



BW Offshore Catcher (UK) Ltd, 2018 Environmental Statement

This document is part of BW Offshore's Management System, which holds the complete revision history and electronic versions of attachments.

<i>Document Owner:</i> HSE Manager	<i>Approval:</i> Asset Manager
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ABBREVIATIONS

BEIS	Department of Business Enterprise & Industrial Strategy
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CH ₄	Methane
CHARM	Chemical Hazard and Risk Management
CNS	central North Sea
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
DSV	Dive Support Vessel
EIA	Environmental Impact Assessment
ESD	Emergency Shut Down
EU ETS	European Union Emissions Trading Scheme
FGL	Fulmar Gas Line
FPSO	Floating Production Storage and Offloading Vessel
FPV	Floating Production Vessel
HSE	Health, Safety and Environment
HP	High Pressure
ISO	International Standards Organisation
LAT	Lowest Astronomical Tide
LP	Low Pressure
MGO	Marine Gas Oil (Diesel)
MODU	Mobile Offshore Drilling Unit
NC	Non Compliance
NO _x	Nitrous Oxides
OCNS	Offshore Chemical Notification Scheme
OCR	Offshore Chemicals Regulations
ODP	Oil Discharge Permit
OPEPs	Offshore Pollution Emergency Plans
OPRED	Offshore Petroleum Regulator for Environment & Decommissioning
OIW	Oil in Water
OSD	Offshore Safety Directive
OSPAR	Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
PDN	Permitted Discharge Notification
PLO	Poses Little or No Risk
PLONOR	Poses Little or No Risk
PON	Petroleum Operations Notice



PPC	Pollution, Prevention and Control
SEGAL	Shell Esso Gas and Associated Liquids
SEMS	Safety and Environmental Management System
SOx	Sulphur Oxides
STP	Submerged Turret Production
SSIV	Subsea Isolation Valve
SUB	Chemicals Rated for Substitution
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
VOCs	Volatile Organic Compounds



1 INTRODUCTION

1.1 Purpose

BW Offshore has one legal entity currently operating in the United Kingdom Continental Shelf (UKCS), BW Offshore Catcher (UK) Ltd, hereafter referred to as BWOCUK. BWOCUK is the Duty Holder / Operator of the BW Catcher Floating, Production, Storage and Offloading (FPSO) facility which is currently producing from the Catcher Area Fields (Premier Oil UK are the licence holder for the Catcher Field Area).

Under Recommendation 2003/5 of the Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) requires that all companies operating in the UKCS have systems and procedures in place to identify, monitor and control the environmental aspects associated with offshore activities.

BW Offshore's worldwide operations are certified to the international environmental management system standard, ISO 14001. Recertification of the BW Offshore ISO 14001 environmental management system was concluded in August 2017. Surveillance visits by the BW Offshore verifier are undertaken annually throughout the fleet.

This report provides information on BWOCUK's offshore operations and the environmental performance of these operations. For the purpose of this report, this includes all production activities in the UKCS. BWOCUK do not conduct drilling operations in the UKCS. All drilling activities for the Catcher Field Area are conducted by Premier Oil UK as the Licence Holder for the field area.

This report has been made available on the BW Offshore website at;

<https://bwoffshore.com/sustainability/environmental-impact/>

2 Overview of Operations

The Catcher Area Development is located in Block 28/9 of the central North Sea (CNS) c. 170 km southeast of Aberdeen and c. 100 km from the UK/Norway median line in water depths of c. 85 m Lowest Astronomical Tide (LAT) (Figure 1).

The BW Catcher FPSO has been contracted by Premier Oil UK to produce from three fields: Catcher, Varadero and Burgman. The three fields are tied back to the BW Catcher FPSO vessel located at c. 56°46'12.43" N and 00°42'46.93" E (WGS84) (Figure 2). The principal facilities include subsea facilities and a turret-moored and free weather-varing FPSO.

The FPSO is capable of processing up to 66,000 bbls of oil per day and has a maximum cargo storage capacity of 650,000 bbls. Therefore, at maximum capacity the FPSO offloads the processed crude oil to a shuttle tanker approximately once every 8 days. When offloading cargo, tank blanketing will normally use LP fuel gas, with this gas being recovered via the flare gas recovery package during filling of the cargo tanks between offloads. Initially, produced gas will be used for power generation and gas lift, with excess being exported into the Shell Esso Gas and Associated Liquids (SEGAL) system (Fulmar Gas Line (FGL) to St Fergus gas pipeline).

In normal operations, BW Catcher flaring will be restricted to HP flare purge gas only. The LP flare system includes a Vapour Recovery Package to recover purges and vents sent to the LP flare system. The LP flare will be lit, as required, in process upset or ESD conditions only. Produced water will be treated and then either re-injected or discharged under an Oil Discharge Permit (ODP) issued by BEIS.

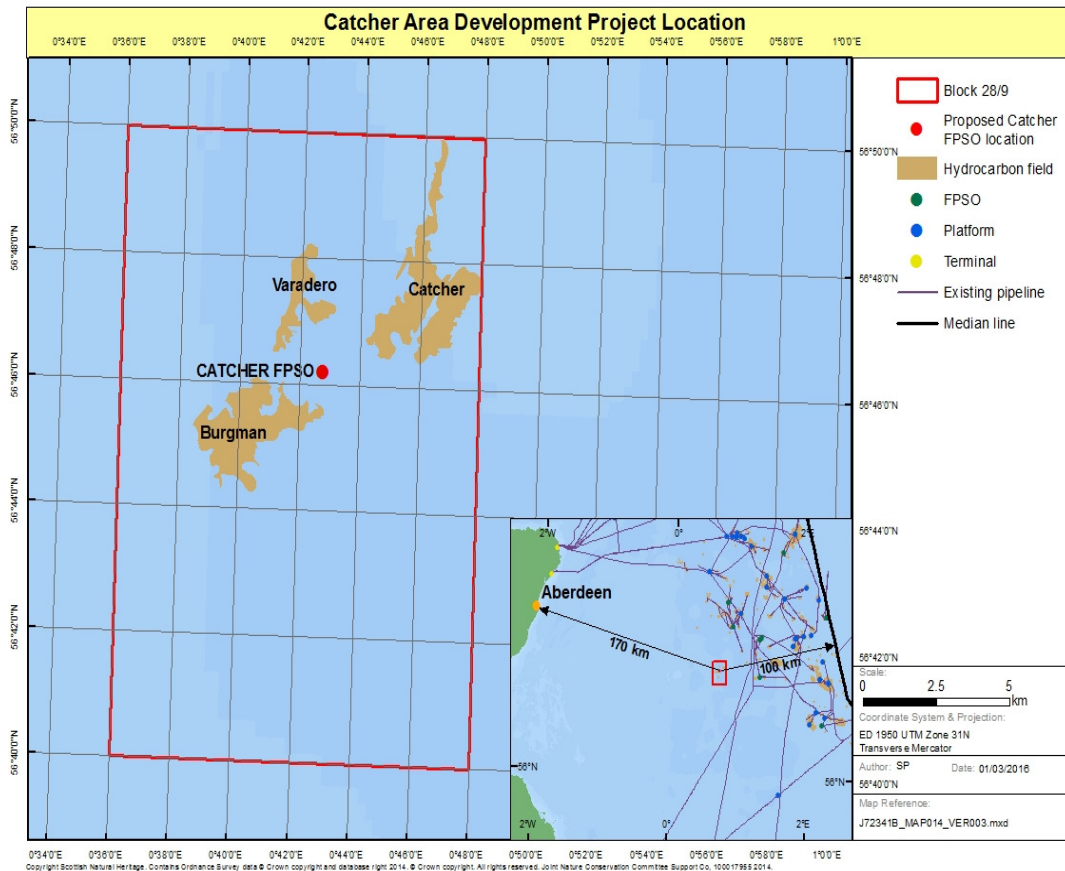


Figure 1: BW Catcher General Location Map



The BW Catcher FPSO in field commissioning activities commenced following hook up in October 2017. The FPSO achieved First Oil on the 23rd December 2017. An interim performance test was successfully completed on the 6th January 2018. Client final acceptance performance test following commissioning was achieved in July 2018 with final acceptance certificate being issued in November 2018.

During 2018 Premier Oil completed drilling operations at the Catcher and Burgman fields. The Ensco 100 Jack-up Drilling Rig was de-mobilised in October 2018. These wells were tied back to the BW Catcher FPSO and commenced production. Remaining development wells at the Varadero Field are scheduled for 2020/2021.

3 BW HSE Policy UK

BW Offshore is focused on protecting the environment in line with our stated commitment to reduce our impact to a level that is as low as reasonably practicable. This involves ongoing assessment, monitoring and reporting on environmental impacts.

The BWOCUK Safety and Environment Management System (SEMS) exists to provide a systematic approach to the management of HSE issues in order to protect people and the environment and comply with UK legislation.

BW Offshore considers that health, safety and environment have equal status with other primary business objectives and are of strategic importance. Safe working practices and due consideration of environmental impact are vital to the overall efficiency and continued success of the business. The HSE policy forms the basis for the SEMS and is presented below.

POLICY STATEMENT

BW Offshore is committed to prioritizing Health, Safety and Environment (HSE) matters in all its operations. We shall continually improve our HSE performance and strive to prevent harm to People, the Environment and Property as we firmly believe that all incidents can be prevented

In order to achieve our commitment, BW Offshore shall:

- Ensure Major Accident Hazards are effectively managed throughout the lifecycle of our assets
- Ensure a robust risk management process is in place to identify and mitigate all operational risks
- Plan our operations in a way that minimize environmental impact and prevents pollution
- Fulfil all compliance obligations
- Register faithfully and analyze all incidents and near misses
- Encourage proactive participation from all personnel on HSE matters to identify needs for training and development
- Set objectives and targets for HSE performance, monitor and communicate the performance to all personnel and stakeholder
- Enhance HSE performance through continual improvement initiatives
- Promote stop and ask without consequences
- Fulfil its duty of care towards anyone associated with BW Offshore name
- Ensure all our people, and our contractors have the competencies required to safely undertake their role and responsibilities
- Communicate internally and externally with the workforce, relevant stakeholders and interested parties on all aspects of HSE Policy

The SEMS was developed in order to meet the requirements of The Offshore Installations (Offshore Safety Directive) (Safety Case) Regulations 2015 and Offshore Installations (Safety Case) Regulations 2005, in particular the contents of Schedules 2 and 3.

The BW Offshore SEMS uses the existing processes and procedures contained within the BW Offshore Integrated Management System, and is therefore an integral part of the BW Offshore Management System, although specific to the operations of BW Offshore. The processes and procedures, which are required to meet the UK Relevant Statutory Provisions, are contained

within the SEMS (Figure 3).

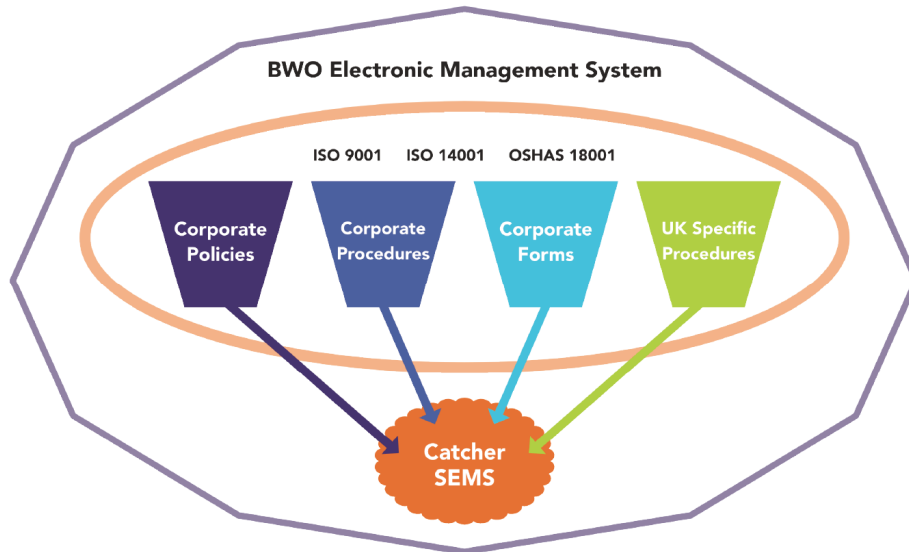


Figure 3: Inputs to BW Catcher SEMS

The purpose of the SEMS is to provide a framework for the management of all hazards and associated risks generated through the operation of the BW Catcher FPSO.

The basic principal applied within the SEMS is one of continual improvement in the management of risk, both environmental and health and safety related. In order to achieve this the SEMS utilises the Plan, Do, Check and Act model (Figure 4).

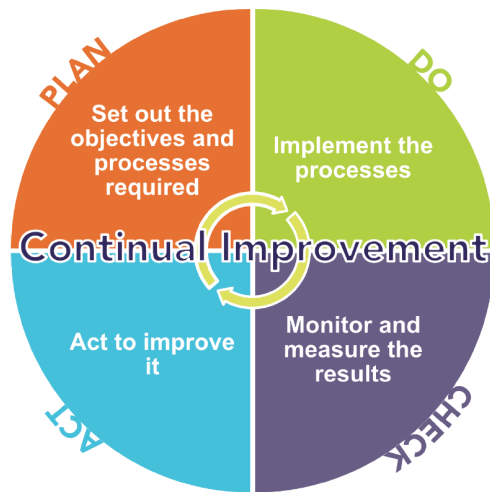


Figure 4: BW Catcher SEMS Continual Improvement Model



4 Environmental Performance

Environmental performance 2018 for the BW Catcher FPSO is detailed below. Comparison data is only available between 2017 and 2018 due to the FPSO only arriving in the field and gaining first oil in 2017. During the commissioning/ start-up phase of operations on a new installation certain permits come into force when the FPSO is hooked up and becomes an installation (Chemical Permit, Consent to Locate, etc) and some only come into force when the FPSO achieves first oil (PPC Combustion Plant Permit, EIA Direction to Commence Production, etc.). For the 2017 data, the following sections will detail the date at which data has been gathered from (hook-up or first oil) to the end of the year (2017).

4.1 Oil in Produced Water

During normal production, water is produced when extracting hydrocarbons from the reservoir.

Despite treatment, produced water still contains traces of oil, and as such, produced water discharge is controlled via a permitting system managed by the UK regulatory authority, OPRED.

The 2018 Oil Discharge Permit held by BWOCUK allows the BW Catcher FPSO to discharge produced water, provided the hydrocarbon concentration is within the limit set out in the permit.

4.1.1 BW Catcher Produced Water 2018

There was no Produced Water from the Catcher Field Area wells during 2017.

Produced Water was only produced from 30th December 2018. Therefore, there were only two days of PW discharge during 2018.

Upstream SI-1865 Overboard Monthly Totals & Averages		
Description	Value	Units
Days on Stream	2	
Oil Discharge	0.01014	Tonnes
Produced Water	1,192.00	m3
Avg. Oil in Water	8.5081	mg/l
Avg. Discharge Rate	596	m3/day

4.2 Chemical Use and Discharge

Various chemicals are used offshore during production operations.

During production operations, chemicals such as scale solvers, corrosion inhibitors, demulsifiers and biocides are used to assist with the separation of oil and water, prevent damage to infrastructure such as pipelines, and to prevent 'souring' of the reservoir.

Any chemical used to process hydrocarbons offshore must, in line with the Offshore Chemical Regulations 2002, first be approved by the Centre for Environment, Fisheries and Aquatic Sciences (CEFAS). The chemicals are subject to robust environmental risk assessment and once approved, their use is controlled and monitored through a permit granted by OPRED.

Under the Offshore Chemical Notification Scheme (OCNS), chemicals are ranked according to the assessed hazard to the environment and are given a lettered heading E, D, C, B or A, with E representing the lowest and A the highest hazard category.

Using the Chemical Hazard and Risk Management (CHARM) model, a colouring band is used to show which chemicals pose the highest environmental hazard. These bands are Gold,

Silver, White, Blue, Orange or Purple with Gold representing the lowest hazard and Purple the highest.

Some chemicals are regarded as PLONOR (PLO), which means that they have been determined to Pose Little Or NO Risk to the environment.

Any chemicals which have been identified as posing potential environmental risks (such as bioaccumulation or slow biodegradation) are subject to controls under which their use must first be approved by OPRED. This is backed up by a detailed justification for use of the chemical. Such chemicals carry a 'substitution warning' (SUB) which aims to encourage the phase out of the use of these chemicals.

BW Offshore, its contractors and its chemical suppliers work on a continuous basis to find suitable alternatives to replace the products with SUB warnings.

4.2.1 BW Catcher Chemical Use and Discharge 2018

Five chemicals with substitution warnings (SUB) were permitted for use on BW Catcher in 2018. The chemicals are detailed in the table below.

Chemical & OCNS Category	Summary of Change Out Review
EC1389B (Corrosion Inhibitor), Nalco Champion (Nalco Ltd)	This chemical was changed out for CORR11389A.
CORR11389A (Corrosion Inhibitor), Nalco Champion (Nalco Ltd)	The product is a CI used in closed heating/cooling systems and discharges from the HMS and CMS are infrequent. The product is water soluble indicating that it will be readily diluted and dispersed on discharge to the marine environment. The component generating the worst case HQ has a Log Pow of -0.1 indicating that this product would not be expected to bioaccumulate.
IFE-WT-62 (Tracer Chemical), Restrack AS	Chemical use was organised and sourced by Premier Oil. It was a one-off use on BW Catcher and will have very little discharge at an extremely low discharge rate due to its injection to the reservoir.
OSCV20016A (Oxygen Scavenger), Nalco Champion (Nalco Ltd)	When being used in water injection the product should not be discharged to the marine environment. However, should it be discharged, the inorganic component would dissociate into naturally occurring components of seawater. This chemical was trialled in 2018 due to water injection specification issues and is not on the BW Catcher permit for use in 2019 operations.
PermaFloc PC-306 (Coagulant), Nalco Champion (Nalco Ltd)	Nalco Champion are actively working to source alternative chemistries that will not attract a substitution warning, however, it is a feature of this type of chemistry.

Figure 5 below details the BW Catcher chemicals permitted for use. Thirty-four chemicals were used on BW Catcher during 2018. These uses are representative of chemical use quantities required to process hydrocarbons that are produced at BW Catcher.

579,884 kgs of chemicals were used in 2018 and of those 48,995 kgs discharged during commissioning and production operations in 2018.

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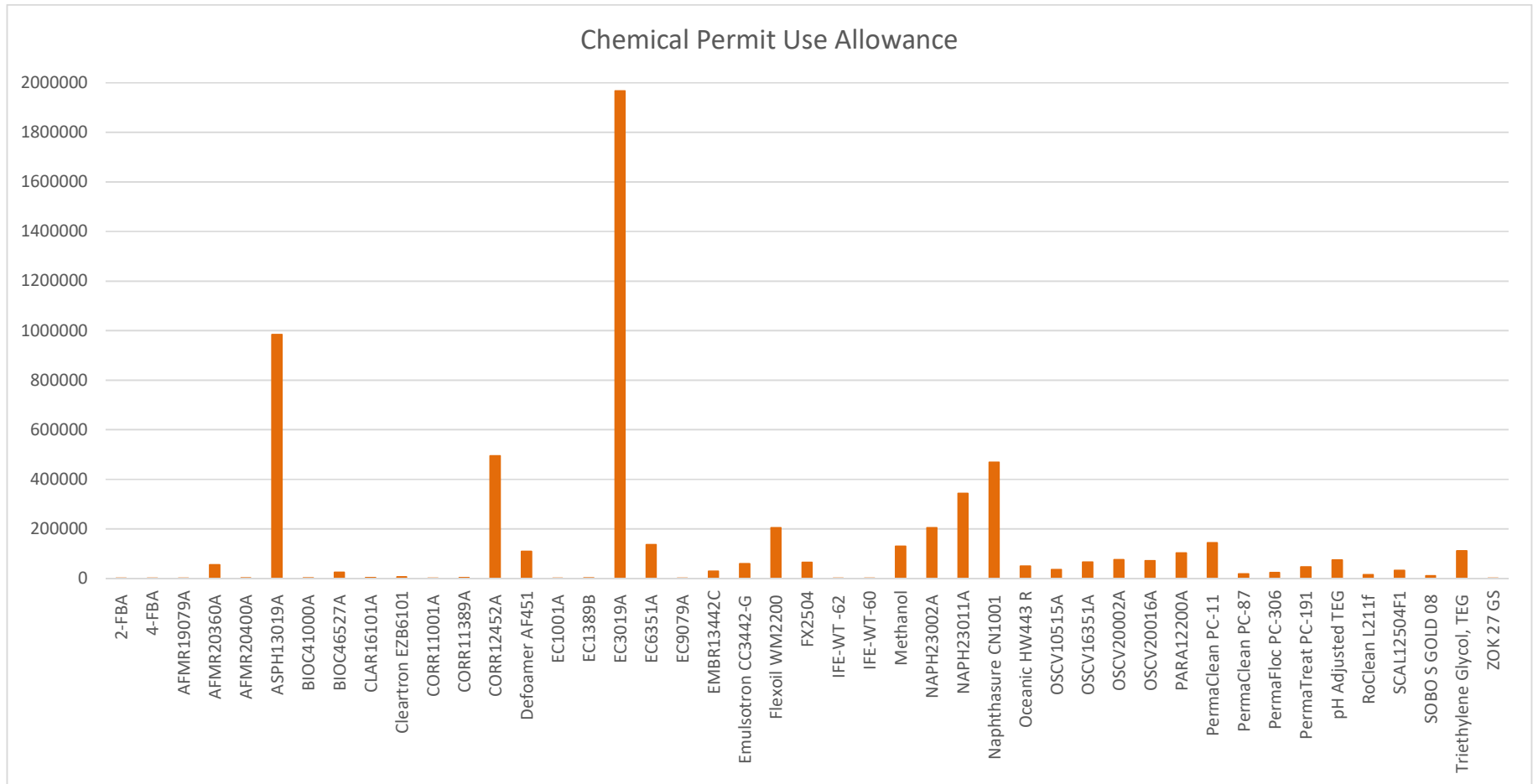


Figure 5: BW Catcher Chemical Permit Allowance (not – Y-axis range)



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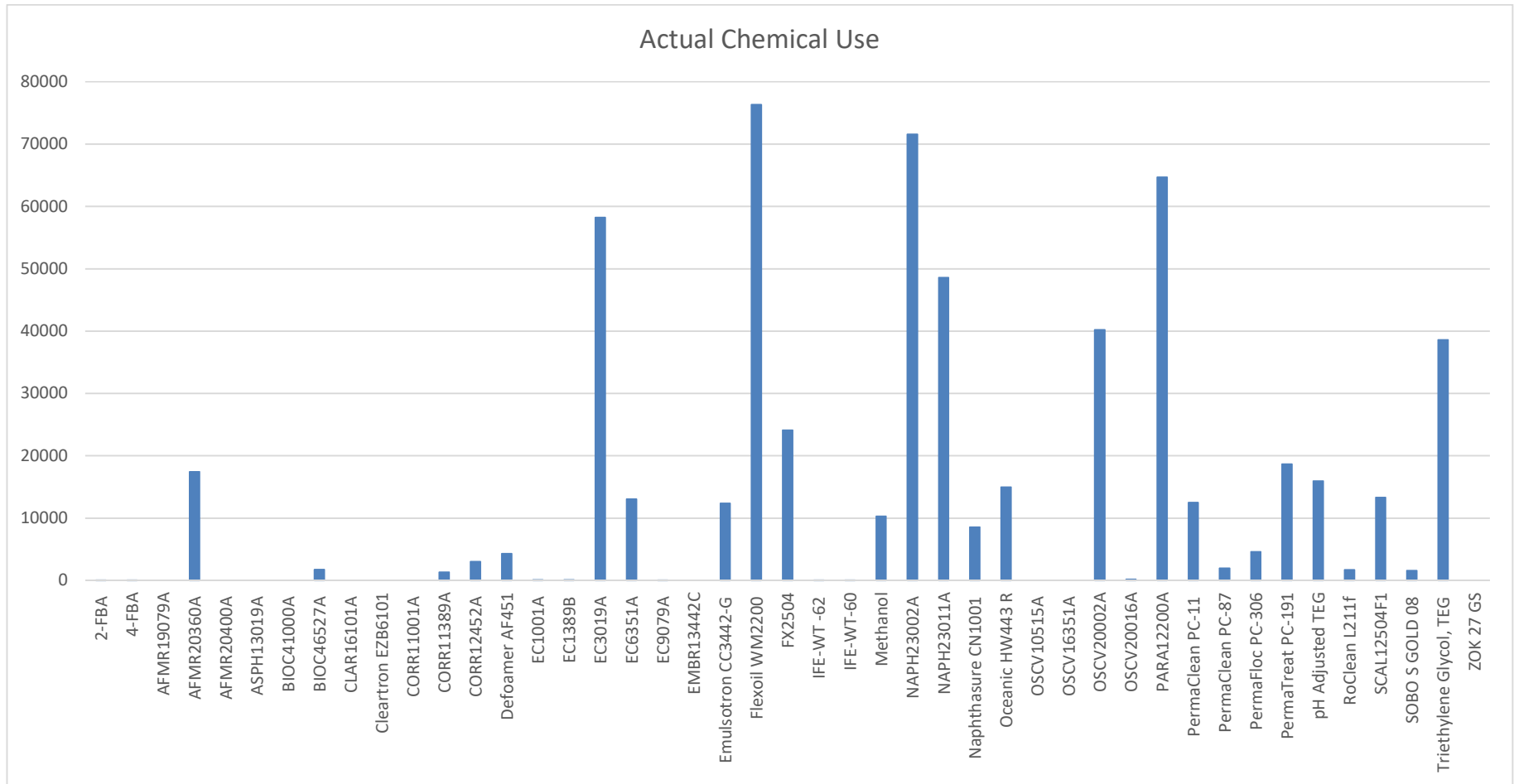


Figure 5: BW Catcher Chemical Permit Actual Use (note – Y-axis range)

4.3 Waste

Waste is generated from offshore operations and is transported onshore for re-use, recycling, treatment or disposal.

Production installation waste is segregated into categories before back-loading. As much waste as possible is sent for recycling. This includes wood, scrap metals, paper/cardboard, glass and plastics.

Waste that cannot be recycled is sent to landfill. Certain types of waste that are harmful to the environment (Special Waste) are sent ashore to be processed and disposed of by licensed handlers in accordance with the relevant legislation.

BW Offshore target areas where the amount of waste generated can be further reduced. On the Catcher E-reps have been established and are actively involved in continuous awareness raising, monitoring and reduction of waste initiatives.

4.3.1 BW Catcher Waste 2018

A total of 182.2 tonnes of waste was disposed of from the BW Catcher FPSO in 2018 via their waste management contract. Of the total waste produced, 55% was recycled, 14% was waste to energy, 0.2% was incinerated and 31% was landfilled (Figure 6).

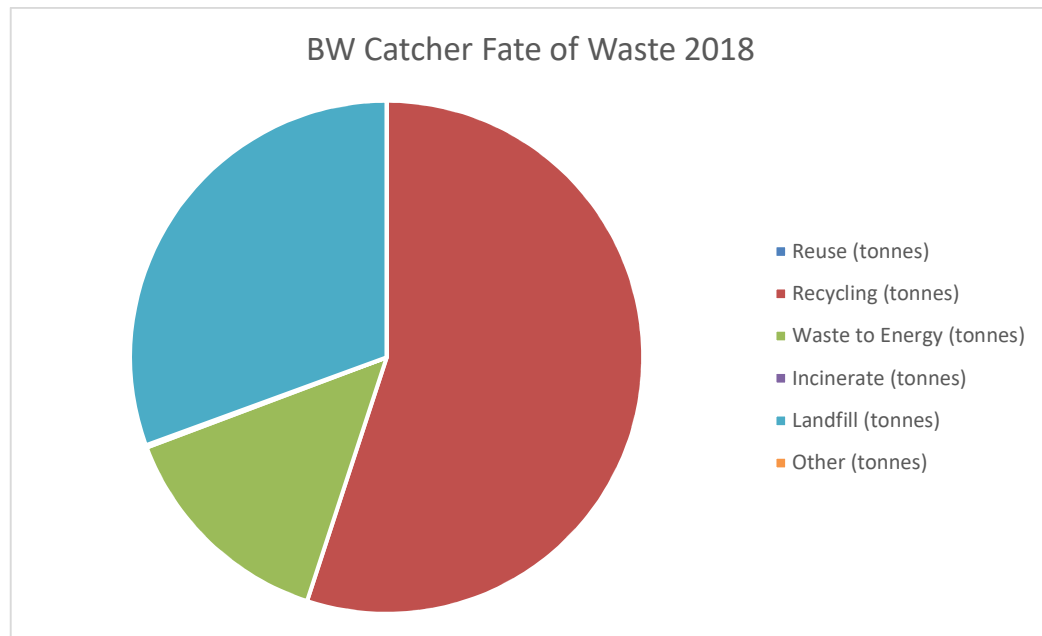


Figure 6: BW Catcher Fate of Waste

4.4 Atmospheric Emissions

Atmospheric emissions arise during offshore drilling and production operations predominantly as a result of fuel combustion for power generation and gas flaring activities.

4.4.1 BW Catcher Atmospheric Emissions 2018

The BW Catcher FPSO is regulated under the Pollution, Prevention and Control (PPC) Regulations as a large combustion installation. As such, the installation has set limits on atmospheric emissions of nitrous oxides (NO_x), sulphur oxides (SO_x), carbon monoxide (CO), methane (CH₄) and volatile organic compounds (VOCs).

Figure 7 below shows the combustion emissions (excluding CO₂) for 2018.

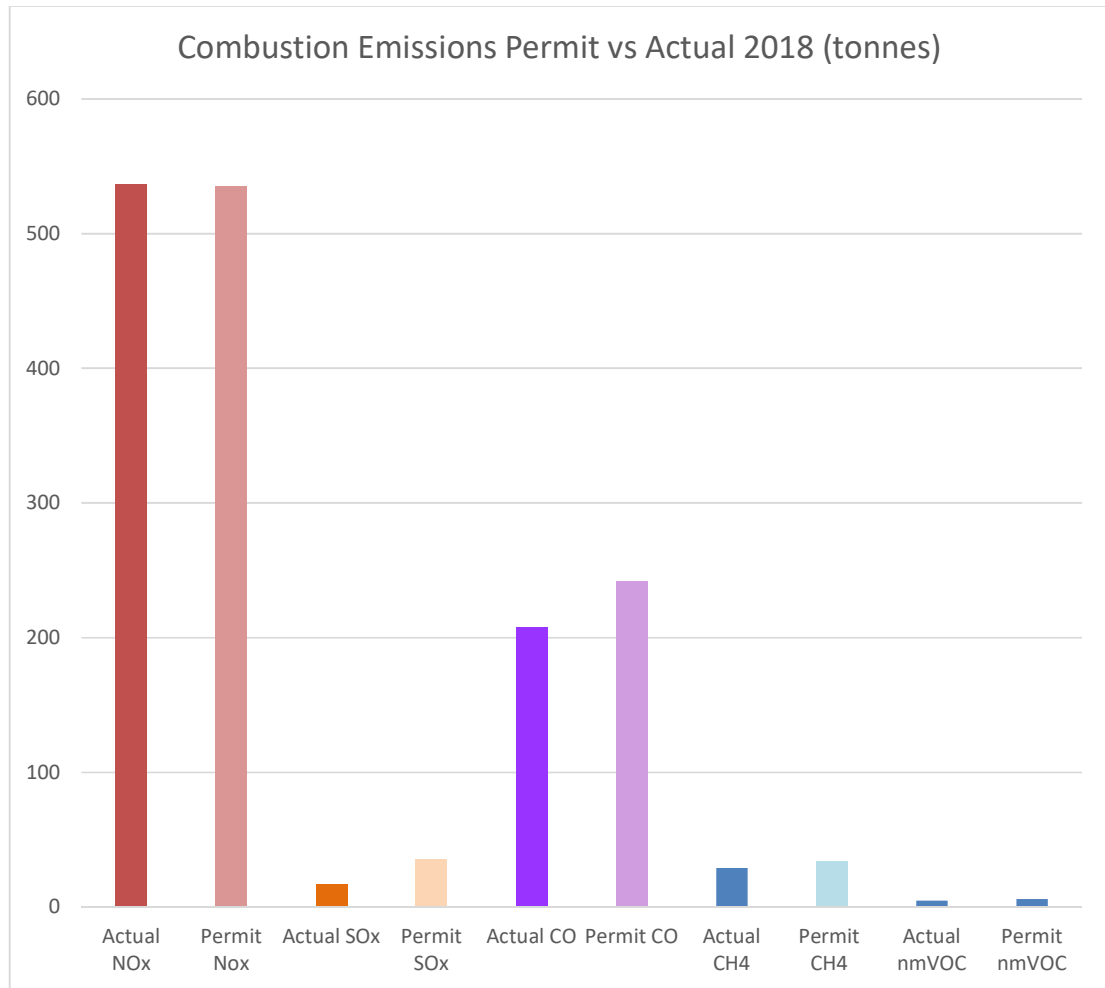


Figure 7: BW Catcher Combustion Emissions

All emissions were within limits set by BEIS in the BW Catcher PPC Permit with the exception of NO_x which was 1.9 tonnes over. A PPC Non-Compliance was submitted to report this. To ensure this does not occur in 2019, BWOCUK have re-assessed the power consumers on BW Catcher along with more detailed work scopes for the year. They have also used the gas analysis mole weight data collected during 2018 in calculation estimates rather than project predicted data.

BW Catcher is also regulated under the European Union Emission Trading Scheme (EU ETS) Regulations, which regulate CO₂ emissions for combustion sources, such as turbines and flaring. In normal operations on BW Catcher all produced gas would be used as fuel with excess gas being exported. During the commissioning phase excess gas was flared (approx. first 6 months of 2018). Fuel gas on BW Catcher was commissioned in January 2018 and gas export commissioned in May 2018.

CO₂ emissions as a result of combustion sources are presented in Figure 8.

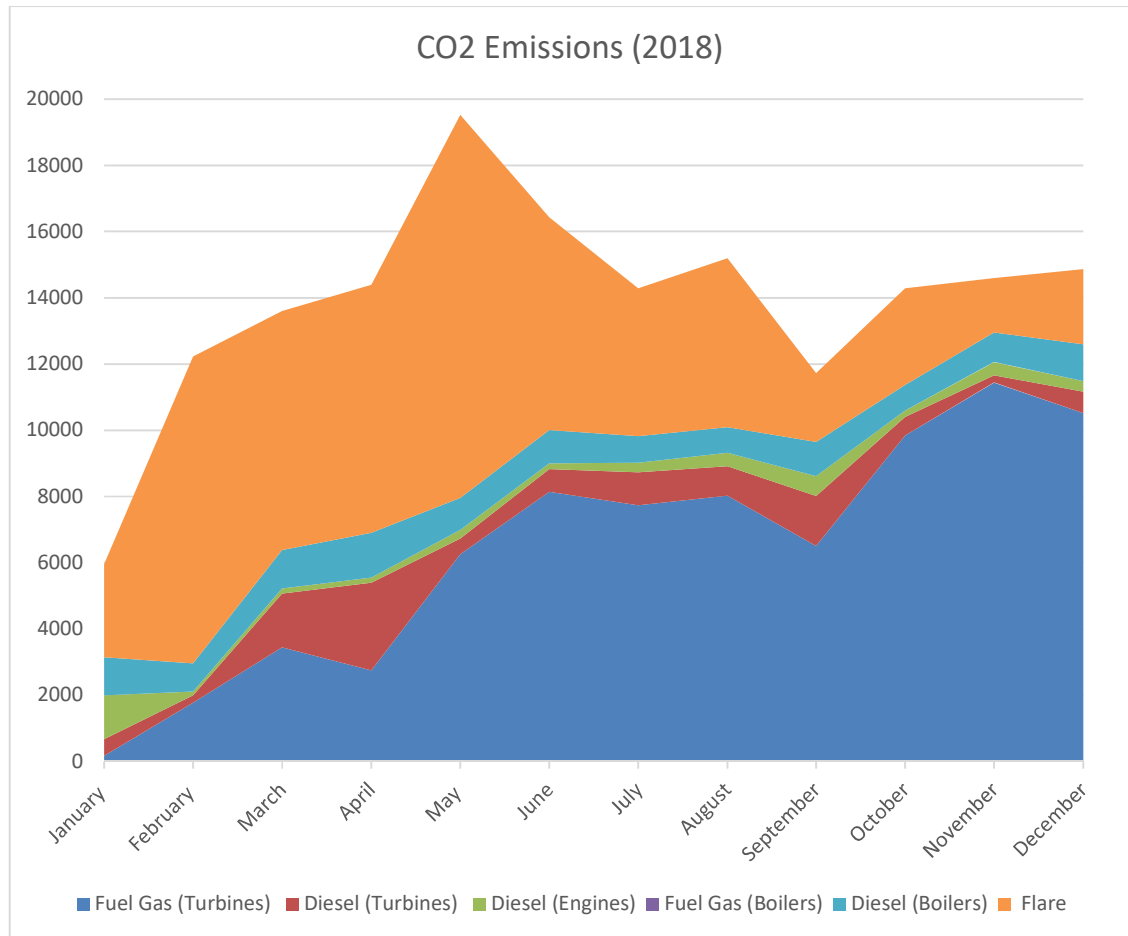


Figure 8: BW Catcher CO2 Emissions

During 2018, 167,079 tonnes of CO2 were emitted from combustion and flaring on BW Catcher. Of these emissions, 62% were as a result of combustion for power generation and the remaining 38% resulted from the flaring of excess gas during offshore commissioning or blowdown operations.

During normal operations, BW Catcher runs with two turbines on fuel gas. During 2018 power generation turbines and gas export systems were gradually commissioned and began to stabilise in June 2018.

The BW Catcher boilers are currently running on diesel. They are yet to be commissioned on fuel gas. Once commissioned on fuel gas they are expected to be more efficient.



5 Incidents

BWOCUK strive to prevent the unplanned release of hydrocarbons and chemicals, however, on occasion accidental releases do occur. All unplanned releases of hydrocarbons and chemicals to sea from offshore oil and gas installations and pipelines, regardless of size, are reported to OPRED and other statutory agencies via the Petroleum Operations Notice 1 (PON1) form. Permitted Discharge Notifications (PDN's) are also submitted using PON 1 forms when permitted discharges are in breach of conditions / limits associated with the installations Oil Discharge Permit.

A number of processes are in place to prevent unplanned releases and these include planned maintenance of equipment, asset integrity inspections, activity risk assessment, area inspections, routine audits, procedural controls and training and competency for individuals interacting with process plant. Oil Pollution Emergency Plans (OPEPs) approved by OPRED are in place covering the installation. The plan is exercised on a regular basis and followed in the event that an unplanned release does occur, to ensure that the incident is reported in a timely fashion and that contingency and mitigation measures are in place.

5.1 Unplanned Release – PON1

During 2018, five PON1s were submitted to the regulator for unplanned releases from BW Catcher. In addition to this, one PON1 was submitted to the regulator for unplanned release from the DSV Seven Falcon which was undertaking pipeline operations in the field area. Details of the releases are described below.

Name/ Description	Release Type (if applicable)	Release Quantity (tonnes) (if applicable)
Overfilling of Fwd Fire Pump Diesel Tank.	Diesel (MGO)	0.09
SSIV hydraulic pressure drop resulting in Oceanic HW443R fluid lost from the umbilical core.	Chemical - Oceanic HW443 R	0.054
DSV Seven Falcon - Broken Seal on Luffing Ram on the 250t Knuckle Boom Crane whilst located within the Catcher Drilling Template 2 conducting spool tie in works.	Chemical	0.00024
Sheen as a result of deck washing. Quantity estimated by sheen.	dirty deck wash (Sobo S Gold 08)	0.003
Small bore tubing loss of containment from port crane during Supply Boat Operations.	Hydraulic Oil	Max 0.09 Min 0.05
Small bore tubing loss of containment from port crane during pre-use checks prior to undertaking cargo handling operations.	Hydraulic Oil	0.01



5.2 Regulatory Non-Compliance (NC)

Three non-compliances were raised in relation to environmental legislation or permit condition breaches during 2018. These are described below:

- PON10 - Navigation Lights
- Offshore Chemical Regulations Non-Compliance
 - Accidental removal of chemical from permit when it was still required to be used offshore.
 - TEG losses to cargo due to suspected chimney tray damage within contactor. No loss to marine environment.

All of the above non-compliances have been closed out.



REVISION SUMMARY

Rev.	Date	Document owner to summarise key changes in the document
0	28-May-2019	Issued for Use