design document.
- **Vortex-Induced Vibration (VIV) screening:** Assessing susceptibility to damaging cross-flow VIV.
- **Strength and stability analysis:** Verifying performance of riser and connection components under prescribed storm and well control conditions.
- **Wave-Induced fatigue analysis:** Evaluating fatigue life of critical wellhead, riser, and interface components across all-year sea states.
- **Top tension optimisation:** Considering recommended tension values alongside a project-specific cement shortfall.

As the OEM, **Aquaterra Energy handled all inspection, assembly, and testing in-house for full traceability and rapid delivery.** The AQC-SR connectors are fully inspectable and repairable, with replaceable components that simplify servicing and extend life. Their lightweight, high-strength design delivers excellent fatigue performance, enabling efficient riser handling and top-tensioning on lower-spec rigs.

Supplied with a riser spider and low-torque drive bolt tooling, **the connectors are run pin up, box down with a metal-to-metal seal and elastomeric back seat test seal.** A lower pin load shoulder supports the riser string, preventing slip damage and speeding up deployment by removing the need for master bushing changes.

Radial dog drive bolts are torqued in a controlled opposing sequence for even make-up, with a visual groove indicator confirming correct assembly. **Their back-off-resistant design maintains preload for high-load, fatigue-sensitive operations.**

Engineered features minimise stress on seal faces, dogs, and threads, boosting fatigue resistance and service life. Once assembled, **the connector is pressure-tested via a patented box test port, with inspection data captured in Aquaterra Energy's asset and fatigue management system.**

To complete the package, an AQC-BC BOP quick connector was supplied, **removing flange make-up hazards including dropped objects and exposed high-pressure hydraulics.**

A final challenge, tallying riser joints on a rig already jacked to height, was solved using pup and intermediate joints and a flexible surface tension joint with full-length load rings, **enabling accurate adjustment and reliable structural performance.**

! The AQC-CW and AQC-SR improve drill floor red zone safety by removing loose parts, eliminating manual bowl and slips, and reducing drop-object potential and hand injury risks via low-torque pneumatic tooling.



Results

The AQC-SR subsea drilling well access system **delivered a reliable, high-performance solution that fully met the demanding HPHT requirements of the campaign.** By combining a rapid mobilisation, robust engineering analysis, and field-proven technology, Aquaterra Energy enabled the operator to maintain project schedule and production timelines without compromising on safety or technical assurance.

Analysis confirmed that the system was not susceptible to VIV when operated under the recommended top tension, meaning no suppression devices were required. **Structural verification demonstrated that all components also met the requirements for rig offsets** of up to ±1.23 m in 10-year extreme storm conditions, combined with a pressure of 12,200psi during a well control event.

The fatigue analysis highlighted that all components had lifetimes far exceeding the 180-day maximum campaign duration required for the project, even with a safety factor of 10 applied. This left plenty of fatigue life in the LPWHH, HPWHH and the subsea tree for future re-entry campaigns and workovers.

Customer feedback recorded our AQC-SR, HPHT 20" ID system achieving a "slip-to-slip" **make-up and break-out time of just 35 minutes**, including lay down of each joint - compared to over six hours for a similarly rated and sized 18-3/4" 15m API riser. **This represented an exceptional saving in rig time, contributing to overall project efficiency and cost reduction.**

Performance Outcomes:

- **Rapid mobilisation:** System delivered, assembled, tested, and ready offshore in two weeks.
- **Efficient make-up time: AQC-SR system achieved:** "Slip-to-slip" make-up and break-out in 35 minutes per joint, versus 6+ hours for a comparable API riser.
- **No VIV suppression devices required:** VIV analysis confirmed inherent stability under recommended top tension.
- **Structural robustness:** Fully compliant with 12,200 psi HPHT operating conditions and ±1.23 m rig offset under 10-year extreme storm.
- **Extended fatigue life:** All critical components achieved lifetimes far exceeding the 180-day campaign, even with a 10x safety factor, supporting future re-entry or workover operations.
- **Improved rig-floor safety:** Fewer loose parts and no hydraulic torquing hazards reduced dropped-object and hand injury risks.

AQC-SR vs Flange

Each Deployment (1xRun + 1xPull) = 20 makes/breaks
Jack Up (Inc. subsea HP riser) = \$86,000/day = \$3,583/hour

Flanged System	AQC-SR System
6 hours / connection \$20,000	35 minutes / connection \$2,078
= \$430,000 per deployment	= \$41,563 per deployment

Using an AQC-SR system saves **\$388,437** each deployment



Well Access Solution, Jack Up Subsea Drilling Brochure

Scan the QR code to download our Jack-Up Drilling Well Access Brochure



Get in touch with Aquaterra Energy to explore how our proven AQC-SR well access systems can **streamline your operations, reduce rig time, and enhance safety assurance.**