1. Provide an **environmental risk assessment for the proposed gasoline ship loading operations at the Tranmere South Jetty**. This risk assessment should address potential impacts during normal operations and abnormal operations potentially leading to accidents of the proposed loading equipment (e.g. loading arms, pumps, etc.). In responding to this question, you should:

    - Describe the **operations of the ship loading equipment** and provide suitable **process flow diagrams**; advice the maximum annual loading **throughput**.

- *Details of the operation of the ship loading equipment are described in excerpts from the 'MoGas Export Project – Control and Operating Philosophy'. Attachment 1.*
- *COMAH Simplified flow scheme – Attachment 2.*
- *Maximum annual loading throughput: This will be the equivalent volume to the current maximum annual loading volume at the Stanlow White Oil Docks. The operational basis of the project is lower than this.*

  The Mogas Export project will not increase the production capacity of the Stanlow refinery. There is no proposal to increase the volume of gasoline and gasoline component imports to the refinery outside of the normal variation associated with the refinery turnaround cycle.

    - Provide an **environmental risk assessment following the source/pathway/receptor methodology** described at Risk assessments for your environmental permit - GOV.UK (www.gov.uk) or an equivalent method, including consideration of **accidents**. The potentially affected environmental receptors (such as statutorily protected habitats) should be identified and referred to in the assessment. Notes: if you are providing a detailed environmental risk assessment, consequence analysis studies and ALARP demonstrations for these operations as part of an updating the site's Safety Report under COMAH, you can refer to the updated COMAH Safety Report and provide in response to this question an outline description of the information and assessments provided under COMAH and their conclusions.

The project has been assessed as part of the COMAH Site Environmental Risk Assessment for the Tranmere terminal. This risk assessment has been updated in 2024 and will form part of the updated COMAH safety report submission in March 2025.

The risk assessment is a Major Accident to the Environment (MATTE) Environmental Risk Assessment (ERA) for Essar Oil (UK) Tranmere Oil Terminal. This assessment has been undertaken in line with the guidance on Environmental Risk Tolerability for COMAH Sites v2.0 published by the Chemical and Downstream Oil Industries Forum (CDOIF), dated March 2016. ERM understands that the Site is classified as an Upper Tier COMAH site due to the volumes

of hydrocarbons stored and transferred. The assessment has been completed as a requirement of the Control of Major Accident Hazards (COMAH) Regulations 2015.

The potentially affected environmental receptors (such as statutorily protected habitats) are detailed in the attached excerpt from the risk assessment (attachment 3).

The risk assessment identifies a number of potential A, B (Mersey Estuary receptors) or C (groundwater) level MATTEs following mitigation. The risk assessment calculates the total risk profile for Tranmere, which includes all potential releases at Tranmere, rather than just for the specific risks associated with the changes associated with the MoGas Export project. The updated Environmental Risk Assessment has reassessed the severity and duration of the potential MATTEs at Tranmere, and has been completed using greater detail on the number and vulnerability of the receptors compared to the previous ERA, which was carried out as part of the 2020 COMAH submission.

As part of the COMAH submission work, Essar are working through the representative set threat lines to ensure adherence to RGP and that all mitigations are appropriately accounted for. The COMAH report submission will include detail of the ALARP demonstration for the major threat lines.

- Describe the **design drainage arrangements** for the Tranmere South Jetty and explain how the proposed loading arms will be drained to **ensure no emissions of gasoline to the river Mersey** happen during/after the normal operations of the loading arms.

The loading arm is designed to ensure no emissions of gasoline to the river Mersey will happen during/after the normal operations of the loading arm. The loading arm is designed such that no emissions of gasoline to the South Jetty will occur during/after the normal operations of the loading arm.

The specifications for the design of the loading arm have been made in accordance with the Essar management system. These include consideration of the following factors:

1. *Relevant Good Practice - The loading arm is designed to relevant standards.*
2. *Process design conditions. The loading arm has been specified for the maximum process conditions which could be seen (e.g. pressure, temperature) and for the liquid which it will be loading (gasoline).*
3. *Ambient Conditions. The loading arm is designed for the maximum and minimum weather conditions at Tranmere (including maximum wind speeds).*

The loading arm will be operated and maintained by competent individuals using operating procedures, including emergency procedures and maintenance work instructions. These will

be developed ahead of the project commissioning process using input from the loading arm manufacturer.

Suitable design and operation of the loading equipment will prevent leakage from the loading arm during normal operation.

The loading arm has been designed to ensure no emissions of gasoline following cessation of gasoline loading. The loading arm will be equipped with dry break couplings at the connection to the ship. The design of the loading arm is such that following loading the 'arm' will drain into the ship before the connection is broken. Any remaining liquid will then be removed from the loading equipment using a purge system. This was originally designed to be carried out using a nitrogen purge (as detailed in the extract from the control and operating philosophy), however a stripping pump system would normally be supplied by the new loading arm manufacturer (Kanon) and therefore both options are currently being reviewed.

- Describe the **process controls, accident prevention, mitigation and response measures included in the design and operational procedures**; this should include, but not be limited to, the description of any emergency shutdown systems and any secondary containment features included in the design, or justification if no secondary containment is provided.

Materials of Construction

The materials of construction specified for the components of the MoGas Export project have been specified in line with design conditions and the relevant Essar standards.

Design of new Export Pumps

Inherent safety to be provided by the selection of fixed speed pumps with a maximum shut-off head below the design pressure of the downstream system. Fixed speed pumps have been selected over variable speed pumps as it was identified during the safety reviews that the variable speed drive presented a hazard due to the pump overspeed and potential to exceed the design pressure rating of downstream linework. High temperature protection is provided in the dedicated discharge lines for each pump to ensure the MoGas Export pumps do not overheat.

Installation of New Marine Loading Arm (MLA)/Vapour Return Hose Assembly New MLA FA-008 and Vapour Return Hose assembly (FR-001) will be installed at the South Jetty Head. Protection against overpressure of the MLA and any systems onboard a connected ship is by a protection system, which comprises a SIL rated high pressure trip located on the MoGas export line at the South Jetty head which closes isolation valve on at the MoGas offtake at the Tranmere Pig Station.

Protection against overpressure of the Vapour Return Hose is not required as the Vapour Return Hose design pressure is greater than the ship design pressure and the maximum discharge pressure of all pumps located within the Vapour Recovery Unit.

Vapour Recovery Unit – Package

The VRU package has been provided by a vendor with experience of similar supply. The VRU overpressure protection has been designed by the package vendor.

Emergency Release Coupler

The MLA is provided with two stages of shut-down to mitigate the hazards arising from ship pull away and manifold disconnection. The first stage is to close an Emergency Shutdown (ESD) valve at the MLA base and the second stage initiates an emergency release coupler, which is an assembly of two valves and a physical disconnection mechanism, which leaves a closed valve on MLA end of the connection and a closed valve on the ship's manifold. This is a standard arrangement for ship loading connections, which comply with industry requirements established via national regulations, conventions and industry organisations such as the International Maritime Organisation (IMO).

Leak Detection Monitoring

A new leak detection system will be installed on the TEP, with instruments near to the new pig valve stations. Each set consists of a flow transmitter, with pressure, temperature and density compensation. The pressure and flow readings allow the Distributed Control System (DCS) to check that the values during a product transfer lie within the expected ranges. A noticeable discrepancy may indicate either leakage or obstruction in the TEP.

Thermal & Thermal Expansion Relief

The philosophy for piping is to provide relief valves to protect against thermal overpressure only. Thermal and thermal expansion relief will be provided in accordance with the requirements of Essar Eng-ETS-608 – Pipework – Venting for Hydrocarbon Expansion to protect against pressure rise due to solar radiation or heat tracing.
Control & Safeguarding

The design philosophy for the MoGas export project is to provide Instrumented Protective Functions (IPF's) as the ultimate safeguard to protect against the following hazards:

- *Underpressure of the export pump discharge – 35-PT-0352/3*
- *Overtemperature of the export pump discharge – 35-TT-0362/3*
- *Overfill of gasoline tanks T-4227/28/29/30/31 at Stanlow (pre-existing)*
- *Overpressure of the gasoil system at Stanlow – 34-PT-0102*
- *Overpressure of the crude system at Stanlow – 34-PT-0105*
- *Overfill of crude oil tanks at Stanlow (pre-existing)*

- *Overpressure of the Tranmere jetty Marine Loading Arm (MLA) and associated pipework – 36-PT-010/11/12.*
- *Overpressure of the gasoil system at Tranmere – 36-PT-0305*
- *Overpressure of the crude oil system at Tranmere – 36-PT-0340*

Vendor packages include safety instrumented functions as appropriate but are compliant with Essar standards and recommended good practice.

Fire and Gas Detection

A Fire and Gas Detection Philosophy has been set for the MoGas Export project based on the Essar DEP on Fire and Gas Detection and the Overlay BOD scope. The new Fire and Gas detection system is compatible with the existing site F&G system and is integrated into the existing site system.

A Passive Fire Protection (PFP) philosophy has been set for the MoGas Export project based on the Essar DEP on Passive Fire Protection.

Overpressure & Surge Protection

The preferred philosophy for protection against overpressure due to pressure surge in liquid pipelines and pipework is to limit the closing time of any actuated valves to prevent surge conditions.

Where this is not feasible, for example, sudden valve closure on a connected ship manifold, the philosophy is, where feasible, to design the export facilities to accommodate the maximum surge pressure within allowable overpressure for transient events (MAIP). Where this approach is also not feasible, protection shall be provided by a SIL rated 2oo3 high pressure trip (36-PT-010/011/012) which closes an ESD valve located at the Tranmere side, designed to mitigate the effects of surge such that the MAIP is not exceeded.

Emergency Shutdown System

The MLA safeguarding will be configured as an ESD1/ESD2 arrangement incorporating jetty head shutdown functions, allowing for remote and rapid isolation of transfers. The following ESD 1 scenarios have been identified relating to ship loading at the South Jetty, as follows: -

- *Ship tanks overfill*
- *Ship tanks high pressure or low pressure*
- *Inadvertent ship sailing or excessive movement*
- *Loss of containment*
- *Fire*

The project has made provision for a shore-side ESD valve (38-V-029), provided to isolate the MoGas loading route to ship. ESD 1 is automatically initiated by the arm over-reach protection and manual buttons in the jetty head cabin, the main control room and a pendant device handed over to the ship's crew in attendance at the manifold. The ESD 2 system consists of a dry-break Emergency Release Coupling arrangement to minimise any loss of containment following greater inadvertent ship movement, which would lead

to a breakaway of the loading arm.
A shore-side ESD valve (38-V-024) is provided to isolate the recovered vapour route from the ship. Initiation of the shore-side valve is by operator intervention, an ESD 1 or from the VRU. The VRU line will also be protected by an ESD 2 system consisting of a drybreak Emergency Release Coupling arrangement to minimise any loss of containment following greater inadvertent ship movement, which would lead to a breakaway of the loading arms. Prior to an ESD 2, an ESD 1 will be initiated. The intention is to protect the VRU package and limitation of escalation. Closure of this ESD valve assumes the ship has its own standalone overpressure protection.

Secondary Containment
The pigging station and VRU are located within the South Interceptor bund, which will provide secondary containment.

- Describe the **process safety design studies** undertaken to ensure safe operations of the proposed activities and confirm whether these studies have taken into account environmental risks.

    - *Combined HAZID/ENVID*
    - *HAZOP – including environmental risks*
    - *Layers of Protection Analysis/Safety Integrity Level (LOPA/SIL) study.*
    - *ALARP workshop -including environmental risks.*
    - *Environmental Risk Assessment completed in line with CDOIF methodology for Environmental Risk Assessment. Assessment is for the Tranmere site including MoGas Export.*

- Since the Tranmere Terminal is within an area liable to flooding, explain whether the existing flood defence infrastructure will be suitable to prevent and **minimise the risk of pollution** associated with the activities proposed in the scope of this variation **in the case of flooding**.

The scope of the permit variation does not change the risk associated with flooding at Tranmere. The flooding risk at the Tranmere terminal was modelled by Jacobs in 2021, which provided detailed flooding maps for the location. The determining flood cases at Tranmere are tidal wave overtopping and surface water flooding.

The surface water flooding cases do not impact any of the areas in which the MoGas Export project equipment is located.

The jetty area is not impacted in either of the flooding situations. However, the tidal wave overtopping scenario would take place during a significant storm. In this scenario it would not be possible for loading operations to take place and it is likely that any ship would leave the jetty ahead of the storm.

The Vapour recovery unit, pigging station and some associated equipment will be located within the South Interceptor bund. This bund is predicted to fill to a depth of 2m during the tidal wave overtopping case. The equipment within the bund will be fully sealed and will not float, therefore there is no increased risk of gasoline release due to the flooding. The vent stack is significantly higher than the maximum flooding height, and therefore there is no threat of water ingress into the VRU through this route. As detailed above, no loading will take place during the period of tidal wave overtopping due to the restrictions on the ship.

There is a potential that the flood in the South Interceptor bund may damage electrical component within the equipment. Maintenance work to repair this equipment may delay the restart of gasoline loading activities, however this is a business consequence only. No loading of gasoline at Tranmere would take place without the VRU in position. Therefore any flooding in the South interceptor bund will not increase the risk of pollution.

Notes: In response to question 6 of application form Part C2 - request to provide an environmental risk assessment - you have referred to Attachment C2_2 'Technical Supporting Evidence' document. This document addresses only the environmental risks and impacts associated with the operations of the proposed new Vapour Recovery Unit and provides a qualitative statement on the proposed change to combine two current discharges into a single discharge, but it does not address environmental risks associated with the gasoline loading operations that are at the core of the activities in the scope of the variation application.

Updated

2. **Provide and updated/final air dispersion modelling study assessing the environmental impacts associated with emissions of residual NMVOC from the operations of the proposed Vapour Recovery Unit**. Notes: you have remarked that the version currently submitted is a draft and that you're working on an updated version. We cannot make permit decisions, or consult stakeholder, based on draft documentation whose update might change the conclusions on the risk. Hence we are not able at this stage to begin the detailed audit of the assessment you have submitted. The updated air dispersion modelling study should:

- Be conclusive / based on the final risk envelope of the proposed permitted operations.
- Provide **full calculations** showing how the emission rates (g/s), emission velocity (m/s) and volumetric flow rate (Am3/h and Nm3/h) used as inputs to the air dispersion models have been calculated from the emission data provided by the VRU manufacturer. Please note that, although we have not carried out a full audit yet, on initial review, we have noticed some inconsistencies (this is not exhaustive):
    - the stack emission velocity stated in the draft modelling report is 6.6 m/s; with a stack diameter of 0.25m stated in the Addendum to Variation Application EPR/TP3301MD/V003 submitted on 26/02/2024, this gives a flue gas volumetric flow rate of 6.6 * pi * 0.25^2 *1/4 * 3600 = 1,166 m3/h, significantly different from the volumetric flow rate of 4,133.7 m3/h stated in the same addendum document and in the material balance attached to the VRU PFD).

See attached clarification from CERC (attachment 4) regarding conversion of mass flow rate to volumetric flow rate.

    - Note (3) to stream No. 6 in the material balance attached to the VRU PFD states that the gasoline in vapour stream is calculated based on the guarantee of 10 g/Nm3, corresponding to the NMVOC BAT-AEL; however, it can be calculated that the mass emission rate of gasoline vapour of 7.2 kg/h (stream

6) corresponds to a concentration of approximately 2 g/Nm3 of NMVOC [4,133 Am3/h @20degC = 4,133 * (273.15/293.15) Nm3/h @ 0 degC = 3,851 Nm3/h ; 7.2 kg/h / 3851 Nm3/h * 1000 g/kg = 1.9 g/m3]. If this basis is used as input to the air dispersion model, we may need to specify a stricter ELV than the BAT-AEL to match the risk envelope assessed in the air dispersion model

The data provided in the material balance attached to the VRU PFD was provided by Aereon, who are the manufacturer of the VRU. We have queried the meaning of Note (3) with Aereon.

However on the assumption that the modelled emissions are at the concentration of 1.87g/Nm3, the maximum predicted off-site concentrations have been upscaled in line with a concentration of 10g/Nm3 at the outlet (this is by a factor of 5.3, calculated as 10g/Nm3 1.87g/Nm3)

The revised results and discussion are included as attachment 5 – Air dispersion modelling results at VOC emissions of 10mg/Nm3.

- Explain the reasons as to why NMVOCs heavier than C5 (other than benzene that was included on our request in the addendum submitted on 26/02/2024) have not been included in the assessment, confirming whether these are expected to be fully adsorbed in the activated carbon beds of the VRU, hence resulting in negligible emissions; If they are not negligible, include them in the assessment. (In particular, if potentially present in the emitted vapours you should risk assess or confirm will not be present in the emissions all, but not limited to, the components listed in the gasoline MSDS you have provided, i.e. **n-hexane (110-54-3), Toluene (108-88-3), Benzene (71-43-2), cyclohexane (110-82-7), Ethylbenzene (100-41-4), Trimethylbenzene (25551-13-7), Xylene (1330-20-7**)).

The information from Aereon states that there will be negligible emissions of all components (see attachment 6). A follow up query has been sent to Aereon to confirm. The benzene included in the assessment was shown to indicate that at an emission level of 1mg/Nm3 (the manufacturers guarantee), offsite emissions would be screened out when compared to the respective short and long term EALS.

- For hydrocarbons that don't have EALs, **justify the proposed assessment levels / DNELs providing a review of the available toxicological information for these substances**. Notes: the draft Air Dispersion Modelling report submitted with the application states that EALs for pentane, butane and pentene were previously approved for use by the Environment Agency. This is incorrect, as we are not able to approve EALs outside of the formal process to adopt and publish them in our official guidance. We rather make permitting decisions on whether we agree with the

conclusions of the site specific risk assessment and emission profile, in consultation with UK health authorities.

- *See attachment 14 – 'Dispersion modelling – Basis of Proposed Assessment Levels' for justification of the proposed assessment levels.*
- *The incorrect statement in the dispersion modelling report will be corrected in the updated version of the dispersion modelling report.*

- Advisory at duly making (it might become required during determination): For hydrocarbons hat don't have EALs, also provide the process contributions at all the relevant discrete receptors, even if the maximum off-site concentrations are shown to screen out against the proposed EAL. You should not rely on the fact that the maximum off-site concentrations are shown to screen out against the proposed EALs, because there is uncertainty on these EALs. In these cases we seek to understand in more detail the risk of the proposal, when taking into account the uncertainties.
- Advisory at duly making (it might become required during determination): consider refining the assumption of continuous operation if this is overconservative.
- **Ensure you send the revised modelling files**.

3. In relation to the proposed changes to the drainage systems and effluent discharge configuration of the site:

- Confirm whether the sources of drainage water from the southern area of the Tranmere Terminal, proposed to be routed to through the North Interceptor and emission point W1 will **remain unchanged compared to the currently permitted operations**.

  The currently permitted operations are for Tranmere water drainings to be split between the North and South Interceptors. The drainage areas are split as per the attached drawing (attachment 7).

  Since September 2020 all water from both drainage areas has been routed through the North Interceptor and the South Interceptor has been decommissioned. As part of the project construction the South Interceptor will be removed and the outfall will be blocked off.

  The project does not increase the total water loading on site. There is no water effluent generated as part of the project. The sources of drainage water at Tranmere will therefore remain unchanged compared to the currently permitted operations.

- Provide additional details as to why you consider that the North Interceptor is 'better equipped' compared to the South Interceptor proposed to be decommissioned, as stated in the application documents.

The North Interceptor is a three bay interceptor with gravity settling bays and installed skimming facilities. The South Interceptor is a single bay interceptor with a parallel plate pack separator. The bay size of the South Interceptor is significantly smaller than the size of an individual bay on the North Interceptor. The nominal average flows for the two interceptors detailed in the permit application (2007 – attachment 8) are as below:

- *North Interceptor 75,000m3/annum*
- *South Interceptor 1,100m3/annum*

The comparative sizes of the North and South interceptors are shown on the attached marked up photograph (attachment 9). The north interceptor is significantly larger and therefore the accommodation of an additional 1.5% of water volume annual is not expected to result in a reduction in performance in the North interceptor effluent.

The following documents are also attached to show comparative size and detail of the North and South interceptors:

- *692728 PEFs South Interceptor Pit (attachment 10)*
- *314825 Tranmere North Interceptor General Arrangement (attachment 11)*
- *317366 Tranmere North Interceptor Skimmer System (attachment 12)*
- *314388 Tranmere North Interceptor Pump Arrangement (attachment 13)*

The water from the South interceptor catchment area has been routed to the North interceptor since September 2020. In this period there have been no exceedances of the Emission Limit Values detailed within the ERP permit.

- Explain the management of change process followed to design the proposed drainage re-routing changes and explain whether these will affect any aspects of the site's containment philosophy.

The proposed drainage is being designed as part of the T6017 bund remediation project. This project is being implemented to remediate the land contaminated in T6017/8 bund and the South Interceptor bund following the release of crude oil from T6017 in September 2020. The project follows the Essar Project Assurance Process as documented in the Management System.

Notes: further information and risk assessment might become required on review of your responses to these questions.

<u>Additional questions not related to duly making</u>

At this stage we have identified the following questions, likely needing to be answered as part of the determination of the permit application. Whilst it is not essential that you respond to these questions to duly make your application, we are raising them now to save time at a later stage:

4. Provide additional information on the functional specification, technology, operating principles and standards for the proposed NMVOC continuous emissions monitoring system;

5. Explain the process monitoring and controls to swap between the carbon beds in the Vapour Recovery Unit, prior to achieving the saturation of the duty bed.

List of Attachments

Attachment Number	***Description***
1	*Excerpts from 'MoGas Export Project – Control and Operating Philosophy'*
2	*MoGas Export Project COMAH Simplified flow scheme*
3	*Essar Tranmere MATTE 2024 Environmental Setting*
4	*Clarification of flow rates for dispersion modelling*
5	*Air dispersion modelling results at VOC emissions of 10mg/Nm3*
6	*Aereon data regarding VRU emissions*
7	*Tranmere drainage drawings*
8	*Tranmere permit application 2007*
9	*Marked up photograph of Tranmere*
10	*692728 PEFs South Interceptor Pit*
11	*314825 Tranmere North Interceptor General Arrangement*
12	*317366 Tranmere North Interceptor Skimmer System*
13	*314388 Tranmere North Interceptor Pump Arrangement*
14	*Dispersion modelling – Basis of Proposed Assessment Levels*