

POSSIBLE MAJOR POINT SOURCES OF PYRIDINE DISCHARGE TO TEES

Vertellus Specialities UK Ltd: chemicals plant (formerly Seal Sands Chemicals), with production facilities for pyridine and pyridine derivatives.

Following an FoI submission to the Environment Agency (EA), it was confirmed that Vertellus/Seal Sands Chemicals did manufacture pyridine and pyridine derivatives. Seal Sands Chemicals discharged effluent to a soakaway from 1979 until 1984. From 1984 until 2017, treated effluent (Seal Sands Chemicals/Vertellus) was discharged directly to Tees Estuary via the “W1 discharge emissions point. Grid Reference NZ 54431 25033.”

A “whistle blower” reported that, during the period 2002-2005, the Seal Sands Chemicals facility (predecessor of Vertellus) did not have an on-site biological effluent treatment plant (BEFT) and that the site’s un-treated liquid effluents were discharged from the site onto nearby wetlands (presumably Seal Sands).

Analysis of EA documents confirm that sometime after 2005, under the ownership of Vertellus, the site did acquire an associated BETP. EA documentation confirms that, by 2019, the BETP was located on the Vertellus site, but a plan of the site reveals that the BETP site was out-with the Vertellus sphere of responsibility.

EA documents confirm that at least two outside companies had operated the BETP by 2019 and that, by that year, the BETP was not in operation. The full treatment of blended effluent at the Veolia operated effluent treatment plant ceased in April 2017. EA documents confirm that up to 49.9 m³ d⁻¹ of Vertellus un-treated liquid effluent was being “tankered”, by road, to Northumbrian Waters Bran Sands Wastewater Treatment Plant (WTP) from 2017 until site closure in 2021, with “treated” liquid effluent discharged to Dabholm Gut.

“The installation involves the aerobic treatment of hazardous and non-hazardous wastes in a number of dedicated processes or ‘trains’.”

“All aerobic treatment processes are activated sludge processes, with aerobic digestion followed by sludge settlement. The effluents from the processes then combine prior to discharge to Dabholme Gut. The digested and dewatered sludge will then be exported for directly beneficial use as fertiliser.”

“Emissions from the installation mainly consist of treated effluent discharged to Dabholme Gut,”

“The Agency has assessed the impact of the emissions from the installation and concluded that although emissions from the installation are significant, they do not cause a breach of any trigger levels:” Variation application number EPR/LP3439LK/V005 Consolidated permit number EPR/LP3439LK

Documentation provided by EA to date does not indicate any specific process for the removal of any specific chemical from Vertellus mixed liquid effluents.

In 2020, the EA issued a permit of surrender to Vertellus, regarding the decommissioning of the Vertellus on site BETP which the EA were informed had already been fully decommissioned.

In 2020, an EA document reported that "Vertellus has an agreement with Northumbrian Water Limited (NWL) to discharge the site's effluent (trade effluent and rainwater). This agreement authorises discharge of the site's effluent to the NWL WTP through a newly constructed pipeline." It is noted that on 13/03/2020, the EA were in receipt of a document titled "Vertellus Effluent Treatment at Bran Sands: Explanation." In 2022, a response from NWL to an Fol submission (EIR22216) confirmed that "Vertellus did contact NWL about a proposed connection to one of our pipelines but this connection was never completed."

Regarding the onsite BETP, the historical evidence confirms repeated problems. Apparently in the early 2000s there was no operating on-site BETP and "whistleblower" reports that liquid effluents were being "hose piped" onto adjacent wetland at this stage. Later, an adjacent BETP facility was operated by at least two different entities (but NOT Vertellus), and although immediately adjacent to the Vertellus site the facility was NOT within the Vertellus site plan and apparently not its direct responsibility.

The scenario laid out above, indicates a chaotic and highly unsatisfactory management regime for Vertellus' liquid chemical wastes during an undefined period in the early 2000s and in the years 2017 to 2021. This regime offers multiple opportunities for a mis-management event.

The whistleblower's report provides an implication that there may have been serious and illegal mismanagement of site chemical effluents in the first decade of the 2000s.

There is broad consensus that high biotoxicity and poor biodegradability of pyridine and its derivatives make treatment of pyridine liquid and sludge wastes both difficult and expensive. To date, the evidence we have found implies that historically it was common practice to treat pyridine liquid and sludge effluents by sludge activation and settlement processes, similar to those used for sewage product treatments.

"The common concentration of pyridine and its derivatives discharged from pharmaceutical and coal processing industries ranged widely from 200 to 5000 mg L⁻¹, only 300 mg L⁻¹ of pyridine can be completely degraded in activated sludge reactor or membrane bioreactor with a hydraulic retention time (HRT) of 20-60 h..... The concentration of pyridine in wastewater discharged from pyridine producing factories and its derivatives is generally in the range of 20-300 mg L⁻¹, the concentration can be as high as 600-1000 mg L⁻¹ during emergency leakage" (Padoley et al., 2006; Wen et al., 2013).

Moreover, pyridine is often accompanied by more toxic derivatives (e.g., halo- and aminopyridine) in practical wastewater matrix (Liu et al., 1998; Jin et al., 2018), which increase the difficulty in biological decontamination.

EA confirm that they undertook no oversight of sampling, analysis or treatment of the liquid effluent or sludge as "not needed to assess compliance with the site permit conditions or management of any environmental risk". The EA holds no detail or information of NWL sampling/analysis or treatment of the process effluent liquids or sludges

Concerning the decommission/decontamination of the Vertellus site (commenced 1st October 2021 and completed March 14 2022), the EA state that “We understand that all significant quantities of hazardous materials were removed from the site in accordance with COMAH Regs by December 2021”. They report that there was a joint Competent Authority (HSE/Env Agency) Redundant Plant Decommissioning inspection under COMAH Regs in Nov 2021. There is no Final Report on the inspection of the decommission/decontamination. Any site remediation work required would be part of a permit transfer/surrender application. EA report that, to date (28th Nov 2022), Vertellus have not submitted an application to surrender the relevant permit (BUO311IX/V006) [Responses to Fol request 279795, received 28th Nov 2022]

Redcar Steelworks site: Demolition of Dorman Long Tower and adjacent coking ovens: Sept 19th, 2021

There exist abundant peer reviewed evidence concerning the toxicology of coke oven residues, which typically comprise PAHs, aliphatic aldehydes & hydrocarbons, phenols, heterocyclic compounds, arsenic, cadmium and mercury. Pyridine is a widely recognised by-product of coal gasification at coking works.

The Dorman Long Tower coke oven batteries consisted of two chimneys and 132 ovens. Following an Fol submission to the Environment Agency (EA), it was confirmed that both the SSI Redcar and South Bank Coke Oven processes did produce liquid pyridine bases which were extracted in the site’s “by-product plants”. Redcar coke oven “by-product plant” liquid wastes were treated at the on-site BETP prior to consented discharge to River Tees. South Bank coke oven by-product plant liquid wastes were transferred to NWL’s Industrial Effluent Treatment Plant prior to consented discharge to River Tees.

YouTube videos of the demolition show both the Long Tower and the coke ovens being demolished at more-or-less the same time, by multiple explosions. The multiple explosions generated a very large and dense plume (smoke, dust and particles). YouTube videos show that there was wind blowing at the time, strong enough to flatten the plume and drive it in the general direction of the South Gare/Coatham dunes and seaward.

ICI crude oil refining

A more historical source of pyridine discharge to the Tees relates to crude oil refining activities. Following distillation, the C5 (or naphtha fraction) was sent from South Tees to North Tees where it underwent thermal cracking. Following extraction of marketable hydrocarbons, any remaining compounds with little economic value (including pyridine) were discharged into the Tees. A whistleblower described that these discharges commonly were untreated.