SHE-REP-214

UK Operations
Environmental Performance

Annual Report 2016

CNR International

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2016

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1 BACKGROUND TO THIS REPORT

The 1992 OSPAR Convention is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic. It combined and up-dated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution.

Work under the Convention is managed by the OSPAR Commission, made up of representatives of the Governments of fifteen Contracting Parties (including the United Kingdom) and the European Commission, representing the European Community.

The Offshore Oil and Gas Industry Strategy of the OSPAR Commission sets the objectives of preventing and eliminating pollution and taking the necessary measures to protect the maritime area against the adverse effects of offshore activities so as to safeguard human health, and conserving marine ecosystems and, when practicable, restoring marine areas which have been adversely affected.

To implement this Strategy, the OSPAR Commission has adopted Recommendation 2003/5 to Promote the Use and Implementation of Environmental Management Systems by the Offshore Industry. The UK Government has fully adopted this Recommendation, and therefore requires that all operators controlling the operation of offshore installations on the UK Continental Shelf should have in place an Environmental Management System (EMS) that is designed to achieve:

- the environmental goals of the prevention and elimination of pollution from offshore sources and of the protection and conservation of the maritime area against other adverse effects of offshore activities; and
- continual improvement in environmental performance; and
- more generally, to achieve the objectives of the OSPAR Offshore Strategy.

The OSPAR Recommendation states that Contracting Parties should also encourage operators to make publicly available an annual statement setting out:

- a brief description of the Environmental Management System;
- the environmental policy of the operator including environmental goals, objectives and targets set for significant environmental aspects and impacts; and
- a summary of performance in relation to that environmental policy, those goals, objectives and targets, and any relevant legislative requirements.

This report describes CNR International's EMS and company environmental performance against internal targets and legislative requirements. We welcome any comments and suggestions from members of the public and regulators in relation to this document, which should be sent to:

SHE Manager
CNR International (UK) Ltd
St Magnus House
Guild Street
Aberdeen
AB11 6NJ

2 CNRI'S OPERATIONS

Canadian Natural Resources Limited (CNRL) is an independent oil and gas exploration and production company with operations in core areas located in Western Canada, the U.K. sector of the North Sea, and offshore West Africa. CNRL's headquarters are in Calgary, Canada, with international operations based in Aberdeen, Scotland.

During 2016, CNR International UK (CNRI's) North Sea operations were focused in four areas: Ninians, T-Block, Banff and Kyle, and Murchison. CNRI operates its fields with a majority working interest, which provides a strong basis for future exploitation and exploration in reserves close to existing reservoirs.

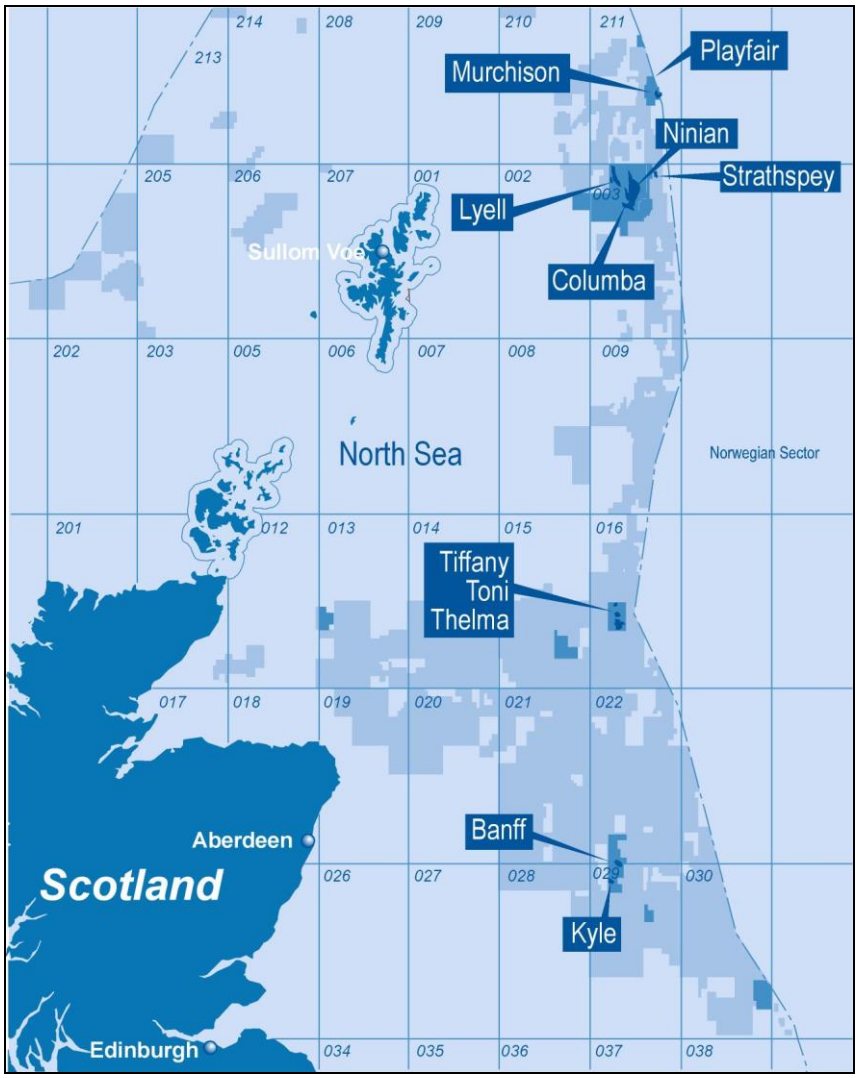


Figure 1 Location of CNRI's operations in the North Sea

The **Ninian** Field hub consists of three fixed platforms (Ninians Northern, Central and Southern) in the Northern North Sea, with the **Lyell** and the **Columba** fields also produced via the Ninian platforms as subsea tie-backs and extended reach wells. The subsea **Strathspey** field lies some distance away and is also tied into the Ninian Hub. Crude oil from the Ninian and associated fields is exported to the Sullom Voe Terminal where CNRI has a 22% working interest.

The **Banff** and **Kyle** Fields are located in the Central North Sea and are produced via subsea templates to the Petrojarl Banff Floating Production Storage and Offtake vessel (FPSO), which is operated by

Teekay Petrojarl Production. Crude oil from the Banff and Kyle fields is exported via shuttle tanker from the linked Apollo Spirit Floating Storage Unit (FSU).

The **T-Block** in the Central North Sea consists of three oil and gas fields **Tiffany**, **Toni** and **Thelma**. The Tiffany Field is developed from a traditional fixed steel jacket platform. Toni and Thelma are developed from subsea templates tied-back to the Tiffany platform. Oil from the fields is exported via the Brae/Forties pipeline through the Forties Pipeline System to the BP-operated terminal facilities at Cruden Bay.

The **Murchison** Field is located in the Northern North Sea, close to the UK/Norway boundary. CNRI initiated the planning for the decommissioning of the Murchison field in the UK sector of the North Sea in 2010. The Decommissioning Programmes were approved by the Regulator in 2014 and formal cessation of production was declared on March 31, 2014. Engineering Down and Cleaning (EDC) of the hydrocarbon containment systems and well Plugging and Abandonment (P&A) followed, with manned operations completed in Q1 2016. Topside removal operations were carried out by the Thialf and Hermod semi-submersible crane vessels (SSCV) during Q3 2016. Future operations will include decommissioning of the remaining topsides, jacket and associated subsea infrastructure.

SSCVs Hermod and Thialf each side of the Murchison Platform.

3 CNRI'S SHE MANAGEMENT SYSTEM

CNRI's integrated Safety, Health and Environmental Management System (SHEMS) helps the company to:

- comply with Safety, Health and Environmental (SHE) legislation and industry standards;
- manage SHE risks in the business; and
- deliver continuous improvement in SHE performance.

The scope of SHEMS is offshore oil and gas exploration and development activities, and associated onshore support. The system structure conforms to the broad principles of the HSE publication Successful Health and Safety Management HS(G)65 and meets the requirements of general and offshore installation-related regulations.

In the North Sea, CNRI's directly operated platforms (Ninian Northern, Ninian Central, Ninian Southern and Tiffany) are certified to ISO14001:2004 by ERM CVS, who are UKAS accredited verifiers of management systems. Decommissioning activities on Murchison are also included in the scope of our EMS certification. The Petrojarl Banff FPSO is owned and operated by Teekay Petrojarl ASA, who also have certification to ISO14001 for their EMS.

3.1 SHE MANAGEMENT SYSTEM STRUCTURE

The SHE Management System implemented on CNRI's offshore installations and within the onshore support organisation can be represented as a pyramid consisting of four levels:

- Policy;
- Management Standards;
- General Procedures;
- Installation/Location Specific Procedures.

3.2 SHE POLICY

CNRI takes all reasonable precautions to achieve the goal of harm-free operations. Our SHE Policy is a public commitment to conducting business in a manner that protects the health and safety of people and preserves the integrity of the environment within which CNRI operates. CNRI's SHE Policy is enshrined in CNRL's Statements on Environmental Protection (see below), Health and Safety, and Asset Integrity Management.

Canadian Natural

CORPORATE STATEMENT ON ENVIRONMENTAL PROTECTION

Environmental protection is a fundamental value of Canadian Natural Resources Limited (Canadian Natural). The Corporation recognizes that every employee and contractor has a vital role to play in identifying, minimizing and mitigating environmental impacts from our operations. Canadian Natural's commitment to environmental management will be incorporated into business activities through the following guiding principles:

- Ensure all employees and others engaged on Canadian Natural's behalf are aware of the commitment to minimizing and managing environmental impacts resulting from Canadian Natural's operations;
- Provide strong leadership to the identification, assessment and management of environmental risks at all levels of the organization and promote a participative culture;
- Proactively identify, evaluate, minimize and mitigate the environmental impacts of Canadian Naturals' business throughout all aspects of our operations;
- Identify significant changes affecting environmental management systems, respond appropriately to issues and concerns and provide a mechanism for feedback;
- Ensure appropriate processes are developed and implemented to prevent pollution, including waste and emission management programs;
- Ensure that effective emergency response measures are in place and provide prompt and effective response to any emergency situation;
- Investigate environmental incidents effectively to prevent recurrence and communicate and implement lessons learned across all parts of the organization, including those from the experiences of others;
- Communicate with the public regarding Canadian Natural activities;
- Ensure that Canadian Natural operations comply with government regulations, industry guidelines and company policies and procedures concerning environmental management; and
- Use energy and other resources efficiently at Canadian Natural operations.

Canadian Natural's management will be responsible for developing specific operational procedures and standards that are consistent with this policy and are accountable for the maintenance, regular review and interpretation of this policy. Canadian Natural expects its suppliers, partners and business associates to have compatible environmental procedures and values.

Canadian Natural's management is committed to achieving continual improvement in environmental performance through annual environmental objectives and targets. Performance is reviewed and corporate status reports are presented regularly to management and the Board of Directors.

Steve Laut
President

Tim McKay
Chief Operating Officer

Next Review Date: June 16, 2017

3.3 SHE MANAGEMENT STANDARDS

Ten Management Standards support CNRI's SHE Policy. These describe the expectations and requirements for performance in relation to key aspects of SHE management. They allow for some flexibility in terms of SHEMS implementation, so that different parts of the company can meet these expectations in different ways, depending on their particular legal and other business drivers.

The ten Management Standards are:

1. Leadership and Commitment
2. Performance Management
3. Managing SHE Risks
4. Competence and Personal Development
5. Communication and involvement
6. Working with Third Parties
7. Change Management
8. Information and Documentation
9. Emergency Preparedness
10. Incident Reporting, Investigation and Analysis

3.4 GENERAL AND INSTALLATION SPECIFIC PROCEDURES

General Procedures support specific Management Standards and, where a documented procedure is needed, they describe the arrangements in place to meet the appropriate standard, for example incident investigation or oil spill response. These procedures are intended to provide consistency across the organisation: they are applicable to any operation and are generally not specific to any one location or installation.

Installation and location specific procedures are particular to an operation or activity; they define the arrangements that CNRI has determined are needed to conform to General Procedures and thus meet the spirit and intent of the Management Standards.

4 CNRI'S SIGNIFICANT ENVIRONMENTAL ASPECTS

CNRI's SHE Management System requires identification of the elements of activities that can interact with and therefore have an effect on the environment (called 'aspects' in ISO14001 standard terminology). This is done so that a means to control or minimise any potential negative environmental effects can be put in place.

In common with most offshore oil and gas operators, CNRI has identified the following significant environmental aspects of its operations:

- Atmospheric emissions, in particular of carbon dioxide;
- Oil discharged in produced water;
- Solid waste generation and disposal;
- Chemical use and discharge; and
- Oil and chemical spills.

CNRI regularly monitors and reports its performance in terms of environmental emissions and discharges as required by UK legislation and the internal SHE Management System. This information is reported via the Environmental Emissions Monitoring System or EEMS, which is a database of environmental information that is accessible by oil and gas operators and by the regulator BEIS (Department of Business, Energy and Industrial Strategy). We also regularly report our SHE performance via monthly and quarterly internal reports and contribute to Canadian Natural's annual Stewardship Report to Stakeholders (available via www.cnrl.com).

Thialf SSCV waiting on weather during Murchison decommissioning operation

5 ENVIRONMENTAL PERFORMANCE

The environmental performance charts below have been compiled using EEMS data to ensure consistency of reporting.

5.1 ATMOSPHERIC EMISSIONS

The majority of power generated on CNRI's offshore installations is from gas-fired turbines, with a smaller amount of diesel also used in generators when fuel gas is not available. CNRI continues to look at emissions reduction opportunities identified in installation specific energy assessments, as well as emissions reduction opportunities identified by both on and offshore personnel, including the optimisation of flare rates through flare purge studies and the re-trimming of valves.

CNRI is a member of the EU Emissions Trading Scheme, which seeks to reduce CO2 emissions using a 'cap and trade' scheme. During 2016, CNRI installations emitted 1.01 million tonnes of CO2, compared with 1.00 million tonnes in 2015 and 0.89 million tonnes in 2014. The increase in 2016 was primarily due to the Ninian Central platform being unable to compress produced gas for turbine consumption leading to higher rates of flared gas. (Note: the Apollo Spirit is outwith the scope of the EUETS as it falls below the minimum installed power generation capacity threshold.)

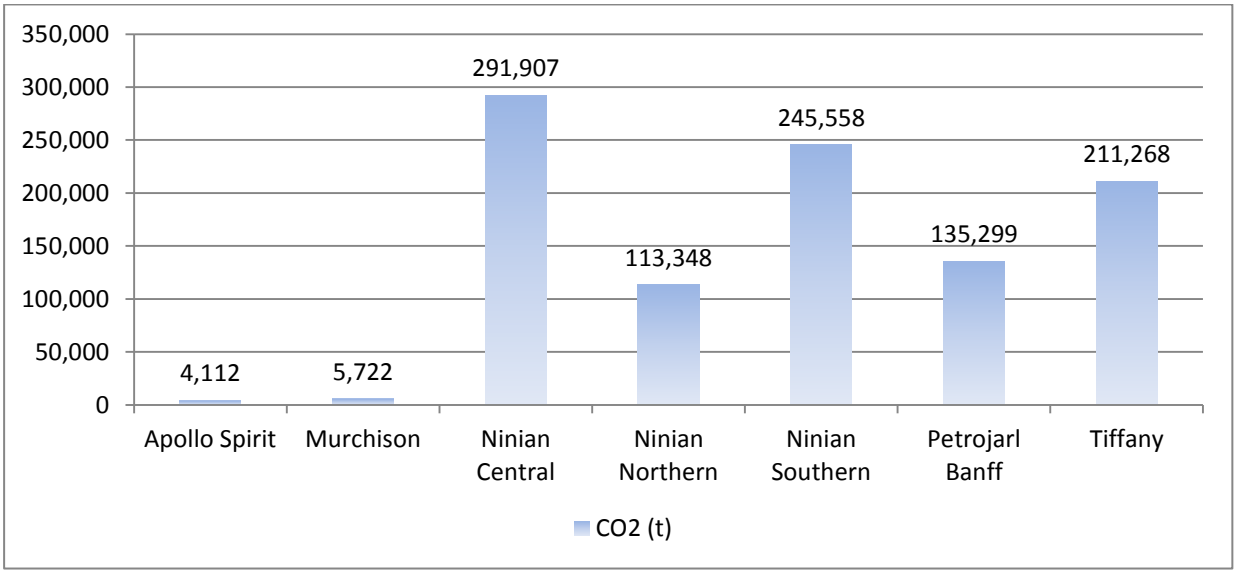


Figure 2 Total carbon dioxide emissions in 2016

CNRI restricts the flaring of gas wherever possible by using it in a variety of ways: produced gas is used for fuel, re-injected to provide reservoir support, used for artificial lift to production wells, and ideally, exported as sales gas. In some cases, however, an installation might not have a gas export route and would have no option but to flare its excess gas. Installations also need to maintain a minimum level of flaring for safety reasons. The amount of gas flared in 2016 was comparable to previous years and the total CO2 emitted was 311 kilotonnes in 2016, compared with 300 kilotonnes in 2015 and 263 kilotonnes in 2014). Flaring levels on Ninian Central were higher than expected due to problems with gas compression on the platform (Figure 3) which also accounts for the high diesel usage (there being a lack of fuel gas available for the turbines).

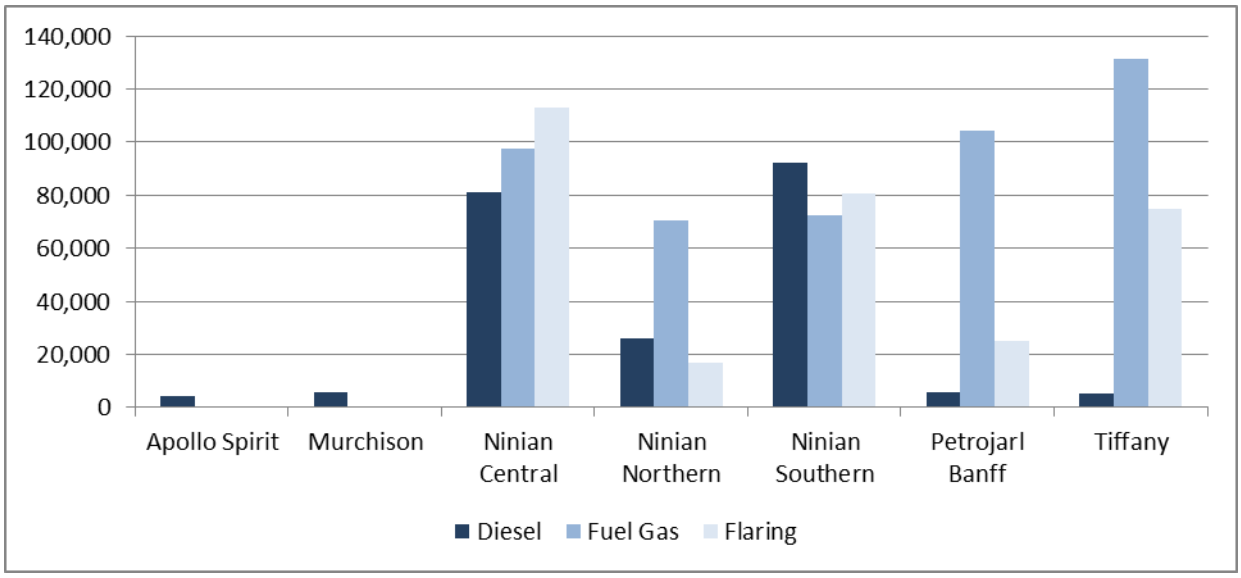


Figure 3 Sources of carbon dioxide emitted during 2016

In addition to CO2, a range of other atmospheric emissions are regulated under the Pollution Prevention and Control (PPC) Regulations. Figure 4 shows our performance in 2016. The majority of these emissions are derived from power generation on the installations.

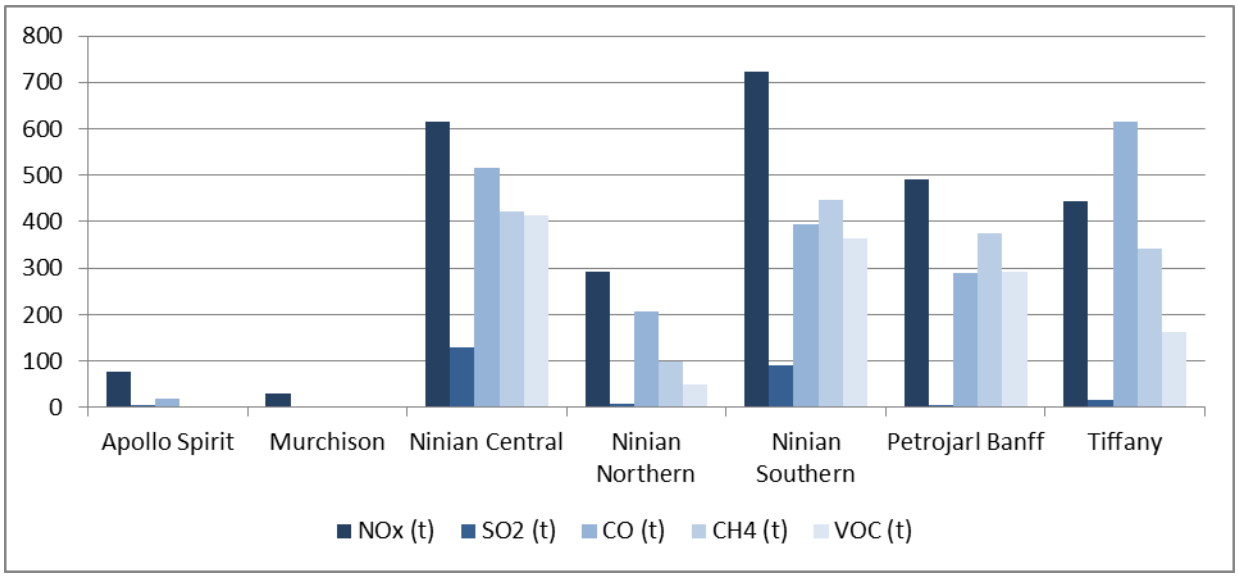


Figure 4 Other atmospheric emissions during 2016

5.2 OIL DISCHARGED IN PRODUCED WATER

Oil and gas reservoirs have a natural water layer (called formation water) that, being denser, lies under the hydrocarbons. As reservoirs become depleted of oil and gas, seawater is usually injected into the reservoirs to support hydrocarbon recovery. Both formation and injected waters are eventually produced along with the hydrocarbons and, as an oil field matures, the volume of produced water tends to increase as the reservoir fills with injected seawater. The 'water cut' or amount of water in produced fluids from wells on mature assets can be >95% by weight compared with the oil content.

On CNRI's offshore installations, produced water is separated from hydrocarbons in gravity separators and treated to remove as much oil as possible before it is discharged to sea. Because produced water

inevitably contains traces of oil, its discharge to sea is strictly controlled by the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005, which define the average oil content of the water that may be discharged and place other limits on the amounts of oil that may be discharged (for example).

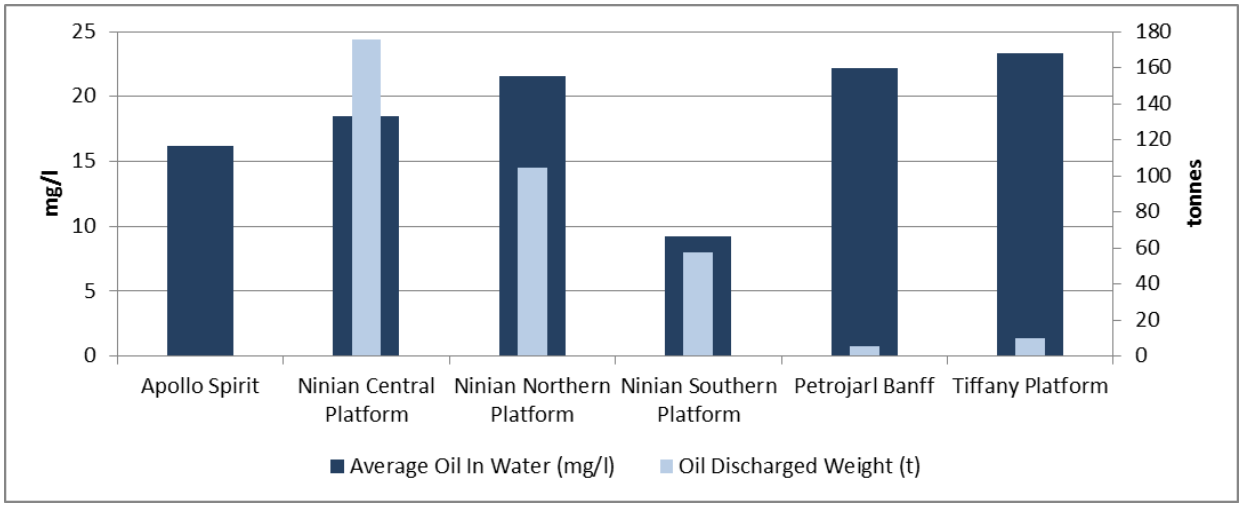


Figure 5 Average oil in water quality and oil discharged in 2016

In 2016, the amount of oil discharged in produced water from CNRI platforms (353 tonnes) was almost 62 tonnes more than in 2015 (291 tonnes). Average quality of produced water discharged in 2016 across all CNRI assets was 16.6 mg/l, almost the same as 2015 (15.6 mg/l). Volumes of produced water discharged were 21 million cubic meters, also higher than 2015 but at the same levels as 2014. These increases are associated with a higher uptime and higher production profile during 2016 when compared with 2015. Produced water quality on each platform over the year was well below the legal limit of 30 mg/l for the monthly average set by the Regulator.

5.3 SOLID WASTE GENERATION AND DISPOSAL

CNRI has to ensure that the segregation, transportation and eventual disposal of wastes generated during their offshore operations are managed in accordance with legislative requirements. The Environmental Protection Act 1990 introduced the 'Duty of Care' with which all waste producers must comply. Hazardous waste that might be harmful to human health or the environment (also known as Special Waste) is governed by specific legislation, which includes strict handling and disposal requirements.

The offshore industry as a whole recycles a large fraction of its waste and CNRI works closely with its waste management contractor to identify recycling routes for as much of its waste as possible. CNRI currently recycles metal, wood, paper and cardboard, glass, plastics, aluminium cans and empty oil/chemical drums. CNRI is also working to reduce the volume of waste generated offshore, especially of hazardous wastes such as oil-contaminated rags and other similar items. CNRI's waste management contractor conducts regular random skip audits and provides monthly lists of 'observations' which allow focus on improvements in offshore waste management.

Operational waste excludes all drilling-related waste (i.e. drill cuttings and tank washings) and decommissioning waste.

In 2016, 1,004 tonnes of solid operational waste (Figure 6) were generated (down from 1,517 tonnes in 2015). The amount of waste sent to landfill was 332 tonnes compared with 582 tonnes in 2015. In

contrast, 672 tonnes of waste were routed either for reuse, recycling or waste to energy in 2016, accounting for 67% of the total waste generated.

Drilling waste is primarily made up of drill cuttings and tank washings. In 2016, drilling operations were conducted on Ninian Southern platform, but all liquid waste generated during the drilling operation was reinjected into a disposal well. Well intervention operations on other platforms generated around 38 tonnes of liquid waste/sludge.

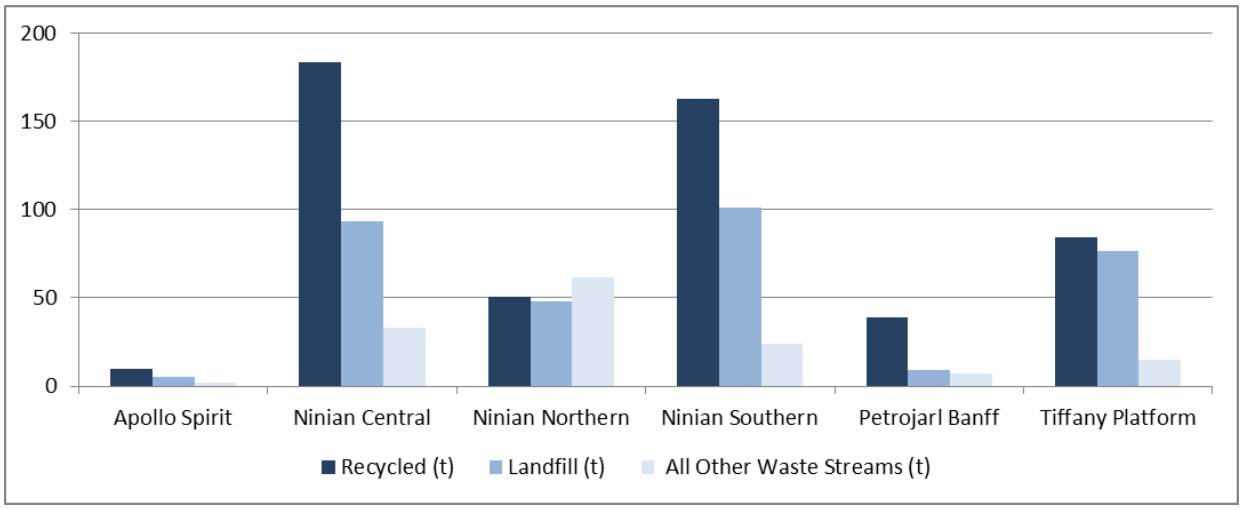
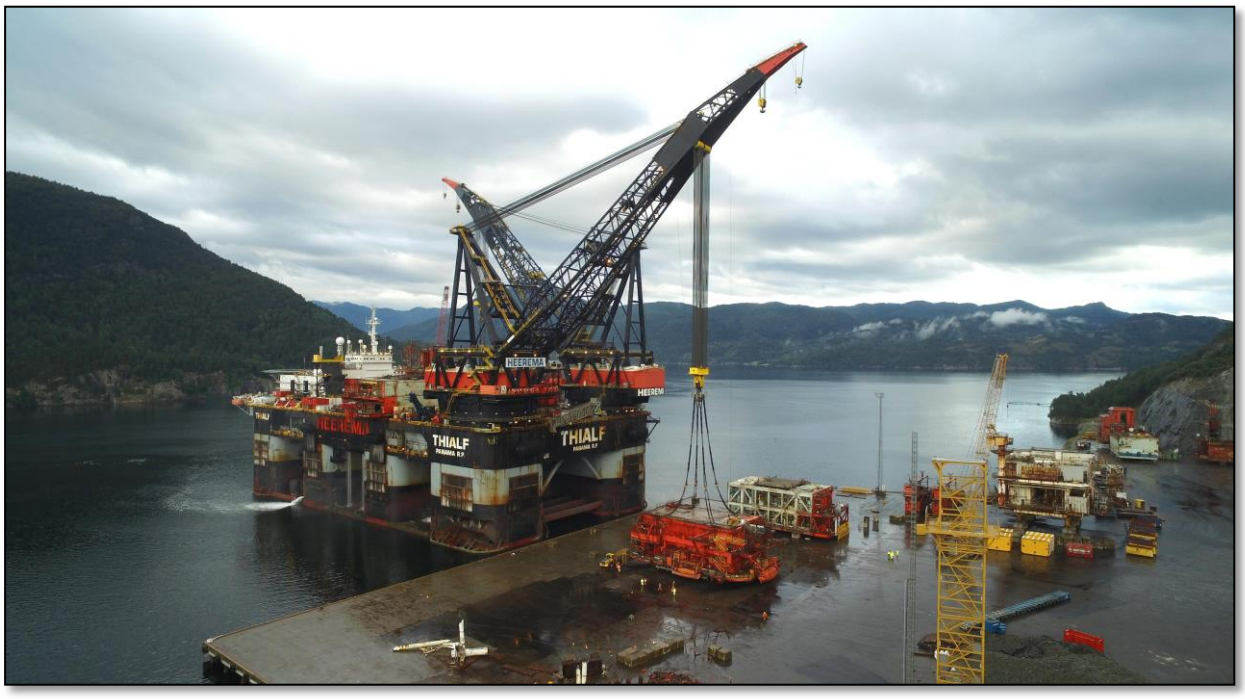


Figure 6 Operational waste generated and disposed of during 2016

Decommissioning waste was generated due to the ongoing Murchison decommissioning programme. Circa 208 tonnes of waste were sent to UK, of which 76% were recycled (including waste to energy). The topsides facilities (circa 26,000 tonnes) were removed during Q3 2016 and transported to the AFDO Vats facility in Norway for recycling and disposal. Further information will be provided once the processing of the waste has been completed.



Thialf SSCV offloading Murchison's modules at Vats for processing

5.4 CHEMICAL USE AND DISCHARGE INTO THE MARINE ENVIRONMENT

All chemicals used offshore during oil and gas production must be approved by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), and their use and discharge is controlled under the Offshore Chemicals Regulations 2002. Each chemical used must be risk assessed by the operator as part of the permitting process, and any chemical which has particular hazardous properties (such as low biodegradability or high toxicity) requires additional justification for its use.

Production chemicals have a number of functions, including corrosion, scale and hydrogen sulphide inhibitors and biocides to prevent microbial souring of reservoirs. Also deoilers and demulsifiers to help to separate oil from produced water.

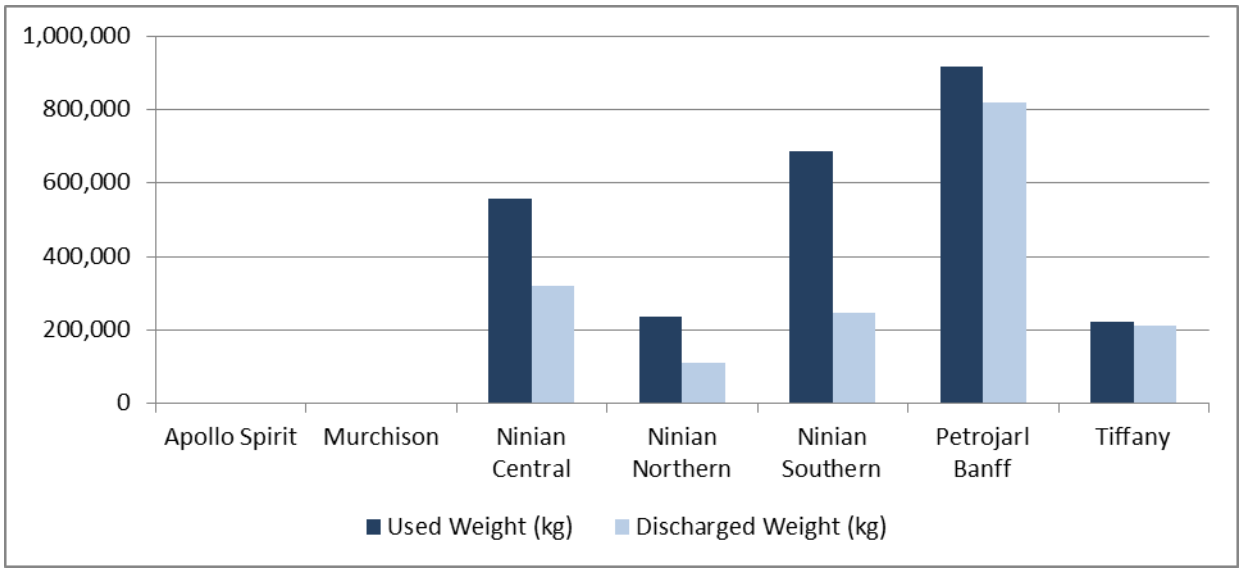


Figure 7 Production chemical usage and discharge during 2016

The total amounts of production chemicals used and discharged during 2016 (Figure 7) were similar to previous years (within 10%) for Ninian Central, Ninian Southern and the Banff FPSO. Increases were observed on Ninian Northern and Tiffany due to increase in total produced fluids.

A wide range of chemical products are used during drilling operations, including complex fluids known as drilling muds, which are used to cool and lubricate the drill bit, to remove rock cuttings from the well bore, to prevent the hole from collapsing, to cement casings and clean wells. Chemicals are also used during intervention and workover operations, including during emergencies, for example to prevent losses of drilling fluids to the formation.

The chemicals used and discharged during drilling and intervention operations are a reflection of activity during the year. The vast majority of these chemicals are not discharged to sea, as seen in Figure 8. Of those discharged to sea during 2016, 95% were PLONOR, 1 % had a SUB warning and the remainder 4% had no warning associated with their use.

During 2016, ten production and four drilling chemicals with components marked for substitution[1] were used by CNRI. The vast majority of the chemicals used had no substitution warning associated with

[1] *An offshore chemical carries a substitution for a number of reasons including (but not limited to):

- The chemical is listed in Annex 2 of the OSPAR Strategy with regard to Hazardous Substances; or
- The chemical is inorganic and has a LC50 or EC50 < 1 mg l-1; or
- The chemical has a biodegradation result < 20% during 28 days.

their use (Figure 9); over 76% of the amount of chemicals discharged during CNRI's operations were classed as Posing Little or No Risk (PLONOR) to the marine environment ('PLO') or had no warning label associated with them ('others'), which is a decrease from 82% in 2015.

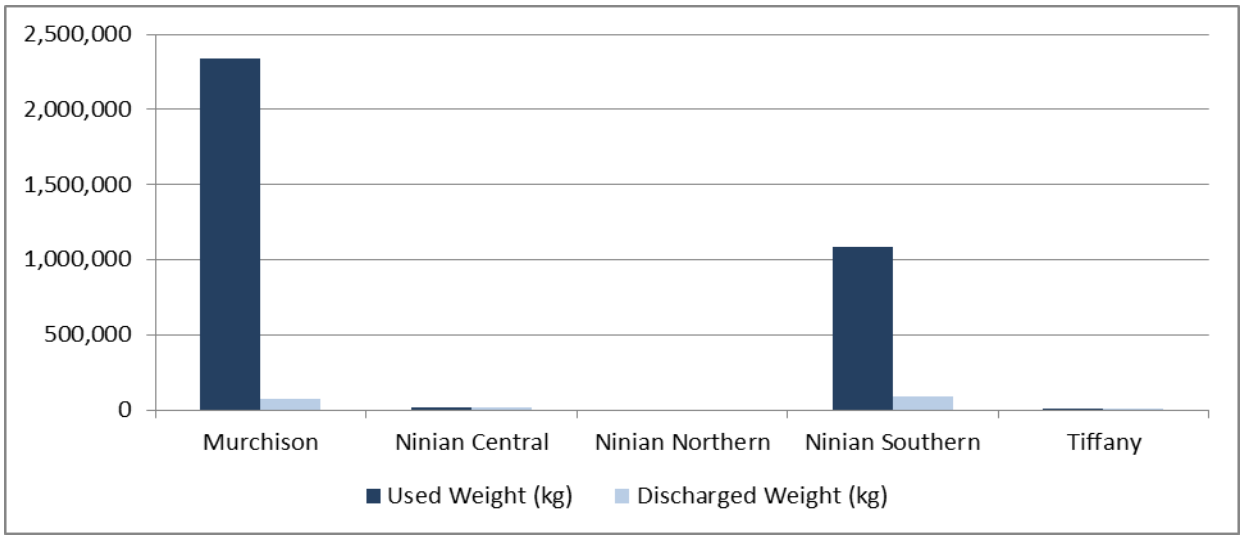


Figure 8 Drilling and well intervention chemical usage during 2016

Three subsea hydraulic fluids with substitution warnings were removed from Production Chemical Permits in 2016. CNRI continues to work with its chemical suppliers to phase out the use of the most hazardous chemicals in their products. Bottle tests were carried out during 2016 with a new deoiler but results were inferior to the incumbent. A defoamer due to be replaced in 2016 was not replaced as this chemical use will cease in 2017. Further testing of alternative 'greener' hydrogen sulphide scavengers, deoilers and corrosion inhibitors continued during 2016.

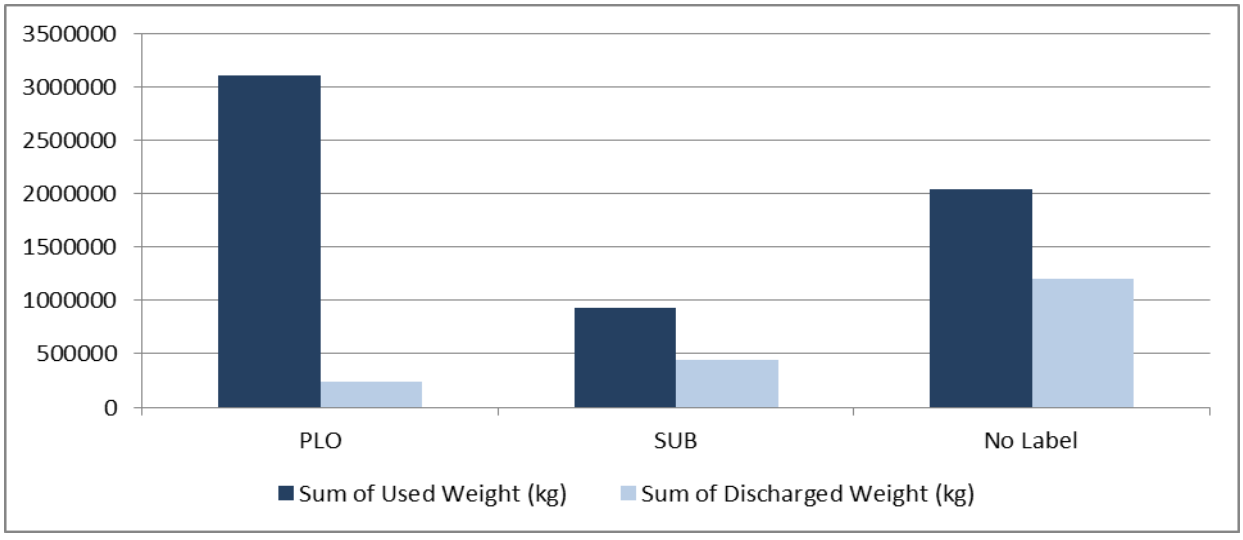


Figure 9 CNRI's chemical usage by CEFAS label during 2016 (all operations)

5.5 ACCIDENTAL RELEASES AND PERMIT NON-CONFORMANCES

All discharges of oil to sea, other than those regulated under an OPPC Permit, must be reported to the relevant authorities, regardless of volume. These reports are made on a PON1 (Petroleum Operations Notice 1) form, and include notification of accidental releases of oils and chemicals to sea, and permitted discharge notifications which report higher amounts of oil discharged to sea under an OPPC permit (>1 tonne in any 12 hour period) or unusual sheens which have the potential to cause environmental impact or affect other users of the sea.

CNRI takes its responsibility to prevent accidental discharges of oil and chemicals to sea very seriously. Procedures are in place to prevent spills (during chemical or diesel handling for example) and our Integrity Management System is designed to ensure that hydrocarbons remain securely within the process system on all installations.

CNRI investigates all accidental releases to sea and permit non-conformances to ensure that lessons are learned and actions are identified and carried out to prevent reoccurrence. Government approved Oil Pollution Emergency Plans (OPEPs) are in place for all offshore installations and CNRI is a full member of Oil Spill Response Limited, the world's largest spill response organisation.

A total of 17 accidental releases were reported in 2016, compared with 15 in 2015: 13 were oil spills and 4 chemical spills. In total, 0.67 tonnes of oil were spilled to sea during 2016, compared with 1.81 tonnes in 2015. The most significant incident was on Ninian Northern in August, where approximately 0.48 tonnes of oil was released due to overflow from the oily water caisson.

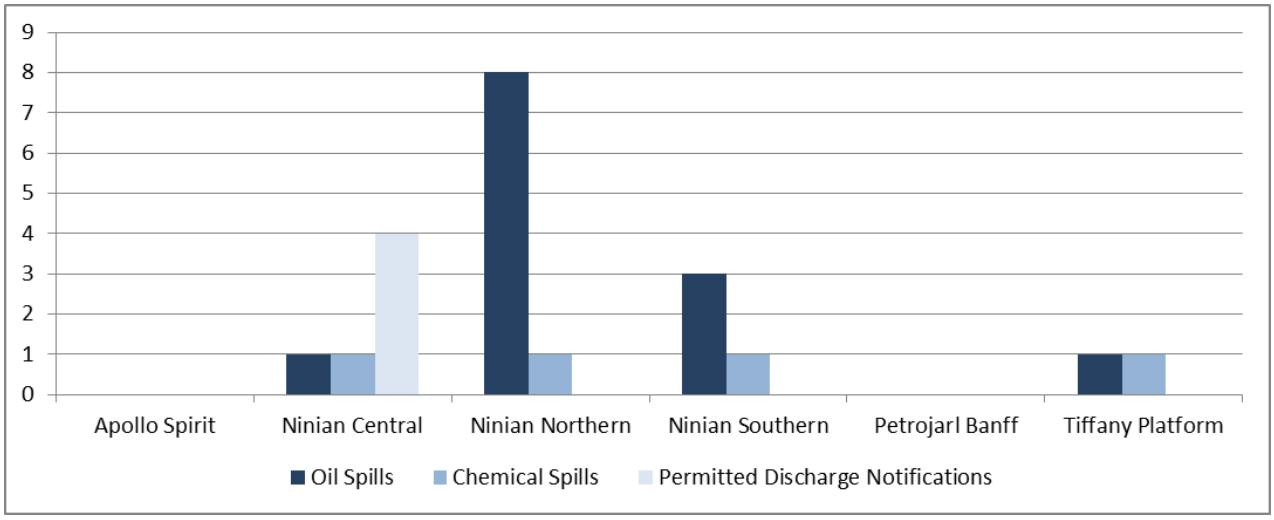


Figure 10 PON1 notifications during 2016

During 2016, there were four instantaneous chemical releases, with a total of 0.6 tonnes of chemicals spilled to the sea. In addition, there were two ongoing leaks of hydraulic fluid from subsea control systems as follows:

- Water-based hydraulic fluid released to sea as a result of loss of integrity of hydraulic jumper hoses connecting Strathspey wells to the manifold. A potential total release of 233 tonnes was reported by the end of 2016. An ROV campaign has identified and located all leaking hoses, and repairs are planned to take place during a 2017 DSV campaign.
- Water-based hydraulic fluid release has been visually confirmed as originating from the BP Magnus SSIV accumulator bank associated with the Strathspey 8" gas import/export SSIV. A total loss of 65 tonnes reported to the end of 2016. Plans are in place to carry out repairs to this system during 2017.

The four PON1 Permitted Discharge Notifications were related to produced water separation issues resulting in abnormal sheens or 'out of spec' water quality. In total, <1 tonne of oil was estimated to have been discharged during these upset conditions.

CNRI submitted 12 non-compliances with Oil Discharge Permits issued under the Oil Pollution Prevention and Control (OPPC) Regulations (compared with 14 in 2015). The majority of these were due to produced water upsets associated with the Strathspey field while conducting well flow trials.

Murchison after completion of 2016's topsides removal campaign

6 2016 ENVIRONMENTAL TARGETS

CNRI develops an annual SHE Improvement Programme for all of its operations. This programme includes targets for a series of leading and lagging performance indicators and sets out the means by which these are to be achieved, as well as improving company SHE performance in general.

For 2016, four specific environmental targets were set, based on the historical performance of CNRI's operations in both UK and West Africa:

- To have fewer than 0.47 reportable spills per million barrels of oil equivalent production (BOE)
- To spill less than 0.02 tonnes of oil per million BOE
- To achieve an average oil in produced water concentration of < 15.2 mg/l
- To emit no more than 0.084 tonnes of carbon dioxide per BOE

How did we perform against these targets?

- ✓ Reported 0.45 spills per million BOE (13 spills in total)
- ✓ Spilled 0.2 tonnes oil per million BOE (0.67 tonnes oil spilled in total)
- ✘ Achieved average oil in produced water concentration of 16.65 mg/l
- ✓ Emitted 0.077 tonnes of carbon dioxide per BOE

The 2017 SHE Improvement Programme for the UKCS includes key performance indicators for oil discharged in produced water, number and volume of reportable spills and leaks, and greenhouse gas emission intensity. Performance against these targets will be reported in the 2017 Environmental Performance Annual Report.

CNR International

THE PREMIUM VALUE DEFINED GROWTH INDEPENDENT