Permitting decisions

Variation to permit

We have decided to issue the variation for Brockham Oilfield operated by Angus Energy Weald Basin No3 Ltd.

The variation number is EPR/BL9763IN/V004.

We have also carried out an Environment Agency initiated variation to the permit.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

This variation is required as the Environment Agency has a duty, under the Environmental Permitting (England and Wales) Regulations 2016 (EP Regulations), regulation 34(1), to periodically review permits. As a result of that review we have identified a number of necessary changes we must make to the permit to reflect current legislation and best practice. These changes principally relate to:

- Implementation of the Mining Waste Directive namely the addition of extractive waste management activities;
- Assessment of any groundwater activities; and
- Oil storage activities

The variation also aims to:

- Consolidate permits - all variations to the permit will be brought together into one permit so the requirements will be clearer.
- Formalise changes to monitoring requirements and compliance limits where we have agreed them in writing
- Address site specific issues which result in a change to the current permit, for example incorporating completed improvement conditions into the permit and removing inconsistencies.

The site is located at Brockham Oilfield, Betchworth, Surrey, RH3 7AU. The national grid reference for the centre of the site is TQ 18840 48672.

The Application was duly made on 20th July 2017.

We gave the Application the reference number EPR/BL9763IN/V004. We refer to the Application as “the Application” in this document in order to be consistent.

The number we have given to the permit is EPR/BL9763IN. We refer to the permit as “the Permit” in this document.

Purpose of this document

This decision document provides a record of the decision making process. It summarises the decision making process in the decision checklist to show how all relevant factors have been taken in to account.

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- explains why we have also made an Environment Agency initiated variation
- summarises the engagement carried out
- shows how we have considered the consultation responses.

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit. The introductory note summarises what the permit covers.

Radioactive Substances

The Applicant also submitted a separate standard rules permit (SR2014 no4) application for a radioactive substances activity, for handling NORM (naturally occurring radioactive materials) as a result of oil and gas production activities, which we have given the application number EPR/ RB3994DK /A001. That application is for a separate permit as Radioactive Substances Activities are a separate regime to the Environmental Permitting (England and Wales) Regulations 2016 and therefore cannot be consolidated into this permit. The applicant was clear that no produced water would be received from any other sites for reinjection into Brockham and has therefore applied for the standard rules permit, rather than a bespoke permit which would allow them to receive produced water from elsewhere.

As this permit is subject to a separate application it is not discussed further in this decision document.

Brief outline of the process

The site is located in the Weald Basin approximately 1km south west of Brockham and 2km east of Dorking in Surrey. The site is centred on National Grid Reference (NGR) TQ 18840 48672. The postcode for the site access is RH3 7AU.

There are 3 wells on the site. Two of these are production wells (one into the Kimmeridge Clay Formation and the other into the Portland Sand Formation). The third well at the site BRX1 was drilled in 1987 and has since been plugged but contains a sidetrack (now referred to as BRX3) into the Portland Sand Formation. This well has been used for reinjection of produced water (which was previously authorised as a Directly Associated Activity), and is now considered to be a groundwater activity.

Due to a lack of suitable information being submitted as part of this application, the Environment Agency has removed groundwater activities under this variation to prevent any risk to groundwater occurring from the reinjection of produced water.

The production well BRX2 was drilled in 1998, this has now been plugged but contains a sidetrack well BRX2-Y which is a production well into the Portland Sand Formation. It also contained a second sidetrack BRX2-Z which has been plugged. The production well BRX4 was drilled in 2007. This has now been plugged but contains a sidetrack well BRX4-Z (drilled in 2017 into the Kimmeridge Clay Formation). BRX4-Z is proposed to be a production well. Well BRX4-Z was drilled under a separate standard rules permit (SR2015 No1) which has been consolidated as part of this permit variation. The standard rules permit (SR2015 No1) only authorised the drilling of this specific well for exploration, and no additional drilling is authorised under this variation.

The site was originally permitted in 2002, and the Environment Agency was advised that the site was mothballed from 2016 to 2018. The Environment Agency received formal notification from the operator in March 2018 that production had restarted in the Portland Sand Formation. In October 2018 we were verbally informed that the operator was looking to start flow testing and production in the Kimmeridge Clay Formation from borehole BRX4-Z in December 2018.

This variation updates the permit to reflect the current production from the Portland Sand Formation from borehole BRX2-Y. Future production from the Kimmeridge Clay Formation from borehole BRX4-Z is subject to additional pre-operational condition PO 01 being approved by the Environment Agency, prior to production commencing.

For crude oil production from both well BRX2-Y in the Portland Sand Formation and well BRX4-Z in the Kimmeridge Clay Formation similar processes will be employed. The oil is extracted from BRX2-Y using a nodding donkey' beam oil abstraction pump. Oil will be extracted from the Kimmeridge Clay Formation using a linear rod pump. The production fluids (oil, gas and produced water) pass through a three phase separator and produced water is separated by gravity. Separate bath heaters are used for production from the Portland Sand Formation and proposed production from the Kimmeridge Clay Formation. Oil is exported by road tanker to the Hamble Refinery.

A number of chemicals will be added to the produced fluids including: hydrogen sulphide (H_2S) scavenger to assist in reducing the H_2S content of the produced fluids to meet tanker specifications, demulsifier to separate the water-oil mixture produced from the reservoir, and pour point depressants (DAE Wax / Sludge Dispersant, 70-90% xylene) to reduce the viscosity of the crude oil, particularly in cold weather and to prevent the formation of waxes.

It is anticipated that the oil from the Kimmeridge Clay Formation will have some associated gas which will be used to power a small power generation package to provide electricity on site and export surplus electricity to the grid. An emergency flare is also proposed as part of this process. The flare is to be used for natural gas resulting from well operations during emergency situations only. For clarity, routine burning of waste gas arising from the operations has not been applied for or permitted under this permit.

In an emergency situation the flare will only be used for a period of 1 to 2 minutes prior to well shutdown. In addition small quantities of gas will also be vented to atmosphere from the oil storage tanks as a result of natural displacement, which has not been already captured by the generator or flare system.

A site plan is shown in Schedule 7 of this permit. There are 4 oil storage tanks on site which will store crude oil produced from the Portland Sand Formation and the Kimmeridge Clay Formation. The total oil storage capacity is 257 tonnes. Produced water, once separated, is stored in a 62 tonne water tower.

The site is partially underlain by an impermeable membrane and concrete hardstanding has been installed above the membrane in the bunded operational area and around the well pads. An assessment of the extent and condition of this impermeable membrane and hardstanding forms part of the work required under improvement conditions (IC 1 and IC8) in this permit. The operational area slopes towards an interceptor ditch to the west and south. This site surface water runoff goes via an oil interceptor to Tanners Brook. Management of the site surface water will be required to be reviewed under improvement condition IC7.

The main process area, including liquid storage (crude, chemicals and produced water) and process equipment are located in a reinforced concrete bund. The total capacity of this concrete containment bund is 485 m^3. Site containment will be required to be reviewed under improvement condition IC1 and bund restoration works are required under improvement condition IC9. Diesel fuel for the electric power generator and chemicals for routine production operations are also stored on site.

The purpose of this permit variation and consolidation application is to bring activities in line with our current onshore oil & gas sector guidance, August 2017.

The principal releases into the environment comprise of:

(a) Emissions of combustion gases (CO_2, CO, NOx) from emergency flare, the bath heaters, gas generator and diesel generator.

(b) Emissions to air of gaseous hydrocarbons from separation of volatiles in storage.

(c) Emissions of gaseous hydrocarbons from the road tanker by displacement on loading.

(d) Rainwater from the site discharges via an oil interceptor to Tanners Brook.

(e) Engineering waste resulting from maintenance work to a licensed waste disposal facility.

The installation has an Environment Management System. There is one European designated site within 10 km of the installation. There are no SSSIs or local wildlife sites within 2km.

Description of the changes introduced by the variation

This is a variation to add or change the following activities.

1) Installation activities, the existing oil storage and handling activities from the Portland Sand Formation have been changed to a section 1.2 Part A(1)(e)(i) activity under Chapter 1 of Part 2 of Schedule 1 to the Environmental Permitting (England and Wales) Regulations 2016, as a result of renumbering of the updated EP Regulations. The new proposed activity of oil and gas production from the Kimmeridge Clay Formation in borehole BRX4-Z cannot take place until the associated pre-operational condition (PO 01) specified in Table S1.4 has been approved. A number of directly associated activities have been added to the permit for the equipment on site, and emission limits set to comply with the Medium Combustion Plant Directive (where required). The surface water discharge to Tanners Brook (A9) is a directly associated activity of the main installation activity. There is also an improvement condition (IC9) added for improvement works to the storage bund as part of this permit variation in Table 1.3.

2) A mining waste operation, as defined by the Mining Waste Directive (2006/21/EC) and Schedule 20 to the Environmental Permitting (England and Wales) Regulations 2016, as amended, relating to the management of extractive waste not involving a mining waste facility. The permit is being varied to include activities specified by the approved waste management plan. This includes venting of gas from oil storage tanks and well workovers. Insufficient details were provided in the application on the well maintenance activities of acid washing and hot oiling, so this has been requested under pre-operational conditions PO 02 and PO 03 and these activities cannot take place until we have approved these pre-operational conditions. No matrix acidisation or acid fracturing takes place as specified in the approved waste management plan, which is an operating technique under table S1.2 in the permit. The previous mining waste standard rules permit (SR2015 No1) and waste management plan (Ref. WMP3) for the exploratory drilling of sidetrack BRX4-Z has also been consolidated as part of this variation. No new drilling activities are permitted under this variation and consolidation. A new permit application would be required for approval prior to this taking place. Similarly, a new permit application will be required for approval prior to any uses of acid within the well, other than the acid washing covered by pre-operational condition PO 02.

There are no groundwater activities authorised by this permit. Any reinjection of produced water and treated site surface water into borehole BRX3 will require a new application to be submitted to add this activity.

This permit variation and consolidation is part of an onshore oil and gas sector wide review. There are no other changes to the permit.

Key issues of the decision

Background

This variation is part of a sector wide permit review of onshore oil and gas sites. The variation to the permit is for continued operation of an existing conventional oil and gas production site. This variation does not permit any hydraulic fracturing as specified in Schedule 1 of the permit under Table S1.1, activity A9.

The operator previously held an installation permit as an onshore oil and gas production facility, unloading, handling or storage of crude oil, or treatment under the Pollution Prevention and Control (England and Wales) Regulations 2000. During 2008, these permits automatically became environmental permits under

the environmental permitting regime. This regime was expanded in 2010 and is now covered by the Environmental Permitting (England and Wales) Regulations 2016 (the 2016 Regulations).

Since 1 October 2013 we have taken the view that operators of new onshore oil and/or gas exploration or appraisal facilities require environmental permits where activities include:

- the management of extractive waste, whether or not this involves a waste facility (as a mining waste operation)
- flaring of waste gas using a flare which has the capacity to incinerate over 10 tonnes a day (as an installation)
- a water discharge activity
- a groundwater activity, such as an indirect discharge of pollutants as part of high pressure high volume hydraulic fracturing
- waste being managed that meets the thresholds for radioactivity set out in the 2016 Regulations (as a radioactive substances activity)

We now consider that the same environmental permits are required for existing onshore oil and/or gas facilities, in addition to the permit required for crude oil unloading, handling or storage, or treatment. This permit variation and consolidation brings these permits in line with the 2016 Regulations and the approach adopted for permits issued since 2013.

Installation Activities

Oil storage and handling has been changed to a section 1.2 Part A(1)(e)(i) activity under Chapter 1 of Part 2 of Schedule 1 to the Environmental Permitting (England and Wales) Regulations 2016, as a result of renumbering of schedule 1 activities in the updated EP regulations. The production from the Portland Sand Formation in borehole BRX2-Y was previously permitted as section 1.2 Part A(1)(h)(i) in the existing permit under earlier EP Regulations.

The production from the Kimmeridge Clay Formation in borehole BRX4-Z is a new activity under this variation and is subject to pre-operational condition PO 01 prior to commencing, to address outstanding information on gas management. Additional information on well maintenance, using acid washing and hot oil washing, that was not provided with the application or subsequent requests under schedule 5 notices and by email has been requested under pre-operational conditions PO 02 and PO 03. The oil storage and handling activities have been separated under Table S1.2 as the Kimmeridge Clay production activity (and related preparatory activities) are subject to the pre-operational conditions.

A number of new directly associated activities (DAAs) have been added to the permit to reflect existing and future activities on site in association with production from the Kimmeridge, and ensure compliance with the Medium Combustion Plant Directive (MCPD). This includes the existing diesel generator and bath heater for the Portland Sand production together with the proposed new gas engine, gas fired bath heater and emergency flare for the Kimmeridge Clay Production.

We have assessed the size of this equipment both individually and in combination and concluded that only the gas fired bath heater is greater than 1MW thermal input and therefore the Medium Combustion Plant Directive applies to this equipment only.

We have included pre-operational condition PO 01 to require the operator to submit further details for approval on the operating techniques that will be used for this new equipment prior to appraisal and production from the Kimmeridge Clay Formation commencing. We have also advised the operator that if the equipment on site changes in the future from that permitted under the variation, based on higher levels of gas encountered than currently anticipated then this will need to be reassessed and a permit variation required. The surface water discharge to Tanners Brook (A8) is a directly associated activity of the main Installation activity.

We are satisfied from the schedule 5 response that the use of the proposed flare on site is for emergency purposes only, in the event of over pressurisation. We have requested additional details on all emergency scenarios as part of the pre-operational condition PO 01 for this activity as this has not been provided in the

application. Usage of the flare when the generator fails for short periods is also considered as emergency use. Emergency Flares are not mining waste activities but a directly associated to the main installation activity of oil storage and handling. The management of the flare is in accordance with the general operational conditions as specified in condition 1.1.1 in accordance with our sector guidance, August 2017.

Gas management

The applicant has provided some details on gas management which is proposed for the Kimmeridge Clay Formation production in their application. As the level of detail on this equipment and operational procedures is insufficient, we have required additional information to be submitted for approval under pre-operational condition PO 01 prior to appraisal or production activities starting in the Kimmeridge Clay Formation.

Gas from BRX4Z will be utilised in a gas engine (0.93 MW thermal input) to generate electricity for use on site with surplus exported to the grid. Natural gas from the Kimmeridge will also be used to power a bath heater (1.53 MW thermal input) for heating the oil pipework and separation equipment. No information on this bath heater has been provided with the current application. There will also be a diesel generator on the site which has a thermal input of 0.25MW. The diesel generator is currently used to provide electricity to the site for production from the Portland Sand Formation. There is also an oil fired bath heater (0.34MW thermal input) associated with production from the Portland Sand Formation.

A flare will be available but will only be used for emergency situations. In the event that the gas engine was shut-down and it takes longer to shut the well in than to shut down the generator, the flare will be there to enable pressure relief if over pressurisation were to occur. The applicant has stated that uses of the flare would be in exceptional circumstances and not for routine use. This flare is to be used for emergency purposes only. Accordingly it is not to be used for the routine disposal of waste gas as a “hazardous waste incinerator” under section 5.1 of Schedule 1 to the 2016 EP Regulations, as amended. Therefore we have determined this flare to be a directly associated activity under this permit

We have set pre-operational condition PO 01 that requires the operator to submit for approval, a full list of emergency situations in which the flare could be used. This pre-operational condition must be approved before the start of any appraisal or production activities from the Kimmeridge Clay formation in BRX4-Z.

Oil storage tanks will have vents to atmosphere to allow pressure relief which will result in some gas being vented to atmosphere. The applicant stated that almost all of the gas will have been separated out in the separator prior to the oil storage tanks. However this should be confirmed with real operational data. There are also emissions on the oil separator, bath heaters and produced water tank as shown in the site plan under schedule 7 of the permit. We have therefore included IC4 and IC5 which will require the operator to monitor and provide data on air emissions and review further beneficial utilisation of the gas generated from the activities.

The gas engine has a thermal input of 0.93 MW thermal input so Medium Combustion Plant Directive (MCPD) requirements do not apply to this engine as it is below the 1MW threshold. We have limited the size of the engine to 0.93 MW in table S1.1 of the Permit. The diesel engine and oil fired bath heater are also below threshold for the MCPD to apply either separately or in combination as aggregated activities. The proposed gas fired bath heater for Kimmeridge production is above the 1 MW thermal threshold and therefore the MCPD will apply to this heater. We have set monitoring requirements in table S3.1 accordingly for this equipment as required. We have set hydrogen sulphide limits on the tank vents at 5mg/m3 under table S3.1 in the permit in line with the current permit for the site. The operator has confirmed in their schedule 5 response that they understand that if they require a larger gas engine for their BRX4-Z operations in future that they must apply for a permit variation to comply under the MCPD.

We have specified limits on the new gas engine and storage vents in line with our standard air monitoring requirements as part of re-permitting this sector. No limits have been specified for the diesel generator or oil fired bath heater due to the smaller scale of this equipment. We have also included improvement conditions to review emissions to air from all equipment on site under ICs 4 & 5, and to produce and implement a plan to reduce and minimise air emissions.

The operator has stated in their H1 air quality report by Socotec dated 6th June 2018 that the flare and gas engine will not be operated simultaneously, and hence separate H1 assessments have been provided for both scenarios of operation. We have specified this under the flare activity (A5) in table S1.1 of the permit.

The H1 assessment was updated in September 2018 following a schedule 5 request to include a worst case scenario for all equipment being in operation together for both the Portland Sand and Kimmeridge Clay production equipment. This includes the gas generator, diesel generator, oil fired bath heater and tank venting, but excludes the flare which would be operated separately and is subject to a separate report as described above.

The additional gas fired bath heater for production from the Kimmeridge which was submitted in the revised site plan with the operator's comments on the draft permit in November was not considered under the H1 assessments provided with the application. We have therefore required a new H1 assessment under pre-operational condition PO 01, which will consider all air emissions from the site including this new proposed equipment, prior to appraisal or production from the Kimmeridge Clay Formation.

Impact assessment – emissions to air

The applicant provided an impact assessment for emissions to air from the new gas engine and the emergency flare which are the main emission points. The impact assessments took the form of H1 screening and dispersion modelling. The assessments considered impacts on human and ecological receptors.

The H1 air quality reports provided in response to the schedule 5 responses (dated 6th June 2018 and 27th September 2018) assessed impacts on pollutants from the emergency flare, proposed gas engine, diesel generator, bath heaters and oil storage tanks.

Emissions of carbon monoxide, sulphur dioxide and nitrogen monoxide were screened out as insignificant, but nitrogen dioxide and volatile organic compounds required further assessment.

Based on an assessment of attenuation of process contributions with distance from the site using ADMS 5.2, it was concluded that neither nitrogen dioxide nor volatile organic compounds would have any significant air quality impact at the nearest location of human exposure, along a footpath to the east of the site, or at the nearest residential locations where air quality standards might be expected to apply.

The emergency flare was assessed separately. Based on H1 assessment criteria the process contributions of all pollutants were screened out from further consideration. Process contributions from the operation of the emergency flare are considered insignificant in relation to their impact on local air quality. In an emergency situation the flare will only be used for a period of 1 to 2 minutes prior to well shutdown.

We have checked the applicant's assessments and we agree with their conclusions that there will not be a significant impact at any human or ecological receptors. The new gas engine associated with BRX4-Z and the flare will not operate at the same time as the flare is for emergency use only. In any event our checks show that emissions would not be significant even if they did operate at the same time. We also took a very precautionary approach in our assessment in assuming that the flare operated continually throughout the year, whereas the operator stated that the flare would only operate for a few minutes at a time.

We consider that the emission limits included in the installation permit reflect the BAT for the sector. As part of this permit variation we have sought the opportunity for the operator to fully review their gas management practices to minimise air emissions and have therefore imposed additional requirements IC4 and IC6 in the permit to require these plans to be produced and approved once we are satisfied they meet BAT or an equivalent standard.

As above, In addition we have imposed a pre-operational condition PO 01 which requires a new H1 assessment to be provided for all emissions to air to capture any new equipment not provided in the application for approval prior to any appraisal or production activities (which would include the new proposed gas fired bath heater) in the Kimmeridge Clay Formation.

Mining Waste Activities

A Mining Waste Operation, as defined by the Mining Waste Directive (2006/21/EC) and Schedule 20 of the Environmental Permitting (England and Wales) Regulations 2016, as amended, relating to the management of extractive waste not involving a Mining Waste Facility. The permit is being varied to add a mining waste operation which includes activities specified by the approved Waste Management Plan.

This includes emissions from emergency flaring of gas, gas generator and oil fired bath heater and venting of gas from storage tanks and well workovers. Well maintenance activities hot oil washing and acid washing

are subject to pre-operational conditions PO 02 and PO 03 as not enough information was provided in order to register them as de minimis from a groundwater perspective.

The approved Waste Management Plan (WMP) which forms part of this permit (WMP version 3 submitted in 15th June 2018 in response to Schedule 5 notice) is an operating technique under table S1.2 of the permit. Any future changes to the WMP will require Environment Agency approval as specified in condition 2.3.1 of the permit.

A permit subject to the Mining Waste Directive covers the management of extractive waste generated during oil and gas production. This variation does not permit any hydraulic fracturing. We have specified this limit in Schedule 1 of the permit under Table S1.1, Activity A9.

This variation does not permit any form of stimulation (of the oil reservoir). The WMP clearly states that no matrix acidisation or acid fracturing will take place. These activities are therefore not permitted, as the mining waste activities are limited by the approved waste management plan in the operating techniques table S1.2.

The existing mining waste standard rules permit (SR2015 No1) was issued for the site for exploratory drilling of the sidetrack BRX4-Z. The operator has applied to consolidate this permit as part of this variation. This variation, which includes the consolidated standard rules permit, does not allow for the drilling of any additional wells or sidetracks. This standard rules permit only applies to the activities applied for under the original application (i.e. sidetrack BRX4-Z only). The mining waste activities included under this permit apply to routine maintenance activities described above and abandonment only. Any new/future drilling would require a separate application to vary the permit and submission of an updated waste management plan for approval.

Pre-operational conditions

We have included three pre-operational conditions in the permit to address information that was not submitted as part of the application. Pre operational condition (PO 01) is in relation to the gas management activities associated with the proposed production from the Kimmeridge Clay Formation.

This essentially requires the operator to submit an updated gas management plan to us for approval prior to any appraisal or production activities in the Kimmeridge Clay Formation starting. We have inserted this pre-operational condition in the permit as insufficient information has been provided by the operator under this application or our subsequent requests for more information under schedule 5 notice and by email correspondence.

We need to ensure that activities will be managed in accordance with our sector guidance and there will be no uncontrolled emissions to air, land and controlled waters as a result of the proposed appraisal and production from the Kimmeridge Clay Formation. We have also required a new H1 assessment to be carried out to assess the additional impact of the new gas fired bath heater activity on total emissions to air. The terms “Appraisal” and “production” are specified in schedule 6 of the permit and our onshore oil & gas sector guidance, August 2017.

Pre operational conditions PO 02 and PO 03 has been inserted to require additional details on the acid washing procedures and oil washing procedures which are typically carried out for well maintenance purposed, in order to assess whether they are de minimis from a groundwater perspective. We expect this to be the case, but require details on the typical volumes and frequency that these activities are carried out, as previously requested during the application. If they are not a new variation would be required to add them as a groundwater activity.

Improvement conditions

We have included a standard suite of improvement conditions (ICs1 to 8 inclusive) to bring the site in line with the rest of the oil and gas sector as part of our re-permitting review described above. The reasoning behind these generic conditions is explained in more detail below in our decision checklist. We have also included a site specific improvement condition IC9 to address some site improvement works which are required to bring the currently installed bund in line with our guidance and CIRIA C736 (2014) standard or equivalent. Whilst the bund is newly installed there were some subsequent penetrations made in the bund which prevent it providing an effective level of containment in the result of a spill. This IC is to ensure that improvement works are carried out to an appropriate standard as soon as possible to rectify this issue.

Groundwater Activities

A groundwater activity is defined in paragraph 3(1) of Schedule 22 to the 2016 EP Regulations. In general, a groundwater activity is defined as the discharge of a pollutant that results in the direct input of that pollutant to groundwater, or a discharge of a pollutant in circumstances that might lead to an indirect input of that pollutant to groundwater or any other discharge or activity that might lead to a direct or indirect input of a pollutant to groundwater.

Re-injection of produced water

The application for this site included a groundwater activity, to re-inject produced water resulting from the extraction of hydrocarbons from both the Portland Sand Formation and the Kimmeridge Clay Formation back in to the Portland Sand Formation. The Portland Sand Formation is located around 750m below ground level and contains groundwater. The re-injected process water would aid the production of oil from the oil reservoir in the Portland Sand Formation.

The discharge of produced water into groundwater within the oil bearing formation, in this specific case the Portland Sand Formation, is considered as a direct discharge to groundwater which is prohibited under the Water Framework Directive except under certain exemptions.

One of these exemptions is:

> The injection of water containing substances resulting from the operations for exploration and extraction of hydrocarbons or mining activities, and injection of water for technical reasons, into geological formations from which hydrocarbons or other substances have been extracted or into geological formations which for natural reasons are permanently unsuitable for other purposes, provided that the injection does not contain substances other than those resulting from the above operations.

A permit can only be granted provided it does not compromise the achievement of any of the environmental objectives relating to groundwater in Article 4 of the Water Framework Directive.

We have given detailed consideration to the proposal and we are not satisfied that the relevant environmental objectives set out in Article 4 of the Water Framework Directive will be met.

Having assessed the information provided in the application it appears that there may be a risk to the groundwater environment. As a result, after several requests for further information, and allowing additional time for further submissions, holding meetings with the applicant and their consultants and carefully reviewing the revised information, we have decided to remove the groundwater activity from the application. No groundwater activity is allowed in the new environmental permit for this site. Any subsequent proposals for a groundwater activity to re-inject produced water will require the applicant to apply for a variation to their environmental permit.

Having reviewed the information submitted in the September 2018 version 5 of the Hydrogeological Risk Assessment (HRA), in the light of the re-permitting process, we still had concerns regarding the proposals to continue re-injecting at this location using the existing well, infrastructure and the present procedures. The information required to complete an HRA to the correct standard for this site does not appear to exist at present. Our technical decision for removing the groundwater activity of re-injection is set out in more detail below:

Well integrity concerns

The operator proposed to carry out reinjection of produced water, which we would consider a groundwater activity. We would require the operator to maintain good well integrity, to monitor groundwater in the aquifer units within the first 400 metres below ground level and to have procedures in place to ensure the process runs smoothly to ensure that there would be no unplanned emissions to groundwater.

We operate using risk based assessments, so in the event of a site being in a naturally lower risk groundwater environment we can consider decreasing our requirements for groundwater monitoring in the event that an operator provides strong evidence of good well integrity and sound procedures that would enable them to confirm that the reinjection is going as expected and that any unplanned emissions can be

detected, reported, investigated and remediated. However as stated above we will not be authorising any groundwater activity under the permit being determined.

Groundwater monitoring

We require groundwater quality monitoring to be undertaken in aquifers around oil and gas sites where groundwater activities are proposed or occurring. In the event that an applicant or operator can demonstrate that the vulnerability of the environment is low and that they have adequate mitigation measures (physical engineered measures to ensure suitable well integrity as well as clear procedures) in place, we may consider that the need for groundwater monitoring is diminished or removed.

The operator is not proposing to install any groundwater monitoring boreholes or to carry out any groundwater monitoring at the Brockham site. As a result we require the integrity of the well to be suitable and for there to be clear procedures in place that will correctly enable the reinjection process to be monitored and procedures in place to identify and address any unplanned emissions to groundwater.

Well integrity data

With regards to well integrity for reinjection well BRX3 the revised HRA states, in Section 5.2.2 (Page 24), "BRX3 cementing data for BR3 is not available, but the diagram of the well in Appendix 3 and discussions with the operator indicate that the 7" casing will be cemented down to at least 600m TVD at the kick off point and is likely to be cemented below this depth towards the base of the well at 754.6m TVD." As with the previous HRA (June 2018) there is a schematic diagram of the proposed well, but no log to confirm the cementing of the well or the integrity of the well following installation.

We have requested information on the "as installed" well and its integrity prior to the re-permitting process commencing and during the re-permitting process. We last requested this information during a meeting with the operator and their consultants on 7 September 2018, however this information was not provided.

We have checked with colleagues in the Health and Safety Executive (HSE) to see if they hold information from the operator or from previous owners/ operators of the Brockham site (Midmar and Key) for the re-injection well. While they do have data for the site it does not provide clarification of the "as installed" well, cementing details or its integrity.

Operational procedures

In the absence of any proposed groundwater monitoring wells or information on the cementing or integrity of the "as installed" well, we requested detailed operating procedures for the reinjection process to ensure that it reinjection does not pose a risk to groundwater.

The operator has provided information on the procedures used at the site, however our review of the procedures raised some concerns.

They were primarily:

- According to the Well Integrity Procedure 3.2 for assessing the BRX3 Integrity testing, on Page 6 of 8:
    - the well head pressures are recorded pre-injection, each day or when injection is planned, the pump injection pressure is recorded every 10 bbls and pressures are graphed logged every quarter (i.e. every three months) to track if there are any pressure decreases that might indicate well integrity issues and trigger an investigation. We would expect that well head pressures were monitored before, during and after the reinjection of fluids and actively monitored against previous reinjection events to ensure that the systems were working in the manner expected and that there was not an unexpected increase or decrease in pressure that may show that there had been a loss in integrity. This would form a risk based procedure. Graphing and assessing the situation every three months (regardless of amount of reinjection) does not appear to provide a clear understanding of well integrity during re-injection periods.
    - a monthly test is carried out against the top packer in the side-track section of the well, which is completed with a 4 1/2"slotted liner, and the information is logged and recorded. While the written description describes this and we were concerned how a pressure test had been carried out against a slotted liner, we can see from the attached diagram that the section involved in the test is likely to

be limited to the length of liner that is not slotted. The procedure itself is not clearly a procedure, more a statement of what is carried out. The results would need to be assessed against the previous results of the test to ensure that the integrity was as expected.

- the annulus between the completion and the 7" casing is monitored at the surface with pressure gauges. According to the submission zero pressures have been observed on this annulus and so it will be possible to implement a monthly check on the pressure gauge to assess consistency, with the values being logged and recorded. We note that it appears that the operator normally observes that the pressure registers zero on the gauge, but until now there has been no procedure in place to review any changes. It appears that the procedure needs to be developed further to include a section to provide the site operative with clear instructions on what to do if something unexpected happens, for example the pressure gauge reads any different to zero. There also needs to be reference to the maintenance of the pressure gauge, to ensure that it is working. It is not clear whether the outer annuli are monitored during the procedure.

• The Water Injection Procedure for Brockham is newly developed so appears to have some gaps that will need to be filled. We noted the procedure:

- Is not clear how the water is transferred from where it is collected or stored to the re-injection well.
- is not clear what is meant by "ensuring the site is safe".
- reminds the operator to monitor and record the levels of fluids, pressures, volumes etc. mentioned in the integrity testing procedure but does not tell the operator how to check the information against what is expected, or what to do if they perceive there is a problem.
- only reviews the data every three months, rather than actively during and immediately after re-injection.
- focusses on not causing an adverse impact on the oil reservoir, rather than considering that the integrity of the wells and monitoring how this is maintained.

We had sufficient concern when assessing the procedures to request a second opinion on the procedures from the Health and Safety Executive (HSE). This was to check that our concerns over the procedures were reasonable and to ensure that our expectations were in line other professional organisations as well as providing a view from a third party in relation to assessments undertaken at other oil and gas production sites. The HSE response showed that they shared our concerns regarding the procedures and they also identified further concerns. The points made, and the questions raised, by the HSE show that our initial thoughts and concerns are valid.

In conclusion, the operating procedures for the Brockham site are not up to the required standard. They lack appropriate detail, do not demonstrate that appropriate management systems are in place and do not clearly show procedures that demonstrate that the integrity of the well is being maintained and the re-injection of fluids is behaving in the manner it is expected to during and post every re-injection event.

It is important to note that we do not have any specific information about an impact on the groundwater environment from the previous activities. However, the reinjection well, BRX-3 which is from BRX-1, were installed in 2007 and 1987 respectively and it is critical that appropriate infrastructure and procedures are in place to carry out reviews of the integrity.

Assessment of the Hydrogeological Risk Assessment

The HRA lacks the appropriate level of site specific information. This means that it has not been possible to justify why the operator does not need to install groundwater monitoring and undertake groundwater monitoring around their re-injection well. With an inadequate level of information to justify good well integrity and with inadequate management procedures in place to assess the re-injection activity means that the information submitted is insufficient for us to assess with that there are adequate safeguards in place to provide protection of the groundwater environment.

Final assessment of re-permitting for groundwater activity of re-injection of produced water

We cannot progress the application for the groundwater activity for the reinjection of produced water into the Portland Sand Formation based on the information provided and therefore this groundwater activity for re-injection cannot be included in the environmental permit. If the operator wishes to carry out re-injection they will need to apply for a permit variation, with the relevant details available, in line with the Onshore Oil and Gas Sector Guidance. We have explained this to the operator as part of the final determination.

Site membrane and containment systems

The site is partially underlain by an impermeable membrane and has areas where the site surface is concreted. Our assessment has shown that a new membrane was installed as part of the refurbishment of the site, but that there were no records of the extent of the installation available. Some testing was carried out in an attempt to prove the impermeable nature of the impermeable membrane. This has only partially answered the questions regarding the integrity of the membrane.

In addition to seeking clarity on the extent, effectiveness and the state of the lining systems the operators will also need to develop a regular inspection plan. As the site is underlain by Weald Clay, which will act as a natural hydrogeological barrier to protect the groundwater environment, there is no immediate risk to the environment via this pathway.

We have, therefore, included an improvement condition (IC8) in the new environmental permit, which will require the operator to clarify the condition of the existing site membrane and containment systems. As there is no perceived risk to the groundwater immediately beneath the site from leaks from the site surfacing, this has not been considered as a potential groundwater activity.

Similarly there is an improvement condition (IC1) to ensure that the containment systems at the site are compliant with CIRIA 736. This will help decrease the risk to the underlying soils and groundwater.

Chemical use on site

The operator has proposed to use biocides, corrosion inhibitors, pour point depressants and sulphide scavenger treatments at the site, as detailed in the Hydrogeological Risk Assessment.

We are satisfied that the proposed use of these particular chemicals is intrinsic to the oil production operations when they are used to aid production they remain within the well, or site infrastructure, and do not come into contact with the groundwater within the rock formations, namely the Portland Sandstone Formation or the Kimmeridge Formation.

We do not, therefore, consider the use of these chemicals as separate groundwater activities in their own right. Where they are used on site they end up being in the oil produced, that goes to the refinery, or in the produced water that, in this specific case, will need to go to an appropriately permitted / licenced site.

Acid washing

We have considered the proposals for acid washing as described in the waste management plan, both the June 2018 and September 2018 versions of the HRA and in a subsequent email (8th November 2018) and we have concluded that the proposals do not meet the groundwater activity exclusion as defined in Paragraph 3.3(b) of Schedule 22 to the Environmental Permitting Regulations 2016.

Insufficient and inadequate information has been provided by the operator to permit this activity or register it as de minimis under this application. The Hydrogeological Risk Assessment and the Waste Management Plan state, "*There are no plans to acid wash, unless the wells unless (sic) they do not flow, and hence the volume of acid required has not been calculated*".

In order to determine that the intended use meets the criteria for exclusion we need to understand the detail of the use of acid on a case-by-case basis, such as the intention behind the use, which formation it will be used in, the volume to be used, the concentration to be used, the details of the chemicals to be used (including any additives), the Material Safety Data Sheets (MSDS) and the frequency of use for the particular site in question.

In the event that the activity described does not meet the criteria for the exclusion from environmental permitting we need to decide if we can permit the activity or not. If there is uncertainty, due to lack of details

or information, we would take a precautionary approach and assume that the activity needs to be considered further.

In the HRA the substance suggested is Chemiphase Hydrochloric Acid 15% plus corrosion inhibitor Protekt-15 Plus, but following the email detailing the procedure suggests the following substances may be used:

- Pre-flush of 3% Potassium chloride brine containing Protekt 318 surfactant
- Acid treatment of ~125 bbls (20m^3) of 15% HCl (by weight) together with corrosion inhibitor of CT-17/02WT
- Iron control of TEKTDRILL-6070 including surfactants
- Displacement fluid and over-flush of 3% potassium chloride brine.

The information differs between the HRA (June or September versions) and the procedure (November 2018).

The MSDS sheets have not been submitted for the substances listed in the procedure. Having reviewed the names there are a mixture of ones that we have not assessed before and some that we have assessed at other sites. We need to determine whether they are considered hazardous or non-hazardous as defined by the Water Framework Directive (2000/60/EC). To do this we check the chemical details against the list, or the methodology, provided by Joint Agencies Groundwater Directive Advisory Group (JAGDAG).

The process detailed in the email of November 2018 is indicative only. There is no differentiation between the use of an acid wash in the Portland Formation and the Kimmeridge Clay Formation, although the operator will hold historic site information on the use in the Portland Formation and will be able to provide estimates for the Kimmeridge Clay Formation.

The email submitted also shows that the operator have not fully comprehended the risk to the groundwater and the associated pathways. There is a need to protect groundwater at depth, in the oil and gas reservoir itself (in this case both the Portland Formation and the Kimmeridge Clay Formation), as well as any groundwater in aquifers nearer the ground surface (in this case the Ashdown and Tunbridge Wells Sand Formations). The line, “Finally, the acid wash is carried out thousands of feet below the surface and away from any groundwater.” cannot be justified at this time.

We are therefore not satisfed that the information submitted allows us to determine that there is an exclusion from the definition of groundwater activity.

To allow for future acid washing for well maintenance purposes only, we have requested the necessary information be provided and approved under the pre-operational condition PO 02, prior to any acid washing taking place.

The *de minimis* assessment applies to acid washing only, and any other activities involving the use of acid in the well (e.g. for well stimulation) would need to be applied for and approved under a new application for this groundwater activity. This application did not include any other use of acid, other than an acid wash. The use of acid for well stimulation which is not authorised under this permit. A fuller description of PO 02 is outlined above in the section on Pre-Operational Conditions.

We have included Pre-Operational Condition PO 02 in the permit which requires the operator to submit an Acid Washing Plan before the use of acid for well maintenance under oil production activities A1 and A2. The Acid Washing Plan will require written approval from the Environment Agency confirming that any proposed acid wash meets the groundwater activity exclusion as described in Schedule 22 Paragraph 3.3(b) of the Environmental Permitting Regulations. Once approved the Acid Washing Plan will be incorporated into the permit as an Operating Technique in Table S1.2.

Hot oil washing

As with Acid washing above the operator has not provided sufficient details on the volumes and frequency of their hot oil procedure in order to register it as *de minimis*. We have therefore requested this information be submitted under pre-operational condition PO 03.

The operator has proposed to carry out hot oil washing as part of their well maintenance regime in their waste management plan. This involves heating crude oil (that has previously been extracted from the oil reservoir) and circulating it down the annulus between the production casing and the tubing, in through the

bottom of the tubing and then up the tubing to the surface. This serves to clean up any paraffin waxes and ashphaltines that have precipitated out on the downhole equipment, such as pumps, sucker rods and tubing. Once approved the Oil Washing Plan will be incorporated into the permit as an Operating Technique in Table S1.2

Gap Analysis

We have assessed the operator's gap analysis response which was received on 2 February 2018.

Initially we asked for clarification of whether the site was mothballed or in production and for the operator to inform us of their future intentions. The operator clarified the situation in March 2018. This resulted in us understanding that the proposed re-injection to the Portland Formation was for production support within the Portland Formation, and that the operator would not be required to provide a "permanently unsuitable" justification to cover re-injection proposals to the Portland Formation.

As a result of our review we have also specified the following improvements to the operator's management system under IC4 for the operator to review:

i) The procedure for identifying bund fill levels, e.g. high level alarm on unmanned sites

ii) The procedures for testing the impermeable membrane and subsequent remediation measures if required.

Any additional gaps have been addressed through improvement conditions and pre-operational conditions in this permit.

Schedule 5 responses

We requested additional information to be provided by 26 January 2018 and 7 June 2018 under schedule 5 notices issued on 16 November 2017 and 3 May 2018 respectively.

We also met with the applicant to request additional information which replaced the outstanding information required under these schedule 5 notices.

With the exception of the groundwater information provided in the Hydrogeological Risk Assessment (HRA) which has not been accepted in order to permit reinjection as a groundwater activity in this permit variation, we are satisfied that these notices have been complied with and sufficient information has been provided in order to determine the Permit.

Aside from the deficiencies in the HRA, any outstanding issues which have not been answered in sufficient detail under schedule 5 notices have either been included as part of our improvement programme under table S1.3 under the permit, or listed as an additional pre-operational condition prior to these activities occurring for future production from the Kimmeridge Clay in table S1.4.

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have identified information provided as part of the application that we consider to be confidential. We have excluded well log information provided as part of the Hydrogeological Risk Assessment from the public register as commercially sensitive. The decision was taken in accordance with our guidance on confidentiality.
Consultation	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was publicised on the GOV.UK website, and the final permit was published on the GOV.UK website, in line with our standard procedures and other oil and gas permits issued under the re-permitting process. We ensured that the local interested parties were aware of the consultation on the application. We consulted the following organisations: • Local Authority: Mole Valley District Council, including their Environmental Health Officer team • Food Standards Agency • Health and Safety Executive • Mineral Planning Authority: Surrey County Council • SES Water • Public Health England • Brockham Oil Watch (as well as neighbouring action groups Leith Hill Action Group and Norwood Hill Action Group) • Local Members of Parliament, District and Parish Councillors The comments and our responses are summarised in the consultation section. We considered this application to be of high public interest, and were originally planning to also consult on our draft decision as part of our “Minded to” procedure. However, due to the numbers of requests for information (including Schedule 5 notices) the application and determination process has taken a long time. The existing permit allows activities to continue at the site that we have concerns over, specifically the potential for re-injection activities to be carried out whilst we determine this application. The existing permit allows the continuation of activities that require more detailed plans or procedures to be in place, such as air quality monitoring, the use of a flare, the use of acid, containment systems and surface water monitoring for example. At present the use of the existing permit and the regulatory position statement mean that the operator can continue as they are until such time as we issue the new environmental permit. We have reached a point in the permit determination process were we are able to provide the operator with a revised permit, based on their application.

Aspect considered	Decision
	We have been receiving several information requests requiring us to explain the lack of controls available to us under the existing permit. In addition the public have launched a petition, currently with over 29 000 signatures. It calls on the Environment Agency and the local Member of Parliament to stop oil production and waste fluid reinjection until a modern environmental permit is in place, require monitoring of air and water quality before the Kimmeridge is tested or produced from, to disclose the type and quantity of acids and other chemicals to be used and to close any environmental loop-holes. The operator is keen to commence new activities, namely appraisal and production of the Kimmeridge Clay Formation. This could commence as early as December 2018. We are now in a position to issue the new environmental permit to bring the site up to a modern standard and so that the operator is clearer on what is required of them in the future and what activities they are permitted to undertake. Taking this into account, we have taken the decision to issue the permit now, without conducting an additional "minded to" stage with the public and stakeholders. This will mean that the permit is issued in advance of these new activities commencing to ensure they are effectively controlled under the new conditions (including pre-operational condition PO 01, PO 02 and PO 03) in the permit. While we have chosen not to undertake an additional consultation stage associated with the "minded to" decision, we recognise that the local community has a strong interest in the site and wish to see the details in the proposed new environmental permit to ensure that their environment is safeguarded. As a result we held a meeting with representatives of the local community on 13 November 2018 We explained all the technical issues to them, the reasoning behind the ways we have chosen to regulate the site and the decisions we have taken. There was time available to ask and respond to questions. We also explained that there will be other opportunities to comment in the future if the operator applies to vary the new environmental permit to include re-injection. Several questions were raised about our enforcement strategy and powers. Representatives were present from: • Brockham Oil Watch • Leith Hill Action Group • Local residents • Parish Councillors • District Councillors (Mole Valley) • County Councillors (Surrey) We also informed the following organisations: • Health and Safety Executive • Oil and Gas Authority • Mineral Planning Authority: Surrey County Council • SES Water • Public Health England • Local Members of Parliament • Sir Paul Beresford, Local MP for Mole Valley was also briefed although he wasn't present at the meeting on 13 November. The comments and our responses are summarised in the consultation section.
Operator	
Control of the facility	We are satisfied that the applicant (now the operator) is the person who will have control over the operation of the facility after the grant of the permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.

Aspect considered	Decision
The facility	
The regulated facility	We considered the extent and nature of the facility at the site in accordance with Regulatory Guidance Note RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN 2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1', guidance on waste recovery plans and permits. The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.
The site	
Extent of the site of the facility	The operator has provided plans which we consider are satisfactory, showing the extent of the site of the facility including emission and discharge points. The plan is included in the permit.
Site condition report	The operator has provided a description of the condition of the site. We have assessed the site condition report and concluded that it will need updating in order to comply with requirements of Article 22 of the Industrial Emissions Directive. We have therefore imposed an improvement condition IC8 requiring the operator to review and update their site condition report include at least the following: i) consideration of oil storage areas including oil storage vessels, bunds, loading and unloading areas and other potential sources of contamination as shown in the site location plan. ii) reference to any historical spillages, the chemicals involved and locations baseline soil sample results and groundwater data. We have included an improvement condition (IC8) in the permit to review the site condition report to ensure Article 22 of the Industrial Emissions Directive is complied with. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.
Waste management plan	The operator has provided a waste management plan which we consider is satisfactory. We have excluded any references to reinjection in this plan as no groundwater activities are authorised under this variation. We have also excluded references to acid washing and hot oil washing which are subject to pre-operational conditions PO 02 and PO 03 respectively.
Biodiversity, heritage, landscape and nature conservation	We consider that the application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified. These include Mole Gap to Reigate Escarpment SAC which is 4km North of the site. We have not consulted Natural England on the application. The decision was taken in accordance with our guidance. An assessment form has been completed for information. Emissions to air: The H1 air quality reports provided in response to the schedule 5 response (June 2018 and September 2018) assessed impacts on pollutants from the proposed emergency flare, gas engine, diesel generator, bath heater and oil storage tanks. It concluded that all emissions were either insignificant or didn't require further assessment. We are therefore satisfied that the activities will not have a likely significant effect on this SAC. We have requested an updated H1 air impact assessment to be provided under pre-operational condition PO 01 for any emissions from the new gas fired bath heater, which was not included with the previous H1 assessment. Emissions to water: The surface water discharge is for surface water from non-process areas of the site via an oil interceptor to the Tanners Brook. The discharge requires checks and monitoring (visual check for hydrocarbons, and chloride limit) prior to any release to the environment.

Aspect considered	Decision
Environmental risk assessment	
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator's risk assessment is satisfactory. This does not include the operator's hydrogeological risk assessment with which we are not satisfied with, and as a result are not permitting any groundwater activities under this variation. There will be no increase in emissions as a result of this variation, and consequently no increase in environmental risk.
Operating techniques	
Operating techniques Water Quality	We have reviewed the operator's Hydrogeological Risk Assessment (latest revision V5) and operating techniques proposed by the operator and compared these with the relevant technical guidance. We do not consider them to represent appropriate techniques for the facility, and based on a lack of information on the reinjection well BRX3 to confirm its integrity as described in detail under our key issues section above, we have taken the decision not to permit any groundwater activities at this site. We are not satisfied that the risks to groundwater have adequately been assessed and the proposed activities are not likely to have an adverse impact on the hydrological features in this area. To the extent that it might lead to a discharge of pollutants to groundwater (a "groundwater activity" under the EPR 2016), the Permit is subject to the requirements of Schedule 22, which delivers the requirements of EU Directives relating to pollution of groundwater. The Permit will require the taking of all necessary measures to prevent the input of any hazardous substances to groundwater, and to limit the input of non- hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfy the requirements of paragraph 6 of Schedule 22 to the 2016 EP Regulations and Article 6(1) Groundwater Daughter Directive. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit. In addition we have imposed condition 3.5.1 which requires the operator to monitor surface water quality. We have also specified several improvement conditions (IC1-9) and pre-operational conditions (PO 01, PO 02 and PO 03) to ensure the operations meet the requirements of our Onshore Oil and Gas Sector Guidance, August 2016. IC1 requires the operator to review their site containment in order to demonstrate there is no pollution risk to surface and groundwater. IC7 requires the operator review their surface water management and implement any agreed changes. PO 01 requires the operator to submit further information on the proposed appraisal and production from the Kimmeridge Clay Formation to ensure there are no uncontrolled emissions to air, land and controlled waters (groundwater and surface water). PO 02 requires the operator to submit further information for prior approval on the use of acid for acid washing activities for the purposes of well maintenance only. PO 03 requires the operator to submit further information for prior approval on the use of oil for oil washing activities for the purposes of well maintenance only.

Aspect considered	Decision
General operating techniques	We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit. This includes the requirement for the operator to provide a waste management plan and the information required within this. The waste management plan, including associated documents, has been assessed in accordance with these requirements and is approved subject to conditions. Condition 2.3.1 ensures that the operations are limited to those described in the WMP and in table S1.2. It also ensures that the operator follows the techniques set out and that any deviation will require our written approval. Any significant changes will require a formal variation of the permit. Where a condition imposes a specific requirement that will take precedence over anything in the plan. In addition we have specified additional improvement conditions as part of the permit review to ensure these operations continue to meet the requirements of our Onshore Oil and Gas Sector Guidance, August 2016.
Operating techniques for emissions that do not screen out as insignificant Installations	The applicant provided an impact assessment for emissions to air from the new gas engine and the emergency flare which are the main emission points. The impact assessments took the form of H1 screening and dispersion modelling. The assessments considered impacts on human and ecological receptors. The H1 air quality reports provided in response to the schedule 5 responses (dated 6 June 2018 and 27 September 2018) assessed impacts on pollutants from the emergency flare, proposed gas engine, diesel generator, bath heaters and oil storage tanks. Emissions of carbon monoxide, sulphur dioxide and nitrogen monoxide were screened out as insignificant, but nitrogen dioxide and volatile organic compounds required further assessment. Based on an assessment of attenuation of process contributions with distance from the site using ADMS 5.2, it was concluded that neither nitrogen dioxide nor volatile organic compounds would have any significant air quality impact at the nearest location of human exposure, along a footpath to the east of the site, or at the nearest residential locations where air quality standards might be expected to apply. The emergency flare was assessed separately. Based on H1 assessment criteria the process contributions of all pollutants from the flare were screened out from further consideration. Process contributions from the operation of the emergency flare are considered insignificant in relation to their impact on local air quality. In an emergency situation the flare will only be used for a period of 1 to 2 minutes prior to well shutdown. We have checked the applicant's assessments and we agree with their conclusions that there will not be a significant impact at any human or ecological receptors. The new gas engine associated with BRX4Z and the flare will not operate at the same time, the flare is for emergency use only. In any event our checks show that emissions would not be significant even if they did operate at the same time. We also took a very precautionary approach in our assessment in assuming that the flare operated continually throughout the year, whereas the operator stated that the flare would only operate for a few minutes at a time. We consider that the emission limits included in the installation permit reflect the BAT for the sector. As part of this permit variation we have sought the opportunity for the operator to fully review their gas management practices to minimise air emissions and have therefore imposed additional requirements IC5 and IC7 in the permit to require these plans to be produced and approved once we are satisfied they meet BAT or an equivalent standard.

Aspect considered	Decision
	In addition we have required a new H1 assessment to be provided for approval under pre-operational condition PO 01 for all emissions to air to capture any new equipment not provided in the application prior to any appraisal or production activities (which would include the new proposed gas fired bath heater) in the Kimmeridge Clay Formation.
Odour management	We have considered potential odour emissions from the activity during our determination. We do not consider that the activity will give rise to significant levels of odour. Condition 3.3.1 in the permit requires that emissions from the activities shall be free from odour at levels likely to cause pollution outside the site. We are satisfied that appropriate measures will be in place to manage odour. However, we have included condition 3.3.2 in the permit. This condition enables us to require the operator to submit a specific odour management plan, should odour become a problem. If a plan be required in the future, once we have assessed this plan as suitable, it will form part of the permit and the operator must carry out the activity in accordance with the approved techniques.
Noise management	We have considered emissions from noise and vibration during our determination. Whilst the existing permit has specific noise conditions we have not received any noise complaints from the site, and see no reason to justify setting site specific noise limits. We have updated the permit in line with other permits in this sector have to include the standard conditions/controls for noise. Condition 3.4.1 in the permit requires that emissions from the activities shall be free of noise and vibration at levels likely to cause pollution outside the site. We have included condition 3.4.2 in the permit. This condition enables us to require the operator to submit a specific noise and vibration management plan, should noise and vibration become a problem. If a plan is required in the future, once we have assessed this plan as suitable, it will form part of the permit and the operator must carry out the activity in accordance with the approved techniques.
Permit conditions	
Use of conditions other than those from the template	Based on the information in the application, we consider that we do not need to impose conditions other than those in our permit template.
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. We have also updated permit conditions to make reference to the most modern legislation. The conditions will provide the same level of protection as those in the previous permits.
Changes to the permit conditions due to an Environment Agency initiated variation	We have varied the permit as stated in the variation notice. This variation is required as the Environment Agency has a duty, under the Environmental Permitting (England and Wales) Regulations 2016, regulation 34(1), to periodically review permits. As a result of that review we have identified a number of necessary changes we must make to your permit to reflect current legislation and best practice. These changes principally relate to the improvement programme and pre-operational conditions specified in conditions 2.4 and 2.5 of the permit.

Aspect considered	Decision
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions. PO 01 requires confirmation of what equipment will be used for appraisal and production from the Kimmeridge Clay Formation. As production from the Kimmeridge Clay Formation has not yet started the pre operational condition also requires the details of the operational techniques to be employed by the operator to ensure that routine and emergency situations to be in place to ensure there are no unplanned/uncontrolled emissions to the environment to air, land or controlled waters. PO 02 requires the operator to submit further information for prior approval on the use of acid for acid washing activities for the purposes of well maintenance only. PO 03 requires the operator to submit further information for prior approval on the use of oil for oil washing activities for the purposes of well maintenance only. These pre-operational conditions are included in the permit due to insufficient details being provided by the operator in their application or in response to the Schedule 5 notices and subsequent requests for this information during determination.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that the standards of operation for the sector are consistent and reflect those currently required by newly permitted sites (since 2013) and meet the requirements of our Onshore Oil and Gas Sector Guidance, August 2016. The following ICs have included in this permit to address the gap analysis responses we received from operator to demonstrate compliance with our Onshore Oil and Gas Sector Guidance, August 2016. This is explained in our key issues above. **IC1 - Secondary and Tertiary Containment Review** Improvement condition IC1 is necessary to ensure that secondary and tertiary containment systems meet the standards required of a new oil and gas site. This will reduce the likelihood of any uncontrolled polluting discharges to the environment. **IC2 - Leak Detection and Repair Plan** Improvement condition IC2 is necessary because a leak detection and repair plan is needed to manage fugitive VOC emissions from potential leak points such as seals, flanges, pumps and valves. This standard technique is a method for identifying and prioritising potential sources of leaks, developing a leak detection and repair programme using the monitoring standard EN 15446 including assessing reductions in emissions resulting from the programme and estimation/calculation of any residual emissions. The EN 15446 method is described in the Refineries BREF (2015) as an available method for carrying out monitoring of fugitive emissions. Alternative but equivalent methods can be proposed. **IC3 - Environmental Management System Review** Improvement condition IC3 is necessary as based on the information submitted with the application we have identified a number of procedures that do not appear to be in place. This improvement condition requires the relevant procedures to be written into the Operator's management system, and to be adhered to. The management system will be subject to usual compliance audit in future. The specific management requirements include: i) The procedure for identifying bund fill levels, e.g. high level alarm on unmanned sites ii) The procedures for testing the impermeable membrane and subsequent remediation measures if required.

Aspect considered	Decision
	IC4 - Gas management Improvement condition IC4 is necessary as the operator does not appear currently to be applying appropriate measures for the management of waste gas arising from their production of hydrocarbons. Gas management is required as the impact of releasing large quantities of uncombusted hydrocarbons leads to a significant environmental impact which can be readily mitigated using available techniques. We have included improvement condition 4 which requires the operator to submit for written approval a plan identifying their identified method for reducing the impact of gas emissions to atmosphere. Gas management is necessary to reduce the environmental and human health impacts of emitting natural gas directly to atmosphere. We consider this condition necessary as although the volume of each individual emission is comparatively small, the quality of combustion employed in each case can significantly alter the levels of various pollutants ultimately present within the emission. By requiring ongoing emissions monitoring, this condition will ensure that the operator achieves, and then continues to operate their processes and equipment to an acceptable standard, and commensurately reduces their environmental impact to as low a level as is reasonably practical.
	IC5 - Air emissions monitoring Improvement condition IC5 is necessary as the site features emissions to air with the potential to cause pollution. We have applied improvement condition 5 to require the operator to undertake appropriate emissions monitoring from each of the emission points on the site to understand the current performance of the process/equipment which gives rise to the emission. We will use the results of this monitoring to determine whether the operator's processes and equipment minimises the emission to air to as low as reasonably achievable in line with best available techniques. Where appropriate, we will use these monitoring results to set appropriate assessment levels or compliance limits for the operator to comply with in future.
	IC6 - Vapour recovery Improvement condition IC6 is necessary as the operator does not appear to be currently complying with the requirement to capture and recover all hydrocarbon vapours arising from the loading and unloading of liquid hydrocarbons into vehicles. Vapour recovery is necessary both for safety reasons and also to reduce the environmental impacts of storing, loading, transporting and unloading hydrocarbons.
	IC7 - Surface water management Improvement condition IC7 is required because the operator has indicated that rainwater is not always being dealt with in accordance with requirements necessary to protect the environment from uncontrolled contaminated discharges of site surface water. The development of a plan to show how rainfall is managed to ensure the environment is not compromised, will clarify how the requirements are being met and how the environment is being protected.
	IC8 - Site Condition Report Review Improvement Condition IC8 is necessary because the operator is required to produce a Site Condition Report where there is a possibility of soil and groundwater contamination from activities that involve the use, production or release of a relevant hazardous substance, as defined in the Industrial Emissions Directive. The Operator has not provided a Site Condition Report with baseline data to confirm the current state of any soil and/or groundwater contamination, or confirmed that existing soil and groundwater data for the site enables a baseline to be defined for the site.

Aspect considered	Decision
	IC9 – Bund Improvement Plan Improvement Condition IC9 is necessary address site improvement works which are required to bring the currently installed bund in line with our guidance and CIRIA C736 (2014) standard or equivalent. Whilst the bund is newly installed there were some subsequent penetrations made in the bund which prevent it providing an effective level of containment in the result of a spill. This IC is to ensure that improvement works are carried out to an appropriate standard as soon as possible to rectify this issue.
Emission limits	We have considered emissions to air during the determination of the application. Fugitive emissions associated with the proposed activities will be at insignificant levels which are unlikely to cause negative impact on nearby receptors. ELVs equivalent parameters have been set for the following substances in Schedule 3 of the permit: Oxides of nitrogen, carbon monoxide, total volatile organic compounds (VOCs), engine gas feed flow rate, gas vented (calculation method) and hydrogen sulphide. For emissions to surface water we have included the existing emission limits as specified in the existing permit to control this emission: Maximum daily discharge volume, visible oil or grease and chloride
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. Condition 3.5 of the permit and table S3.1 requires the operator to monitor emissions to air from the gas engine, gas fired bath heater, and oil and produced water storage tank vents. The surface water discharge is also required to be monitored for chloride and visible oil and grease. In addition following approval of the surface water management plan under IC8, we will also require additional surface water monitoring under S3.5 under the permit. The operator will keep records of the data collected, which must be submitted to the Environment Agency on a regular basis. We made these decisions in accordance with the requirements of our Onshore Oil and Gas Sector Guidance, August 2016 and the Groundwater Directive and to baseline report required under the Industrial Emissions Directive. Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate as required under 3.5.3 of the permit.
Reporting	We have specified reporting in the permit. The reports will enable information on trends to be assessed and interventions to be carried out when required. We made these decisions in accordance with the requirements of our Onshore Oil and Gas Sector Guidance, August 2016 and the Groundwater Directive and to baseline report required under the Industrial Emissions Directive.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions. The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.

Aspect considered	Decision
Financial provision	We are satisfied that the waste from the site has properly been characterised as non-hazardous waste and that there is no mining waste facility for extractive waste. By virtue of paragraph 9(3) of Schedule 20 to the Environmental Permitting (England and Wales) Regulations 2016 the requirements mentioned in Article 2(3) of the MWD are waived. These requirements include the need for a financial guarantee for non-hazardous waste, unless deposited in a Category A facility.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.
	We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.
Further Legislation	
Schedule 22 to the EPR 2016 – Water Framework and Groundwater Daughter Directives	Even though no groundwater activity is being authorised, the Permit will require the taking of all necessary measures to prevent the input of any hazardous substances to groundwater, and to limit the input of non- hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfy the requirements of paragraph 6 of Schedule 22 to 2016 EP Regulations and Article 6(1) Groundwater Daughter Directive.
Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive through (inter alia) environmental permits, but we consider that existing conditions are sufficient in this regard, and no other appropriate requirements have been identified.

Consultation

The consultation requirements were identified in accordance with the Environmental Permitting Regulations 2016 and our public participation statement.

The application was publicised on the GOV.UK website, and the final permit was published on the GOV.UK website, in line with our standard procedures and other oil and gas permits issued under the re-permitting process.

We consulted the following organisations:

- Local Authority: Mole Valley District Council, including their Environmental Health Officer team
- Food Standards Agency
- Health and Safety Executive
- Mineral Planning Authority: Surrey County Council
- SES Water
- Public Health England
- Brockham Oil Watch (as well as neighbouring action groups Leith Hill Action Group and Norwood Hill Action Group)
- Local Members of Parliament, District and Parish Councillors

No objections were received from the statutory consultees whom we consulted, but some concerns were raised. Their specific comments, concerns and recommendations are summarised below. 30 comments were received from members of the public (18 objections and in 12 in support of the application) and 1 response was received from Brockham Oil Watch, and these have been dealt with as summarised below.

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public, and the way in which we have considered these in the determination process.

Responses from statutory consultees listed in the consultation section

Response received from
Surrey County Council, Mineral Planning Authority, 17th August 2017
Brief summary of issues raised
Outlined the planning history of the site and clarified that no planning permission in place for the drilling and production from Well BRX4-Z. Also no infrastructure on site since mothballed and planning approval required for plant, equipment or works.
Summary of actions taken or show how this has been covered
The production from Well BRX4-Z is subject to additional pre-operational conditions of this permit. We are in regular contact with the planning department to ensure there is no conflict between the permit requirements and the planning permissions/requirements.

Response received from
SES Water, 21st August 2017
Brief summary of issues raised
No objections to application, but concerns about integrity of existing bund, liner, concreted area and interceptor, monitoring prior to resuming production to ensure no risk of Surface Water or Groundwater pollution to River Mole or downstream leatherhead boreholes

Summary of actions taken or show how this has been covered
A number of conditions have been included to address these issues around containment and monitoring of discharges to ensure the environment is protected. The conditions are standard requirements across the sector and represent best available techniques for onshore oil and gas production activities.

Response received from
Public Health England, 23rd August 2017
Brief summary of issues raised
Recommended conditions to protect public health including, emissions of nitrogen dioxide and particulates to air from equipment - generators, flares, and fugitive emissions of volatile organics and hydrogen sulphide from storage tanks. Also requirement for accident management plan.
Summary of actions taken or show how this has been covered
The emissions and limits to air are detailed in schedule 3.this permit There is also an improvement programme to assess gas management and fugitive emissions (ICs 2, 5-7). Accident management plan requirements are specified in condition 1.1.1 of the permit.

Other Responses received

Response received from
Brockham Oil Watch (BOW), 1st September 2017
Brief summary of issues raised
We received a 19 page document which raised a number of concerns about a) the hydrogeological risk assessment (HRA), b) other comments on the application, c) the target formation and extraction method. Questions A1-7 are summarised as concerns over the level of detail provided in the operators hydrogeological risk assessment (HRA) which does not adequately assess the risk of the activities on underlying groundwater resources, potential seismicity and surface water receptors. Other concerns under section B; include Question 1 the limited resources of regulators for continuous supervision of fluid injections. Questions 2 and 3 related to concerns over water resources in the Weald area. Question B4 requested the need for a quantitative risk assessment. Question B5 requested to know the details around storage, handling and disposal of hazardous materials. Questions B6 & 7 related to concerns over the operator's environmental management system and no emergency action plan. Question B8 related to risk of surface water flood risk, which hasn't been explained in HRA. Question B9 questioned the operator's competency, attitude and financial position, Question 10 raised concerns about no limits being proposed on air emissions for methane and non- methane VOCs Questions in section C related to the target strata and extraction method Questions C1 to C7 are concerned with the site geology based on data obtained by BOW and the likelihood that techniques such as acidisation will need to be employed. .
Summary of actions taken or show how this has been covered
For Questions A1-7 we have raised similar concerns with the operator as part of our permit determination. We requested additional information to be provided in the HRA submissions via schedule 5 notices (V3 of the HRA was submitted by the applicant in June 2018) however our assessment showed that additional details were still required to demonstrate there will not be a risk to groundwater from the use of BRX3 for reinjection. As a result we have removed the groundwater activity for reinjection from the permit accordingly. We have also defined the extent of the mining waste activities permitted. We have specifically excluded hydraulic fracturing. Under B1- Well examination is under the remit of the HSE. In response to B2 and 3 we consulted SES Water formally on the application. Their comments are above and we have dealt with them as part of the permit determination, with specific conditions designed to protect both GW and SW, including monitoring and reporting to show no impacts

In response to B4 – We have accepted the operator's risk assessment. Additional controls have been put in the permit to minimise risk from environmental accidents (see response to Public Health England above). We have also put in a number of improvement conditions in line with the rest of the sector on site containment and leakage. HSE also regulate the site under risk to human health/site operatives for blowouts and other accidents

In response to B5 – Hazardous materials handled on site will be specified in the approved waste management plan for extractive waste. Chemicals intrinsic to production activities have been specified and will form part of the operator's general environmental management system. We have put limits and controls on handling as appropriate. There is also a separate Radioactive Substances Permit for handling of NORM (Naturally occurring radioactive materials) wastes on site. The permit ensures all chemicals/ hazardous materials and wastes are stored and disposed of appropriately in compliance with all relevant legislation.

In response to B6&7 – The permit requires an environmental management system (EMS) to be in place under condition 1.1.1. This will also include an accident management plan. These documents will continue to be assessed as part of the ongoing regulation of the site. The operator is not required to submit a full copy of the EMS for the permit application process, just a summary outlining the main points covered. In addition we have requested the EMS be updated under IC4

In response to B8 surface water risk. This has been considered as part of the determination. We are satisfied that the site does not sit in a flood risk zone. We have inserted an improvement condition (IC7) to manage surface water on site

In response to B9 regarding operator competence, we acknowledge issues with planning permissions in respect of this site and are in regular contact with other regulators to ensure our permit adequately controls the activities at the site. There are sufficient controls in the permit to ensure the operator will operate in a competent manner, and allow us to take measures to bring them into compliance as required. The new permit conditions will update the activities permitted and help ensure compliance. Financial provision is not required for this site as it is not a Category A or hazardous mining waste facility.

In response to B10, there is no limit for methane or non-methane VOCs from emissions from vent tanks currently in the permit, but we have required monitoring of volume of gas vented and put a limit on hydrogen sulphide (H_2S), in line with the existing permit held by the site. We have also included IC4 and IC5 which requires the operator to monitor and measure air emissions and come up with a gas management plan to minimise these emissions. Further work is currently being done at a national level in the Environment Agency to build on our current oil and gas sector guidance and provide more details for operators on the appropriate level for emissions to air from tank vents in accordance with best available techniques (BAT) for the sector.

In response to C1 and C2 the operator has not applied to stimulate the formation with acid or undertake any form of unconventional production. They are very clear that any acid treatment proposed is for well cleaning only as detailed in their application (waste management plan and Hydrogeological Risk Assessment (HRA)). Due to insufficient information being provided in the application on this we have included pre operational condition PO 02 to address this. Any unconventional well stimulation would require a separate permit variation and prior approval before taking place.

Representations from individual members of the public.

Brief summary of issues raised
30 responses were received from members of the public. 18 of these were in opposition to the application. There was also a number of responses (12) in support of the application. Of the opposition responses 13 were concerns regarding the operator's past history/attitude with local authority and regulators, general competency and financial standing and 5 were general objections to the oil and gas production activity taking place assuming this was a new application for a new site. One detailed response was concerned around the acid treatments, risk of the site from surface water flooding, storage of hazardous materials on sites and company suitability. Another detailed response was concerned around chemicals used in reinjection and acidisation activities and risks to public health. One general comment was also received in relation to appropriate planning controls being in place for this type of activity

Summary of actions taken or show how this has been covered
We have considered these responses as part of our permit determination and addressed these concerns as follows: We have put additional controls in this permit to ensure the site is operated in line with best available techniques (BAT) for the sector in line with our technical guidance, and to ensure that any pollution risk to air, land or water is minimised and managed appropriately. We have also considered the risks related to management of surface water at this location. We requested full details on the chemicals used at Brockham during the permit determination. We have also assessed the operator's Hydrogeological Risk Assessment and requested specific additional information in order to mitigate any risk to groundwater from these activities. We have addressed any remaining gaps with pre-operational conditions in the permit, except for reinjection itself which is a groundwater activity that we have decided to remove from this permit. We have also consulted with Public Health England (see above for their response and how we have addressed their comments). The comments on planning controls were not considered as they do not fall under our remit and we have consulted with the local planning authority as part of this permit application (see above for their response and how we have addressed their comments). The general objections to this application based on it being perceived as a new activity are not relevant as this is a variation to an existing oil and gas production operation. In addition any future changes to appraisal and production activities are subject to additional control via pre-operational conditions (PO 01, PO 02 and PO 03).