

## Environmental Impact Assessment for the VYNOVA HPE Plant, including EDC Road Loading activities, under Normal Operating Conditions.

	Environmental Aspect	Source of Impact	Substance	Threshold Condition (where applicable)	Actual emission (where applicable) <sup>1</sup>	Significant Y/N	Recommendations and Comments
<b>1</b>	<b>Releases to Air</b>						
1.1	EPR authorised releases from HPE-1 Incinerator vent stack.	Combustion of plant process vents & organic liquid residues generated from the process.	Particulate matter derived from combustion activity.	WID limit of 10mg/m <sup>3</sup>	<6.78mg/m <sup>3</sup> (measured bi-annually)	N	Emissions are also continually monitored and alarms are set up to warn of higher than normal levels.
			Total organic carbon (TOC).	WID limit of 20mg/m <sup>3</sup>	<7.76mg/m <sup>3</sup> (measured bi-annually)	N	Emissions are also continually monitored and alarms are set up to warn of higher than normal levels.
			Hydrogen Chloride	WID limit of 30mg/m <sup>3</sup>	<5.9mg/m <sup>3</sup> (measured bi-annually)	N	Emissions are also continually monitored and alarms are set up to warn of higher than normal levels.
			Hydrogen Fluoride	WID limit of 2mg/m <sup>3</sup>	<0.17mg/m <sup>3</sup> (measured bi-annually)	N	
			Carbon monoxide	WID limit of 100mg/m <sup>3</sup>	<1.7mg/m <sup>3</sup> (measured bi-annually)	N	Emissions are also continually monitored and alarms are set up to warn of higher than normal levels.
			Oxides of nitrogen (as NO <sub>2</sub> )	WID limit of 200mg/m <sup>3</sup>	<48.8mg/m <sup>3</sup> (measured bi-annually)	N	Emissions are also continually monitored and alarms are set up to warn of higher than normal levels.
			Cadmium + Thallium and their compounds	WID limit of 0.05mg/m <sup>3</sup>	<0.02mg/m <sup>3</sup> (measured bi-annually)	N	

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			Mercury and its compounds	WID limit of 0.05mg/m <sup>3</sup>	<0.004mg/m <sup>3</sup> (measured bi-annually)	N	
			Other Metals (e.g. Lead, Copper, Nickel, etc.)	WID limit of 0.5mg/m <sup>3</sup>	<0.152mg/m <sup>3</sup> (measured bi-annually)	N	
			Dioxins/Furans (I-TEQ)	LVOC BREF limit of 0.08ng/m <sup>3</sup>	<0.036ng/m <sup>3</sup> (measured bi-annually)	N	
			Chlorine	LVOC BREF limit of 4mg/m <sup>3</sup>	<0.26mg/m <sup>3</sup> (measured bi-annually)	N	
			Sulphur dioxide	WID limit of 50mg/m <sup>3</sup>	<0.62mg/m <sup>3</sup> (measured bi-annually)	N	
1.2	EPR authorised releases from HPE-21, HPE-22 & HPE-23 intermittent vents which only operate when the incinerator is unavailable.	Wet (HPE-21) & dry (HPE-22) process vents directed to atmosphere via caustic scrubbers if vents could contain chlorine. HPE-23 is only used if the effluent plant vents need to be directed away from the main wet vent header.	Hydrogen chloride	1.73e <sup>-2</sup> g/s for ~30m stack (from EA Technical Guidance Note E1, Table D1)	Not measured	N	Only from HPE-21 and HPE-22. Surrogate monitoring of caustic soda strength of the scrubber liquor, this is a Process Safety KPI.
			Chlorine	7.41e <sup>-3</sup> g/s for ~30m stack (from EA Technical Guidance Note E1, Table D1)	Not measured	N	Only from HPE-21 and HPE-22. Surrogate monitoring of caustic soda strength of the scrubber liquor, this is a Process Safety KPI.

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			EDC	2.96e <sup>-1</sup> g/s for ~30m stack (from EA Technical Guidance Note E1, Table D1)	0 – 29.75g/s (i.e. max 2570kg/day)	Y	When vents in use, 4-hourly sampling & analysis carried out on all applicable vents. EPR limit of 2650kg/day and targets on vent diversion times.  <b>Project summer has now installed new boiler feedwater pumps which were the main source incinerator unreliability</b>
			Ethylene	N/A	0 – 11.21g/s (i.e. max 969kg/day)	N	Only from HPE-22. When vent in use, 4-hourly sampling & analysis carried out. EPR limit of 1500kg/day and targets on vent diversion times.
			Vinyl chloride	?	0 – 2.39g/s (i.e. max 207kg/day)	N	Only from HPE-21. When vent in use, 4-hourly sampling & analysis carried out. EPR limit of 300kg/day and targets on vent diversion times.
			Other VOC's	?	0 – 2.76g/s (i.e. max 239kg/day)	N	When vents in use, 4-hourly sampling & analysis carried out on all applicable vents. EPR limit of 500kg/day and targets on vent diversion times.
1.3	EPR authorised releases from HPE-15. Intermittent vent which will	Outbreathing requirements of the nitrogen padded EDC/residues stock	EDC	8.89e <sup>-1</sup> g/s for ~50m stack (from EA Technical Guidance Note E1, Table D1)	0.31 – 0.97g/s (i.e. 26.4 – 84.1kg/day)	Y	When vents in use, 4-hourly sampling & analysis carried out on all applicable vents. EPR limit of

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	only operate when the incinerator is unavailable	tanks on HPE and dry process vents from distillation to HPE-15 vent at 60m (stack 49).	Other VOC's				2650kg/day and targets on vent diversion times.  When vents in use, 4-hourly sampling & analysis carried out on all applicable vents. EPR limit of 500kg/day and targets on vent diversion times.
1.4	Fugitive emissions	Diffuse VOC emissions from plant equipment	EDC		3,234 kg yr <sup>-1</sup>	Insignificant	Value estimated using hygiene monitoring data and reported to the environment agency annually via the pollution inventory. High integrity equipment has been specified for project summer to minimise emissions where possible.  LDAR program to be updated/implemented following plant start up (to meet LVOC/CWW BREF requirements)
1.5	Other direct emissions	Direct carbon dioxide emission via HPE -1 from combustion of vents, residues and natural gas	CO <sub>2</sub>	N/A	11221 tonnes yr <sup>-1</sup>	Insignificant	These emissions are controlled by the UKETS  Future sustainability projects will look to reduce this emission with alternative combustion technology/fuels
1.6		Evaporation from cooling towers	The plant operates 3 cooling towers with minimal losses			Insignificant	

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			to the air through evaporation				
1.7		Laboratory fume cupboard(s)	The plant operates two fume cupboards which are primarily used for sample storage and no lab work takes place using our fume cupboards			Insignificant	Any quantities released are small and trivial.
1.8	<b>Indirect emissions</b>	CO <sub>2</sub> from steam	The plant used an average of 177.2 GWhrs of steam (Max 200 GWhrs) over the last three years of operation. This has produced an average of 45884 tonnes yr <sup>-1</sup> of CO <sub>2</sub>  Carbon dioxide leads to Global warming				Steam supplied to site uses CHP technology to maximise generation efficiency. It also includes renewable fuel sources, e.g. energy from waste and hydrogen combustion

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1.9		CO <sub>2</sub> from electricity	Approximately 71000MWhrs have been used by the plant over the last three full years of operation. This has led to an average of 13654 ton yr <sup>-1</sup> of CO <sub>2</sub>  Carbon dioxide leads to Global Warming			Insignificant	Power supplied to site uses CHP technology to maximise generation efficiency. It also includes renewable fuel sources, e.g. energy from waste. Ongoing drive to improve energy efficiency and participate in ESOS
<b>2. Releases to water</b>							
2.1	<b>Direct Releases</b>	EP Permit Release point W49	This outfall provide storm water drainage only around the plant area			Insignificant	Regular testing of the outfalls ensures compliance with the consent limits agreed with the EA.
2.2		EP Permit Release points W56	This outfall provide storm water drainage from around the plant and blowdown purge from HPE cooling tower ponds.		Blowdown purge rate designed to be 39m <sup>3</sup> /hr but to be confirmed during plant operation based on cooling water chemistry	Insignificant	Bunded areas have drains that are sealed to outfall. Any material (normally rainwater) that collects in the bund is then either safely pumped to Effluent treatment (600 unit) or removed by external contractors and treated on/off site.

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2.3	<b>Releases to be disposed of by others</b>	Process effluent ex 600 unit Effluent treatment unit – pumped by pipeline to Inovyn EIP	Water containing metals, salts and trace organics.	0.05 g/t of EDC purified		Insignificant	EIP will treat stream for metals and salts but not organics hence 600 unit is designed to meet the BAT-AEL for direct emission of EDC.
2.4		Foul Drains collect sewage and drainage from amenity blocks, offices, etc.	There are no links between the foul drains and the plant effluent systems. ensuring no industrial contaminants can impact on public treatment systems. The material is discharged into the domestic sewage system or cesspit.			N/A	
<b>3 Releases to land</b>							
3.1		Laydown areas / transportation of equipment.	Minor spillages of residual liquors/solids from contaminated equipment.			Insignificant	Contaminated equipment is either fully cleaned before being removed from the plant, thereby collected in the effluent system, or bagged and sealed prior to transportation.
3.2		Portable Containers	IBC's are used minimally on site. They are stored in a kerbed area with it's own dedicated sump, that is emptied by tanker on a schedule. As			Insignificant	IBC's are labelled clearly to ensure that acid and alkali material is not inadvertently mixed, and containers are stored appropriately to minimise risk of spillage.

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			such any leaks from these vessels will not contaminate ground or reach outfall				
3.3		Mobile equipment	Mobile pumps, air compressors, etc. are temporarily used during times of maintenance on the plant and have potential for oil spillage.			Insignificant	All equipment is hired in from designated suppliers who are aware of the site standards e.g. drip trays, etc.
<b>4 Community</b>							
4.1		Traffic – cars, tankers, cranes, etc.	Little disturbance to local residence as the access to the Site is via the expressway rather than through residential areas.			Insignificant	
4.2		Visual Impact	The plant appearance is in keeping with an industrial area.			Insignificant	
4.3		Noise	No noise complaints received relating to normal operation. Noise surveys will be			Insignificant	



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			conducted in and around the plant following plant start up.				
<b>5 Natural Resources</b>							
5.1		Water	On average for the last 3 years 371 km <sup>3</sup> /yr of water is supplied to the plant.			Insignificant	Water is not consumed by the process and ultimately be returned to the environment, mostly in releases to water as described above
5.2		Fossil Fuels	Fuel used for maintenance van/truck and occasional portable equipment hire. Owing to the amount of portable equipment on hire for project summer the total diesel used in the past year has been 114.8 tonnes.		CO <sub>2</sub> emissions of 366.5 tonnes in 2022	Insignificant	
5.3		Lubricants (Oil)	Approx. one 45-gallon (200 litre) drum of hydraulic/mineral oil is purchased each year for lubrication purposes.			Insignificant	Oils are stored in an off-plant 'garage' on concrete-made ground, under lock and key. Approx. 2-3 oil drums are stored at this location. This is now compliant with the Oil Storage Regulations 2001 SI2954.

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<b>6 Waste Management</b>							
6.1	<b>Hazardous waste</b>	Organic contaminated waste	EDC contaminated waste e.g. spoils, sludges, lagging etc. These are sent off site for safe disposal				All waste is disposed of through the Inovyn Environmental Operations Group (Envops) in accordance with national and corporate requirements for waste disposal.
6.2		General / Non-process waste	Day-to-day activities also generate non-process waste which must be recycled where possible or sent to landfill. Separate skips are used for this purpose.			Insignificant	
6.3		Asbestos – CAF joints	Waste of this nature is generated by maintenance activities. It is handled and disposed of according to the relevant site instruction.			Insignificant	The installation of CAF joints has now been phased out on the site. As maintenance activities occasionally come across this material, it is replaced with a modern equivalent and are disposed of via a regulated disposal company.
6.4		Packaging	A number of items are delivered on the plant using FLT's and pallets. These pallets are re-used			Insignificant	

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			time and time again until they are no longer fit for purpose. These will then be recycled				
6.5		Samples	Negligible impact. All samples that are routinely taken on the plant are returned into the process via portable containers into the plant effluent treatment.			Insignificant	
6.6		Off-specification products	Minimal impact. In general no 'off spec' products are produced, but when necessary such material is internally recycled or blended in to the process.			Insignificant	

**Notes:-**

Actual emissions taken from last 3 years of available data i.e. 2019-2021 inclusive.

Historic land contamination is the responsibility of the land owner and site hosts Inovyn.

Plant Overhauls are carried out in accordance with SAF17 procedures and as such an environmental impact assessment of the event is completed prior to the shutdown.

**Key :-**

EPR Environmental Permitting (England and Wales) Regulations 2016  
WID Waste Incineration Directive (Directive EC2000/76/EC)  
VOC Volatile Organic Compound  
LVOC Large Volume Organic Compounds  
CWW Combined Waste Water  
BREF Reference document for Best Available Techniques  
BATc Best Available Technique Conclusions document