Permitting Decisions- Variation

We have decided to grant the variation for Stallingborough Titanium Dioxide Site operated by Tronox Pigment UK Limited.

The variation number is EPR/UP3537SJ/V012.

The variation is for the following changes to the permit:

- To remove the restriction in Table S2.3 that Tronox Pigment UK Limited (called Tronox further in this document) can accept from Singleton Birch Camp Wood Landfill Site no more than 0.3m^3 leachate/tonne filter cake deposited (annual average).
- To add reverse osmosis as a permitted method for raw water purification.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision-making process. It

- highlights key issues in the determination
- summarises the decision making process in the decision considerations section to show how the main relevant factors have been taken into account
- explains why we have also made an Environment Agency initiated variation

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit and the variation notice.

Key issues of the decision

Treatment and Disposal of Filter Cake Leachate Returned to Tronox.

The filter cake produced at Tronox and sent for disposal at Singleton Birch Camp Wood Landfill Site contains approximately 60% moisture – a proportion of which leaches out at the landfill site. This leachate is returned to Tronox for disposal to the Humber Estuary alongside other permitted Tronox effluent as authorised in permit variation, EPR/UP3537SJ/V009.

The 0.3 m^3 leachate/tonne of filter cake ratio was included in permit variation, EPR/UP3537SJ/V009, as an attempt to link the leachate being returned to Tronox to that leachate which actually leaches from the Tronox filter cake and not any other leachate that may be present from other wastes deposited at the landfill site. In reality, there is no method to ensure that all the leachate returned to Tronox has actually leached out of Tronox filter cake waste.

In removing this ratio restriction, we have required Tronox to demonstrate that there are acceptance criteria for the leachate (in application document 'Env-ext-1036a' and responses to Schedule 5 Notice questions 3a, 3c, 3d and 3e), treatment for the leachate prior to disposal and evidence that the leachate screens out as insignificant in its impact on the receiving waters without the dilution it receives with existing Tronox effluent to which it is added.

(a) Leachate Acceptance.

Each road tanker of leachate arrives with a sample of leachate from that tanker which is tested on site to ensure it meets pH, temperature and colour requirements before it is offloaded. A weekly composite sample is prepared from individual tanker leachate samples and analysed for a range of parameters that are in the Tronox permit discharge consent. The results of these weekly analyses are uploaded to a spreadsheet which is reviewed regularly to ensure the leachate composition is remaining consistent.

As a result of this variation application, Tronox have agreed, in response to Schedule 5 Notice question 3d, to include specific trigger levels against which the weekly analyses will be assessed. These trigger levels are now included in procedure, SHEI-40-3. This weekly composite sampling provides an overview of the consistency of the leachate pollutant levels which gives confidence that emissions are unlikely to contain pollutants at levels that are likely to have significant impact. Should the trigger levels be exceeded, the environmental monitoring staff shall raise the matter for further attention.

(b) Leachate Treatment.

There are four potential offloading locations at the Tronox site for the filter cake leachate:

(1) FU151 flume (which discharges to release point, W2).

(2) FU161 flume (which also discharges to release point, W2).

(3) F680 (which discharges to release point, W1).

(4) Chalk pits followed by neutralisation plant (which also discharges to release point, W1).

The preferred offloading locations are (1) and (2) as offloading access is more convenient and there is no risk in hydraulically overloading the effluent treatment (neutralisation) plant. Should the leachate be disposed to (1) or (2), there is automated pH and temperature monitoring and the opportunity to carry out pH trimming prior to discharge with the site effluent.

If leachate is discharged to (3), there is also continuous pH and temperature monitoring and the ability to divert leachate to the effluent treatment (neutralisation) plant if is not within specification. Any leachate discharged to (4) automatically is transferred to the effluent treatment plant.

(c) Leachate Dilution.

Following the removal of the 0.3 m^3 leachate/tonne of filter cake ratio, Tronox will be permitted to discharge up to 150 m^3 of leachate daily to the Humber Estuary mixed with the daily site effluent of up to a permitted 18,000 m^3/day.

The applicant is not applying to increase the maximum permitted amount of landfill leachate discharged to the Humber Estuary. They were previously permitted to discharge up to 150m^3 leachate per day and will remain permitted to discharge a maximum of 150m^3 leachate per day. They will be permitted to discharge that volume every day as previously they had an additional restriction of 0.3m^3 leachate/tonne filter cake sent to landfill (annual average). The leachate does not come out of the filter cake immediately on deposit at the landfill site and there may be many

months before that leachate is released. The removal of the ratio restriction means that the maximum volume of leachate (150m^3) can be removed from the landfill site every day independent of the amount of filter cake being deposited in any one day. The discharge of up to 150m^3 /day of leachate was assessed and approved in the permit variation of 2016 that authorised acceptance of the leachate at Tronox site. Due to the ratio restriction, the maximum daily amount of leachate accepted at Tronox has been approximately 135m^3.

Tronox has carried out a risk assessment using the Environment Agency's H1 tool of discharge of solely the 150 m^3 of leachate without the dilution impact of the site effluent. This H1 assessment demonstrates that addition of solely the leachate screens out as insignificant and there is no requirement for the dilution factor of the main site effluent to ensure the discharge of the leachate has an insignificant impact on the receiving waters.

The concentrations of releases in the following tables are all reported as µg/l.

TEST 1 - TRaC Waters	Annual	Average	EQS	Maximum	Allowable	EQS
Substance	Release	EQS	Release <100% EQS	Release	EQS	Release <100% EQS
Arsenic	3.62	25	Pass	20.9		N/A
Cd and compounds (<40mg/l CaCO3)	23.24	0.2	Fail	59.1	0.44	Fail
Chromium (VI) (95%ile)	9.0	0.6	Fail	11	32	Pass
Copper	3.43	3.6	Pass	7.06		N/A
Iron	355.4	1000	Pass	1130		N/A
Lead and its compounds	1.8	1.3	Fail	2.2	14	Pass
Mercury and its compounds	0.018		N/A	0.124	0.07	Fail
Nickel and its compounds	11.92	8.6	Fail	19.2	34	Pass
Vanadium (0-200mg/l CaCO3)	9.0	100	Pass	11		N/A
Zinc	180.0	6.8	Fail	346		N/A

Maximum release value is the maximum of the weekly composite samples and so higher daily discharge concentrations may occur which could result in other substances not being screened out as insignificant in the Test 1 screening for maximum allowable EQS. At this stage (Test 1) of the assessment, arsenic, copper, iron and vanadium screen out as acceptable.

For a release to Trac waters with the characterisations of the Tronox discharge to the Humber Estuary, Tests 2, 3 and 4 of the H1 assessment process are not applicable. The applicant therefore moves to Test 5 where the effective volume flux of the discharge is calculated from the release concentration, flowrate, environmental quality standard (EQS) and background concentration (assumed to be 50% of the EQS) and compared against the allowable volume flux for the discharge location.

At this stage (Test 5) of the assessment, all remaining pollutants screen out as acceptable.

TEST 5 - TRaC Waters	Substance	Annual	Average	EQS	Maximum	Allowable	EQS		
Substance	Background Concentration	Release Conc.	EQS (AA)	Effective Volume Flux (EFV) (AA)	Release Conc.	EQS (MAC)	Effective Volume Flux (EFV) (MAC)	Allowable EVF	Test 5
Arsenic	12.5	3.62	25	<0.01	20.9	-	-	3.5	Pass
Cd and compounds (<40mg/l CaCO3)	0.1	23.24	0.2	0.07	59.1	0.44	0.1	3.5	Pass
Chromium (VI) (95%ile)	0.3	9.0	0.6	<0.01	11	32	<0.01	3.5	Pass
Copper	1.8	3.43	3.6	<0.01	7.06	-	-	3.5	Pass
Iron	500	355.4	1000	<0.01	1130	-	-	3.5	Pass
Lead and its compounds	0.65	1.8	1.3	<0.01	2.2	14	<0.01	3.5	Pass
Mercury and its compounds	0.04	0.018	-	-	0.124	0.07	<0.01	3.5	Pass
Nickel and its compounds	4.3	11.92	8.6	<0.01	19.2	34	<0.01	3.5	Pass
Vanadium (0-200mg/l CaCO3)	50	9.0	100	<0.01	11	-	-	3.5	Pass
Zinc	3.4	180.0	6.8	0.02	346	-	-	3.5	Pass

Maximum release value is the maximum of the weekly composite samples and so higher daily discharge concentrations may occur but given the headroom available for the EFV versus the allowable EFV, we consider it unlikely that a daily concentration would fail TEST 5 unless as a outlier value.

The applicant also assessed the overall impact on receiving waters of leachate discharged alongside the main site effluent. Tronox are permitted to discharge 18,000m^3 /day of all combined liquid effluents and normal discharge at current titanium dioxide manufacturing rates is approximately 11-12,000m^3 /day. The leachate discharge is therefore approximately 0.8% of permitted effluent volume and 1.25% of current average effluent volume discharge

To carry out this assessment they used:

- an average instantaneous flow rate of 0.1490 m^3/s which equates to an average daily flow of 12,874 m^3/day.

- a maximum instantaneous flow rate of 0.2187 m^3/s which equates to a maximum daily flow of 18,896 m3/day. As Tronox is permitted to discharge only 18,000 m^3/day effluent and has never exceeded this figure, this assessment is very much a worst-case scenario.

- average and maximum effluent concentration data for W1 and W2 discharges for 2022.

TEST 1 - TRaC Waters	Annual	Average	EQS	Maximum	Allowable	EQS
Substance	Release	EQS	Release <100% EQS	Release	EQS	Release <100% EQS
Arsenic	1.82	25	Pass	13.16	-	N/A
Cd and compounds (<40mg/l CaCO3)	1.002	0.2	Fail	1.6	0.44	Fail
Chromium (VI) (95%ile)	14.86	0.6	Fail	74.5	32	Fail
Copper	7.909	3.6	Fail	105.78	-	N/A
Iron	2818.3	1000	Fail	113235	-	N/A
Lead and its compounds	2.384	1.3	Fail	5	14	Pass
Mercury and its compounds	0.023	-	N/A	0.122	0.07	Fail
Nickel and its compounds	36.08	8.6	Fail	157.7	34	Fail
Vanadium (0-200mg/l CaCO3)	16.141	100	Pass	133	-	N/A
Zinc	40.295	6.8	Fail	453.6	-	N/A

TEST 5 - TRaC Waters	Substance	Annual	Average	EQS	Maximum	Allowable	EQS		
Substance	Background Concentration	Release Conc.	EQS (AA)	Effective Volume Flux (EFV) (AA)	Release Conc.	EQS (MAC)	Effective Volume Flux (EFV) (MAC)	Allowable EVF	Test 5
Arsenic	12.5	1.82	25	0.022	13.16	-	-	3.5	Pass
Cd and compounds (<40mg/l CaCO3)	0.1	1	0.2	1.49	1.6	0.44	1.03	3.5	Pass
Chromium (VI) (95%ile)	0.3	14.86	0.6	7.38	74.5	32	0.51	3.5	Fail
Copper	1.8	7.91	3.6	0.65	105.78	-	-	3.5	Pass
Iron	500	2818.33	1000	0.84	113235	-	-	3.5	Pass
Lead and its compounds	0.65	2.38	1.3	0.55	5	14	0.08	3.5	Pass
Mercury and its compounds	0.04	0.023	-	-	0.122	0.07	-0.1	3.5	Pass
Nickel and its compounds	4.3	36.08	8.6	1.25	157.7	34	1.16	3.5	Pass
Vanadium (0-200mg/l CaCO3)	50	16.14	100	0.05	133	-	-	3.5	Pass
Zinc	3.4	40.3	6.8	1.77	453.6	-	-	3.5	Pass

At Test 1, only arsenic and vanadium screen out as acceptable. At Test 5, all pollutants with the exception of chromium (VI) screen out as acceptable.

This is the same scenario as assessed when originally permitting the discharge of leachate to the Humber Estuary – all parameters except chromium (VI) screened out.

Tronox has made the worst-case assumption that all the chromium analysed is present as the most harmful chromium (VI) form as there is an EQS for this species. However, the discharge from the chemical process (which has previously gone through the effluent treatment plant before formation of the filter cake) would be expected to be predominately the much less harmful chromium (III) for which there are no EQS values to assess against.

This scenario is therefore very much worst-case, and the Humber Estuary is very unlikely to experience that amount of chromium in its harmful chromium (VI) oxidation state.

It is noted that, in the original permit variation determination to permit the discharge of leachate, the effective volume flux values were:

- Effective Volume Flux (Annual Average) = 21.59.

- Effective Volume Flux (Maximum Allowable Concentration) = 0.38.

The values in the most recent H1 assessment are:

- Effective Volume Flux (Annual Average) = 7.38 (significantly lower than previously calculated).

- Effective Volume Flux (Maximum Allowable Concentration) = 0.51 (higher than previously calculated but as noted earlier, a very much worst-case scenario was considered for maximum flowrate).

Decision considerations

Confidential information

A claim for commercial or industrial confidentiality has not been made.

The decision was taken in accordance with our guidance on confidentiality.

Identifying confidential information

We have not identified information provided as part of the application that we consider to be confidential.

The decision was taken in accordance with our guidance on confidentiality.

The regulated facility

The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.

This permit applies to only one part of the installation – the production of titanium dioxide and associated operations except operation of the Combined Heat and Power Plant. The names and permit numbers of the operators of other parts of the installation are detailed in the permit's introductory note.

There are no key issues associated with the use of the newly permitted reverse osmosis plant. This is an established technology for water purification and the applicant has assessed its suitability against a range of criteria including water usage, chemical usage, electricity consumption and waste water (concentrate) production.

Tronox has been operating this plant since October 2020 as an extended trial period with major benefits in effluent pH control. Prior to the operation of the reverse osmosis plant, Tronox were dosing the effluent with alkali at a rate of approximately 8 m^3/month to manage pH fluctuations prior to discharge to the Humber Estuary. Since the operation of the reverse osmosis plant, the amount of alkali required for dosing the effluent is now about 0.5 m^3/month.

Nature conservation, landscape, heritage and protected species and habitat designations

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations. The application is within our screening distances for these designations.

We have assessed the application and its potential to affect sites of nature conservation, landscape, heritage and protected species and habitat designations identified in the nature conservation screening report as part of the permitting process.

We consider that the application will not affect any site of nature conservation, landscape and heritage, and/or protected species or habitats identified.

See the Key Issues section for further information.

We have not consulted Natural England.

The decision was taken in accordance with our guidance.

Environmental risk

We have reviewed the operator's assessment of the environmental risk from the facility.

The operator’s risk assessment is satisfactory.

General operating techniques

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility.

The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.

Operating techniques for emissions that do not screen out as insignificant

Emissions of chromium (VI) to receiving waters cannot be screened out as insignificant. We have assessed whether the proposed techniques are Best Available Techniques (BAT).

See the Key Issues section for further information.

Operating techniques for emissions that screen out as insignificant

Emissions of arsenic, cadmium, copper, iron, lead, mercury, nickel, vanadium and zinc to receiving waters have been screened out as insignificant, and so we agree that the applicant’s proposed techniques are Best Available Techniques (BAT) for the installation.

We consider that the emission limits included in the installation permit reflect the BAT for the sector.

Updating permit conditions during consolidation

We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide the same level of protection as those in the previous permit.

Changes to the permit conditions due to an Environment Agency initiated variation

We have varied the permit as stated in the variation notice.

These variations relate to only updating the permit to reflect the current template.

Raw materials

We have specified limits and controls on the use of raw materials and fuels – low sulphur diesel oil and coke. No changes have been made to these specified limits and controls as a result of this variation.

Waste types

We have specified the permitted waste types, descriptions and quantities, which can be accepted at the regulated facility.

We are satisfied that the operator can accept these wastes for the following reasons:

- they are suitable for the proposed activities
- the proposed infrastructure is appropriate; and
- the environmental risk assessment is acceptable.

We have changed only one restriction on the import of filter cake leachate (EWC Code 19 07 03).

Emission limits

No emission limits have been added, amended or deleted as a result of this variation.

Monitoring

Monitoring has not changed as a result of this variation.

Reporting

Reporting has not changed as a result of this variation.

Management system

We are not aware of any reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.

The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.

Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit variation.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.