

Permitting decisions

Variation to permit

We have decided to issue the variation for Wytch Farm Oilfield, Gathering Station and Wellsites operated by Perenco UK Limited.

The variation number is EPR/NP3730CZ/V006.

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, 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 reflect current legislation and best practice. These changes principally relate to:

- Implementation of the Mining Waste Directive namely the variation of extractive waste management activities,
- Addition of groundwater activities;
- Variation of oil storage activities; and other installation activities
- Variation of the radioactive substances permit

The variation also aims to:

- Consolidate all previous variations to the original permit so as to bring them 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, for example as the result of a hydrogeological risk assessment review.
- 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 permit comprises of fourteen separate sites between Wareham and Swanage in Dorset. The primary site is the Gathering Station (NGR SY 975 850) with associated sites joined by pipeline including: wellsites A, 2B, X, D, F, G, K, L, M, Wareham C, Wareham D, Cleavel Point and Furzebrook. The Application was duly made on 11th July 2017.

We gave the Application the reference number EPR/NP3730CZ/V006. 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/NP3730CZ. 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 permit introductory note summarises what the permit covers.

Radioactive Substances

The Applicant also submitted a permit application for a variation to their radioactive substances activity Permit. This a separate permit in place for the handling of naturally occurring radioactive materials (NORM). This bespoke permit variation (VB3435DJ) is to review underground pipework and manage decommissioning of NORM wastes in line with best available techniques (BAT). This permit was issued on 07/12/2017. Please refer to the permit and separate decision document for more information.

Water abstraction

Whilst there is a directly associated activity in the permit for abstraction of seawater from Cleavel Point, as part of this permit review we have checked the source water from this abstraction from Poole Harbour, and whilst saline it also will contain some fresh water from some surrounding surface water inputs which drain into Poole Harbour. A separate water abstraction licence is likely to be required for this abstraction of water if greater than 20 m³ per day is abstracted for use in reinjection for production support. The operator has been advised under this permit review that they will need to apply for this abstraction permit separately as it is regulated under a separate regime.

Kimmeridge Wellsite

The main Gathering Station which is part of this permit also receives production fluids (crude oil and produced water) and extractive wastes from well workovers from Kimmeridge Wellsite (permit EPR-ZP3230CE) also operated by Perenco UK Ltd. This is all received by road tanker from the Kimmeridge Wellsite as unlike other adjoining wellsites, which form part of this permit, these are connected by pipeline.

COMAH (The Control Of Major Accident Hazards Regulations 2015)

The site is an existing COMAH site, which is jointly regulated by the Health and Safety Executive and the Environment Agency. The site falls under COMAH due to the quantities of LPG (liquefied petroleum gas) and crude oil processed on site. The last notification was made on 04/04/216 due to changes under the 2015 regulations. The permit introductory note includes the COMAH authorisation for completeness of other associated permits held by the site.

Brief outline of the process

Perenco UK Limited, 'the operator', holds a number of permits (within differing environmental regimes) for 'Wytch Farm' Installation, which is an on-shore crude oil extraction process (encompassing a number of individual wellsites connected via 'in-field' pipelines). There are 14 sites under this permit, including 11 wellsites with 70 production wells and 37 reinjection wells into 3 reservoirs: the Frome Clay Limestone, Bridport Sandstone and Sherwood Sandstone Formations.

Production activities in the Wytch Farm area include the Gathering Station, wellsites A, 2B, X, D, F, G, K, L, M, Wareham C, Wareham D, Cleavel Point and Furzebrook. The main activities are summarised below:

Table 1: Main Activities

| Site Name / Reference | Site Location (Grid Ref) | Description of process and activities | Emissions |
|---------------------------|--------------------------|--|--|
| Gathering Station | NGR SY 975 850 | 2 x 17.7MW Gas turbines with waste heat recovery unit (27MW) Emergency Flare (low temperature, low pressure and high pressure) gas odourisation, hydrochloric acid storage tank, nitrogen system, produced water storage tank, system 63 (oily water/sludge separation) system 51 (oil water separation) storm water discharge to Wytch Lake | Combustion NOx & CO |
| | | | Site rain water run off (emergency only) to Wytch Lake |
| Furzebrook | NGR SY 930 841 | Site office, old rail terminal, no production activities | No emissions |
| Well Site A | NGR SY 989 855 | 8 producing wells, 5 reinjection wells (2 into Sherwood Sandstone Formation and 3 into Bridport Sandstone Formation) 1 site surface water discharge to Fitchworth Copse Stream Oily water collection system Acid Stimulation of production wells in Cornbrash and Forest Marble Limestone Formation | Produced water reinjection Site surface rain water run off to Fitchworth Copse Stream |
| Well Site 2B | NGR SY 973 853 | 0 producing wells, 5 reinjection wells (3 into Sherwood Sandstone Formation and 2 into Bridport Sandstone Formation) 1 site surface discharge to soakaway | Produced water reinjection Site rain water run off to ground via soakaway |
| Well Site D Wytch Farm | NGR SY 995 856 | 3 producing wells, 1 reinjection well (into Bridport Sandstone Formation) Oily water collection system 1 site surface water discharge to Claywell stream Acid Stimulation of production wells in Cornbrash and Forest Marble Limestone Formation | Produced water reinjection Site rain water run off to Claywell stream |
| Well Site F | NGR SZ 010 857 | 16 production wells, 6 reinjection wells (5 into Sherwood Sandstone Formation and 1 into Bridport Sandstone Formation) 1 soakaway to be decommissioned Acid Stimulation of production wells in Cornbrash and Forest Marble Limestone and Frome Clay Limestone Formations | Produced water and site rain water run off collected for reinjection |
| Well Site G – Arne | NGR SY 957 870 | 3 producing wells, 1 reinjection well (into Bridport Sandstone Formation) | Produced water and site rain water |

| | | | |
|-----------------------------|----------------|---|--|
| | | 1 soakaway to be decommissioned Acid Stimulation of a production well in Cornbrash and Forest Marble Limestone Formation | run off collected for reinjection |
| Well Site K – Furzey Island | NGR SZ 010 870 | 6 producing wells, 8 reinjection wells (2 into Bridport Sandstone Formation, 3 into Sherwood Sandstone Formation and 3 into Frome Clay Limestone Formation) Oily water collection system 3 soakaways to be decommissioned Acid Stimulation of production and re-injection wells in Frome Clay Limestone Formations | Produced water and site rain water run off collected for reinjection |
| Well Site L – Furzey Island | NGR SZ 011 870 | 7 producing wells, 5 reinjection wells (3 into Sherwood Sandstone Formation and 2 into Frome Clay Limestone Formation) 4 soakaways to be decommissioned Acid Stimulation of production wells in Frome Clay Limestone Formation | Produced water and site rain water run off collected for reinjection |
| Well Site M | NGR SZ 010 859 | 12 producing wells, 6 reinjection wells (5 into Sherwood Sandstone Formation and 1 into Frome Clay Limestone Formation) 1 soakaway to be decommissioned Acid Stimulation of a production well and re-injection wells in Frome Clay Limestone Formation | Produced water and site rain water run off collected for reinjection |
| Well Site X | NGR SY 980 852 | 3 producing wells, no reinjection wells Oily water collection system 1 site surface discharge to ground Acid Stimulation of production wells in Cornbrash and Forest Marble Limestone Formation | Site rain water run off to ground via soakaway |
| Wareham C | NGR SY 905 872 | 8 producing wells, no reinjection wells 1 site surface discharge to ground Acid Stimulation of production wells in Cornbrash and Forest Marble Limestone Formation | Site rain water run off to ground via soakaway |
| Wareham D | NGR SY 897 875 | 5 producing wells, no reinjection wells 1 site surface discharge to ground Acid Stimulation of production wells in Cornbrash and Forest Marble Limestone Formation | Site rain water run off to ground via soakaway |
| Cleavel Point | NGR SZ 002 860 | Seawater abstraction and treatment prior to use for reinjection | Continuous backwash discharge to Poole Harbour |

There are 9 inactive wells, 7 of which are abandoned and 2 which are currently suspended. These are listed below. In addition, Wellsite B1 was decommissioned and restored in 2000 and doesn't form part of this permit.

Table 2: suspended and abandoned wells

| Well site | Well reference | Status |
|--------------|--------------------------|---|
| Well Site M | Well 1M-18, 1M-19 | Suspended wells |
| Well Site 2B | Well 2B-06SI, 2B-07SI | Abandoned except for wellhead |
| Wellsite F | Well 1F-03BP | Abandoned except for wellhead |
| Wareham C | Well WC-02 | Fully abandoned |
| Well Site 1B | Well 1B-01, 1B-02, 1B-03 | Abandoned. Site decommissioned and restored in 2000. Not part of the permit |

The Installation is located between Wareham and Swanage in an area of outstanding natural beauty and close to a number of Natura 2000 habitat sites comprising Special Protection Areas (SPA), Special Areas of Conservation (SAC) Ramsar, and Special Sites of Scientific Interest (SSSI). The installation is also close to the Jurassic Coast World Heritage Site.

Crude oil is extracted from several geological reservoirs at eleven well-sites (Wellsites A, 2B, D, F, Arne G, K, L, M, X, Wareham C (WC) and Wareham D (WD)) and transferred to the main Gathering Station via underground pipelines. Production is declining, but currently in the range of 14,000 barrels of oil equivalent per day. The crude oil is stabilised prior to distribution to the Hamble Oil Terminal via a 90km pipeline (not included within the extent of this Installation) for further refining. During stabilisation, produced water and gas are extracted. Gas is refined to produce:

- fuel gas, which is used within the two gas turbines located at the Gathering Station for heating and electricity generation,
- liquid petroleum gas (LPG), which is odourised and distributed by road tanker to customers, and
- a methane rich sales gas, which is odourised and passed to the national grid system.

Table S1.1 details the activities carried out.

- Activity AR1 concerns scheduled activity section 1.2 Part A(1)(a) for refining gas of Part 2, Chapter 1 of 'The Environmental Permitting (England & Wales) Regulations 2016'.
- Activity AR2 concerns scheduled activity section 1.2 Part A(1)(e)(i) for the collection and stabilisation of crude oil of Part 2, Chapter 1 of 'The Environmental Permitting (England & Wales) Regulations 2016'.
- Activity AR3 concerns scheduled activity section 1.2 Part B(a) for odourising gas of Part 2, Chapter 1 of 'The Environmental Permitting (England & Wales) Regulations 2016'.
- Activity AR4 concerns scheduled activity section 1.2 Part A(1)(a) for burning fuel in an appliance <50MW of Part 2, Chapter 1 of 'The Environmental Permitting (England & Wales) Regulations 2016'.
- Activities AR5 – AR15 concern Directly Associated Activities associated to listed activities AR1 – AR4 above, including site discharges to surface water.
- Activity AR16 concerns the management of extractive waste covered by a 'underground non-hazardous Mining Waste Facility and above ground hazardous Mining Waste Facility'.
- Activities AR17-AR25 concerns the re-injection of produced water as a groundwater activity.
- Activities AR26- A33 concerns the use of acid for well stimulation in production and re-injection boreholes as a groundwater activity
- Activities A34-A37 concerns the discharge of site surface water to ground via soakaway as a groundwater activity.

The main sources of emissions to air are from the flare (used for emergency and maintenance only) and 2 gas turbines (total 36 MWth input) via the waste heat recovery unit at the Gathering Station. Key emissions are nitrous oxides, carbon monoxide and carbon dioxide. Emissions from flaring are mitigated through operational control to minimise flaring. Emissions of nitrous oxides from the turbines are mitigated through the use of water injection. Other smaller point sources of air emissions include vents from storage tanks containing odourant and hydrochloric acid. Emissions are mitigated from these sources through the use of filters and scrubbers.

There are four discharges to surface waters, however only one would operate continuously, this being the backwash from the seawater abstraction points. All other releases to water are sampled and analysed to ensure limits are met prior to any discharge.

There are a number of discharges to groundwater. These include nine groundwater activities for reinjection of produced water for production support. The produced water is re-injected into the three reservoirs in order to support the reservoir pressure so that further oil can be extracted. Reservoir pressure is also supported through injection of abstracted seawater; abstraction occurs at one location within Poole Harbour.

There are eight groundwater activities for the use of acid for well stimulation. The acid is injected at the fracture pressure of the formation to create fractures which connect to the existing natural fracture network in the oil reservoir. The use of acid for stimulation of production and re-injection wells is controlled by the Hydrogeological Risk Assessment, Acid Stimulation Risk Assessment and the acid stimulation plan required under pre-operational condition PO 01. These documents are operating techniques under table S1.2 of the permit.

There are four discharges to soakaway of site surface water from the wellsites. These are all sampled and analysed to ensure limits are met prior to discharge. The remaining soakaways at the other five wellsites from the previous permit are no longer in operation, with surface drainage being collected, treated and used to supplement the reinjection of produced water. An improvement condition (IC9) has been included under this variation to ensure these are all decommissioned and will not present a future pollution pathway risk.

The site was previously permitted as a Category A mining waste facility for disposal of hazardous wastes from oil production activities as part of an earlier permit variation. Although permitted as a Category A facility since 2011, there have been no deposit of extractive wastes that meet this classification, and as part of this permit review and variation we have re-assessed the extent of the mining waste facilities and activities undertaken. We have re-defined them under this permit variation as an underground non-hazardous facility for historic deposit of water based muds in 2013, and non-hazardous spent acids (hydrochloric) used in reinjection wells which are not fully recovered from the Frome Clay Limestone reservoir. There is also an above ground mining waste operation and hazardous waste facility for treatment and storage of oily wastes from system 63 at the Gathering Station. System 63 receives rainwater and brines (seawater) contaminated with oil along with solids, with trace chemicals for processing and separation. This facility has an associated financial provision agreement in place for temporary storage of hazardous waste (condition 1.1.5). All the extractive wastes associated with oil production (including operational wastes, well workovers, maintenance, decommissioning, well stimulation and cleaning) are regulated under the permit conditions (Activity AR16 of Table S1.1) and the approved Waste Management Plan, which is an operating technique under table S1.2.

Previous changes as a result of past variations include:

Variation EPR/NP3730CZ/V003 was issued on 30/05/2013 to reflect the implementation of the Industrial Emissions Directive into England and Wales.

Variation EPR/NP3730CZ/V004, issued on 11/03/2014, incorporated a number of changes including minor amendment to Table S1.1, the removal of the Emission Limit Value (ELV) for carbon monoxide from emission point A3 and amendments to the ELV for chloride from emission points W3 and W5.

The last variation EPR/NP3730CZ/V005, issued on 02/08/2017, incorporated a number of changes as a result of the refineries sector review.

This variation was carried out under an onshore oil and gas sector review. All activities are consolidated into this variation with the exception of radioactive substances which has also been varied under this review and any water abstraction activities which are authorised under separate standalone permits.

The schedules specify the changes made to the permit.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Description of the changes introduced by the variation

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

1. The installation activities. These activities on site haven't changed but the regulation of them under the Environmental Permitting Regulations now includes four separately listed activities and seven

Directly Associated Activities (DAAs), including flaring for emergency purposes only. The main installation listed activities are for: oil storage and handling, refining gas, odourising gas, and burning fuel in a turbine (less than 50MW thermal input), under Part 2 Schedules 1.1 and 1.2 of the Environmental Permitting (England and Wales) Regulations 2016. There are also four discharges of site surface water to surface water which are not standalone water discharges and are DAAs of the main installation activity.

2. The existing permitted activities for mining waste operations including a Category A mining waste facility as defined by the Mining Waste Directive and Schedule 20 of the Environmental Permitting (England and Wales) Regulations 2016 as amended. These activities have been reassessed under this permit review and variation. As a result the Category A mining waste facility status has been removed, and the activities authorised by this permit variation now fully reflect the site activities. These include an underground non-hazardous mining waste facility for historic deposit of water based muds, and for spent (hydrochloric) acid used in reinjection wells which is not fully recovered from the Frome Clay Limestone reservoir. There is also an above ground mining waste operation and hazardous waste facility for treatment and storage of oily wastes from system 63 at the Gathering Station. This facility has an associated financial provision agreement in place for temporary storage of hazardous waste (condition 1.1.5). The mining waste activities are regulated under the permit conditions and approved Waste Management Plan which is an operating technique in table S1.2 of this permit.
3. Groundwater activities, as defined by the Groundwater Directive and Schedule 22 of the Environmental Permitting (England and Wales) Regulations 2016 as amended for existing site activities. These include nine groundwater activities for reinjection of produced water for production support, eight groundwater activities for the use of acid for well stimulation and four groundwater activities for discharges of site surface water to ground via soakaway. A number of soakaways are no longer used at five well sites, and will be de-commissioned, with the collected site surface water collected, treated and used to supplement reinjection of produced water. The groundwater activities are regulated under the permit conditions, and approved Hydrogeological Risk Assessment, which is an operating technique under table S1.2 of this permit. The acid stimulation activities are subject to a pre-operational condition (PO 01) for approval of an acid stimulation plan submitted by the operator, prior to these taking place. Well maintenance treatments have also been assessed and registered in accordance with the groundwater activity exclusion paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Key issues of the decision

Installation Activities

The Installation activities covered by this permit are:

The refining of gas under S1.2A(1)(a) remains a listed A1 activity. As the operator is no longer producing sales gas, the limits of specified activity column has been changed to fuel gas accordingly.

The oil storage and handling activity under S1.2A(1)(e)(i) remains the same. The limits of specified activity column has been updated to reflect the current standard requirement wording for the sector and align with the standard rules permit for onshore oil and gas storage and handling (SR2015 No2).

Odourising gas under S1.2B(a) as a part B activity and has not changed under this variation.

Burning fuel gas in two gas turbines and use of a waste heat recovery unit has been changed from a directly associated activity to a part B activity under S1.1B(a)(iii) due to the engine size. The site activity has not changed but the activity has been updated under the EPR Regulations and medium combustion plant Directive.

We have also assessed emissions from these engines and continued to apply the current limits for Nitrogen Oxide and Carbon Monoxide from the current permit issued under the refineries sector review. We have also

considered Sulphur dioxide but decided no limit was applicable. The gas turbines only burn natural gas that meets supply standards. The Gas Safety (Management) Regulation 1996 set a maximum total sulphur content of 50mg/m^3. At this level it would be impossible to exceed the Medium Combustion Plant Directive limit of 15mg/Nm^3 once allowable dilution by combustion air (reference conditions) is taken into account. Reference conditions provide approximately 40x dilution therefore the maximum Sulphur dioxide emission would be approximately 1.25mg/m^3 . Based on this, we have concluded there is no benefit in setting an emission limit for Sulphur dioxide.

Flaring was originally considered under this application to be an Installation activity for hazardous waste disposal due to the flares occasional use for disposing of off spec sales gas, alongside its main emergency role, but the operator has subsequently changed their operations in and confirmed that sales gas is no longer produced. This was confirmed in their waste management plan (revision 3.0, originally submitted in May 2019), and is part of the final approved version (revision 6) dated May 2020. We have therefore agreed with the operator's assessment and consider the flare to be classed as emergency only and therefore is a Directly Associated Activity of the main installation. Whilst there are no emission limits on the flare, we have required the operator to calculate emissions and flow rate and inserted improvement conditions for gas management and efficient use of the flare (Improvement conditions ICs 5&6) to ensure that gas continues to be managed using Best Available Techniques (BAT). We have also included a site specific management plan review under IC4 which will require the operator to review and reduce the amount of gas combusted in the flare for purging purposes.

Site Address

Whilst the permitted area and number of wellsites has remained the same we have updated the site address under this permit to the main Gathering Station, rather than the Furzebrook site which is an office address with no production activities, as this reflects more clearly where the main activities under this permit are taking place.

Mining Waste Activities

Category A Mining waste facility

As part of this oil and gas sector permit review we have re-assessed the current classification of the existing mining waste activities taking place at the site and have re-defined them to more accurately reflect them in line with the Mining Waste Directive and our sector guidance.

The site is currently permitted as a mining waste operation including a Category A facility. This was carried out under an earlier permit variation in 2011 to allow the operator to reinject a range of extractive wastes including hazardous oily cuttings and liquid wastes from drilling operations as part of a future well drilling program at the site. We have asked the operator to investigate the extractive waste produced under this drilling program and they have confirmed that the no hazardous extractive wastes have been deposited underground at any of the wellsites under this permit, and the majority of extractive wastes from drilling activities were sent offsite for disposal.

Underground Mining Waste activities and facilities

The operator has confirmed that the only extractive wastes deposited below ground since the 2011 variation was issued were in 2013 at wellsite L. The operator has classified these extractive wastes (water based muds) using WM3 as non hazardous.

In addition the operator has also classified their spent acid (hydrochloric) resulting from the acid stimulation of reinjection wells as extractive waste and therefore also included this as an underground non-hazardous mining waste facility. This is because acid used in reinjection wells is not immediately back produced as for production wells, and therefore has a greater potential to enter the oil reservoir and not be fully recovered. For precautionary reasons the operator has designated the entire Frome Clay Limestone reservoir as the extent of the facility, but in reality the amount of spent acid from dissolution of the limestone that remains in

the reservoir is likely to be minimal, but due to their being no equivalent de-minimis arrangement under the Mining Waste Directive it is included here. These activities are covered under AR16 in tables S1.1 and S1.2 which includes the approved waste management plan (May 2020) as an operating technique under the permit.

The operator has also described the use of small quantities of xylene/diesel in their waste management plan for well cleaning to remove waxy sludge from reinjection wells. We have considered this activity under the Mining Waste Directive and have concluded that the xylene and diesel that enter the formation will partition back into the oil phase within the reservoir and be recovered as part of routine oil production. The xylene/diesel will not be discarded and therefore does not become extractive waste under the Directive. This process is included in the operators waste management plan for completeness and transparency on the activities and substances which are used on site.

Above ground Mining waste activities and facilities

In addition at the main Gathering Station there is a crude oil/ water separation system known as system 63. We have also considered any requirements under the Waste Framework Directive for the operation of system 63, but as the Mining Waste Directive applies the Waste Framework Directive doesn't by virtue of Article 2(1)(b)(ii) of the Waste Framework Directive, therefore the treatment activity is characterised as a mining waste operation rather than a waste management operation.

The system 63 treatment process is classed as a hazardous mining waste activity with storage of residual hazardous oily sludge classed as a hazardous mining waste facility. The capacity of system 63 is around 73 tonnes for oily water with around 2 tonnes of oil sludges being produced per year from the separation process.

The oily sludge is stored in drums on site temporarily for between 7-90 days whilst being sampled for naturally occurring radioactive materials (NORM) prior to offsite disposal. The NORM accumulation (temporary storage for up to 3 months), testing and disposal is regulated under a separate radioactive substances permit as shown in the introductory note. The storage area is classed as a hazardous waste mining facility, as stored oily sludge is classed as hazardous extractive waste and there is no minimum storage/retention time for hazardous wastes under the Mining Waste Directive. This above ground hazardous mining waste facility is not classed as a category A facility. This is because the nature of the facility is neither a heap nor a dam and no wastes are to be left in the facility at the end of the period of operation, as explained under Article 7 of the EU decision on classification of waste facilities (20.04.2009). All wastes are temporarily stored prior to offsite disposal and there is no permanent deposit of wastes from system 63. The separated and recovered oil and water fractions are not classed as wastes as they are either added to the oil production tanks or used for reinjection for production support accordingly.

As such there is no category A mining waste facility at this site and the extractive waste management activities previously permitted have been amended under this variation in line with the updated waste management plan (Version 6, received in May 2020) to reflect the extractive waste management activities on site. This is consistent with the approach we have taken for other oil and gas operators in this sector.

The presence of a hazardous mining waste facility requires that financial provision be in place to cover the expense of removal of this hazardous waste if required, in the event of the oil production ceasing at the site. This includes any drummed oily waste and liquid waste in System 63. Whilst the previous permit also required financial provision for the Category A facility, this had not been put in place, due to the previous uncertainty as to the extent of any hazardous mining waste facilities on site. Following this permit review financial provision has been put in place in accordance with condition 1.1.5 of this permit.

Groundwater

A groundwater activity, in general terms, is defined in Schedule 22 of the 2016 Regulations as meaning 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.

There are 21 groundwater activities specified in the permit as a result of this permit review. These include 9 activities for reinjection of produced water resulting from the extraction of hydrocarbons into the Frome Clay Limestone, Bridport Sandstone and Sherwood Sandstone Formations for production support. There are 8 groundwater activities for acid stimulation of the oil production wells in the Cornbrash, Forest Marble and Frome Clay Limestone and reinjection wells in the Frome Clay Limestone. There are also 4 activities for discharge of treated site surface water to ground via soakaway at wellsites 2B, X, Wareham C and Wareham D.

Re-injection of produced water

The discharge of produced water into groundwater within an oil bearing formation, in this specific case the Frome Clay Limestone, Bridport Sandstone and Sherwood Sandstone Formations, is 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.

We are satisfied that the re-injection of produced water into Frome Clay Limestone, Bridport Sandstone and Sherwood Sandstone Formations meets the above exemption. 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 proposals and we are satisfied that the relevant environmental objectives set out in Article 4 of the Water Framework Directive will be met.

We have reviewed the Hydrogeological Risk Assessment (HRA) submitted with the supporting documents against our information and conceptual understanding of the location. We are satisfied that the potential risks to groundwater have been identified and addressed through mitigation measures and controls specified in this permit. This includes a requirement for a revised groundwater monitoring plan to be carried out under Improvement Condition 3 to ensure that the risk of pollution from re-injection of produced water continues to be assessed throughout the lifetime of the permit. We have also included the following limits and conditions in the permit to mitigate against any potential pollution of groundwater:

- A limit on the maximum volume of produced water that can be discharged per day for each groundwater activity. The operator is required to monitor the volumes and rate of discharge and report this to us every 6 months
- A requirement for the operator to report annually a summary of the well integrity for all re-injection wells to verify there has been no escape of fluids from the re-injection wells

Production Chemical use on site

The operator uses a biocide, demulsifier, corrosion inhibitors, oxygen scavenger and cobalt catalyst at various stages in the oil production process, as detailed in the Hydrogeological Risk Assessment (v8, May 2020). These chemicals are added in minor quantities to production fluids, produced water, and abstracted sea water to prevent scale build up and bacterial growth, corrosion and to remove oxygen from seawater.

We are satisfied that the use of these chemicals as detailed in the HRA are intrinsic to the oil production operations and where present in produced water will not have a discernible impact on groundwater in the oil bearing formations. We do not, therefore, consider the use of these chemicals as separate groundwater activities in their own right. We have included an annual reporting requirement in the permit for the operator

to report the volumes of process chemicals used throughout the year to ensure this is in accordance with the approved HRA.

Acid Stimulation

The operator carries out acid stimulation periodically in the Cornbrash and Forest Marble Limestone and the Frome Clay Limestone oil reservoirs. The purpose of acid stimulation is to increase the permeability around the well and enhance oil production. Acid stimulation may also be undertaken on re-injection wells in the Frome Clay Limestone to aid the re-injection of produced water. The acid stimulation is designed so that fractures are created in the target formation that extend approximately 6 to 10m laterally from the well.

Acid Stimulation involves pumping an acid solution from the surface into the well. The injection pressure is increased until the fracture pressure of the formation is reached. Fractures are created to allow the well to connect to the existing fracture network in the formation and the injection pressure is maintained to hold the fractures open. The acid etches or dissolves the rock in a non-uniform manner to create enhanced flow channels. These flow channels remain open after the injection pressure has been reduced and the fracture closes.

The acid spends in the reservoir and is converted to calcium chloride (a salt), carbon dioxide and water. Where the acid stimulation is undertaken on a production well the by products are recovered to the surface when the well is started up and produced through the production facilities. Where the acid stimulation is undertaken on a re-injection well, the by-products remain in the reservoir. There are four re-injection wells constructed into the Frome Clay Limestone where acid stimulation may be carried out. The acid by products will not be recovered and will remain in the Frome Clay Limestone. As these by products are not fully recovered from the reinjection wells they will become extractive waste and therefore are included as part of the underground mining waste facility covered in the section above.

The acid solution consists of 28% Hydrochloric Acid (HCl), acetic acid for iron control, citric acid an iron sequestering agent, sodium carbonate for pH control and a corrosion inhibitor. 28% HCl is used in the acid stimulation because it results in increased production rates compared to 15% HCl. The corrosion inhibitor is also necessary to prevent the acid damaging the metal tubing and casing in the well and at the well head during any acid stimulation.

Based on the information presented, we have determined the acid stimulation in the Cornbrash and Forest Marble Limestone and Frome Clay Limestone to be a groundwater activity. We consider that this activity does meet the definition of a groundwater activity under paragraph 3(1) of Schedule 22 of Schedule 22 EPR 2016 in that the acid stimulation involves the discharge of an acid solution which, without control measures might lead to an indirect input of pollutants to groundwater.

There are 8 groundwater activities in the permit for acid stimulation in Cornbrash and Forest Marble Limestone and Frome Clay Limestone Formation. The purpose of the permit is to ensure control measures are in place that will prevent inputs of pollutants and pollution of groundwater. The target formations where acid stimulation will be carried out is the Cornbrash and Forest Marble Limestone and the Frome Clay Limestone. The Cornbrash and Forest Marble Limestone is present approximately 639 metres below ground level (m bgl) and have a combined thickness of up to 45m. They have the same oil column and the perforated sections of the production wells is across both Limestones.

The Frome Clay Limestone is present at approximately 790m bgl and underlies the Cornbrash and Forest Marble Limestones. In the Wytch Farm field, the Frome Clay Limestone is a sub- circular mound feature between 40 to 50m thick.

In the Wytch Farm oilfield, the Cornbrash and Forest Marble Limestone and Frome Clay Limestone do not contain groundwater. Petrophysical logging carried out by the operator shows that the target formations contain oil and no groundwater. Produced water is injected into the Frome Clay Limestone to support the production of hydrocarbons, however the formation does not contain groundwater.

The Kellaways Beds overlie Cornbrash and Forest Marble Limestones and are approximately 12m thick across the field. The Kellaways Beds consist of very fine mudstones in lower part passing through to siltstone interbedded with mudstone and into fine grained sandstone and siltstone in the upper part. The Kellaways Beds are oil saturated and has the same oil column as the Cornbrash and Forest Marble Limestone. The Kellaways Beds do not contain groundwater in the Wytch Farm field.

The Oxford Clay overlies the Kellaways Beds and varies in thickness between 80m – 180m. The Oxford Clay is the main sealing formation for the Cornbrash, Forest Marble and Frome Clay Limestone. The Oxford Clay is a clay rich sequence with interbedded mudstones and fine grained siltstone and is impermeable. The impermeable nature of the Oxford Clay has prevented the upward migration of oil to the surface trapping it in the underlying more permeable formations of the Kellaways Beds, Cornbrash and Forest Marble Limestone and Frome Clay Limestone.

The production and re-injection wells in the Wytch Farm oilfield penetrate the Chalk Group at approximately 140m bgl and Upper Greensand Formation at approximately 500m bgl. The Chalk Group includes the Portsdown Chalk, Seaford Chalk, Holywell Nodular Chalk and Zig Zag Chalk Formations. The Upper Greensand Formation is present below the Chalk Group. Both the Chalk Group and Upper Greensand Formations are classed as Principal Aquifers under the Environment Agency's Protect Groundwater and Prevent Groundwater Pollution Guidance. They contain groundwater and at the surface are capable of providing significant quantities of drinking water. Whilst they are present at depth below the Wytch Farm Field and confined they require significant protection from pollution

The operator has submitted a Hydrogeological Risk Assessment and Acid Stimulation Risk Assessment which gives detailed consideration to the subsurface environment and evaluates the risk to groundwater from acid stimulation.

The Acid Stimulation Risk Assessment details how acid stimulation is carried out to prevent any induced fractures from acid stimulation extending upwards through the Oxford Clay. One of the main controls is the maximum surface injection pressure of the acid solution is limited so that it does not exceed the fracture gradient of the Oxford Clay seal.

Additional mitigation measures undertaken by the operator include a review of well integrity before acid stimulation is carried out on a well to ensure that acid stimulation is only carried out on a well with good production and intermediate casing and shoe integrity. The operator will also monitor the A and B annulus pressures throughout acid stimulation to identify any potential failure of the production or intermediate casing.

There is no evidence of any adverse impacts from acid stimulation to date which has been undertaken since 1991 in the Frome Clay Limestone and 2015 in the Cornbrash and Forest Marble Limestones. The presence of at least 80m of impermeable Oxford Clay, operating techniques and permit conditions will ensure induced fractures from acid stimulation will be contained in the Cornbrash, Forest Marble and Frome Clay Limestone Formations.

Permit Conditions

The groundwater activity permit conditions are designed to ensure the acid stimulation activities are controlled and monitored so the acid solution and fractures do not migrate out of the target formations.

We have included the following limits and conditions in the permit:

- Acid stimulation can only be carried out in the Cornbrash and Forest Marble Limestone and Frome Clay Limestone Formations
- The operator can only discharge a maximum volume of 66m³ during an acid stimulation on a vertical well and 496m³ in an extended reach well
- The rate of discharge is limited to 13 litres per second from the Cornbrash and Forest Marble Limestone and 21 litres per second for the Frome Clay Limestone. The operator is required to monitor the rate of discharge during acid stimulation and report this to us every six months.
- Surface Injection pressure is limited to 800psi and will need to be monitored throughout an acid stimulation treatment. This is based on the average fracture gradient of the Oxford Clay obtained from Leak Off Tests. This is the maximum surface pressure that acid can be discharged during acid stimulation to prevent fracturing the Oxford Clay sealing layer. The permit includes a requirement to report the surface injection pressure during an acid treatment every six months.

We have also included preoperational condition PO 01 in the permit which requires the operator to submit an Acid Stimulation Plan before each acid stimulation. The Acid Stimulation Plan requires the operator to collect additional information to demonstrate that any acid stimulation activities are carried out in line with the approved Hydrogeological Risk Assessment and Acid Stimulation Risk Assessment.

The Acid Stimulation Plan will need to:

- confirm the lateral and vertical extent faults present in the target formations and their locations with respect to the wells where acid stimulation will be carried out
- confirm the geomechanical properties of the Cornbrash and Forest Marble Limestone from field step tests because field data from the Cornbrash and Forest Marble Limestone has not been collected previously
- include details of the modelling used to predict the fracture extent of the proposed acid stimulation including input parameters from field tests
- outline the procedure for demonstrating the extent of the stimulated rock volume following acid stimulation

The permit also includes a requirement for the operator to report the location, orientation and extent of the stimulated rock volume from any acid stimulation treatments every six months.

Groundwater Monitoring

As outlined above, we have also included Improvement Condition 3, which requires the operator to submit a revised groundwater monitoring plan to ensure that the risk of pollution from re-injection of produced water and acid stimulation continues to be assessed throughout the lifetime of the permit.

The operator will need to review the existing network of groundwater monitoring boreholes and groundwater sampling and analysis to determine whether this is sufficient to confirm that there is no pollution of groundwater from site activities including the re-injection of produced water and acid stimulation. The approved Groundwater Monitoring Plan will be implemented as an Operating Technique in the permit and the permit includes a requirement for groundwater monitoring data to be submitted annually to the Environment Agency.

Well Maintenance treatments

The operator will undertake well workovers and a number of routine well maintenance treatments on the pumping system to maintain well production and re-injection as detailed below:

Well Clean Outs

The operator periodically uses diesel and a mixture of diesel and xylene to dissolve the build-up of waxy sludge around the perforated sections of re-injection wells and electrical submersible pumps in producing wells to maintain production and re-injection operations.

Re-injection Wells

The operator undertakes a diesel or xylene and diesel squeeze on small re-injection wells in the Frome Clay Limestone and Bridport Sandstone Formations. The purpose of this squeeze is to dissolve the build-up of waxy sludge within the wellbore.

The process involves pumping a maximum volume of 5m³ of a mixture of xylene and diesel or diesel down to the perforated section of the well and allowing the diesel to soak for a short duration. The xylene/ diesel mixture or diesel dissolves the waxy sludge and is displaced into the near wellbore area in the reservoir by fresh water. The objective is to treat the perforations of the wellbore and the mixture will be displaced approximately 1.5m into the reservoir. Following the squeeze, the re-injection well is turned back on and the xylene/diesel mixture or diesel would be further displaced into the formation from produced water re-injection.

The volumes of xylene and diesel to be used are low. The activity is not intended to discharge the xylene/ diesel mixture or diesel any significant distance into the formation and will be carried out a pressure below the injection pressure limits for the receiving reservoir.

The Frome Clay Limestone does not contain groundwater and any groundwater present in the Bridport Sandstone will be naturally contaminated with hydrocarbons and salt due to the presence of oil in this formation. Although xylene and diesel will be displaced into the formation, the displacement of minor volumes of xylene and diesel into the formation would not be discernible against natural background groundwater quality because xylene and diesel exist naturally in the formation. Any potential impact would be insignificant.

The activity as presented in the Hydrogeological Risk Assessment does not require a groundwater activity permit and can be registered in accordance with the groundwater activity exclusion in paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Production Wells

Diesel is also used on production wells with electric submersible pumps which produce from the Frome Clay Limestone and Bridport Sandstone to dissolve waxy sludge build up around the pumps. A maximum volume of 29m³ of diesel is pumped down the A annulus (the void between the tubing and casing annulus of the well) and returned back up the production tubing and to the surface. The diesel is circulated down to the pump depth above the perforated section of the well, left to soak and produced back out of the well when it is started up again. The diesel will not make contact with the perforated section of the well because it is circulated to a depth above the perforated section of the well. In the unlikely event diesel does make contact with the perforations and reservoir, the diesel will be recovered with produced fluids when the production well is started up. Therefore there will be no diesel remaining in the reservoir and there will be no impact on groundwater.

The activity as presented in the Hydrogeological Risk Assessment does not require a groundwater activity permit and can be registered in accordance with the groundwater activity exclusion in paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Hot Oiling

The operator undertakes hot oiling periodically on beam pump wells to remove the build-up of wax deposits from the production tubing to prevent rod breaks and to keep the production wells flowing. The process involves heating oil at the surface and pumping it down the A annulus (the void between the tubing and casing annulus of the well) to the production tubing above the perforations and circulating it back to the surface with the produced fluids. It is unlikely that the heated oil makes any contact with the perforations in the well. In the unlikely event the hot oil makes contact with the perforations in the well, the heated oil will be

less dense than the oil produced from the formation which would prevent any discharge into the formation and any impact on groundwater would be trivial.

The activity as presented in the Hydrogeological Risk Assessment does not require a groundwater activity permit and can be registered in accordance with the groundwater activity exclusion in paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Chemical Water Shut off Procedure

A chemical water shut off procedure may be undertaken occasionally in production and re-injection wells in the Frome Clay Limestone and Sherwood Sandstone Formation. The procedure is undertaken where there is direct communication between an injection well and producing well or on a well which produces a lot of water due to a fracture or high permeability channel.

The purpose of the chemical water shut off procedure is to plug a high permeability channel or fracture connecting two wells, and allowing produced water to support pressure in the surrounding reservoir.

The water shut off procedure is designed on a well specific basis, however a maximum of 573m³ of polymer gel could be used in a chemical water shut off procedure and there could be a maximum of two procedures undertaken on a well for the lifetime of that well.

A polymer gel is mixed at the surface with freshwater and pumped into the well and spotted into the reservoir. The gel is pushed into the natural fractures and allowed to set. The well is left offline for approximately 1 week to allow the gel to set and then the production or re-injection well is re-started. The gel remains in the reservoir because it is too viscous to be moved. The polymer gel is expected to breakdown in the reservoir over a period of 10 – 20 years. The polymer will either remain in the reservoir or be produced back to the surface with oil where the procedure has been carried out on a production well.

Any breakdown of polymer gel in the reservoir will contain minor concentrations of chromium triacetate and hydrocarbons. The Frome Clay Limestone does not contain groundwater. Groundwater present in the Sherwood Sandstone Formation will be naturally contaminated with oil related hydrocarbons, salts and varying concentrations of heavy metals. Therefore when the polymer gel breaks down in the reservoir there will be no discernible impact on background groundwater quality because they are of such a small concentration and quantity and are likely to be present naturally in formation.

The activity as presented in the Hydrogeological Risk Assessment does not require a groundwater activity permit and can be registered in accordance with the groundwater activity exclusion in paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Acid wash

An acid wash is used periodically to dissolve scale and debris that builds up in a well over the course of producing oil.

A dilute acid solution (15-28%HCl mixed with water) will be pumped into the well and either spotted at the bottom of the well or circulated around the well.

The acid reacts with the formation debris and scale and converts the hydrochloric acid to calcium chloride (salt), carbon dioxide and water. The acid spends in the wellbore and the by products are subsequently recovered to the surface.

The volumes of acid to be used are low (maximum 15m³) and the acid will come into contact with a relatively small area of the reservoir formation. The acid will react with the formation and fines to produce an inert salt solution and carbon dioxide. The acid will make contact with the reservoir through the perforated section of wellbore but does not penetrate the formation.

There will be no residual product remaining in the reservoir and any groundwater present will be naturally contaminated with hydrocarbon and salts, therefore any impact on this groundwater would be insignificant.

The activity as presented in the Hydrogeological Risk Assessment does not require a groundwater activity permit and can be registered in accordance with the groundwater activity exclusion in paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Radial Drilling

The operator will undertake radial drilling to increase the productivity of the Cornbrash Limestone using a jetting process and hydrochloric acid. The purpose of the radial drilling process is bypass near wellbore formation damage and increase the drainage area of the well in the Cornbrash Limestone to produce more oil. The jetting process using 15 or 28% HCl creates small diameter drain holes horizontally away from the vertical production well up to 100m long and 50mm diameter.

A maximum of 8 horizontal drain holes will be drilled per production well and the operator expects to undertake radial drilling on three production wells. The acid reacts with the formation and the by-products are ejected behind the jetting tool, driving the tool forwards. Any by-products from the process are pulled back into the sump and subsequently recovered to the surface when the production well is brought online.

Radial drilling will be undertaken in the Cornbrash Limestone which is a producing formation in the Wytch Farm oilfield. There is no oil water contact in the Cornbrash Limestone and the formation at this location does not contain groundwater.

The volume of acid to be used is low, and the acid will react with the formation to produce an inert salt solution and carbon dioxide. There will be no residual product remaining in the formation and the formation does not contain groundwater therefore there is negligible risk to groundwater.

The activity as presented in the Hydrogeological Risk Assessment does not require a groundwater activity permit and can be registered in accordance with the groundwater activity exclusion in paragraph 3(3)(b) Schedule 22 to the Environmental Permitting Regulations 2016.

Discharges of site surface water to ground

The permit includes four groundwater activities for the discharge of site surface water ground via soakaway at Wellsite 2B, Wellsite X, Wareham C and Wareham D. The discharge of site surface water to ground is an indirect discharge to groundwater and therefore a permitted groundwater activity in accordance with Schedule 22 to the Environmental Permitting Regulations 2016.

The previous permit had 9 discharges of site surface water to ground via soakaway. The operator has confirmed that 6 of these are no longer used with any site surface water being collected, treated and used for reinjection to support production. These soakaways at Wellsites F, M, K, L and Arne G are no longer emission points. These have been removed from the permit and we have included Improvement Condition 9 which requires the operator to investigate and decommission the soakaways to prevent a preferential pollution pathway risk. The remaining 4 soakaways at Wellsite 2B, Wellsite X, Wareham C and Wareham D are still in operation and are listed as groundwater activities under this permit variation. Although these are present, it is preferable for the operator to collect this water and send it back to the main gathering station for treatment via system 53 prior to being used for re-injection for production support.

We have included discharge limits for oil and chloride in Table S3.2 of the permit to prevent any impact on shallow groundwater underlying the sites

Surface Water discharges

There are 4 discharges to surface water listed on the permit. These are directly associated activities of the main permitted installation activity. This is consistent with our approach for these water discharges for the oil and gas installation sector.

The discharge to Wytch Lake whilst described as “emergency” is for storm related runoff events or firewater runoff from the main Gathering station only.

There are two discharges to surface water – Claywell stream and Fitsworth Copse Stream. These discharges are subject to sampling and approval prior to any releases taking place.

There is one continuous discharge of seawater backwash to Cleavel point. This seawater discharge is not treated, just physical screening to remove any debris present, and therefore no conditions are specified on its release.

Emission point W2 Furzey Island backwash has been removed as a result of this variation. Backwash from the intake filters of the Furzey Island Seawater Intake Filtration System (FISWIS) was released back into Poole Harbour with no added components i.e. it comprised of only seawater with sediments that had been filtered from the original intake. The operator confirmed in their response to the schedule 5 notice on 31/01/18, that this is a historic emission point and was decommissioned many years ago (2011/2012). It has therefore been removed as part of this permit variation.

A summary of emissions to surface water emissions from the application is presented in the table below:

| Emission point ref & location | Source | Release Frequency |
|--|--|--|
| W1 SZ 0037 86125 [Poole Harbour] Cleavel Point | Cleavel Point seawater intake backwash | Continuous backwash of seawater occurs when seawater intake plant is online. |
| W2 SZ 0144 8724 [Poole Harbour] Furzey Island | FISWIS seawater intake backwash | Discharge point no longer in use and can be removed from the permit (See Question 34). |
| W3 SY 9771 85741 [Wytch Lake] Gathering Station | Wytch Farm Gathering Station emergency discharge (fire water, storm water) | For use in an emergency only. Discharge point locked closed. |
| W4 SY 98878 85694 [Fitsworth Copse Stream] Wellsite A | Wellsite A surface water run-off. | Periodic release of surface water from moats following testing, analysis and authorisation. |
| W5 SY 99411 85610 [Claywell stream] Wellsite D | Wellsite D surface water run-off. | Periodic release of surface water from surface water pit following testing, analysis and authorisation. Water is released from the site into a clay-line lagoon. |

Gap Analysis

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

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

This is a standard requirement under the sector review for operators to review their management procedures for ongoing maintenance of the impermeable membrane.

- ii) The monitoring procedures and testing in place to confirm the integrity of the re-injection well(s) for the lifetime of those wells, monitoring frequency, remediation measures (and reporting procedures) should the integrity monitoring results indicate that a well integrity failure has potentially occurred.

This is a standard requirement under the sector review for operators to review their management procedures for integrity testing of all reinjection wells to prevent pollution risk to groundwater. We do not place a

requirement integrity testing of production wells as these are regulated separately by the Health and Safety Executive.

- iii) The procedures governing the use of purge gas in the flare system. [A significant volume of gas is currently used to keep the gas inlet lines to the flare purged of air. The management system review should consider alternative methods of maintaining a positive pressure within the inlet lines that minimise the amount of gas that is used for purging].

This is a site specific requirement for the operator to review their management procedures to reduce the amount of gas that is combusted in the flare for purging the gas inlet lines. We have also required a review of the gas management at the site under IC5, but this issue was identified with the flare following a review of the information submitted with the application. The operator is already taking pro-active steps to reduce the volumes of gas used for purging.

Any additional gaps have been addressed by the other improvement conditions in this permit.

Schedule 5 responses

We requested additional information under schedule 5 notices issued on 20/10/2017 and for groundwater on 20/02/2019. We also requested further information following these responses and consulted on the draft permit. As a results of these requests for information and clarification we have accepted the revised hydrogeological risk assessment (v8, dated May 2020) and Acid Stimulation Risk Assessment (dated June 2020) to account for all the reinjection and acid uses at the site, and detailed consideration of both the hydrogeological environment. Please see key issues – Groundwater section above for more information.

We also accepted the revised waste management plan (v6, dated May 2020) to characterise all of the mining waste operations and mining waste facilities under the permit. Please see key issues – Mining Waste Activities section above for more information.

Decision checklist

| Aspect considered | Decision |
|--------------------------------------|--|
| Receipt of application | |
| Confidential information | A claim for commercial or industrial confidentiality has been made. |
| Identifying confidential information | We have identified information provided as part of the application that we consider to be confidential. We have excluded the Hydrogeological Risk Assessment and Acid Stimulation Risk Assessment submitted which was used in the determination from the public register as it contains commercially sensitive information. The operator has also provided redacted versions of both of these documents for our public register. 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 consulted the following organisations: |

| Aspect considered | Decision |
|------------------------------------|--|
| | <p>Local Authority: Purbeck District Council, including their Environmental Health Officer team</p> <p>Food Standards Agency</p> <p>Health and Safety Executive</p> <p>Mineral Planning Authority: Purbeck District Council</p> <p>No objections were received. The comments and our responses are summarised in the consultation section.</p> |
| Operator | |
| Control of the facility | <p>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.</p> |
| The facility | |
| The regulated facility | <p>We considered the extent and nature of the facilities at the site in accordance with 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.</p> <p>The extent of the facilities are defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.</p> <p>The mining waste facilities have been fully defined under this variation in the permit and Waste Management Plan. These changes to changes to activities under the main Installation facility are both detailed in the key issues section above.</p> |
| The site | |
| Extent of the site of the facility | <p>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 plans are included in the permit.</p> <p>The extent of the Mining waste facilities are defined in the Waste Management Plan which is an operational technique under Table S1.2 of this permit.</p> |
| Site condition report | <p>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:</p> <ul style="list-style-type: none"> 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 |

| Aspect considered | Decision |
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| | <p>the site condition report to ensure Article 22 of the Industrial Emissions Directive is complied with.</p> <p>The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.</p> |
| Waste management plan | The operator has provided a waste management plan which we consider is satisfactory. |
| External emergency plan | As the site is regulated under COMAH, an External Emergency plan remains in place for the main Installation activity. As this site is no longer categorised as a Category A Mining Waste Facility as a result of this variation there is no requirement for an External emergency plan for the mining waste facilities under this permit as they are no longer classed as Category A. |
| Biodiversity, heritage, landscape and nature conservation | <p>The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat.</p> <p>We have assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process.</p> <p>We consider that the application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified.</p> <p>The activities on site have not changed from those previously permitted and therefore the impacts from air and land emissions have not altered from those previously accepted. See the section on “operating techniques for emissions that screen out as insignificant” below. We have included additional improvement conditions in the variation to further improve gas management at the site and minimise air emissions from the site.</p> <p>We have not consulted Natural England on the application. The decision was taken in accordance with our guidance.</p> <p>An assessment form has been completed for information.</p> |
| Environmental risk assessment | |
| Environmental risk | <p>We have reviewed the operator's assessment of the environmental risk from the facility.</p> <p>The operator’s risk assessment is satisfactory.</p> <p>There will be no increase in emissions as a result of this variation, and consequently no increase in environmental risk.</p> |
| Operating techniques | |
| Operating techniques Water Quality | <p>We have reviewed the Operators Hydrogeological Risk Assessment and operating techniques proposed by the operator and compared these with the relevant technical guidance and we consider these to be appropriate for the facility.</p> <p>We are satisfied that the risks to groundwater have adequately been assessed and the proposed activities are not likely to have an adverse impact</p> |

| Aspect considered | Decision |
|--|---|
| | <p>on the hydrological and hydrogeological features in this area.</p> <p>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 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.</p> <p>IC1 requires the operator to review their site containment in order to demonstrate there is no pollution risk to surface and groundwater.</p> <p>IC3 requires the operator to review groundwater monitoring to monitor reinjection and acid stimulation activities on site.</p> <p>IC4 requires the operator to ensure the procedures for well integrity are maintained during for all reinjection wells.</p> <p>IC7 requires the operator review their surface water management and implement any agreed changes.</p> <p>IC9 requires the operator to decommission the soakaways that are not used to prevent these being a preferential pollution pathways.</p> <p>PO1 requires the operator to submit an Acid Stimulation Plan before each acid stimulation treatment.</p> |
| <p>General operating techniques</p> <p>Waste and installations</p> | <p>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.</p> <p>The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.</p> |
| <p>Operating techniques for emissions that screen out as insignificant</p> | <p>Emissions of Nitrogen Dioxide, Carbon Monoxide, Sulphur Dioxide, Methane and Non methane Hydrocarbons have been screened out as insignificant in the H1 assessment resubmitted on 05/02/218, and so we agree that the applicant’s proposed techniques is are BAT for the installation.</p> <p>The operator also responded to the schedule 5 notice on 31/01/2018. A H1 was previously submitted in 2006, and a full environmental statement under planning was submitted to Dorset County Council in 2012. A copy of the air quality assessment was submitted with this variation application. The key conclusion is summarised below.</p> <p><i>“Airborne NOx concentrations from the Gathering Station is not considered to pose a risk to habitats on European sites. Although the annual mean NOx contributed by the Gathering Station would be slightly above the 1% trigger point for the Critical Level, the total airborne NOx concentration is below 70% of the Critical Level. Following EA guidance, the NOx concentration is therefore not considered to be significant.</i></p> <p><i>Modelled acid deposition from emissions at the Gathering Station predicts a marginal exceedance above the 1% significance threshold for a process contribution, over a very small area of the nearby European Heathland sites. However as modelled conditions are based on a number of worst-case</i></p> |

| Aspect considered | Decision |
|---|--|
| | <p><i>scenarios acting together, it is unlikely that there would be any effects in reality from continued operation of the Gathering Station. It is concluded that it would be unlikely there would be any adverse effects on integrity of the European Heathland."</i></p> <p>Since the dispersion model was run there have not been any changes to the operation of the Gas turbines, however there have been significant reductions to emissions from flaring.</p> <p>We consider that the emission limits included in the installation permit reflect the BAT for the sector.</p> |
| Noise management | <p>We have reviewed the noise management plan in accordance with our guidance on noise assessment and control.</p> <p>We consider that the existing noise management plan is satisfactory.</p> <p>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.</p> <p>We have included condition 3.4.2 in the permit. This condition enables us to require the operator to submit an updated noise and vibration management plan, should noise and vibration become a problem. If a revised 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.</p> |
| Permit conditions | |
| 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 | <p>We have varied the permit as stated in the variation notice.</p> <p>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 specified in conditions 2.4 and 2.5 of the permit</p> |
| Raw materials | We have not specified limits and controls on the use of raw materials and fuels. |
| Pre-operational conditions | <p>Based on the information in the application, we consider that we do need to impose pre-operational conditions.</p> <p>We have inserted PO 01 to require the operator to produce an acid stimulation plan for approval prior to any acid stimulation activities commencing.</p> |

| Aspect considered | Decision |
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| Improvement programme | <p>Based on the information on the application, we consider that we need to impose an improvement programme.</p> <p>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.</p> <p>All previous ICs in the permit which were added under the 2017 permit variation as part of the refineries sector review have either been complied with or superseded with the new IC programme below.</p> <p>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.</p> <p>IC1 - Secondary and Tertiary Containment Review</p> <p>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.</p> <p>IC2 - Leak Detection and Repair Plan</p> <p>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. A leak detection plan was provided as part of the last permit variation in 2017 which was carried out under a refineries permit review, but we have required this information to be re-submitted again under this variation/ oil and gas sector permit review to ensure a consistent approach with other operators, and in case of any operational changes since 2017.</p> <p>IC3 - Groundwater Activities</p> <p>We have included Improvement Condition IC3 which requires the operator to submit for written approval a groundwater plan. The groundwater monitoring plan, once approved, shall be incorporated into the permit as an operating technique. There is an agreed groundwater monitoring plan in place under the existing permit, but as a result of this permit variation we need the operator to review this to ensure it still remains satisfactory and is in line with our sector guidance and the updated approved hydrogeological risk assessment submitted as part of this application.</p> <p>Groundwater Monitoring is necessary to help determine whether the reinjection activities are affecting the quality of groundwater and whether satisfactory measures are being undertaken to prevent groundwater pollution. Groundwater monitoring is required for the purposes of requisite surveillance in accordance with the Environmental Permitting Regulations 2016. The re-</p> |

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| | <p>submission of a groundwater monitoring plan will ensure that groundwater monitoring is based on the site conceptual model and hydrogeological risk assessment.</p> <p>IC4 - Environmental Management System Review</p> <p>Improvement condition IC4 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.</p> <p>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.</p> <p>The specific management requirements include:</p> <p>i) The procedures for testing the impermeable membrane and subsequent remediation measures if required.</p> <p>This is a standard requirement under the sector review for operators to review their management procedures for ongoing maintenance of the impermeable membrane.</p> <p>ii) The monitoring procedures and testing in place to confirm the integrity of the re-injection well(s) for the lifetime of those wells, monitoring frequency, remediation measures (and reporting procedures) should the integrity monitoring results indicate that a well integrity failure has potentially occurred.</p> <p>This is a standard requirement under the sector review for operators to review their management procedures for integrity testing of all reinjection wells to prevent pollution risk to groundwater. We do not place a requirement integrity testing of production wells as these are regulated separately by the Health and Safety Executive.</p> <p>i) The procedures governing the use of purge gas in the flare system. [A significant volume of gas is currently used to keep the gas inlet lines to the flare purged of air. The management system review should consider alternative methods of maintaining a positive pressure within the inlet lines that minimise the amount of gas that is used for purging].</p> <p>This is a site specific requirement for the operator to review their management procedures to reduce the amount of gas that is combusted in the flare for purging the gas inlet lines. We have also required a review of the gas management at the site under IC5, but this issue was identified with the flare following a review of the information submitted with the application. The operator is already taking pro-active steps to reduce the volumes of gas used for purging.</p> <p>IC5 - Gas management</p> <p>Improvement condition IC5 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.</p> <p>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.</p> <p>We have included improvement condition 4 which requires the operator to submit for written approval a plan identifying their identified method for</p> |

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| | <p>reducing the impact of gas emissions to atmosphere.</p> <p>Gas management is necessary to reduce the environmental and human health impacts of emitting natural gas directly to atmosphere.</p> <p>IC6 - Air emissions monitoring</p> <p>Improvement condition IC6 is necessary as the site features emissions to air with the potential to cause pollution. We have applied improvement condition 6 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.</p> <p>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.</p> <p>IC7- Surface water management</p> <p>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.</p> <p>IC8 - Site Condition Report Review</p> <p>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.</p> <p>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.</p> <p>IC9 – Soakaway abandonment</p> <p>Improvement condition IC9 is site specific and is required to ensure that any soakaways have been decommissioned fully to prevent them being a potential pollution pathway to groundwater. The operator has confirmed that a number of soakaways which were previously permitted are no longer required as the site surface drainage water is now collected for reinjection for production support.</p> |

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| | <p>We have removed the standard Improvement Condition on vapour recovery (IC7) from this variation. This was not required as the operator already captures and recovers all hydrocarbon vapours arising from the loading and unloading of liquid hydrocarbons into vehicles, and had completed IC16 under the previous refineries permit variation in 2017.</p> |
| Emission limits | <p>Emission limit values ELVs or equivalent parameters or technical measures based on BAT have been set for the following substances.</p> <p>Oxides of Nitrogen and Carbon Monoxide for the gas turbines in line with our sector guidance and the Medium Combustion Plant Directive.</p> <p>No limits have be set on the flare currently as it is used for emergency and maintenance only, but calculation measures have been specified for Oxides of Nitrogen, Carbon Monoxide, Total volatile organic compounds (VOCs) and Methane. We have also required flare gas feed flow rate monitoring and specified improvement conditions IC 5 and 6 for gas management going forward, which may set future limits on the flare depending on this IC or any future revisions to our M2 guidance. This is in line with our current sector guidance and best practice.</p> <p>For groundwater activities AR17 – AR25 produced water reinjection we have set limits on the maximum daily discharge volume and maximum rate of discharge in line with the approved Hydrogeological Risk Assessment (V6) to protect groundwater.</p> <p>For groundwater activities AR26 – AR 33 acid stimulation we have set limits of maximum discharge volume per acid stimulation treatment, maximum discharge rate and surface injection pressure to protect groundwater.</p> <p>For groundwater activities AR34 – AR 37 we have set discharge limits for maximum discharge volume, oil and chloride to protect groundwater.</p> |
| Monitoring | <p>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 turbines, flare, and produced water storage tank pressure safety valves.</p> <p>We require monitoring of rate and volume of produced water re-injected along with concentrations and volumes of chemicals added to the produced water prior to reinjection.</p> <p>We also require monitoring of the volume of acid solution and rate discharged into the target formations for groundwater activities AR26 – AR33. The operator will also be required to monitor the surface injection pressure for these groundwater activities.</p> <p>The surface water discharge and soakaway discharges are 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.</p> <p>The operator will keep records of the data collected, which must be submitted to the Environment Agency on a regular basis.</p> <p>We made these decisions in accordance with the requirements of our</p> |

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| | <p>Onshore Oil and Gas Sector Guidance, August 2016 and the Groundwater Directive and to baseline report required under the Industrial Emissions Directive.</p> <p>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, or equivalent as required under 3.5.3 of the permit.</p> |
| Reporting | <p>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.</p> <p>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.</p> |
| Operator competence | |
| Management system | <p>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.</p> <p>The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.</p> |
| Financial competence | <p>There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.</p> |
| Financial provision | <p>The financial provision arrangements satisfy the financial provisions criteria. Financial provision is in place for the hazardous mining waste facility as described in activity AR16 and condition 1.1.5 of the permit.</p> |
| Growth Duty | |
| Section 108 Deregulation Act 2015 – Growth duty | <p>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.</p> <p>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.”</p> <p>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.</p> <p>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</p> |

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| | 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 | 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 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: Purbeck District Council, including their Environmental Health Officer team
- Food Standards Agency
- Health and Safety Executive
- Mineral Planning Authority: Purbeck District Council

No objections were received from the statutory consultees whom we consulted.

No responses were received to our notice of application on GOV.UK from members of the public.