HyNet Hydrogen Production Plant

Environmental Statement

Volume 1 - Non-Technical Summary

Document reference: 5194812-000-4PER-4-0004

22/09/2021

HyNet North West

DOCUMENT CONTROL

Version	Date	Author	Description
V0.1	25/08/2021	Dan Parsons / Sally Phillips	Draft for review
V0.2	22/09/2021	Dan Parsons / Sally Phillips	Final for issue

CONTENTS

1.0 INTRODUCTION

HyNet North West

HyNet is a significant clean growth energy opportunity for the UK, based on the low carbon production of hydrogen from natural gas. It is a complete system of hydrogen production, hydrogen transportation, hydrogen use, and carbon capture and carbon storage located in an area of concentrated industry with an existing technical skill base.

HyNet North West comprises multiple standalone, but technically interconnected, projects which will be consented separately. It has been designed to be expandable, low-cost, and low risk through the repurposing of existing assets as far as possible. The first of these projects is the HyNet Hydrogen Production Plant (the Proposed Development) for which Essar Oil (UK) Limited has submitted a hybrid planning application to Cheshire West and Chester Council to construct and operate the plant in two phases. The hybrid planning application seeks full planning permission for the majority of Phase 1 plant components and outline planning permission for Phase 2 and some of the Phase 1 plant components.

The Proposed Development

The Proposed Development is one of the first standalone commercial project of HyNet North West and would be located in the Stanlow Oil Refinery in Ellesmere Port.
The Proposed Development comprises two phases, both of which include a hydrogen production plant, which together are capable of producing 300,000 normal cubic metre per hour of hydrogen (the energy equivalent to fuelling over 1800 medium sized average cars in the UK). It also includes all of the associated utilities and tie-ins to the hydrogen export pipelines, the carbon dioxide export pipeline, and the natural gas import pipeline.

HyNet North West would initially focus on industrial emissions, with the dominant customer being the Stanlow Refinery, owned and operated by Essar Oil (UK) Limited. However, it would also provide hydrogen that would support decarbonisation of other sectors in the region including transport, heating and dispatchable power generation.

The new infrastructure to be built by HyNet is readily extendable beyond the initial project and provides a replicable model for similar programmes across the UK, as well as export opportunities. Figure 1.1 shows a diagrammatic overview of the overall HyNet Project.

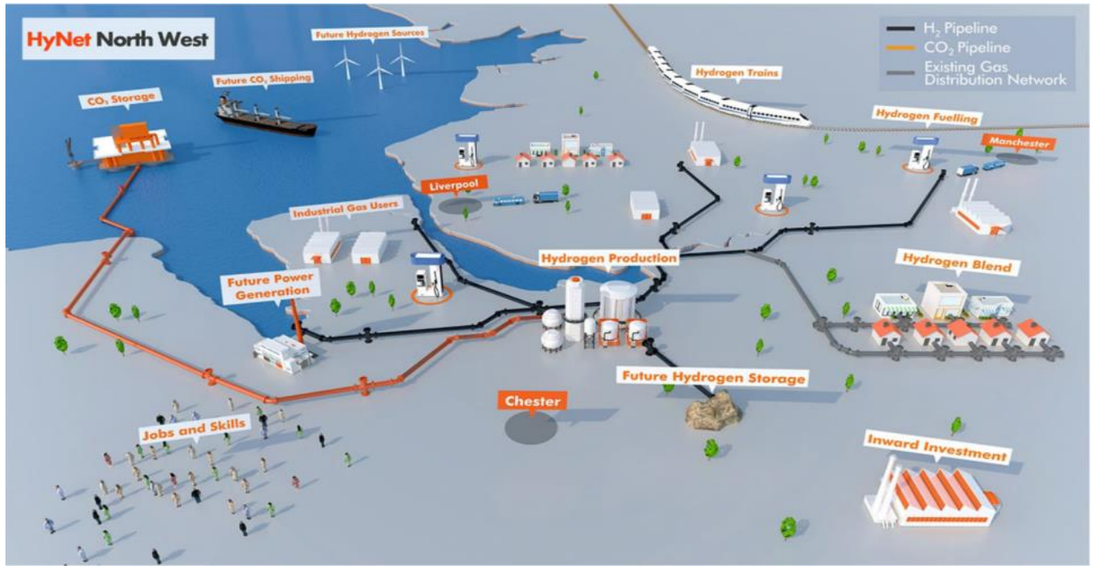


Figure 1.1 Overview of HyNet and the North West Industrial Cluster

HyNet has been developed to address industrial carbon dioxide emissions in the North West and is recognised by the UK Government Department for Business, Energy & Industrial Strategy (BEIS) as the key industrial decarbonisation project in this region. The close proximity of hydrogen production, utilisation, and carbon storage means that the HyNet system offers lower capital cost and development risk compared to other potential clusters around the UK. It also meets the major challenges of reducing carbon emissions from industry, domestic heat and transport and an enabler towards the UK achieving Net Zero carbon dioxide emissions.

Understanding the Environmental Statement

Under 'The Town and Country Planning (Environmental Impact Assessment) Regulations 2017' the Proposed Development is classed as Environmental Impact Assessment (EIA) development. This means that there is potential for significant environmental effects to arise during the Proposed Development's construction, operation, or decommissioning.

The planning application for an EIA development is required to be accompanied by an Environmental Statement (ES) which describes the Proposed Development and the measures to be implemented to avoid, reduce, or mitigate any predicted significant environmental effects.

The ES comprises three volumes. A brief description of each of these volumes is provided below to help you determine which document is the most useful for you to find the information you require.

Volume 1 – Non-Technical Summary

This is a concise summary document that provides a description of the EIA process and its findings in a manner that is easily understood by the general public.

Volume 2 – Main Report

This is the overall assessment of the environmental effects likely to be experienced during the construction and operational phases of the Proposed Development.

Volume 3 – Appendices

This includes all the relevant technical documents and appendices that are associated with the Chapters covered in Volume 2.

This document is Volume 1, the Non-Technical Summary, of the ES and provides an overview of the environment as it is now, a description of the Hydrogen Production Plant and the possible impacts that could result in significant environmental effects.

Approach to assessment

Once it had been determined that the Proposed Development is an EIA development the scoping stage was undertaken. As the applicant, Essar Oil (UK) Limited requested a Scoping Opinion from Cheshire West and Chester Council. The Scoping Opinion is a written statement by Cheshire West and Chester Council, stating their opinion as to what information needs to be provided in the ES, in order to determine the planning application.

Aspects scoped into the Environmental Statement

- Biodiversity
- Visual effects
- Historic environment
- Geology and soils
- Water environment
- Climate vulnerability
- Greenhouse gas emissions
- Air quality
- Noise and vibration
- Waste and materials
- Population and human health

To inform the council's decision making, a Scoping Report which detailed the findings of a high-level environmental appraisal was submitted to Cheshire West and Chester Council in January 2021. A formal Scoping Opinion was issued by Cheshire West and Chester Council in March 2021, which determined which environmental aspects should be assessed and reported in the ES.

The assessments reported within the ES have been based on the Scoping Opinion and also any relevant guidance issued by the Government, professional bodies, or statutory authorities.

The EIA considers both the direct and indirect effects of the Proposed Development. Direct effects are the physical changes made by the Proposed Development, such as the removal of vegetation. Indirect effects are those which are not a direct result of the development and are often experienced away from the Site, such as noise from construction machinery or road traffic.

Environmental effects can be adverse or beneficial and can range from neutral to very large. Moderate, large, or very large effects are considered 'significant'. A significant effect is one which is considered to be material in the decision-making process.

2.0 THE PROPOSED DEVELOPMENT

Overview of the Proposed Development

The Proposed Development will be located on a 29-hectare plot of land within the existing Stanlow Refinery, which is owned and operated by Essar Oil (UK) Limited. The location of the Site is shown on Figure 2.1. Essar Oil (UK) Limited will operate the Proposed Development and is the applicant of this planning application.

The Proposed Development, and the HyNet North West Project as a whole, is built around Johnson Matthey's Low Carbon Hydrogen (**LCH™**) technology *(a trademark of the Johnson Matthey Group of Companies)* and is designed to produce compressed hydrogen at greater than 99.9% purity by volume.

The Proposed Development can be divided into the following main component areas:

- Process Areas
- Air Separation Units
- Utilities area
- Pipeline reception area
- Flare
- Pipe racks

The Site layout with respect to these component areas is shown in Figure 2.2.

THE HYDROGEN PRODUCTION PROCESS

Natural gas or a mixture of natural gas and refinery off-gas (a gas which is a by-product of the Stanlow Refinery operations) is supplied to the plant as feedstock. This feedstock includes trace amounts of sulphur which is removed from the feedstock by a standard absorption process before it can be used in the hydrogen production process.

The resulting treated gas is then broken down into a mixture of basic components in a reaction process referred to as steam reforming, which converts natural gas into a mixture of carbon oxides, hydrogen, and residual methane (known as syngas) in the presence of steam.

The gas is later cooled, and the water is removed resulting in a cool dry gas product. This gas is then separated into two streams, carbon dioxide and a raw hydrogen mix which contains other gases. The carbon dioxide stream is transported via pipeline for carbon storage and the raw hydrogen mix is further separated into hydrogen, carbon monoxide, methane, and nitrogen. The hydrogen is extracted as the end product.

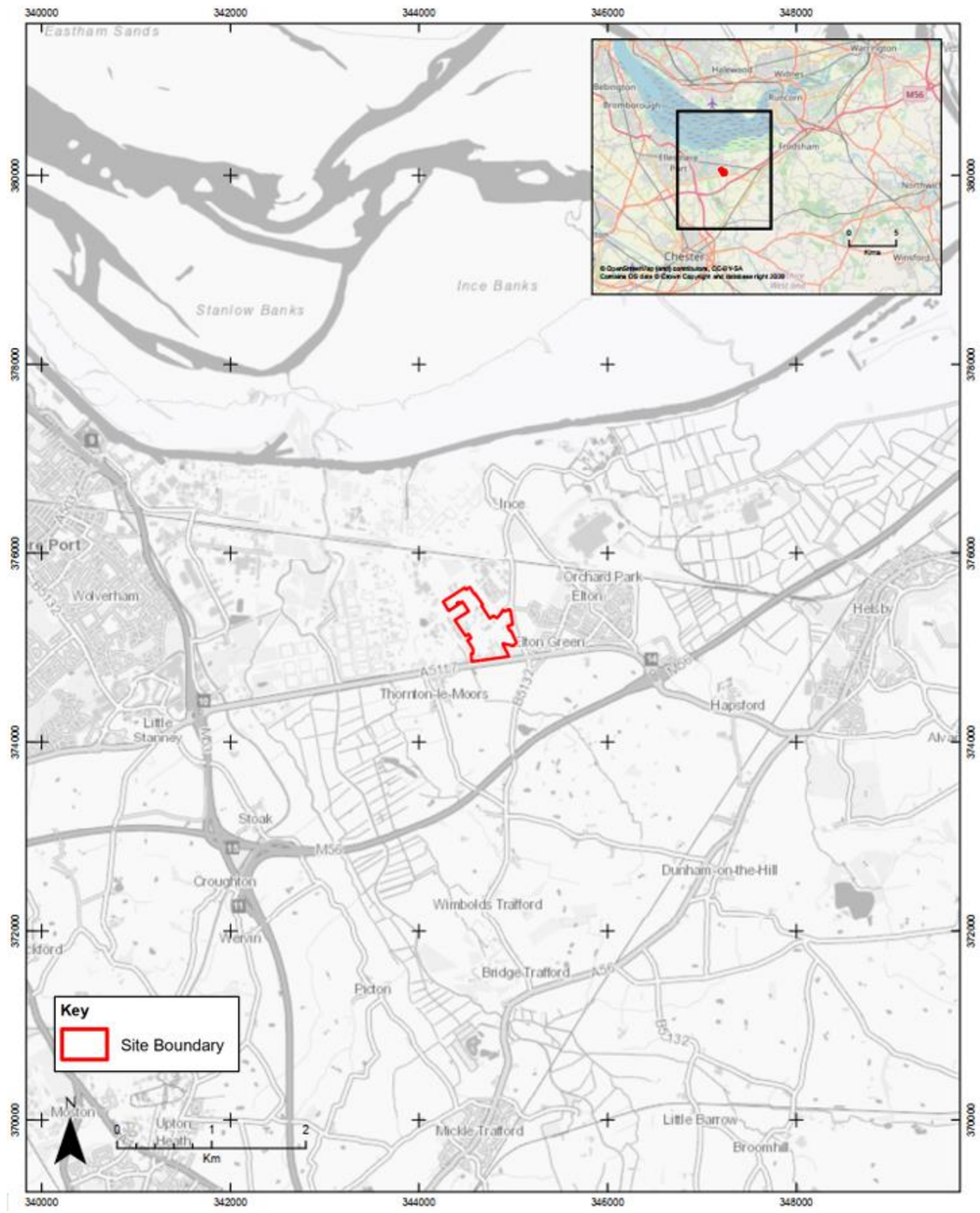


Figure 2.1 Site location

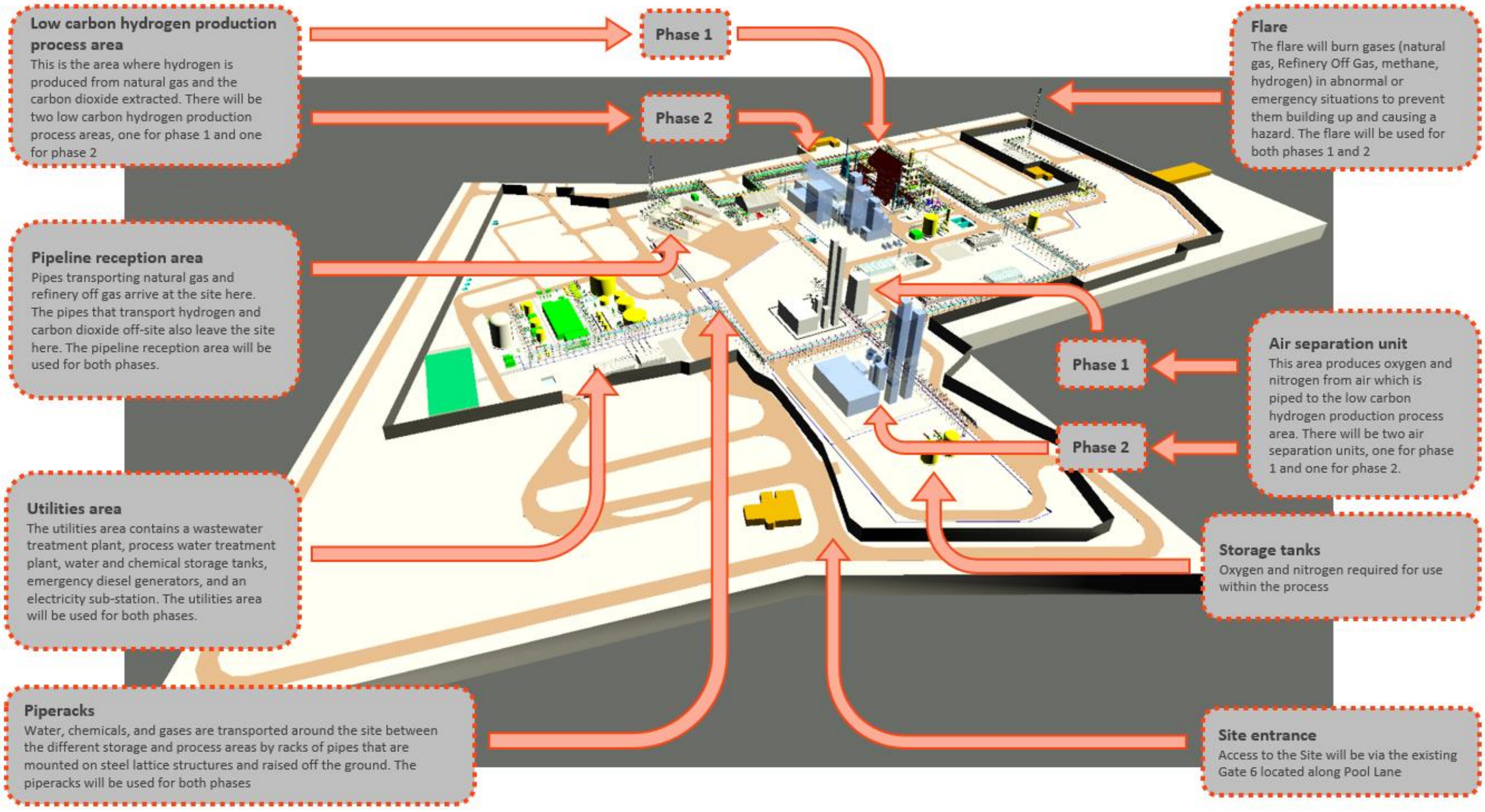


Figure 2.2 The physical component areas of the Proposed Development and where they will be located on the Site

Constructing the Proposed Development

Pending gaining the necessary planning permission and obtaining the required permits, construction of the Proposed Development is due to start in Autumn 2022 (at the earliest) and take approximately 56 months for both Phases. Phase 1 of the Proposed Development will be operational and producing hydrogen in 2025 and Phase 2 in 2026.

There will be five main construction stages as follows.

Stage 1: Early works

During the early works, a security fence will be erected around the perimeter and the Site made secure. The construction compounds will be established which will include the temporary construction offices, car parking, welfare facilities and the areas for parking, maintaining and storing construction plant, and storage for equipment and materials. The early works will only need to be undertaken for Phase 1.

Stage 2: Site preparation

The Site will need to be cleared of the existing buildings, infrastructure and equipment that are currently on the Site. Under work separate to this application (planning reference: 20/04382/DEM), Essar Oil (UK) Limited are currently demolishing the existing and no longer used Alcohols chemical process unit located within the Site. This will be completed prior to the construction phase of the Proposed Development commencing. Site preparation will only need to be undertaken for Phase 1 as the Site will already be prepared for Phase 2.

Stage 3: Site access

The existing access to the Site off Pool Lane is used by traffic accessing other areas within the Stanlow Refinery. This access will be reconfigured so that construction traffic does not disrupt the normal operations of the Stanlow Refinery. Works to create the new access will only be needed for Phase 1. However, the current understanding is that this access point will be used for both Phase 1 and Phase 2.

Stage 4: Construction execution

This is the main stage of construction for Phases 1 and 2 of the Proposed Development. The design maximises the use of pre-fabricated modules which are manufactured off Site and then transported to the Site and assembled. This approach is more efficient and minimises material usage, waste production, pollution, and general disturbance on the Site during construction.

Stage 5: Commissioning and handover

Once constructed, the Proposed Development will be tested to check that everything works properly, and any adjustments made to ensure smooth operation before it is handed over to Essar who will then operate it. This stage will apply to both Phases 1 and 2 at different times.

Operating the Proposed Development

Once fully operational the Proposed Development will produce 300,000 normal cubic metres of hydrogen per hour. Phase 1 will produce 100,000 normal cubic metres of hydrogen and the remaining 200,000 normal cubic metres of hydrogen will be produced by Phase 2.

Figure 2.2 on the previous page shows the main physical components of the Proposed Development and where they are located within the Site. As oxygen, hydrogen, refinery off gas and natural gas are potential fire hazards, safety has been a main focus of the design process. The design has located the parts of the Proposed Development which contain combustible substances away from the Air Separation Unit and oxygen storage tanks, the Site boundary, and public areas. This is to ensure the safety of neighbouring residents, members of the public, and also to minimise any potential risk to the Stanlow Refinery.

Under normal conditions, the Proposed Development will be operated continuously 24 hours per day and seven days per week. Planned maintenance periods will occur approximately every four years, during which time one Phase of the Hydrogen Production Plant will not operate.

The Proposed Development will be operated remotely from the central Stanlow Refinery control room so most of the time there will be no staff physically present on the Proposed Development . However daily tankers will be driven onto the Site to collect and transport waste away, these will be supervised during their visits. Additionally, from time to time maintenance and inspection visits will be undertaken.

Material and energy consumption

The main inputs for the hydrogen production process are natural gas and refinery off gas from the Stanlow Refinery, raw water from the River Dee, air extracted from the atmosphere and electrical power.

Water used in the plant will primarily be sourced from an existing United Utilities raw water supply drawn from the River Dee. However, consumption of raw water has been reduced by optimising the re-use of process water and harvested rainwater. Approximately 221 tonnes of water per hour will be required for both Phases of the Proposed Development. Phase 1 has an estimated power consumption of 30 megawatts (MW) and Phase 2 has an estimated consumption of 60 MW resulting in a total estimated power consumption of 90 MW for both phases.

Waste products

The main types of waste produced during the operation of the Proposed Development will be emissions to air, process effluents, and waste sludge.

Emissions to air will result from the combustion of the gas in the Steam Boiler and Feed Fired Heater. The gas burnt in this process is from an element of plant called the Pressure Swing Absorption (PSA) and the gas is known as PSA tail gas. Point source emissions to air are controlled through the use of a de-sulphurised processed fuel (PSA Tailgas) as well as combustion plant controls, including combustion control systems, air control and the use of low NOx burners in the Steam Boiler and Feed Fired Heater. The emissions will be vented to the atmosphere and include oxides of nitrogen, carbon monoxide, carbon dioxide and sulphur dioxide. Emissions to air achieve the indicative emissions values identified in relevant Best Available Techniques (BAT)[1] Guidance documents. Particulate matter ($PM_{2.5}$ and PM_{10}) is not regarded as relevant as the fuel used in the gas fired plant (processed PSA gas) is clean.

Nitrogen will be generated in the Air Separation Unit as a by-product of oxygen production; it will be used as an inerting and purge gas. Inerting is the introduction of a non-combustible gas (inert) into a closed system for explosion prevention. Excess nitrogen will be vented to the atmosphere at the Air Separation Unit.

The hydrogen production process requires purified water to produce the steam used in the steam reforming process. The efficient re-use of water within the process and use of rainwater harvesting and biological water treatment controls the quantity of water discharged. A number of processes are used to produce the purified water and these are shown in Figure 2.3. The by-products of the water treatment process include a salty water (brine) reject stream and sludge. The brine contains the salts and minerals that naturally occur in water but at higher concentrations. The brine reject stream joins the existing refinery process drainage treatment system, before discharging to the Manchester Ship Canal under existing permit limits, the majority of which are already established for the refinery discharge.

The sludge is made up of minerals, salts, and suspended solids and approximately 80% water. The sludge is taken off Site for treatment and disposal, the location of which is not yet confirmed. Approximately three lorry tankers per day are needed to remove the sludge from Site although opportunities are being investigated to integrate this with the Stanlow Refinery to reduce the need of road tankers.

Surface water drainage will be collected and piped for treatment at the Stanlow Refinery (U7800 facility) then sent for further treatment at the United Utilities Waste-water Treatment Works facility, at Stoak, prior to being discharged to local rivers which flow into the Mersey Estuary.

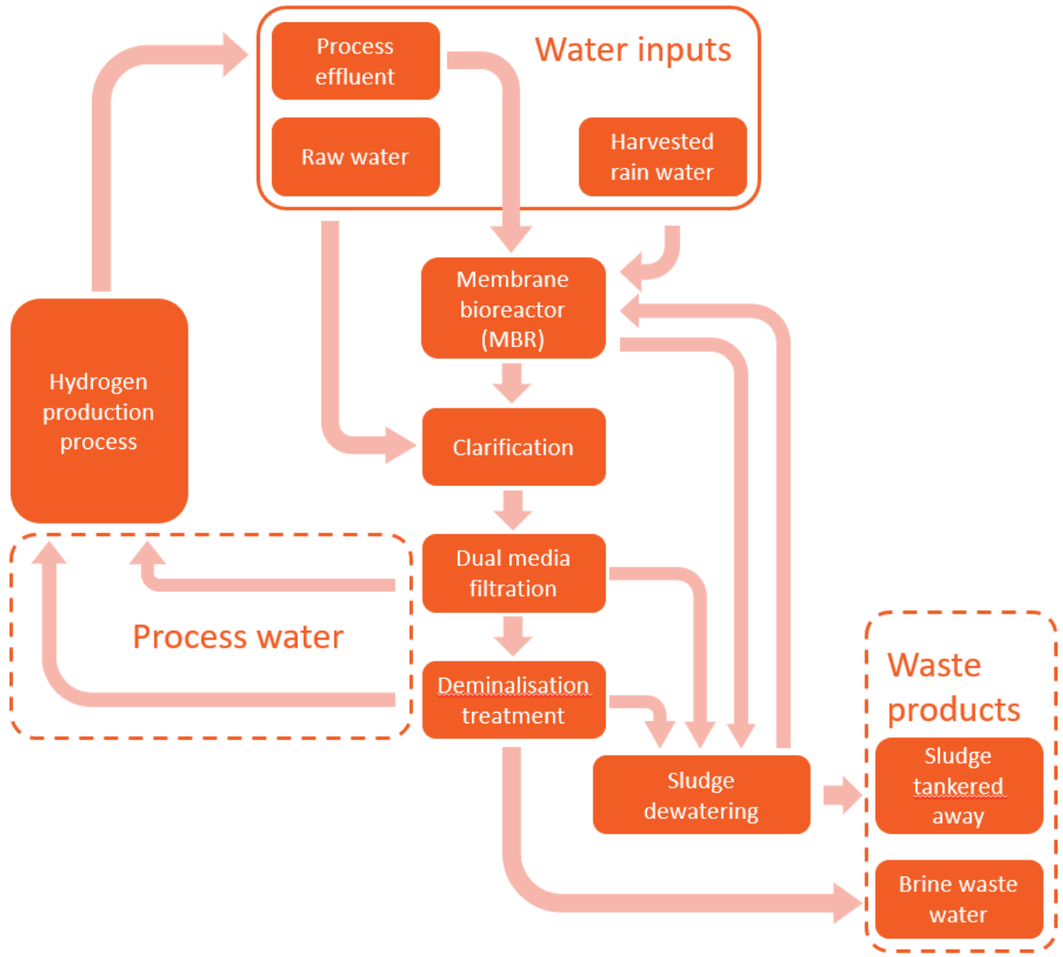


Figure 2.3 Water process flow diagram

[1] Industrial installations undertaking specific types of activity are required to use 'Best Available Techniques' to reduce emissions to air, water and land. 'Best Available Techniques' means the economically and technically viable available techniques which are the best for preventing or minimising emissions and impacts on the environment as a whole.

Decommissioning the Proposed Development

The design life for the Proposed Development is 25 years, but if it is economically viable then it is likely to continue running until operating and maintenance costs become too high. This is normal for industrial installations and it is possible that the Proposed Development could continue operating for 40 years.

At the end of its life the Proposed Development will be isolated and depressurised, then purged with nitrogen and air to remove any liquids and gases within the system and pipework. These liquid and gases would be collected and disposed of off Site at an appropriate waste treatment facility.

A demolition contractor would then dismantle the plant and separate out the high value materials such as catalysts, cables and steels which would be recycled. Non-recyclable materials will be disposed of at an appropriate waste facility (off Site).

Once the above ground plant has been removed, all that would remain would be the concrete slabs and any sub-surface structures including drainage networks and any foundations. Some of this material may be removed but it is anticipated that the drainage network would be left in place.

3.0 THE SITE AND SURROUNDING ENVIRONMENT

History

The area now occupied by the Stanlow Refinery was historically a rural one, with agricultural fields and historic villages. The Refinery was originally developed by Shell in 1924 to blend distributed imported oil products, and to manufacture bitumen and special solvents such as turpentine substitute. This original part of the Refinery was located north of the railway adjacent to the Manchester Shipping Canal. Shell continued to operate the Stanlow Refinery until 2011 when it was sold to the current owner, Essar.

After the Second World War the Refinery expanded and the southern half was constructed between 1948 and 1952. The Alcohols complex, which is where the Proposed Development will be located, was developed at this time and originally housed processing plant, associated product and feedstock tanks. The Alcohols complex has been decommissioned and demolished in stages.

The Site

The existing Site can be characterised based on the two main former uses, the northern area associated with the former Alcohols complex incorporating the Alcohols plant and tank farm and the southern area associated with the contractor's compound. The Site and its features are shown on Figure 3.1. The Site is accessed from Pool Lane via Access Gate 6.

The decommissioned Alcohols plant and storage tanks in the centre of the Site are scheduled for demolition in 2021 under permitted development application 20/04382/DEM. These works are being undertaken independently from the proposed Development and are not considered in the EIA.

Surrounding environment

Figure 3.2 provides an overview of the main environmental features in the area surrounding the Site. North and west of the Site is the rest of the Stanlow Refinery complex. The southern boundary is marked by A5117 School Lane and the eastern boundary Pool Lane. A belt of mature trees provides visual screening along the A5117, limiting views from the public highway into the Site. There is also a small block of woodland to the south east of the Site.

The eastern boundary forms a dog leg around the Thornton Science Park which is situated between the Site and Pool Lane. Thornton Science Park is currently occupied (in part) by the University of Chester research facility and around 40 science and technology companies.

The closest residential receptors are The Stables and Little Meadow Park travellers' sites, located off the A5117, approximately 55 m south of the Site. Thornton Le Moors, a small historic village centred around a conservation area, is a few hundred metres further west of these sites.

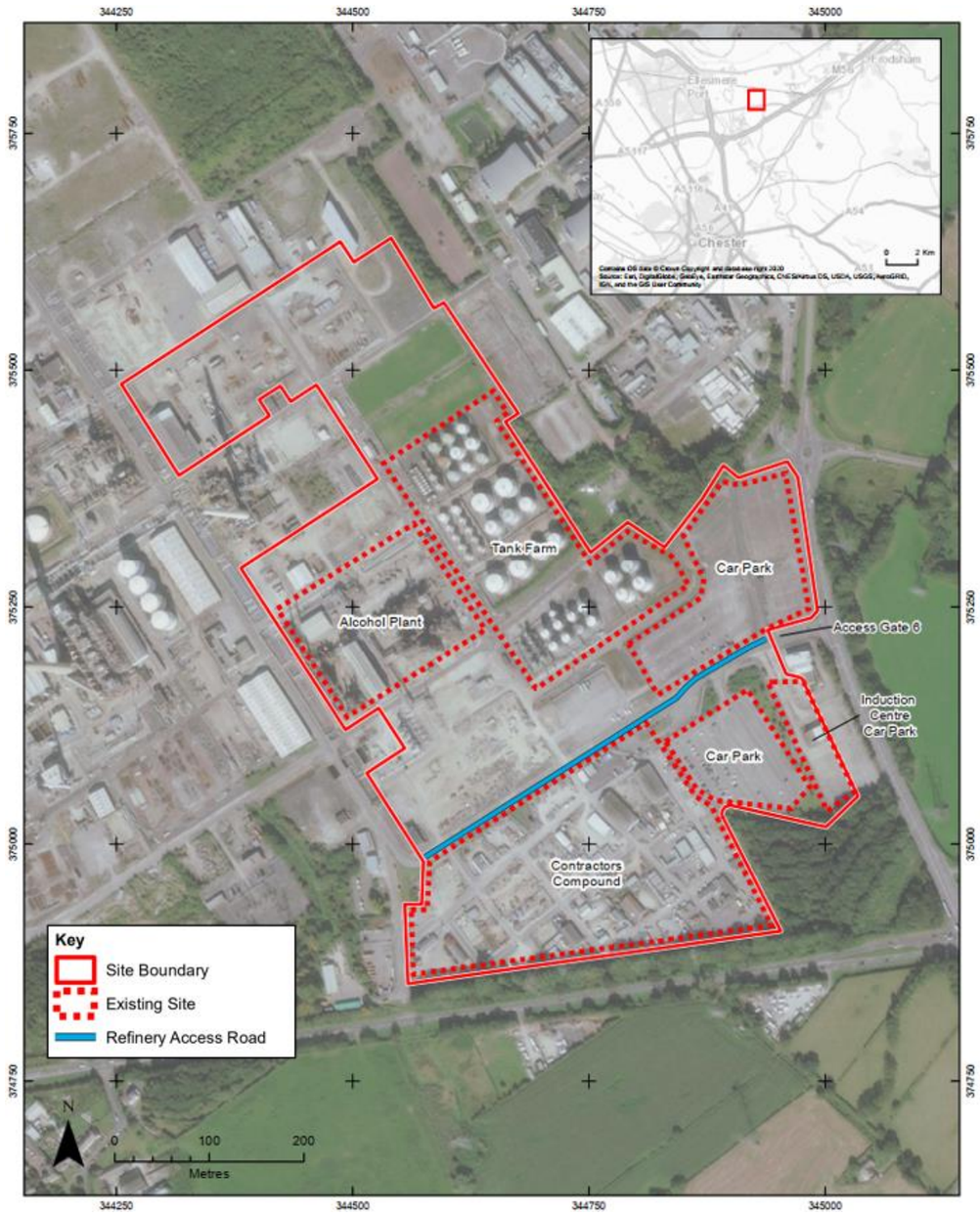
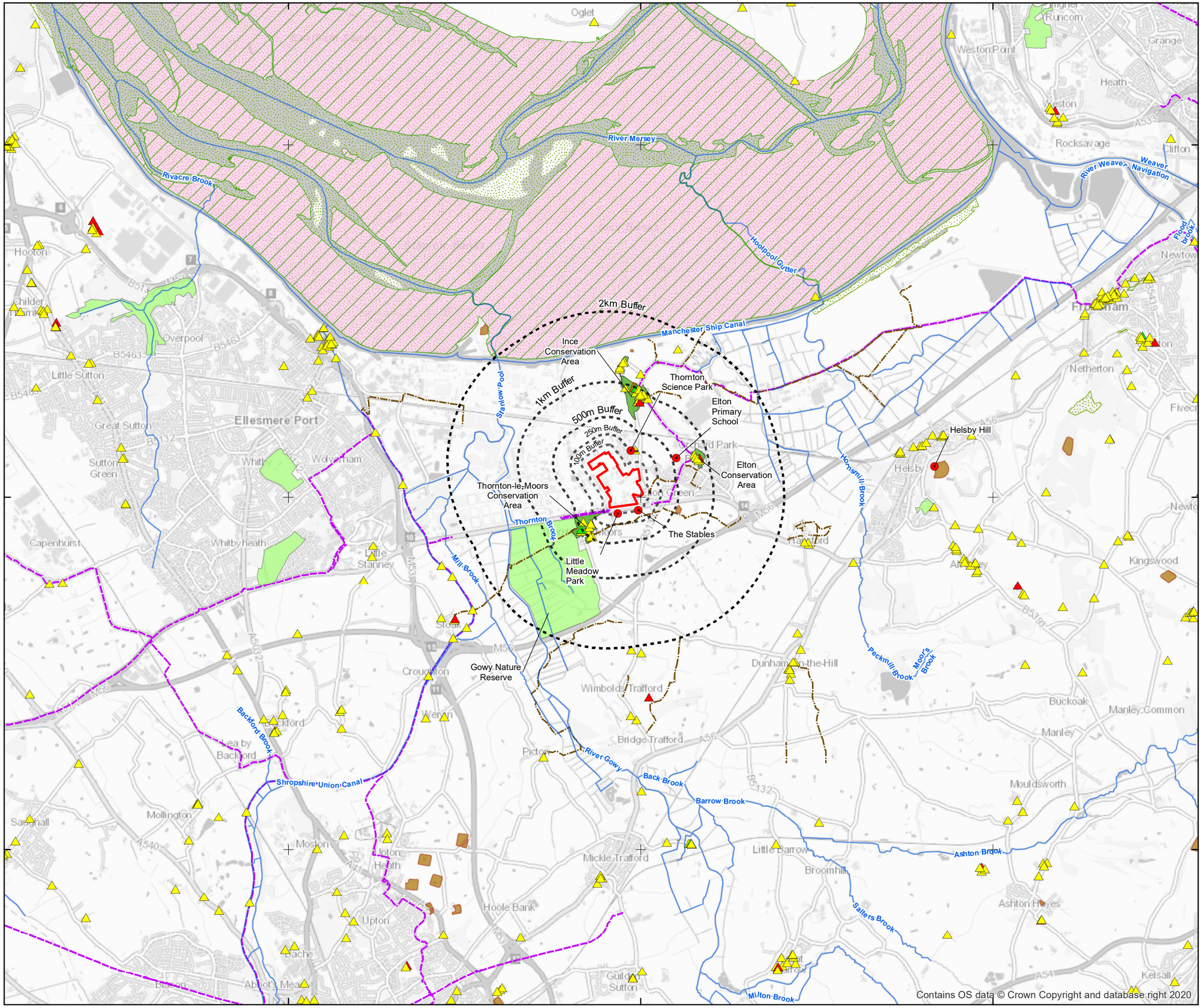


Figure 3.1 Existing site and internal features



Key

- Site Boundary
- Site Buffer
- Notable Sites
- Listed Building - Grade II*
- Listed Building - Grade II
- Listed Building - Grade I
- PRoW
- National Cycle Network - Route 5
- Surface Water Courses
- Scheduled Monuments
- Ramsar
- Conservation Areas
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)

N

0 1 2

Kilometres

Note: Map exhibits the British National Grid.

PROJECT: HYNET HYDROGEN PRODUCTION PLANT			
Progressive energy / SNC·LAVALIN / ATKINS			
JM Johnson Matthey / ESSAR			
TITLE: FIGURE 3.2 ENVIRONMENTAL CONTEXT			
SCALE 1:50,000		ORIGINAL DRG SIZE A3	
DRAWN FM	CHECKED SP	APPROVED DP	
19/05/21	19/05/21	21/09/21	
PROJECT NO. 5194812	DRAWING NO. 5194812_ENVCONTEXT		REV. 02

The village of Elton is located to the east of the Site, beyond Pool Lane, an agricultural field, and an allotment site. As with Thornton Le Moors, Elton is an historic village focused around a conservation area and listed buildings but has expanded to become a much larger village with a residential estate, primary school and a static caravan park named Orchard Park.

Ince village is located to the north east of the Site and is also centered around a conservation area and listed buildings. Ince is separated from the Site by a block of woodland and the Thornton Science Park and there are no direct views from the village to the Site. Further afield are the settlements of Ellesmere Port (approximately 2.8 km west), Stoak (approximately 2.6 km south west), Dunham-on-the-Hill (approximately 2.8km south east), Hapsford (approximately 2.3 km south east), and Helsby (approximately 3.5 km east).

The Mersey Estuary is approximately 1.5 km north of the Site and is designated as a Special Protection Area (SPA), Ramsar Site, and Site of Special Scientific Interest (SSSI). Other notable watercourses include the main river Gale Brook, which runs through the wider Stanlow Refinery, adjacent to the western boundary of the Site.

The Gowy Meadows Nature Reserve and Local Wildlife Site is an area of approximately 165 ha of lowland grazing marsh surrounding Thornton Le Moors. The reserve has no statutory protection but is managed by the Cheshire Wildlife Trust. There is a network of designated and permissive footpaths across this reserve.

There is a dense public transport and right of way network surrounding the Site. The A5117 links directly to the M56 at Junction 14 between Hapsford and Elton and the M53 at Junction 10 to the west. A network of B roads and other minor roads provide connectivity to local residents. The Hooton-Helsby railway line bisects the Stanlow Refinery approximately 330 m to the north of the Site. The nearest station is Stanlow and Thornton approximately 620 m north west of the Site. National Cycle Network Route 5, a long distance cycle route from Bangor in North Wales to Reading, is located along the A5117. The route travels through Elton and Ince to the east of the Site and along the Shropshire Union Canal tow path to the west.

There are numerous public footpaths in the vicinity of the Site, notably 294/FP1/1 (Thornton-le-Moors FP1) which crosses the Gowy Nature Reserve. Footpath 294/FP2/1 (Thornton-le-Moors FP2) continues eastwards connecting Thornton Le Moors to Elton Green via 123/FP5/1 (Elton FP5) passing directly south of the Site, approximately 150 m at the closest point. East of the Site is 123/FP1/2 (Elton FP1) which connects residential properties in Elton to Pool Lane close to the Site boundary.

Helsby Hill to the east of the Site is a Scheduled Monument and popular local viewpoint with commanding views across the Mersey Estuary, including the Site, and into North Wales, as shown in Figure 3.3

Figure 3.3 Panoramic view from Helsby Hill looking west towards the Site and Stanlow Refinery (far left of the image), Helsby in the foreground, CF Fertilisers (centre of the image) and the Mersey Estuary in the background

4.0 PREDICTED ENVIRONMENTAL EFFECTS

Biodiversity

What is the existing environment like?

Within 2km of the Site there are 10 statutory and non-statutory designated ecological sites. The Mersey Estuary has several statutory designations including designation as an important wetland site (Ramsar site), Special Protected Area for birds (SPA) Site of Special Scientific Interest (SSSI).

The Site where the Proposed Development would be located is currently dominated by large areas of hard standing, gravelled bare ground and scattered scrub. An area of priority habitat (one which is listed as a UK Biodiversity Action Plan habitat) has been identified within the north east section of the Site. The habitat is called 'Open Mosaic Habitat on Previously Developed Land'.

Ecology surveys have been undertaken to determine the suitability of the habitats within and adjacent to the Site to support protected or priority species. These found that the Site is not likely to be of importance to any protected or priority species, however some individual animals which are designated as protected species could be present including amphibians (including great crested newts), bats, birds, reptiles, invertebrates, and badgers. There is also evidence of water vole on Gale Brook located to the west of the Site. There is no suitable habitat for water vole on Site.

What are the effects during construction?

Impacts during construction include loss of habitat, degradation of adjacent habitats from dust smothering, disturbance from noise, and impacts to aquatic habitats from construction run off.

The area of priority habitat 'Open Mosaic Habitat on Previously Developed Land' would be temporarily lost as it is within the footprint of the works. Replacement planting within the Site will be undertaken to ensure as a minimum there is no net loss of this habitat and any adverse effects would be temporary.

There are a number of protected species which may be present on Site during construction. The use of precautionary methods of working would avoid harm to these species and no significant effects would occur.

Mitigation measures have been identified to ensure that there would be no significant adverse effects to any designated sites, habitats, or species outside of the Site boundary.

Summary of construction assessment:

The temporary loss of a priority habitat (Open Mosaic Habitat on Previously Developed Land) will result in a minor adverse effect. Compensatory habitat will be created to replace the lost habitat.

What are the effects during operation?

Impacts during operation include emissions to the atmosphere and surface water courses.

Emissions to the atmosphere which could be potentially harmful to habitats include oxides of nitrogen which, if deposited in high concentrations, can result in changes to the composition of plant communities. However, modelling of these emissions shows that there won't be any adverse effects to any designated sites or habitats.

Process effluent (brine) from the Proposed Development will be piped to the Stanlow Refinery where it will be treated prior to discharge to the Manchester Ship Canal. Surface water will be treated within the Stanlow Refinery and then sent to United Utilities waste water treatment facility at Stoak for further treatment prior to discharge to Thornton Brook. The quality of the effluent will be continuously monitored, prior to discharge, to ensure that no adverse effects will occur to the aquatic environment.

No protected or priority species are anticipated to be affected within the operational phase.

Summary of operational assessment:

During operation, there will be no significant effects as a result of direct or indirect impacts.

What are the effects during decommissioning?

Decommissioning effects are considered to be similar (if not less) than those identified within the construction phase.

Decommissioning assessment summary:

There are not anticipated to be any adverse effects during decommissioning.

Visual assessment

What is the existing environment like?

The Proposed Development is set within the low lying, linear valley of the River Mersey. Industrial development including the Stanlow Refinery dominates the immediate landscape surrounding the Site. Areas of farmland separates the industrial areas from nearby villages.

The village settlements of Ince, Elton, Elton Green and Thornton-le-Moors are all located within the surrounding area alongside a number of scattered more rural residences. Woodland, mainly associated with nearby settlements, provide localised screening for those settlements.

There are also a number of active travel routes which provide access through the area including Public Rights of Way (notably Thornton-le-Moors FP1, Elton FP1 and Elton FP5) and National Cycle Network Route 5 which runs along the A5117 (School Lane).

What are the effects during construction?

Impacts during construction will be limited to changes to views due to the presence of construction plant and activities.

Partially constructed new built form and associated large crane activity would be visible from some locations within the surrounding area. Where views are open or partially screened, views of construction compounds, vehicles moving around the Site and ongoing construction activities would be visible and alter the baseline view. During the winter months, additional lighting will be provided on the Site which could result in an additional changes in the view albeit only over a small area. Construction impacts would be temporary and reversible.

Construction assessment summary:

Significant adverse effects are only anticipated where there are gaps in screening vegetation. This is limited to two viewpoints along footpaths to the south of the Site: Elton FP5 and Elton FP1.

What are the effects during operation?

The form and mass of the Proposed Development is similar to the industrial context of the Stanlow Refinery which would provide the backdrop to the Proposed Development. Due to the built-up nature of some of the nearby settlements and screening vegetation (both within the settlements and adjacent to the Site) only the taller structures of the Proposed Development would be visible. Additionally, flaring events could result in a temporary visual effect due to a new light source. This would be an infrequent event given the flare would only be used in emergency situations.

As a result of the overall flat topography of the surrounding area, long distance views of the raised elements may be afforded.

Operational assessment summary:

No significant effects are anticipated during operation as the Proposed Development which would be in keeping with its surroundings and would, at most, constitute a minimal change in the view.

What are the effects during decommissioning?

During decommissioning the visual effects are anticipated to be similar to those experienced during the construction phase as the equipment and activities required to demolish and disassemble the Plant would be similar.

Decommissioning assessment summary:

Significant adverse effects are only anticipated where there are gaps in screening vegetation. This is limited to two viewpoints along footpaths to the south of the Site: Elton FP5 and Elton FP1.

Historic environment

What is the existing environment like?

The historic environment assets located within 1km of the Site include:

- Two Scheduled Monuments: Moated Site, Fishpond and Connecting Channel in Elton, and Ince Manor Monastic Grange and Fishpond.
- Two Grade I Listed Buildings: Manor House of Abbey of St Werburgh Chester, including Old Hall and monastery cottages, and the Church of St Mary.
- Two Grade II* (two star) Listed Buildings: Church of St James, and Rock Farmhouse.
- 29 Grade II Listed Buildings.
- Three Conservation Areas.

The majority of the Listed Buildings are located within the historic cores of Thornton-le-Moors, Elton and Ince, and their respective Conservation Areas. A further eight designated heritage assets, outside of 1km buffer, have theoretical views of the Proposed Development and have been included within the assessment.

What are the effects during construction?

During construction, partial views of construction activity would be available from heritage assets and this would slightly infiltrate the setting of these assets. However, given the existing views of features within the Stanlow Refinery this will not alter the setting significance of any of the historic assets and the effect will be temporary and not significant.

What are the effects during operation?

During operation, the presence of the stacks and flare would infiltrate the setting of some heritage assets through partially screened views. This would not result in a change to the setting significance of any of the assessed heritage assets and there would be no significant effects during operation of the Proposed Development.

What are the effects during decommissioning?

During decommissioning, impacts would be similar to construction with some views of construction plant and activities infiltrating the setting of some heritage assets. This will not alter the setting significance of any of the historic assets and the effect will not be significant.

Assessment summary:

No physical alterations will occur to any heritage assets at any stage of the Proposed Development. Changes to the setting of any historical assets would not result in any significant effects.

Geology and soils

What is the existing environment like?

The Site is currently occupied by legacy infrastructure associated with the Alcohols complex and includes pipes, storage tanks and bunds which are no longer operational and will be demolished prior to the construction. Residual contamination associated with the Site's former use is present in the underlying soils.

The Site is underlain by part of the Sherwood Sandstone Group (till and bedrock). The Till is an undifferentiated aquifer, and the bedrock geology (Chester Pebble Beds) is a Principal Aquifer.

What are the effects during construction?

During construction, it is possible that ground disturbance could result in movements of existing contamination or ground gas on the Site. This could result in human health impacts for construction workers through migration of vapours or dust inhalation. This would be managed through best practice measures and health and safety procedures.

Piling is required to construct the Proposed Development which could (if not managed) impact the underlying Principal Aquifer. The piling will be completed using a Continuous Flight Auger (CFA), which seals the pile as it is being drilled to prevent a new pathway between ground contamination and the underlying aquifer from occurring, and also prevents contamination from being driven downwards into the aquifer. It is therefore unlikely that the underlying aquifers would be affected.

Construction assessment summary:

The design avoids historic contamination and minimises disturbance where this is not possible. With this, coupled with good practice construction techniques, no significant effects relating to geology and soils are anticipated.

What are the effects during operation?

During operation, the Site will be operated under an Environmental Permit and will be largely unmanned. No effects are anticipated, and the geology and soils operational phase assessment was scoped out of the ES.

Operational assessment summary:

There would be no effects to geology and soils during operation.

What are the effects during decommissioning?

The Environmental Permit will likely include surrender conditions which would need to be met during the decommissioning phase.

During the decommissioning phase, some below ground works are required. This could disturb residual contamination or enable cross contamination of the underlying aquifer. The implementation of standard industry guidance for contamination and dust, health and safety measures and environmental monitoring would reduce the potential for residual and pre-development contamination being disturbed.

Decommissioning assessment summary:

With the implementation of industry guidance and best practice no significant adverse effects are anticipated.

Water environment

What is the existing environment like?

Gale Brook, a partially culverted Main River, is located approximately 35 m to the west of the Site. Currently, the Site is in direct connectivity with Gale Brook as run-off from the southern area of the Site flows into a ditch into Gale Brook. Gale Brook flows into the River Gowy, another Main River, approximately 1.8 km north west of the Site.

Thornton Brook, located 900 m to the west of the Site, also flows into the River Gowy. The River Gowy flows into the Mersey Estuary 1.7 km downstream of the confluence with Gale Brook.

There are several unnamed ditches located near to the Site. Other notable surface water features include Manchester Ship Canal and the River Mersey.

What are the effects during construction?

The excavation and deposition of materials, spillage of contaminated liquids (such as fuel) and water runoff from construction sites all have the potential to affect the water environment. The application of mitigation measures will prevent significant adverse effects from occurring to the water environment.

These measures will be implemented through a Construction Environmental Management Plan and will include best practice construction techniques such as dust management, emergency spill procedures, appropriate storage of hazardous materials, secondary containment measures and appropriate construction drainage.

Construction and Decommissioning assessment summary:

With the implementation of mitigation measures, no significant effects are anticipated on the water environment.

What are the effects during operation?

Surface water run-off from the process areas, where there is a risk of contamination, will all be directed to water treatment plants within the Stanlow Refinery prior to discharge to the Thornton Brook. Process effluent will be directed to a cooling tower pond (known as CT2) prior to discharge into the Manchester Ship Canal. The discharges are operated under an Environmental Permit so that any discharges from the Proposed Development will meet the environmental quality standards specified in the appropriate Environmental Permit and there would be no significant effects to the water quality of any receiving water courses.

Operational assessment summary:

The operational drainage strategy and treatment of process effluent would ensure no significant effects occur to any watercourses.

What are the effects during decommissioning?

During decommissioning, there will be no direct discharges to any surface watercourses. The Site drainage network will be retained through decommissioning so any spills or leaks will be collected and treated as per the operational phase of the Proposed Development prior to discharge under permit. Additional temporary drainage would also be provided where required to ensure that no surface run-off could contaminate watercourses.

Climate vulnerability

What is the existing environment like?

The current climate in the study area is one of relatively mild winters and warm summers. Monthly average temperatures in the North West are just above the average for the UK whilst monthly mean maximum temperatures are close to the average. Long-term average monthly rainfall is close to the UK average as is the number of heavy rainfall days.

In the future, the climate is likely to experience hotter and drier summers and warmer and wetter winters. Alongside this, it is possible, but less certain, that climate change will also increase the frequency and severity of extreme weather events; such as: heavy rainfall, storms, and heatwaves.

What are the effects during construction?

The construction of the Proposed Development is not expected to be far enough into the future for climate to change so significantly that its influence on construction will be different to that expected in the current climate. Therefore, no significant effects are identified from climate change on construction.

What are the effects during operation?

Hotter summers predicted in the future may lower water levels in watercourses, whereas the wetter winters expected would do the opposite.

The effluent discharged from the Proposed Development is predominantly brine. Therefore, as rivers receiving process effluent from the Proposed Development could have less water within them during the summer, they could become saltier as there is less dilution potential. However, the large volume of the water in the Mersey Estuary would still achieve dilution of these discharges so that this would not be a significant effect.

Water required to operate the plant will be obtained from the River Dee and supplied by United Utilities. As climate change is expected to lower water levels during summer, the operation of the Proposed Development will further reduce water levels. The opposite would occur during future wetter winters where flows are predicted to increase resulting in the Proposed Development's water demand being an even small proportion of the freshwater inflows.

Operational assessment summary:

Although climate change will intensify effects identified within other topics, none of these are anticipated to result in significant effects.

What are the effects during decommissioning?

The assessment of decommissioning effects has been scoped out as any impacts will be mitigated or removed by adherence to standard good practice.

Greenhouse gas emissions

What is the existing environment like?

The UK is one of the world's largest emitters of greenhouse gases, with emissions for 2019 (the latest reported year) being 455 million tonnes of carbon dioxide equivalent, accounting for around 1% of the total global emissions.

Greenhouse gas emissions for the Cheshire West and Chester Council borough have decreased between 2005 and 2018 but the borough still has comparatively high greenhouse gas emissions when compared to other UK authorities. This is due to the high concentration of heavy industry comprising the Mersey Industrial Cluster located within its borders.

What are the effects during construction?

Greenhouse gases will be emitted during the production, extraction and transportation of materials required to construct the Proposed Development. Additionally, construction activities, including emissions from construction machinery, would also emit greenhouse gases. Mitigation measures to reduce these emissions will include exploring the potential for low carbon solutions (including technologies, materials, and products) to minimise consumption of resources.

Construction and Decommissioning assessment summary:

Machinery used to construct and decommission the Proposed Development will release carbon emissions. Materials required to construct the Development also have associated carbon emissions. Neither phase would result in a significant effect on the climate.

What are the effects during operation?

The Proposed Development will produce hydrogen which will replace natural gas as a fuel source for various industrial units across Cheshire and Chester. The displacement of carbon will avoid the release of significant quantities of greenhouse gasses to the environment within the region.

Carbon dioxide (a greenhouse gas) will be produced during the LCH process and approximately 97% of this will be captured and sent for long term geological storage in Liverpool Bay. The energy required to operate the Proposed Development will also result in the release of carbon emissions.

The carbon savings resulting from switching industrial processes from natural gas to hydrogen greatly outweigh the relatively small amount of carbon emissions that would result from the operation of the Proposed Development. This will be a significant benefit and will greatly help the region decarbonise to meet its future carbon budget.

Operational assessment summary:

The Proposed Development would support the decarbonisation of industrial, transport and heating sectors.

Although emissions would be generated due to the operation of the Proposed Development, these would be offset from the emissions saved as a result of HyNet.

What are the effects during decommissioning?

The Proposed Development will give rise to greenhouse gas emissions relating to decommissioning activities during clearance activities. During the decommissioning phase, further emissions will be emitted due to the transportation of workers and materials from the Site to a disposal or recycling facility. It should be noted that as these activities will occur 25 – 40 years in the future, it is expected that the transport fleet will be electric, or hydrogen and emissions are likely to be much lower than during construction which will use mainly conventional diesel plant and equipment.

Noise and vibration

What is the existing environment like?

The noise climate in the area is typical of a mixed residential and industrial area, comprising transport and industrial noise sources.

Noise from transport includes road traffic from the M56, A5117 School Lane, Pool Lane, and other local roads. Other sources of transportation noise include rail traffic on the Hooton-Helsby line to the north, and air traffic associated with Liverpool John Lennon Airport and Manchester Airport.

The Site is located within the existing Stanlow Refinery to the west. There is also a Biomass Energy plant and a Fertiliser plant to the north-east of the Site. These all contribute to the background noise environment.

What are the effects during construction?

Construction activities including plant noise, material handling and demolition works have the potential to cause increased noise levels on nearby locations. The additional traffic on local roads also has the potential to increase noise at nearby sensitive receptors either side of working hours (8am to 6pm).

Although piling is required during the construction of the Proposed Development, continuous flight auguring (CFA) which does not produce significant levels of vibration is the selected method. The main source of construction vibration is therefore from compaction activities, such as vibratory rollers. Both noise and vibration levels during construction will be managed by the implementation of best practicable means stated in a Noise and Vibration Management Plan.

Construction assessment summary:

At worse, the construction phase will result in minor adverse effects at residential receptors closest to the development. These effects would be short term and temporary.

What are the effects during operation?

During operation of the Proposed Development, noise egress from the various items of plant, and the associated processes, have the potential to increase noise at nearby sensitive receptors.

The potential changes in noise has been modelled to determine the likely effects. This modelling has been based on the ‘worst-case’ scenario (i.e., modelled for the loudest plant specification) and the actual noise from the Proposed Development would in reality be lower than modelled. The output of the model indicates that the noise emitted from the Proposed Development would not be noticeable against the background noise.

Operational assessment summary:

Noise from the Proposed Development is not anticipated to be notably different from the existing baseline.

What are the effects during decommissioning?

Works in the decommissioning phase will include similar activities to the clearance and demolition works that will be undertaken during the construction phase. Therefore, it is anticipated that decommissioning works will result in similar effects to the construction phase.

Decommissioning assessment summary:

At worse, the decommissioning phase will result in minor adverse effects at residential receptors closest to the development. These effects would be short term and temporary.

Waste and materials

What is the existing baseline like?

The receptors considered in the existing waste baseline are landfills, and more specifically their capacity to accept waste, within the North West region (the area in which any waste from the Proposed Development would likely be sent to).

The materials baseline is derived from the sale of the key materials required to construct the Proposed Development at regional and national scales. This will be mainly aggregate, asphalt, concrete, and steel.

What are the effects during construction?

The consumption of resources (materials) required to construct the Proposed Development would have an adverse effect on material availability. This effect will be short-term, in that the demand would be a single event lasting the duration of the construction phase, but permanent, in that the non-renewable resources (i.e., those that cannot or will not be replaced in short (non-geological) periods of time) would be consumed.

Waste generated during construction will include both hazardous waste and non-hazardous waste. These would require disposal at a registered facility and result in a reduction in landfill capacity. The quantity of waste will be reduced through optimising the design (in line with the waste hierarchy), implementation of a Site Waste Management Plan and recycling and reusing materials where possible.

Construction assessment summary:

The expected quantities of materials required, and waste generated will not have significant effects on the materials market or the waste capacity in the North West.

What are the effects during operation?

During operation, only small quantities of waste that would be sent to landfill will be generated and it is not anticipated that there would be significant adverse effects on landfill capacity. There will be no significant material usage during operation.

Operational assessment summary:

No significant adverse effects are anticipated due to the use of materials or generation of waste during operation.

What are the effects during decommissioning?

During decommissioning the Proposed Development will be dismantled and removed from Site. The majority of the materials will be reused or recycled, based on industry good practice, and will not require disposal to landfill. Where materials cannot be recycled or reused, they will be disposed of at an appropriate facility. Process chemicals removed from the plant will be reused or recycled where possible but there is likely to be some residual hazardous waste that will need to be disposed to an appropriately engineered landfill. No raw materials would be used during this phase.

Decommissioning assessment summary:

The decommissioning phase of the Proposed Development is set to have a neutral or slight effect on regional landfill capacity, based on the disposal of hazardous waste.

Population and human health

What is the existing environment like?

The Site is located within the borough of Cheshire West and Cheshire and is in a predominantly industrial area, surrounded by a number of small residential settlements including Elton, Elton Green, Thornton-Le-Moors and Ince. Within these settlements are a number of different receptors including residents and local businesses.

The existing health profile of people living local to the Site is broadly characterised by the following:

- A higher proportion of young (under 16) people
- A higher proportion of older people (over 65)
- A higher proportion of people killed or injured from road traffic collisions
- A higher proportion of people living in more deprived areas
- A higher proportion of people who experience barriers to housing and access to services

What are the effects during construction?

Construction of the Proposed Development will introduce additional vehicles and vehicle traffic on local roads. However, traffic collision data concludes there is no significant risk identified of injury or death on the roads near the Site.

During construction, it is not anticipated that human receptors close to the Site would experience significant adverse effects to health.

Local businesses located within the area surrounding the Site would experience increased road traffic as a result of construction vehicles which could result in changes in accessibility. Additionally, on-going construction activities would result in changes to noise and dust. However, these effects would not be significant and would be temporary.

The construction phase would result in direct jobs for local residents with the appropriate skills as approximately 80% of the workforce are expected to be local to the Site. Additionally, the influx of construction workers may benefit the local economy, as construction workers increase expenditure at local businesses.

Construction assessment summary:

The Proposed Development would result in significant beneficial effects from temporary employment opportunities generated during the construction phase.

Adverse effects would occur as a result of increased disturbance and increased demand for housing. These effects would not be significant.

What are the effects during operation?

During the operational phase, human health receptors are contractors completing maintenance tasks on the Site and the local population. During this phase, there is a low risk to human health for both on and off-Site human receptors. There would be some minor employment benefits for up to 35 operational and maintenance staff.

Operational assessment summary:

No significant adverse effects would occur for human health receptors on or off Site during the operational phase.

What are the effects during decommissioning?

Given the location of sensitive receptors, decommissioning related exposures (dust, pollutants, noise, vibration, contaminants, and changes to views) are unlikely to result in significant effects to human health.

Although the Proposed Development will introduce additional vehicles on local roads during the decommissioning phase, traffic collision data identifies there is no significant identified risk of injury or death on the roads near the Site.

Decommissioning assessment summary:

The effects experienced during the decommissioning phase would be adverse, temporary, and not significant.

Air Quality

What is the existing environment like?

There are multiple receptors surrounding the Site which could be sensitive to changes in air quality. These include human health receptors such as residential properties, schools and hospitals and designated ecological sites such as the Mersey Estuary Ramsar and SPA.

The Proposed Development lies partially within an Air Quality Management Area which was declared for exceedances of sulphur dioxide. Local authority monitoring data indicates that currently there are no exceedances of Air Quality Standard objectives for nitrogen dioxide and particle matter (dust) at sensitive locations in the vicinity of the Proposed Development.

What are the effects during construction?

Construction and demolition activities have the potential to result in visible dust plumes, dust deposition resulting in soiling of surfaces and an increase in airborne particulate matter. Appropriate mitigation will be secured in a Construction Environmental Management Plan (or similar) which when applied correctly would limit the potential for disturbance from off Site dust soiling.

Construction traffic movements also have the potential to cause a change in air pollutant concentrations at sensitive human health receptors. A road traffic dispersion model was completed using construction traffic movements data. This found no modelled exceedances of the Air Quality Standard objectives with the maximum change in concentrations of nitrogen dioxide, particulate matter at any receptor is described as negligible.

Construction assessment summary:

There will be no significant effects with the implementation of suitable mitigation measures.

What are the effects during operation?

The Phase 1 and Phase 2 Steam Boilers and Feed Fired Heaters will each discharge continuous oxides of nitrogen through individual raised stacks. There will also be minor emissions of carbon monoxide and sulphur dioxide generated by the combustion process. To understand the impact of operational stack emissions, a detailed air quality model was used to estimate the change in pollutant concentrations.

The design incorporates a suitable stack height to facilitate dispersion and minimise potential air quality impacts at sensitive receptors. The modelling concluded that the Proposed Development will not exceed the Air Quality Standard objectives for any of the emitted pollutants at any modelled human health receptor. Critical thresholds at ecological sites would also not be exceeded.

Operational assessment summary:

Operational emissions will not result in any significant adverse effects at human health or ecological receptors.

What are the effects during decommissioning?

The risk of dust impacts during the decommissioning phase, including demolition activities, are likely to be similar to the risk of impacts during the construction phase. With the implementation of appropriate mitigation measures, secured through a dust management plan, there should be limited potential for off Site dust soiling and vehicle / plant emissions.

Traffic movements associated with the decommissioning phase are expected to be lower than the construction phase and would therefore be no worse than predicted for construction.

Decommissioning assessment summary:

Mitigation, which comprises best practice, to minimise construction dust has been proposed which would avoid adverse effects occurring.

Cumulative effects

What is the existing environment like?

The cumulative effects assessment considers the overall effect of the Proposed Development at a receptor or group of receptors from all of the different environmental aspects.

It also considers how other developments (which have not yet been built) in the area can cumulatively affect environmental receptors identified by the Proposed Development. The following developments have been included in the assessment:

- The wider HyNet programme of projects
- Combined Heat and Power (CHP) within the Stanlow Refinery
- Replacement of Crude Distillation Units within the Stanlow Refinery
- Land at Ince Marshes Lordship Lane Frodsham Cheshire
- Protos / Ince Resource Recovery Park

What are the effects during construction?

There would be no significant interactions to environmental receptors from the Proposed Development.

Cumulative effects which are likely to occur with the other developments during construction are:

Moderate adverse and significant cumulative effects are predicted to occur at the following environmental receptors:

- Viewpoints to the south of the Proposed Development
- Thornton-le-Moors conservation area
- Residential receptors due to noise

Minor adverse cumulative effects may also occur for designated ecological sites, habitats, listed buildings, local residents (as a result of increased exposure to dust and contamination, and general disturbance), the underlying aquifer, and local businesses.

Significant beneficial cumulative effects will occur to the local workforce due to increased economic activity.

Construction assessment summary:

Significant adverse cumulative effects could occur during construction due to other developments occurring at the same time.

The construction phase will also result in a significant beneficial effect as a result of increased job opportunities to the local workforce.

What are the effects during operation?

There would be no significant interactions to environmental receptors from the Proposed Development.

No significant cumulative effects are likely to occur with the other developments during operation. Minor cumulative effects are likely to occur to designated ecological sites, viewpoints to the south of the Proposed Development, listed buildings, and local residents due to potential combustion emissions.

Operational assessment summary:

No significant cumulative effects are anticipated for any receptor during the operational phase of the Proposed Development.

What are the effects during decommissioning?

Proposed Developments interactions are not anticipated for the decommissioning phase with no receptors experiencing significant adverse effects.

Limited details are available for the decommissioning phase of the Proposed Development and even fewer are available for the other developments. It is assumed that as a worst-case scenario, all developments would be decommissioned at the same time, in which case the cumulative effects for the decommissioning phase will be similar to the construction phase.

Decommissioning assessment summary:

It is anticipated that the decommissioning phase cumulative effects would be similar to those experienced during the construction phase.

5.0 WHAT HAPPENS NEXT?

Essar Oil (UK) Limited has submitted an application to Cheshire West and Chester Council as the Local Planning Authority under the Town and Country Planning Act 1990 for the Proposed Development.

Cheshire West and Chester Council will now consider whether the application should be accepted.

During this period, the Local Planning Authority will consult with statutory consultees and make the application documents available via their planning portal. Interested parties will be able to make representations on the Proposed Development and its potential impacts via this planning website.

Additionally, further information on the Proposed Development and the other HyNet North West Projects are available on the HyNet North West website (https://hynet.co.uk/).

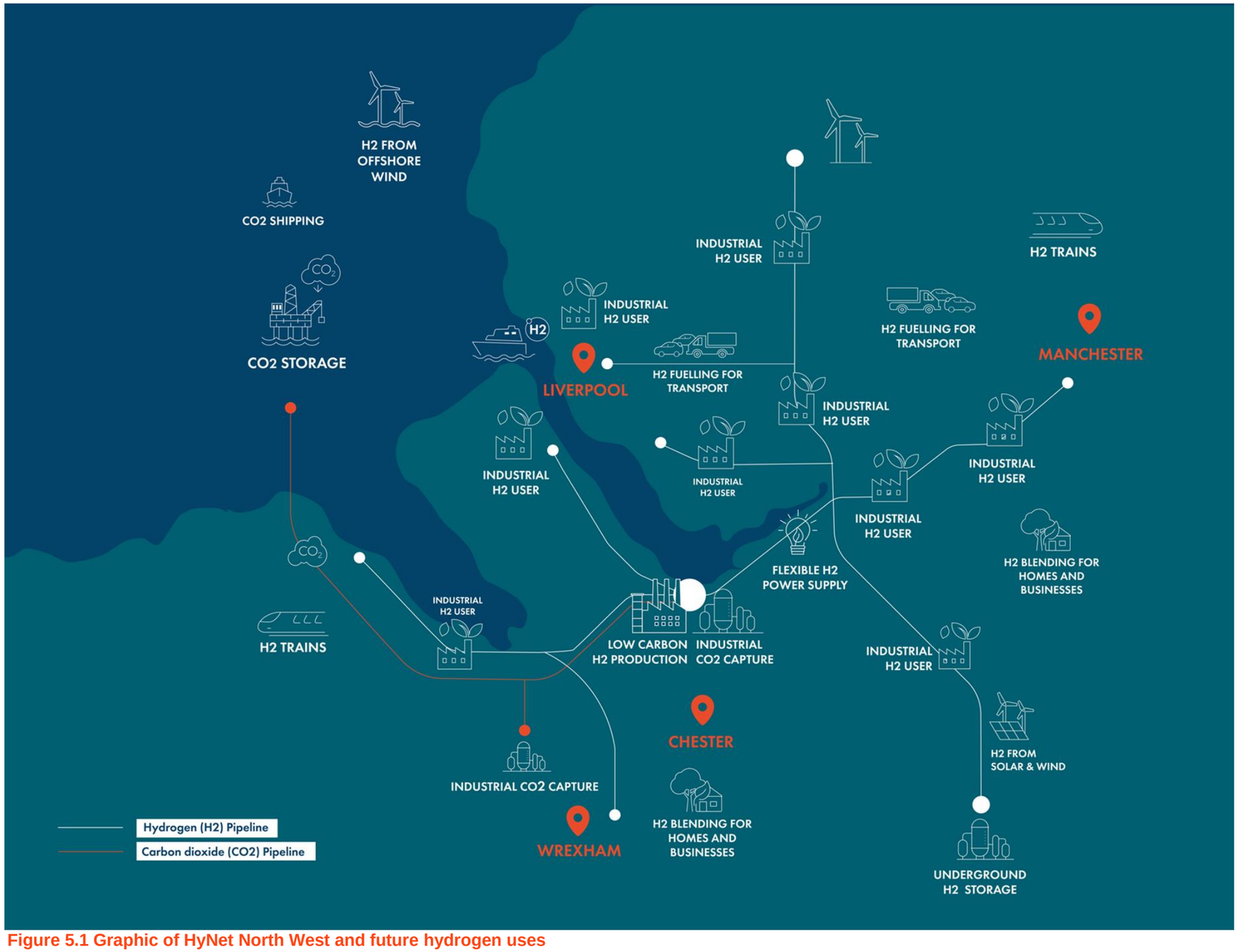


Figure 5.1 Graphic of HyNet North West and future hydrogen uses