SOCIO-ECONOMIC ANALYSIS

Public version

Name of applicants:	$CrO_3$4UK Group: Aalberts Integrated Piping Systems Ltd Borough Ltd Quality Plated Products Ltd Samuel Heath and Sons plc
Submitted by:	$CrO_3$4UK Group
Prepared by:	$CrO_3$4UK Group Risk & Policy Analysts Ltd (RPA) Technology Sciences Group Consulting Ltd (TSG Consulting)
Date:	30th June 2022
Substance:	Chromium trioxide (EC no. 215-607-8, CAS no. 1333-82-0)
Use titles:	Use 2: Industrial use of chromium trioxide for functional chromium plating with decorative character for automotive, sanitary, heating and other applications
Use number:	2

Contents

Tables

Figures

Declaration

We, the Applicants (Aalberts Integrated Piping Systems Ltd, Borough Ltd, Quality Plated Products Ltd and Samuel Heath and Sons plc), are aware of the fact that further evidence might be requested by the Health and Safety Executive ('the Agency') to support the information provided in this document.

Also, we request that the information blanked out in the "public version" of Socio-Economic Analysis is not disclosed. We hereby declare that, to the best of our knowledge as of today (30th June 2022), the information is not publicly available, and, in accordance with the due measures of protection that we have implemented, a member of the public should not be able to obtain access to this information without our consent or that of the third party whose commercial interests are at stake.

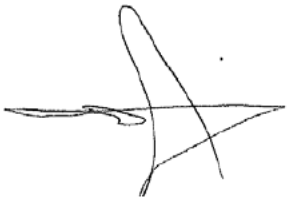
Signatures: **Date, Place:**

Guy Robinson
Chief Executive Officer, UK & Middle East
Aalberts Integrated Piping Systems Ltd

30th June 2022
Doncaster

David Brereton
Director
Borough Ltd

30th June 2022
Leigh on Sea



John Timmins
Managing Director
Quality Plated Products Ltd

30th June 2022
Birmingham

Martin Harrison
Manufacturing Director
Samuel Heath and Sons plc

30th June 2022
Birmingham

List of abbreviations

ABS	Acrylonitrile butadiene styrene
AfA	Application for Authorisation
AFUS	Applied-for use scenario
AoA	Analysis of Alternatives
CAGR	Compound annual growth rate
CAS	Chemical Abstracts Service
CLP	Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (Please note that references in this report to CLP should be taken as referring to GB CLP, as retained EU law following Brexit and the end of the Implementation Period on 31 December 2020, unless otherwise specified.)
CMO	Contract manufacturing organisation
CMR	Carcinogenic, mutagenic or toxic to reproduction
COGS	Cost of goods sold
COSHH	Control of Substances Hazardous to Health Regulations 2002
Cr(O)	Metallic chromium
Cr(III)	Trivalent chromium
Cr(VI)	Hexavalent chromium
CrO_3	Chromium trioxide
$CrO_3$4UK	The group of four applicants applying for authorisation (Aalberts Integrated Piping Systems Ltd, Borough Ltd, Quality Plated Products Ltd and Samuel Heath and Sons plc)
CSR	Chemical Safety Report
CTACSub	Chromium Trioxide REACH Authorisation Consortium
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
EC	European Commission
ECHA	European Chemicals Agency
EEA	European Economic Area, i.e. the EU plus Norway, Iceland and Liechtenstein
ERC	Environmental Release Category
ERY	Excess risk per year
ES	Exposure scenario
EU	European Union
EUSES	European Union System for the Evaluation of Substances
FTE	Full-time equivalent
GB	Great Britain
GDP	Gross domestic product
HSE	Health & Safety Executive
IUPAC	International Union of Pure and Applied Chemistry
LCI	Labour cost index
MOQ	Minimum Order Quantity

NPV	Net Present Value
NUS	Non-use scenario
OC	Operational Conditions
OEM	Original Equipment Manufacturer
ONS	Office for National Statistics
PC	Polycarbonate
PEC	Predicted environmental concentration
POP	Plating on plastics
PPM	Parts per million
PROC	Process category
R&D	Research and development
RAC	Risk Assessment Committee
RAR	Risk assessment report
RCR	Risk characterisation ratio
REACH	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (Please note that references in this report to REACH should be taken as referring to UK REACH, as retained EU law following Brexit and the end of the Implementation Period on 31 December 2020, unless otherwise specified.)
RMM	Risk Management Measures
RMOA	Regulatory management options analysis
SAGA	Suitable alternative generally available
SDR	Social discount rate
SEA	Socio-economic analysis
SEAC	Committee for Socio-economic Analysis (ECHA)
SP	Substitution Plan
SU	Sector of use
SVHC	Substance of very high concern
UK	United Kingdom
VCM	Value of cancer morbidity
VSL	Value of a statistical life
WCS	Worker Contributing Scenario
WTP	Willingness to pay

1. Summary

This application for authorisation (AfA) is being made jointly by a group of four companies established in Great Britain (GB) who undertake electroplating using chromium trioxide:

- Aalberts Integrated Piping Systems Ltd (Doncaster, England)
  https://www.pegleryorkshire.co.uk/
- Borough Ltd (Leigh-on-Sea, England)
  https://www.borough.co.uk/
- Quality Plated Products Ltd (Birmingham, England)
  http://www.qppltd.co.uk/
- Samuel Heath and Sons plc (Birmingham England)
  https://www.samuel-heath.com/

The applicants have formed the $CrO_3$4UK group and are submitting a joint AfA under Article 62(2) of REACH. The applicants are successful UK companies producing for a vast national and international market. While the products the applicants manufacture and the sectors they serve differ, each company uses chromium trioxide to electroplate articles (referred to as substrates) made from metals and plastics to create a metallic chrome coating. The outer chrome coating is free of chromium trioxide and provides the coated articles with a resistant, durable and safe finish, normally with a bright or matt silver finish although occasionally other finishes such as black are produced. This is referred to as functional chrome plating with decorative character.

The application for authorisation concerns two different but interlinked uses of chromium trioxide:

Use 1: Industrial use of chromium trioxide for the etch pre-treatment step in the electroplating process for functional chromium plating with decorative character for automotive, sanitary, heating and other applications ('etching').

Use 2: Industrial use of chromium trioxide for functional chromium plating with decorative character for automotive, sanitary, heating and other applications ('plating').

Not all applicants undertake etching and so Table 1 below shows which applicants are applying for which uses. Where etching is undertaken, it occurs on the same lines as plating and is part of the overall process of applying metallic chrome coatings to substrates. Amalgamating both etching and plating within one overall use has been considered for the purposes of this AfA. However, it has been ruled out on the basis that the challenges associated with identifying potential alternatives are significantly different between etching and plating, which poses significant implications for the socio-economic analysis (SEA) and substitution plan (SP).

Applicant	Use 1: Etching	Use 2: Plating
Aalberts Integrated Piping Systems Ltd		✓
Borough Ltd	✓	✓
Quality Plated Products Ltd	✓	✓
Samuel Heath and Sons plc		✓

***Table 1**: Applicants and uses applied for*

This Socio-Economic Analysis (SEA) forms part of the AfA for use 2, i.e. the continued use of chromium trioxide for the electroplating of plastic and metal (e.g. brass) substrates. The use is required for electroplating to achieve functional surfaces with high durability and decorative character (bright or satin appearance) for different applications.

Two separate reports illustrate the SEA for Use 1 and Use 2. This report concerns the use of chromium trioxide for plating (Use 2) by the four $CrO_3$4UK applicants (QPP, Borough, Aalberts and Samuel Heath). For this Use 2, **the applicants request a review period of 10 years**.

It is important for the $CrO_3$4UK applicants to continue using chromium trioxide to manufacture products with the high quality functional and decorative characteristics currently demanded by the market. As described in the Analysis of Alternatives (AoA), at present, the applicants have not yet identified a technically and economically feasible alternative with the same function and acceptable level of performance to the use of chromium trioxide in the plating processes. As a consequence, in the Non-Use Scenario (NUS), the applicants will no longer be able to produce and sell plated products using chromium trioxide with serious consequences on their businesses and with impacts on UK industry and society.

Following internal discussions, the $CrO_3$4UK applicants have assessed the following eight non-use scenarios:

NUS 1: Downgrade of the quality of the final products
NUS 2: Relocation of production outside of the UK
NUS 3: Outsourcing of electroplating to either UK or non-UK countries
NUS 4: Subcontracting of production outside of the UK to European companies holding a REACH authorisation or to other European companies who do not hold REACH authorisation
NUS 5: Building stocks
NUS 6: Partial closure (only the chrome related operations)
NUS 7: Prolonged downtime until substitution
NUS 8: Shut down of the site and closure of the business since the company' revenues rely on chrome that is the core business and layoff of all staff employed

Based on analysis of all these potential non-use scenarios, the NUS 8, i.e. the complete shutdown of plant and business closure is considered by two of the applicants (QPP and Borough) as the only possible scenario in case of a non-granted authorisation, while a combination of NUS 6 (i.e. partial closure) and NUS 3 (i.e. outsourcing) is considered as the most likely non-use scenario by the two other applicants (Aalberts and Samuel Heath), at least during an initial period. If there will be serious knock-on effects on the other products of these applicants, most likely these two companies will also have to close. These non-use scenarios would result in severe socio-economic impacts for the applicants, their suppliers and customers. The impacts are assessed in this socio-economic analysis over the requested review period of 10 years.

If authorisation is not granted, QPP and Borough would most likely have to close their businesses (NUS 8). This would entail high socio-economic impacts:

- decommissioning costs less the sale value estimated to be in the range £1M - £3M over the requested 10 years review period. This range includes the decommissioning costs for the plants of QPP and Borough as well as decommissioning costs for plating lines of Aalberts and Samuel Heath.
- foregone profits (estimated to be £5M - £12M over the review period).
- loss of all jobs (social costs monetised in the range of £25M - £62M).

If authorisation is not granted, then at least initially, Aalberts and Samuel Heath would most likely close the plating lines (NUS 6) and outsource plating activities (NUS 3).

The following costs of the non-use scenario 6 (closure of the plating lines) and NUS 3 (outsourcing) are expected for Aalberts and Samuel Heath:

- decommissioning costs due to the closure of the plating lines (included in the total range of decommissioning costs).
- layoff of workers directly related to the plating activities (social costs monetised included in the total range of social costs).
- one-off costs to identify CMO partners and establish new partnership relationships project work time, consultants, samples, tests, etc monetised in the range of £0.1M - £0.4M.
- additional transport and logistic costs due to outsourcing (not quantified given the uncertainties concerning the distances from the CMO).

If outsourcing will have negative knock-on effects on other product ranges, Aalberts will have to close the plant while Samuel Heath would have to shut down the plant and end its business. In this case (NUS 8), the impacts would be those described above for QPP and Borough and their supply chains.

Moreover, the closure of QPP and Borough would entail significant impacts on other UK actors along the applicants' supply chains. Other UK actors along the supply chain, mainly suppliers of raw materials (such as chromium trioxide, plastics, etc.) and services as well as certain customers would face socio-economic impacts:

- economic losses (not monetised)
- jobs at risk (not quantified)

Such socio-economic impacts for upstream and downstream users are only described qualitatively, as quantitative information is lacking, or the level of uncertainty is too high. Nevertheless the impact at UK suppliers will clearly result in substantial foregone profits and impacts to UK industry including automotive, sanitaryware and other sectors and should not be overlooked.

On the other hand, the risks of continued use of chromium trioxide are the following:

- health impacts on directly exposed workers at the applicants' sites (monetised to £113,514 – £160,789 over the period)
- health impacts by inhalation and oral route on the local population including indirectly exposed workers (monetised at £25,099 - £35,382 over the period)

The analysis of alternatives, the substitution plan and the socio-economic analysis demonstrate that:

- Considerable R&D efforts are being undertaken to investigate suitable alternatives with a similar performance. According to the current state of investigations, the full development and implementation of an alternative for chromium trioxide will take at least until mid-2032.

- There are no alternatives available with the same function and similar level of performance that are technically and/or economically feasible for the applicants before the end of the requested review period.

- Appling a highly conservative approach that overestimates health impacts and underestimates economic impacts, the benefits of continued use outweigh the risks of continued use of the substance by a considerable degree (considerably more than 100 times) and this situation is not likely to change during the 10-year review period requested for Use 2.

2. Introduction

2.1. About this socio-economic analysis

Chromium trioxide is listed in Annex XIV of UK REACH and therefore its use requires authorisation. The applicants currently benefit from transitional measures under Article 127GA of UK REACH. However, should an AfA not be made by the end of the transitional period then their use will become unlawful. The latest application date is 30 June 2022.

This SEA has been undertaken as part of work to demonstrate the case for granting the applicants an authorisation to allow for continued use of chromium trioxide during the requested review period of 10 years. The aim of the SEA is to assess and monetise human health and socio-economic impacts of the continues use and of the non-use scenarios.

2.2. Scope of the analysis

Electroplating of different plastic and metal substrates using chromium trioxide is carried out by the applicants to achieve functional surfaces with decorative character to improve the appearance of components in several applications and sectors.

As mentioned above, the scope of this assessment is the evaluation of health impacts from exposure to chromium trioxide in the production of different applications at the applicants' sites as well as the socio-economic impacts resulting from the non-use scenario. A detailed description of technical requirements and process can be found in the CSR for this application.

2.3. Geographical scope

The applicants are all located in the UK. Therefore, the UK is the geographical scope for the assessment of socio-economic impacts of not using chromium trioxide as well as the health impacts of the continued use. These impacts are described in the following sections.

***Figure 1**: Aalberts Integrated Piping Systems Ltd, Doncaster*

***Figure 2**: Borough Ltd, Leigh-on-Sea*

***Figure 3**: Quality Plated Products Ltd, Birmingham*

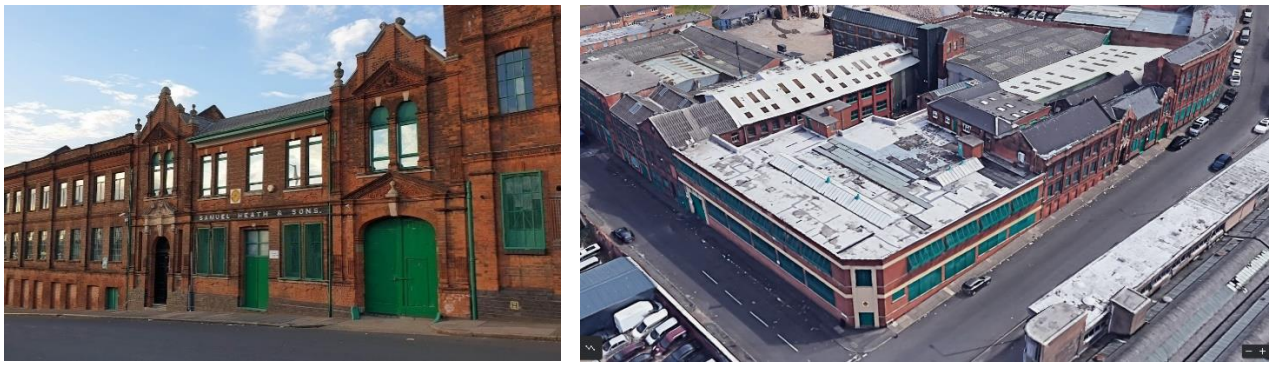


***Figure 4:** Samuel Heath and Sons plc, Birmingham*

2.4. Temporal scope

A review period of 10 years is requested for plating (Use 2) as currently no technical and economical feasible alternative is available for the applicants with the same function and similar level of performance as chromium trioxide. Consequently, further R&D, plant adaptation and customers' acceptance will be necessary. Therefore, the temporal scope of socio-economic assessment of this SEA runs from 30 June 2022 (date of submission of this application) to 30 June 2032.

Please refer to section 17 for more details of the length of the requested review period.

2.5. Annual quantities for plating

For Use 2, the tonnages of chromium trioxide used annually is estimated based on the average of the tonnages used in 2019-2021 taking into account that, on one hand, the forecasted growth in sales per year over the duration of the review period may increase the tonnage of chromium trioxide used, while on the other hand, the use will start to decrease as substitution to Cr(III) progresses.

The total annual quantity of chromium trioxide used by all four applicants for plating for automotive, sanitary, heating and other applications is in the range of 3 to 10 tonnes per year (the lower quantities for 2020 were due to the effects of COVID). This tonnage value for plating is considered conservative and represents an upper bound based on the most optimistic market growth.

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
QPP	[redacted]													
Borough	[redacted]													
Aalberts	[redacted]													
Samuel Heath	[redacted]													
Total	[redacted]													
Total (range)	5-10	3-7	5-10	5-10	5-10	5-10	5-10	5-10	5-10	3-7	3-7	3-7	3-7	3-7

***Table 2**: Total maximum annual quantities (in tonnes) of CrO_3 for Use 2 by the applicants over the requested review period*

2.6. The product portfolio of the applicants

The applicants have a large portfolio of products for sectors as various as the automotive, sanitaryware, heating, white goods, domestic appliance, brewery/drink, medical, display electronics and other applications. Plastic and metal substrates are plated using chromium trioxide and are offered with a variety of finishes, including satin and matt black chrome. The applicants also manufacture and plate products without using chromium trioxide by using, for example, nickel, bronze or brass.

All of the applicants undertake functional plating with a decorative character to achieve products that have high-quality finishes which are subject to a multitude of different demanding environments. All parts are required to withstand differing levels of humidity, aggressive chemicals during use and cleaning and achieve a high level of durability, whilst maintaining an aesthetically-pleasing appearance.

The following table provides an overview of the main products of the applicants.

Sector	Products
Sanitary	Shower heads, shower buttons, shower valves, thermostatic shower sets, shower flow controls, shower flow diverters, toilet unit covers, flush handles, buttons, surrounds, thermostatic roll holders, toilet brushes, towel rails, towel rings, mirrors, wastes, soap dispensers, soap dishes, baskets, robe hooks, trims, sink wastes, bath waste, tap handles, pipe fittings
Taps	Deck mounted basin taps, wall mounted basin taps, deck mounted batch taps, wall mounted bath taps, freestanding bath fillers, kitchen mixer taps

Sector	Products
Heating applications	fittings and valves, thermostatic and manual radiator valves, thermostatic mixing valves, pipe fittings including couplings, bends, tees and adaptation fittings to equipment and termination fittings and taps
Automotive	Exterior automotive parts: number plate surrounds, bumper trims, door handles, light surrounds, brand labels, trim stripes, rims, front skirts, door openers, lamp rings, emblems, chrome bar, etc Interior automotive parts: interior door trim, dashboard trim, seat trim plus other decorative parts within the car cabin, badgework, bumper inserts, handles, gear levers, gearstick, decorative frames, switches, knobs, lamp surrounds and grilles to speaker covers, head speakers, interior trims, etc
Domestic appliances	Cooker knobs, handles, bar fittings, sink waste, TRV valves, trim, washing machine fronts
Electrical / Electronics	Components of passive infrared sensor (PIR) alarm sensors, EFI and RFI shielding for computers and electronics, parts for installation into handheld measuring devices and door switches, coffee machine parts, door lights, electronic shielding boxes, machine trim, buttons, kitchen knobs
Point of sale Brewery	Brewery fixtures and fittings, beverage dispensers
Leisure	Pool table feet and corners, caravan door handles, gaming machine trims.
Display	Signage displays, badge car show room, cosmetic displays, award trophies
Plumbing and heating	Valves, heating systems, filters, plumbing, shower products shower assemblies, spa fitting, bathroom fitting, sink fittings, etc.
Medical	Interior parts of life-saving ventilator systems
Drinks	Bar font, drink trays
Architectural hardware	Door handles, doorknobs, door bolts, window fittings, letter boxes, cupboard knobs, coat hooks, door closers

***Table 3**: Overview of the main products of the applicants*

2.6.1. QPP's products

On average, QPP processes and dispatches more than 45,000 plastic parts a day to a multitude of customers in the automotive, sanitaryware, domestic appliance, brewery, display and electronics industries, mainly in the UK. Of QPP's products, close to [redacted] depend on the use of chromium trioxide for their functional and decorative character. QPP offers durable products with a variety of finishes, including bright and dark chrome, "noble" chrome, medium and dark satin chrome and nickel, Aztec and antique gold, together with finishes for EMI/RFI (Electromagnetic Interference/Radio Frequency Interference) shielding. The main products of QPP are summarised in the following table.

Sector	Type of products	Pieces / year	Associated turnover and profit	Main customers (UK and non-UK)	Country
Automotive	Car and van **exterior** parts: Number plate surrounds, bumper trims, door handles, light surrounds and various other trims and parts Car and van **interior** parts: Interior door trim, dashboard trim, seat trim plus other decorative parts within the car cabin.	4.6M	[redacted]	[redacted]	EU [redacted] UK UK UK UK UK UK

Sector	Type of products	Pieces / year	Associated turnover and profit	Main customers (UK and non-UK)	Country
	Interior and exterior trim, badgework, bumper inserts, handles, gear shift levers			[redacted]	UK EU [redacted] EU [redacted] UK EU [redacted]
Sanitary ware	Shower heads, unit covers, flush handles, buttons, surrounds, washing machine fronts, shower buttons, trims, sink wastes, bath waste, tap handles, pipe fittings	3M	[redacted]	[redacted]	UK UK UK UK UK UK UK UK UK UK
Domestic appliances	Cooker knobs, sink waste, thermostatic radiator valves (TRV), , handles, trims and fittings	2M	[redacted]	[redacted]	UK EU [redacted] UK UK UK
Display	Components of passive infrared (PIR) alarm sensors, EFI) and RFI shielding for computers and electronics, parts for handheld measuring devices and door switches	0.01M	[redacted]		
Point of sale brewery	Brewery fixtures and fittings, beverage dispensers	0.05M	[redacted]		
Leisure	Pool table feet and corners, caravan door handles, gaming machine trim	0.2M	[redacted]	[redacted]	UK UK UK
Electrical / Electronics	Coffee machine parts, door lights, electronic shielding boxes, machine trim, buttons		[redacted]	[redacted]	

***Table 4**: Product portfolio of QPP*

Below are some pictures of the main products of QPP in each sector.

***Figure 5**: QPP's automotive products*

***Figure 6**: QPP's sanitary & heating products*

***Figure 7**: QPP's domestic appliances and other consumer products*

Type of plastic articles	Number of plastic articles of QPP
ABS or blend PC/ABS	1,000
Native PC and ABS or PC/ABS as part of a single article	2,000-3,000 multi-component plastic articles

***Table 5**: Number of plastic articles of QPP (etching and plating)*

2.6.2. Borough's products

The portfolio of Borough's products requiring a chromium electroplating process includes [redacted] product types for the sanitary, automotive, medical and drinks sectors.

The end products for the sanitary sector are e.g. shower, bathroom and kitchen accessories as well as door and window furniture. The sanitary product range includes thermostatic valves, thermostatic sets, taps, flow control, diverter, odour closers, toilet rolls, toilet brush, towel racks, taps filters, plumbing, shower, etc. Such products are offered as a set, hence requiring the same appearance as the appliances for water. It is crucial that the aesthetics is the same for all chromium electroplated plastic articles and constant over time. The turnover deriving from the products manufactured by Borough using chromium trioxide represent approximately [redacted] of overall annual turnover.

Functional plating with decorative character is used to apply a finish to achieve a high durability when exposed to aggressive and demanding conditions (indoor or outdoor) and highly decorative finishes.

	Type of products plastic components	Main customers	Country	Impacts in case of the most likely NUS
Automotive	Exterior automotive parts: brand labels, trim stripes, rims, front skirts, door openers, lamp rings, emblems, chrome bar, etc. Interior automotive parts: gear levers, gearstick, decorative frames, switches, knobs, lamp surrounds and grilles to speaker covers, head speakers, interior trims, etc.	[redacted]	EU [redacted] Asia [redacted] EU [redacted] UK UK Asia [redacted]	Loss of business
Sanitary ware	Valves, heating systems, filters, plumbing, shower products and assemblies, spa fitting, bathroom fitting, sink fittings, etc.	[redacted]	UK UK UK	Quality demands need CrVI Loss of business
Medical	Interior parts of life ventilator systems	[redacted]	EU [redacted]	Medical product certified with chrome part
Drinks	Bar font, drink trays, whiskeys bottle trims, etc.	[redacted]	International UK UK	
Domestic appliance	Kitchen knobs, measuring tape cases	[redacted]	UK UK	

***Table 6**: Product portfolio of Borough*

Below are some examples of the main products of Borough in each sector.

***Figure 8**: Borough's products in the automotive sector*

***Figure 9**: Ventilator for COVID-19 treatment with Borough plated parts*

***Figure 10**: Borough's products for drinks dispensing*

***Figure 11**: Borough display/signage*

***Figure 12**: Borough's products in the sanitary and consumer goods sector (shower heads, sanitary ware components, cooker controls, cistern flush, electric shower box covers)*

2.6.3. Aalberts' products

Articles plated with chromium trioxide by Aalberts at its Doncaster site can be summarised as fittings and valves for heating and sanitary applications. As indicated in the table below, within these applications, there are many sub-sets of products, including thermostatic and manual radiator valves, thermostatic mixing

valves, pipe fittings including couplings, bends, tees and adaptation fittings to equipment and termination fittings and taps.

The products are used in new building and constructions as well as for repair, maintenance and improvement of existing buildings. Fittings and valves are made from both metal and plastic components and subsequently treated. Multiple components are required for completing a single saleable item.

Chrome plating is required on these products to meet customers' and industry standards in product performance including durability, chemical resistance and customer quality expectations. The portfolio of chrome plated products of Aalberts includes around 680 product types. The chrome products manufactured by Aalberts using chromium trioxide represent approximately [redacted] of overall annual turnover of the Doncaster site. Aalberts also market and sell other products manufactured by other companies within the Aalberts group thereby diluting the proportion of chrome plated products from Aalberts' overall revenue. Plastics substrates are of different types (PP/Acetal/Nylons), all of which are chrome plated by a third party, by QPP that is a co-applicant in this application for authorisation.

Aalberts also manufactures products without using chromium trioxide (by using, for instance, nickel or brass), and the annual turnover associated to these products is approximately 79% of overall turnover.

***Figure 13**: Alberts production volumes 2021 vs 2019*

Below are some examples of Aalberts' products.

Chrome plated angle pattern thermostatic radiator valve with integral push-fit fitting

Chrome plated brass hose union ball-type bibtap valve

Compression fittings, various types

Thermostatic mixing valve

***Figure 14**: Examples of Aalberts products*

£	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Aalberts	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

***Table 7**: Aalberts' production volumes and expected growth*

Products	Heating applications	Main customers	Country
Fittings	Pipe fittings including couplings, bends, tees and adaptation fittings to equipment and termination fittings and taps	[redacted]	UK UK UK UK
Valves	Thermostatic and manual radiator valves, thermostatic mixing valves, etc	[redacted]	UK UK UK UK

***Table 8**: Aalberts' products and main markets*

2.6.4. Samuel Heath's products

The portfolio of chrome plated products of Samuel Heath includes components for applications as taps, showers, bathroom accessories and door and window furniture. The table below details types of products for each of these applications.

	Products	Main markets and customer	Country
Taps	Deck mounted basin taps, wall mounted basin taps, freestanding bath fillers, kitchen mixer taps	[redacted]	UK US ROW
Bathroom accessories	Toilet roll holders, toilet brushes, towel rails, towel rings, mirrors, wastes, soap dispensers, soap dishes, baskets, robe hooks	[redacted]	UK US ROW
Shower	Thermostatic shower valves, thermostatic shower sets, shower flow controls, shower flow diverters,	[redacted]	UK US ROW
Door and window furniture	Door handles, doorknobs, door bolts, window fittings, letter boxes, cupboard knobs, coat hooks, door closers	[redacted]	UK UK US ROW

***Table 9**: Samuel Heath's products and main markets*

Examples of Samuel Heath products are provided below.

Bright chrome flow control for shower

Matt black chrome single lever basin mixer

Architectural hardware in various finishes including satin and matt black chrome

Thermostatic shower set with 2 low controls in chrome (source: Samuel Heath)

***Figure 15**: Examples of Samuel Heath products*

The company also manufactures similar products offered in different finishes without using chromium trioxide (using for instance, nickel, bronze or brass), and the annual turnover associated with these products is approximately [redacted] of the overall turnover. The [redacted] of turnover is associated with Samuel Heath's products using chromium trioxide.

2.7. Market and market segments of the applicants

Although there are some specificities, the applicants operate in markets with high competition from other companies inside and outside the UK (in Europe or rest of the world) that produce and sell similar products. If an authorisation is not granted to this application, and the applicants can no longer use chromium trioxide, their current customers of chrome-plated parts would seek out competitor suppliers who can (still) use chromium trioxide for plating.

2.7.1. QPP's market

In the UK, QPP holds an important market position in the automotive and sanitary sectors. QPP operates in a competitive market in which there is just one UK competitor (Borough Ltd, a co-applicant in this application for authorisation), and many competitors outside the UK that offer similar products electroplated with chromium trioxide.

While QPP sells to high end/luxury brands, EU suppliers of chrome components prioritise the large volume markets of e.g. [redacted]. The automotive market has seen a fall off over the COVID pandemic period and with a shortfall of raw materials (semi-conductors etc.) and has struggled to grow back to its previous levels. Prior to the pandemic, in Europe there was a shortage of plating on plastics with growth at very high levels. QPP had planned major investment to grow the business to meet this demand. In 2022, the level of growth is increasing as the market continues to recover. This is expected to increase the turnover and profitability of QPP and therefore increase QPP levels of employment.

As more automotive companies develop their electric vehicles, the demand for plastic as a replacement for metal components will grow with the need for lighter and more efficient cars. To be at the leading edge of this process to provide light weight, high quality components that will fulfil the requirements of its customers, QPP is strengthening its relationship with the major OEMs and Tier I companies.

The following chart shows the different markets in which QPP operates and their relative shares.

***Figure 16**: QPP markets and relative shares*

The automotive sector represents [redacted] of QPP's business. Of the overall production [redacted] is supplied to the UK while [redacted] is exported to the EU.

2.7.2. Borough's market

Borough is positioned in high end/volume uses. Most products are high end. In terms of markets, the automotive products are sold to UK customers for the worldwide market, products for the drinks and the sanitary sectors are sold to UK and to the rest of the world and the components of ventilators is sold to an EU country that then sells the final product worldwide.

2.7.3. Aalberts' market

The main market for Alberts is the plumbing and heating, thermostatic mixing valves and fittings sector for the residential and commercial buildings sectors. Aalberts is positioned in a competitive market of sanitary products. Currently, [redacted] of the production is sold to UK countries. Other main markets are the EEA, the US, Australia, Far East, etc. The radiator valve market is particularly competitive with brand and heritage playing a large part in retaining value. Product differentiation is low and many "own label" products are being imported particularly from the Far East. Whilst attempts have been made to differentiate using digital technology and modern design, there is little market appetite for these as the basic thermostatic radiator valve is deemed to be functionally acceptable. Manual radiator valves are somewhat commodity products with low levels of technology and low market values.

The chrome plated components for heating and thermostatic mixing valves (TMV) represent [redacted] of the production in the Doncaster site. Aalberts expects a market growth in the sector of fittings and valves for heating and sanitary applications in the UK. In fact, as energy prices continue to rise and remain at high levels (even more after the war in Ukraine), the need to control heating systems will become increasingly important. Moreover, a market growth is expected as a result of the need for more housing to alleviate the housing crisis and continued activity in the refurbishment market. The heating and thermostatic mixing valves market can be considered as commodity, saturate market, therefore, if an authorisation was not granted, in case of outsourcing any increase in prices would compromise the possibility for Aalberts to remain on the market.

2.7.4. Samuel Heath's market

Samuel Heath is positioned in a luxury niche in the market of sanitary products. Currently, the products of Samuel Heath are sold mainly in the UK and in the US and, to a smaller extent, in other countries worldwide (EEA, Australia, Middle East, Hong Kong, South America, Far East, etc.). The UK market represents around [redacted] of the total sales of Samuel Heath.

Orders come mainly from small individual residential/hotel projects or housing developments, but from time-to-time Samuel Heath also services large contracts to supply big development projects. Currently, Samuel Heath has a very large contract customer for products plated with chromium trioxide and, if Samuel Heath would not be able to supply the chrome finish in house due to a non-granted authorisation, this order would be lost with serious socio-economic consequences for Samuel Heath.

Over the last 20 years the quality of finishes is the reason why customers are willing to pay a premium for buying products of Samuel Heath which have high aesthetic appearance and performance. The colour of parts chrome-plated with Cr(III) is often associated with lower quality product imported from the Far East at a lower price. Therefore, in case of premature substitution with a less performing alternative, Samuel Heath would lose its premium advantage of its high-quality finishes.

3. Impact on the environment

The environmental impacts are not included in the impact assessment of the continued use, since in Annex XIV of the REACH Regulation chromium trioxide is not classified for risk to the environment but for human impacts as Carcinogen cat. 1A and Mutagen cat. 1B (in accordance with Article 57 a and b).

4. Human health impacts of continued use

Chromium trioxide is covered by entry 16 of Annex XIV and solely authorised uses are permitted after the sunset given in the entry (September 21, 2017) unless otherwise exempted. As chromium trioxide is a non-threshold carcinogen, adequate control of risks cannot be demonstrated and therefore applications for authorisation must follow the socio-economic route.

The human health impacts that arise from the remaining risk associated with the exposure of humans to chromium trioxide in the applied for use scenario have been assessed. The excess lifetime risk (ELR) for directly exposed workers and for the general population via the environment for developing lung cancer or small intestine cancer is derived based on the exposure assessment and on the existing reference dose-response function established for carcinogenicity of hexavalent chromium that was published by ECHA's Risk Assessment Committee (RAC)[1].

The main health impact resulting from the intrinsic hazardous properties of chromium trioxide is lung cancer due to inhalation of dust and/or aerosols hence the risk assessment for workers is limited to inhalation of airborne residues of chromium trioxide and the oral route is not taken into account. Therefore, in summary, the main endpoints related to the exposure to chromium trioxide are:

- lung cancer by inhalation exposure for directly exposed workers.
- small intestine cancer by oral exposure for local population (including indirectly exposed workers) via the environment in a 100m radius from the industrial plants.
- lung cancer by inhalation for local population (including indirectly exposed workers) via the environment in a 100m radius from the industrial plants.

The monetisation of human health impacts is carried out based on the values of willingness-to-pay (WTP) indicated in the ECHA study for the reduction of cancer risk[2] for fatal and non-fatal cancer cases. To evaluate the fatal cases, a lower and upper Value of Statistical Life (VSL) of £4,146,039 and £5,922,913 respectively is used. To assess the non-fatal cases, a Value of Cancer Morbidity (VCM) of £485,678 is used. These three values are derived by adjusting the values recommended by ECHA (€3.5M - €5M for VSL and €0.41M for VCM base year 2012) to the year 2022 and then by converting them in UK pounds.

4.1. Health impacts on regional population for Use 2 (plating)

Risks to the regional population by inhalation and oral route are considered negligible, hence they have been omitted in the SEA assessment as Cr(VI) will transform in the environment to Cr(III).

[1] ECHA, 2013 (a).

[2] ECHA, 2016 (a).

4.2. Directly exposed workers

A total of [redacted] workers at the applicants' sites face additional risk of lung cancer from direct exposure by inhalation to airborne residues of chromium trioxide for plating at their production sites[3].

For directly exposed workers, the excess cancer risk estimate applies to each exposed worker for a total working life of 40 years. Therefore, to reflect exposures to chromium trioxide over the length of the requested review period, exposures are adjusted over 10 years for Use 2 (plating).

Under the applied for use scenario the annual value of an avoided cancer case would be £113,514 lower bound and £160,789 upper bound for the directly exposed workers over the requested review period of 10-years for Use 2.

4.3. Humans via environment for Use 2

Chromium trioxide is used in processes with a high degree of closure from an environmental point of view. However, to be conservative, risks to the general population are calculated in terms of lung cancer by inhalation and small intestinal cancer by ingestion of drinking water and consumption of food. Exposure by inhalation is meaningful only at a very local level, in a 100m radius from the point source.

4.3.1. Local population including indirectly exposed workers for Use 2

The production facilities of QPP and Samuel Heath in Birmingham, Borough in Leigh on Sea and Aalberts in Doncaster are all located in mixed industrial, commercial and residential areas.

Using the standard value of the European Union System for the Evaluation of Substances (EUSES) model, for Use 2, 40,000 residents and indirectly exposed workers in nearby companies (10,000 for each site) are assumed to be potentially exposed to chromium trioxide by inhalation and oral route at the local level within a 100m radius. As explained in the CSR, the plating line is in a separate building with barriers in place (either locked doors or cordoned off areas), exposure to indirect workers will not occur. The indirectly exposed workers have therefore been classed as part of the local population. This number of people includes workers who are indirectly exposed at the applicants' sites, as well as indirectly exposed employees in other companies that are located close to the four applicants' sites.

Considering excess lung cancer risk for a lifetime exposure of 70 years, under the applied for use scenario, there would be 4,10E-02 additional statistical lung cancer cases in the assumed local population. Applying the above-mentioned value of an avoided lung cancer case the monetised excess risk of lung cancer for the local population amounts to £20,000 - £28,320 over the review period.

Considering the exposure of humans via the environment, under the applied for use scenario, there would be 9,64E-03 additional statistical intestinal cancer cases for the population in the areas of Birmingham, Leigh on Sea and Doncaster.

The lifetime excess intestinal cancer risk is assessed for a lifetime exposure of 70 years. Taking into account the value of an avoided intestinal cancer case, the monetised excess risk to the local population amounts to £5,100 - £7,060 over the review period.

[3] [redacted] workers in total are involved in etching and plating at the applicants' sites. While it is not possible to allocate workers to either etching or plating, for the purpose of this application for authorisation, [redacted] workers are allocated to plating and [redacted] to etching.

Overall, the estimated monetised excess risk for the local population (via oral intake) amounts to £25,099 - £35,382 over the review period.

4.3.2. Health impacts on regional population for Use 2

As explained in the CSR, risks to the regional population by inhalation and oral route are considered negligible, hence they have been omitted in the SEA assessment as Cr(VI) will be reduced in the environment to Cr(III).

4.4. Total health impacts (directly exposed workers and local population)

Considering altogether directly exposed workers plus local population (including indirectly exposed workers), it can be concluded that the total monetised human health risk value from the continued use is £13,861 to £19,617 per year (NPV adjusted in 2022 price level).

4.5. Human health impacts on end users

No chromium trioxide residues are present on the chrome plated article. Therefore, the absence of the substance in the final product guarantees a safe use by the end users.

	Excess lifetime cancer risk *	Number of exposed people	Monetised excess risk lower bound VSL £4,146,039 VCM £485,678	Monetised excess risk higher bound VSL £5,922,913 VCM £485,678
Directly exposed by inhalation FATAL	5,12E-03	26	£11 028	£15 755
Directly exposed by inhalation NON-FATAL	5,12E-03	26	£323	£323
Local inhalation FATAL	1,03E-06	40,000	£1 943	£2 775
Local inhalation NON-FATAL	1,03E-06	40,000	£57	£57
Local population oral FATAL	2,41E-07	40,000	£457	£653
Local population oral NON-FATAL	2,41E-07	40,000	£54	£54
Total per year			£13,861	£19,617
Total per review period			£138,613	£196,170
* Latency (years): - 10 years lung cancer - 26 years intestinal cancer				

***Table 10**: Summary of additional statistical lung and small intestine cancer cases for Use 2*

5. Non-use scenarios

Eight different non-use scenarios (NUS) have been assessed by the applicants:

NUS 1: Downgrade of the quality of the final product
NUS 2: Relocation of production outside of the UK
NUS 3: Outsourcing of electroplating to either UK or non-UK countries
NUS 4: Subcontracting of production outside of the UK to European companies holding a REACH authorisation or to extra European companies
NUS 5: Building stocks
NUS 6: Partial closure (only the chrome related operations)
NUS 7: Prolonged downtime until substitution
NUS 8: Shut down of the site and closure of the business and layoff of all staff employed

NUS 3 in combination with NUS 6 was considered as the most likely non-use scenario for Aalberts and Samuel Heath whereas NUS 8 was considered to be more relevant for QPP and Borough. NUS 1, 2, 4 and 7 were discarded for reasons described below.

NUS 1 - Downgrade of the quality of products (functionality and aesthetics)

The surface properties provided by chromium trioxide in the plating process is crucial to confer high functional and aesthetic character.

In terms of functionality, the protective top layer should ensure wear resistance, high corrosion protection, humidity stability, abrasion resistance, thermal resistance, durability (long lasting products and warranties), good adhesion strength, chemical/cleaning agent resistance (easy cleaning), that it's safe to use, hygienic and non-allergenic. In order to be easily cleaned and avoid corrosion all sanitary and automotive parts must ensure chemical resistance to all cleaning products.

Currently in the absence of chromium trioxide that guarantees the durability of the components, the applicants will not be able to offer 1-5 years on certain products for sanitary and other applications and up to 5-10 years for automotive components warranties, in line with their commitment to deliver the highest quality chrome plated components. As a consequence of the NUS 1, and applying an inferior alternative resulting in shorter lifespan of the product, the majority of the applicants' customers (mainly in the sanitary and automotive sectors) will not be able to guarantee a minimum of 5-years warranties on their products. Customers would not accept a downgrade of the functionality of final products (series parts or spare parts) that would not comply to their technical requirements and specifications.

Therefore, if chromium trioxide was withdrawn from the chrome plating processes of the applicants, in case of failure to offer products with the same durability, warranties and appearance, customers would rather turn to competitors, who are allowed to plate their products using chromium trioxide, outside of the UK.

In terms of aesthetics, having parts with high quality and durable decorative finishes is essential for the $CrO_3$4UK applicants and their customers. For a large variety of applications, the applicants' customers need to mix and match serial production and spare parts e.g. having identical satins finishes (medium satin chrome and dark satin) or bright finishes (bright dark black and bright blue mirror finish) that are standard in the industry. The smallest change would lead to non-repeatability of colour, poor colour stability or poor appearance of finishes. Additionally, as chrome coated products from different companies are often installed together (for example bathroom, automotive interior), the colour harmonization and colour match of these products is crucially important. It has to be underlined that parts with identical finishes will continue to be manufactured in the rest of the world and can be imported to the UK without regulatory restrictions. As a consequence, a degradation of aesthetic will end up in loss of current and future customers who would reject the applicants' products and rather turn to competitors, most probably outside of the UK.

For all these reasons, NUS 1, a downgrade of functional and aesthetic character, was considered clearly unfeasible at this time by all four $CrO_3$4UK applicants.

NUS 2 - Relocation outside of the UK

Three of the four applicants (QPP, Borough and Samuel Heath) do not have manufacturing facilities outside of the UK. One of the applicants (Aalberts) is part of a larger group of companies that has production facilities outside of the UK, however none of these facilities has chroming capability. This would have to be sub-contracted which would imply all the complexities associated to NUS 4.

For all $CrO_3$4UK applicants a relocation of production outside of the UK is a very complex process. First and foremost, the applicants don't consider it ethically acceptable moving potential health risks from the UK (where plating with chromium trioxide take place under regulatory scrutiny) to countries outside of the UK that may not have similar high health and safety standards/regulations in place.

Moreover, this non-use scenario will not be feasible on economic, financial and logistical grounds since it would require:

- time (at least 3 years to carry out all required steps before starting the production) to identify a suitable country and location, buy the land, build new facility, acquire new machinery and equipment and hire and train skilled personnel
- huge investment
- financially critical issues to secure the investment in a new facility
- complex logistics for the shipment and additional transportation
- bureaucratic efforts, costs and regulatory constraints to gather all necessary permits, export controls, import licenses technical qualifications and quality approvals
- high risks due to uncertainties
- high environmental impacts in terms of CO2 emissions

The costs and the time needed to relocate outside of the UK cannot be quantified since they very much depend on the selected location and on the regulations of the country.

NUS 3 - Outsourcing the production of chrome-plated products

Currently, the $CrO_3$4UK applicants do not outsource the chrome-plating of products**.** Outsourcing by Borough and QPP was ruled out for the following reasons.

Ethically, outsourcing is not a solution as:

- shifting the risks related to use of Cr(VI) and the associated human health impacts from the UK where they are very low to countries outside of the UK where risks might be less well managed is not in line with the applicants' ethical values

Logistically, outsourcing is not viable as:

- It requires long transport and complex logistics

Practically, outsourcing is not viable as:

- it is extremely difficult and time consuming (1-2 years) to identify potential contract manufacturing organisations (CMOs) outside the UK able to carry out chrome plating of plastic parts in a reliable way and in the same quantities and quality
- the current safety stock period would not suffice to maintain market share during the time needed to start outsourcing

Commercially and strategically outsourcing is not viable as:

- additional costs would need to be passed to the customers and likely customers would try to source the product directly from the CMO at a lower price without passing through the applicants

- the customer acceptance of products not being manufactured in the UK is not guaranteed as the "Made in England" is important in some markets
- outsourcing from countries far away, most likely from China, would come with significant risk (including geopolitical) that could affect the market position of the applicants

Economically, outsourcing is not viable as:

- costs would increase due to freight/duty
- penalties might be applied in case of delays
- there would be additional cost to outsource all of the products that are currently chrome plated by the applicants
- to support the supply chain, net working capital / stock would have to be increased to cover increase in lead-times, market and seasonal variations.

Financially, outsourcing the chrome plating operations is unfeasible as:

- the initial set-up up of supply chain from a 3rd party would need significant capital funding that would be extremely detrimental to profitability

Environmentally, outsourcing is not viable as:

- There would be high environmental impacts in terms of CO2 emissions from transportation of products back to the UK

NUS 4 - Subcontracting the chrome plating operations outside of the UK to European companies holding a REACH authorisation or to companies in other countries

In strategic, practical, economical or environmental terms, subcontracting of the chrome plating activities is not a viable alternative for the $CrO_3$4UK applicants.

Strategically, subcontracting is not viable as:

- the businesses of the applicants would have no value other than brokering and managing the logistics
- customers might choose to go directly to the subcontractor outside of the UK cutting out the applicants from their supply chains

Practically, subcontracting is not viable as:

- the volumes of components chrome plated by the applicants daily is significant and it is difficult to find a subcontractor having the same production capacity
- components would have to be validated by the end customer on the new site
- there are only few UK or EU based subcontracting companies with authorisation and capacity to support the demand therefore it would require
- time is needed to identify a potential subcontractor as well as for the adaption and setup of the chrome plating activities, for obtaining export permits and import licenses, for approvals, etc.

Economically, subcontracting is not viable as:

- subcontracting would entail additional costs that would highly increase prices of the chrome plated components

Environmentally, subcontracting is not viable as:

- increased transport and logistics costs for delivering products to the UK will also adversely affect UK carbon footprint in terms of CO2 emissions in the UK

NUS 5 - Building stocks

This non-use scenario was ruled out as unfeasible as there would not be enough available space in the current structures to stockpile parts plated with chromium trioxide for more than maximum of two-three months hence the applicants would need to build warehouses to cover any lead times before the

acceptance by the market of parts plated using Cr(III). For building such warehouses time (at least 18 months) and huge investment are required.

NUS 6 - Partial closure (only the chrome related operations)

This non-use scenario for the use of chromium trioxide for plating was discarded by two of the applicants (QPP and Borough). A partial closure is completely unrealistic as the profitability of these applicants highly rely on the sales of Cr(VI)-plated products. Therefore, a partial closure is not feasible and the non-use scenario would correspond to a total and immediate closure of the business (see NUS 8). Moreover, even if a temporary closure until substitution was possible, in the highly competitive sectors of this application (especially the sanitary and automotive sectors), it is unlikely that customers would return to the applicants after a temporary closure. Chrome plating activities represent more than [redacted] businesses so a partial closure is not realistic. QPP and Borough would be obliged to shut down their plants and close their business.

For the other two applicants [redacted], this non-use scenario of partial closure is considered likely in combination with the NUS 3. In fact, the two companies will immediately close their plating lines to explore outsourcing their plating activities.

NUS 7 - Prolonged downtime until substitution

This scenario was ruled out by all $CrO_3$4UK applicants as in the highly competitive markets in which the applicants operate (especially the sanitary and automotive sectors), customers will purchase from competitors, most likely outside of the UK. When the production could start again, after substitution, it is unlikely that customers that have gone through the costly and lengthy process of changing supplier would change again and come back to the applicants. Moreover, there are no guarantees that the existing plants would be fully operational after a prolonged downtime.

NUS 8 - Shutdown of the site and business closure

If an authorisation was not granted for the plating use, most likely two applicants [redacted] would have to cease their businesses (NUS 8) as more than [redacted] of their profits depend on the products plated with chromium trioxide. In fact, as Cr(III) as a substitute is not yet qualified and accepted by customers, at least these two applicants would not gain sufficient profit to continue their businesses. Therefore, in case of a non-granted authorisation for Use 2, their sites will shut down and their businesses will close.

The main reasons for the closure of the businesses of [redacted] can be summarised as follows:

- the production and profits, that depend on the use of chromium trioxide, are essential for the applicants
- parts concerned by Use 2 are crucial for the applicants' main customers
- a downgrade of the quality of the products is not acceptable by the applicants considering the specific requirements of their customers related to the parts affected by Use 2 hence NUS 1 has been discarded
- the other non-use scenarios assessed (relocation, outsourcing, subcontracting, partial closure and stockpiling) have been discarded for the reasons quoted above

Non-use scenario 8 will entail the following socio-economic impacts for the applicants:

- loss of market shares loss of EBITDA
- decommission costs
- low resale value of the assets
- additional transport costs in case of outsourcing
- layoff of workers

5.1. Most likely non-use scenarios for the applicants

5.1.1. Most likely non-use scenario for QPP

QPP would have no option but to implement an immediate site closure (NUS 8). This action would lead to shortages at all customers creating line stoppages in a number of manufacturing sectors. First affected would be the major UK automotive OEM's due to lack of parts. Currently QPP supplies plated components which fit either inside or outside of most OEM's entire vehicle ranges. QPP carries a one week contingency stock of plated product which would be quickly exhausted due to the high volume nature of the automotive sector. Transfer of this product outside of UK/Europe would be extremely complex and time consuming for the OEM's to undertake. Non-build of vehicles would have a knock on effect to every other supplier to the OEM's as their parts would not be required until the new sourcing of chrome was in place which could take months.

QPP's other customers, such as shower manufacturers would lose a key supplier who would be very difficult to replace in short time. The shower manufacturers would struggle to resource their components as showers tend to be produced by large numbers of mould tools producing many variants of parts. If all chrome plating activities leave the UK not only will they struggle to find alternative plater/moulders they will struggle to compete in a chrome plating market where there is suddenly limited capacity where the plating companies still operating, will give priority to high volume jobs where premium prices can be charged.

5.1.2. Most likely non-use scenario for Borough

The chrome plating activities are crucial for Borough's products lines. Borough's business in supplying plated parts (which need etching and final plating) supports other manufacturing processes on site. Borough has an injection mould shop which supplies the mouldings that are processed (etched and plated). Without the plated plastic moulding business there would be no need for a mould shop set up. Borough's location is too far from automotive assembly plants to be competitive in the supply of 'mould only' parts. Borough's USP is the supply of plated mouldings, so without the ability to plate Borough would have no business for neither plating or mouldings operations. In case an authorisation is not granted Borough would have to implement immediate site closure (NUS 8) and lay off its staff.

Borough's customers would be put in a position that would threaten their supply chain due to Bourgh's inability to supply parts in the NUS. Without the capability to supply, customers would need to resource in Europe or further afield (China) parts to meet their criteria, and possible uneconomical and implementation of retrograde designs. This would give added problems to customers, as Borough is currently able to deal with quick changes in the market and respond to with new designs in weeks. For the customers, dealing with suppliers further afield in the world, would mean longer leads times, stock builds, longer response times to market conditions. The non-use scenario would mean OEMs buying complete assemblies from e.g. Far East, cutting out Boroughs immediate customers and in so give potential risk to their businesses.

5.1.3. Most likely non-use scenario for Aalberts

In case an authorisation is not granted, Aalberts chrome plating line would close. The partial closure (NUS 6) of Aalberts' production related to the use of chromium trioxide with the consequent layoff of 167 workers at the Doncaster site would also be unavoidable.

Initially, in the very short run, Aalberts could rely on existing stocks which provide about six weeks contingency to continue supplying its customers with radiator valves and thermostatic mixing valves. As a drop in alternative to chromium plating product is not available and a drop in performance quality will not

be acceptable so long as chrome-plated product from other suppliers remains on the market, there would be a collapse in sales when existing stocks of chrome parts were used after six weeks leading to a rapid down turn in the Aalberts business.

NUS 2 is not economically viable. NUS 3 and NUS 4 are neither practically nor economically viable considering the volume of component parts processed daily (approximately [redacted] parts per day). Aalberts UK site is vertically integrated, from production and processing of raw metal through to finished product. All products utilise and are dependent on the same manufacturing route. Chrome plated products represent [redacted] of manufacturing at the Aalberts UK site, and removal of this would render the remaining product ranges unsustainable for manufacture as these would have to absorb the full operational cost of the site. Therefore, the most likely outcome following closure of chrome plating activities is that the Aalberts UK site would close.

The NUS assumes that Aalberts would start the complex outsourcing process (NUS 3) with the possibility of success. In this NUS, Aalberts would need to identify and to start a business collaboration with a supplier with sufficient capacity to process the large volumes of its different chrome-plated products. As there are limited UK/EU based subcontracting companies with a REACH authorisation and the capacity to support the demand and the authorisation to use chromium trioxide by European suppliers is expected to last in 2024 (under temporary arrangements of the REACH application CTAC sub Use 3), given the uncertainties on longer authorisation, Aalberts would be obliged to outsource from countries beyond the EU, most likely from China. This would result in significant risk and financial implications. Environmentally, it cannot be considered a sensible option as increased logistics will result in increased net energy use and carbon footprint.

Setting up the supply chain with a third-party supplier for >1000 different products would take at least 12 months, more likely 18-24 months, over which time there would be no production of chrome plated products. It would also need significant capital funding.

In a best-case scenario, Aalberts would be able to bridge this period of non-production to maintain a position in the market of heating and thermostatic mixing valves (currently representing around [redacted] of the site production). This best-case scenario assumes that once outsourcing was established and supply re-established (12-24 months following a decision not to grant authorisation) Aalberts would be able to resume and continue the manufacturing of chrome-plated products as well as of all other product ranges in the longer term, and avoid additional dismissal of workers.

It is important to note that this assumption is unlikely to be realistic. In practice, succeeding in the outsourcing of chrome plating operations without losing substantial market share would be impossible, not least due to the substantial non production period in which time customers would need to source product elsewhere. Additionally, there are other unknown risks, including geopolitical, cost escalations for freight/duty and the customer acceptance of products not being manufactured in the UK (loss of Made in England).

Additionally, outsourcing (from long distances) would entail very high logistic costs for Alberts as well as the need to cover the fixed expenses at the Doncaster site and incurring additional costs relating to project management of the outsourcing project and managing product quality. These additional costs will have to be reflected in increased prices for Aalberts' customers who could then decide to change supplier.

The significant additional costs associated with outsourcing are estimated at approximately [redacted] per annum and in an additional net working capital of approximately [redacted] to cover increase in lead-times, market and seasonal variations.

These costs would need to be recovered as an increase in the prices of the products to the customers (estimated at approximately [redacted] increase in average per product)). Given the importance of keeping prices

low to remain competitive in the commodity and saturated market in which Aalberts is operating, Aalberts would probably lose large shares of sales of all its products. If this were the case, aside the chrome-plated products, Aalberts would not be able to continue its manufacturing activities of other product ranges. As a consequence, the Doncaster site would be closed with the layoff of all its with [redacted] people [redacted] (NUS 8). Customers would continue to purchase these chrome-plated radiator and thermostatic mixing valves products from other suppliers located outside the UK.

Non-use scenario 3 is considered highly conservative in terms of under-estimating the economic consequences to the manufacturer. The socio-economic impacts for Aalberts have been considered:

- one-off costs to identify CMO partners and establish new partnership relationships
- additional transport and logistic costs due to outsourcing
- layoff of [redacted] workers directly related to the production of chromium parts

Additionally, economic loss would prevent continuing the R&D currently focused on Cr(VI) substitution.

In addition, the end of Aalberts production would put at risk the businesses of UK suppliers such as [redacted] who supply components and service providers such as [redacted] who provide technical support for production equipment.

5.1.4. Most likely non-use scenario for Samuel Heath

If no longer able to plate in-house with chromium trioxide, at least initially, Samuel Heath would outsource the chrome plating to an external contractor (NUS 3). This would entail the immediate closure of the plating line (NUS 6) and dismissal of the workforce directly involved in the plating activities. As Samuel Heath's production and turnover related to products that require chromium trioxide is below [redacted], their most likely scenario is outsourcing. However, this scenario is only considered as a temporary solution.

Samuel Heath would not be able to sustain knock-on effects beyond three years at most (by 2026/2027). By that time, unless something currently unforeseen would solve the issues with predicted loss of business, Samuel Heath would have to close.

For Samuel Heath, the combined non-use scenario 3 and 6 will entail the socio-economic impacts that are described below in section 7.6.

The additional costs associated with outsourcing will entail an increase in prices of chrome-plated components. Likely this will be followed by knock-on effects on other Cr(VI)-free product ranges resulting in a significant loss of sales and profit.

As a consequence, under a reasonable worst-case scenario, it is anticipated that, a few years after the closure of the chrome-plating lines, the reduction of the business associated to other products would oblige Samuel Heath to shut down the whole production site in Birmingham and close the business (NUS 8). As a result, all other workers in production, sales and management functions would lose their jobs.

5.2. Most likely non-use scenario for Use 2 (plating)

The non-use of chromium trioxide by the $CrO_3$4UK applicants would entail severe socio-economic impacts in the UK supply chain for suppliers and downstream users in various sectors and industries. The implications would be:

- the need to seek other suppliers outside of the UK with potentially lower quality
- a loss of business (potential plant closures)
- the risk of job losses and the associated social costs

Due to the high level of associated uncertainties, these impacts along the supply chain are only qualitatively described and not included in the socio-economic assessment.

	QPP	Borough	Aalberts	Samuel Heath
NUS 8 **Closure and layoff of all workers**	QPP would have to implement an immediate site closure. This would lead to shortages at all customers creating line stoppages at all major UK automotive OEM's due to lack of parts as well as all of QPP's shower manufacturers who would lose a key supplier who would be difficult to replace in short time. All work for both industries would leave the UK.	Borough would immediately close its site with shortages for customers and interruptions at major UK automotive OEM's due to lack of parts. Other manufacturers would lose a key supplier that would take time to replace. Dependent sector suppliers would leave UK.	-	-
NUS 3 and 6 **Outsourcing and partial closure**	-	-	The NUS assumes Aalberts will seek to outsource the chrome plating process. However, if sales decrease significantly, the business would no longer be profitable and would close.	Initially Samuel Heath will start by outsourcing the plating process, but if sales decrease, the business would no longer be profitable and would close

***Table 11**: Most likely non-use scenario for Use 2 (plating)*

6. Impacts on the applicants' suppliers

The applicants purchase raw materials such as chemicals, plastics, metals, packaging, engineered jigs, machinery spares, consumables, heating, energy, as well as logistics, maintenance, external security and other services from several suppliers. Most of these materials and services that are needed to manufacture the applicants' products are purchased within the UK from a multitude of (local) companies.

The most significant socio-economic impacts from a non-granted authorisation for the use of chromium trioxide for plating will be suffered by those small and medium size UK companies that currently supply large amounts of raw materials or services exclusively or mainly to the applicants. For these suppliers, at a minimum, some downsizing or, in the worst cases, closure can be expected. As a consequence, there will

be significant impacts on many of the clients' suppliers leading to additional profit and job losses in their supply chain.

Some other UK suppliers, even if they do not rely just on the applicants' purchases, might potentially face reduced sales, profit losses and negative social impacts in terms of job losses. For companies for which the applicants' businesses represent a minimal part of their revenues would only be temporally impacted until they find other customers.

All applicants buy chromium trioxide from the same UK supplier of chemicals [redacted]. It is expected that this chromium supplier will be significantly affected by a non-granted authorisation to the four applicants. This provider would no longer supply these chemicals to the four applicants, so other areas of business (that are not Use 2) would be affected. There would be knock-on effects on other chemicals used by the applicants (e.g. a cost increase) that would have implications for other surface treatment activities for the applicants and their customers. This may have consequences for hard chrome platers/functional platers authorised for other uses, who have a licence to trade but will lose their main source of chemistry in the UK leading to higher import costs, loss of sales, loss of jobs and potential product shortages to UK manufacturers in different industries.

Due to the high level of uncertainty, impacts on suppliers of raw material and services within the UK are described but not quantified. Therefore, these (not monetised) impacts are not included in the applicant's assessment of the socio-economic impacts of the NUS.

The following tables describes impacts on the applicants' suppliers.

	Type of material and service	Supplier	Country	Impacts on suppliers associated with the NUS for ETCHING USE
Raw materials	CrO3 and other chemicals	[redacted]	UK UK	Loss of business in some UK Plating on plastic industries
	Plastic	[redacted]	EU[redacted]	Loss of business in some UK Plating on plastic industries
	Energy	[redacted]	UK UK	Loss of business in some UK Plating on plastic industries
	Metals	[redacted]	UK EU[redacted]	Lower demand in some UK Plating on plastic industries
	Water	[redacted]	UK	
Services	Logistics	[redacted]	UK	Loss of parts delivery and supply business in some UK Plating on plastic industries
	Packaging	[redacted]	UK UK UK UK	Loss of business in some UK Plating on plastic industries
	Labour	[redacted]	UK UK	

***Table 12**: Main impacts on the suppliers of QPP in the case of NUS 8*

	Type of material and service	Suppliers	Country	Impacts in the event of the most likely non-use scenario
Raw materials	CrO_3 and other chemicals	[redacted]	UK UK UK UK	The NUS would kill the demand for etching in UK, resulting in loss to UK suppliers Reduction in trade, loss of [redacted] direct business and possible jobs
	Plastic polymer	[redacted]	UK EU[redacted] UK	Loss of [redacted] t/y of polymer to UK suppliers Reduction in sales
	Engineered jigs	[redacted]	UK UK	Reduction in sales of UK suppliers of jigs and loss of profits
	Metals	[redacted]	EU[redacted] UK	Reduction in sales of UK suppliers of metals and loss of profits
Services	Logistics	[redacted]	UK	Transport company would cut driver jobs at company that distributes products to customers (loss of jobs x 2)
	Packaging	[redacted]	UK	Loss of sales
	Electricity provider	[redacted]	UK	Loss of electricity demand [redacted] per month
	Cleaners	[redacted]	UK	Loss of work
	Electrician	[redacted]	UK	x 2 contractors employed on maintaining facilities
	Landlords	[redacted]	UK	Loss of tenant
	Tooling engineers	[redacted]	UK	Loss of tooling maintenance

***Table 13**: Main impacts on the suppliers of Borough in the case of NUS 8*

	Type of material and service	Suppliers	Country	Impacts in case of the most likely non-use scenario
Raw materials	CrO_3 and lubricants, oils, greases, chemicals etc.	[redacted]	UK	In the NUS 6 & 3: Potential closure, as NUS would affect all plating companies in UK In the NUS 8: Potential closure, as NUS would affect all plating companies in UK (our consortium are largest operators)
	Plastic	[redacted]	UK EEA[redacted] UK UK UK	In case of NUS 6 & 3: [redacted] of annual turnover would be affected, probable redundancy and/or closure (excluding [redacted] as this is only for [redacted]) In case of NUS 8: [redacted] of annual turnover would be affected, probable redundancy and/or closure

	Type of material and service	Suppliers	Country	Impacts in case of the most likely non-use scenario
	Energy	[redacted]	UK	In case of NUS 6 & 3: Small reduction in annual turn-over, limited impact In case of NUS 8: Small reduction in annual turn-over, limited impact
	Metals	[redacted]	UK UK EU[redacted]	In case of NUS 6 & 3: Small reduction in annual turn-over, limited impact In case of NUS 8: Small reduction in annual turn-over, limited impact
	Other raw materials	[redacted]	UK UK	In case of NUS 6 & 3: Small reduction in annual turn-over, limited impact In case of NUS 8: Small reduction in annual turnover, limited impact
Services	Logistics	[redacted]	UK UK	In case of NUS 6 & 3: Small reduction in annual turn-over, limited impact In case of NUS 8: [redacted] of annual turnover would be affected, probable redundancy and /or closure
	Packaging	[redacted]	UK UK UK	In case of NUS 6 & 3: Small reduction in annual turn-over, limited impact In case of NUS 8: [redacted] of annual turnover would be affected, probable redundancy and /or closure
	Technical support for production equipment	[redacted]	UK	In case of NUS 6 & 3: Small reduction in annual turn-over, limited impact In case of NUS 8: Small reduction in annual turn-over, limited impact

***Table 14**: Main impacts on the suppliers of Aalberts in the case of NUS 8 and NUS 6 & 3*

	Type of material and service	Supplier	Country	Impacts in case of the most likely non-use scenario
Raw materials	CrO_3	[redacted]	UK	In case of NUS 6 & 3: Impact on their turnover in the UK, but unlikely to cause them significant damage on our own. If others are also refused extension, this would be a major blow to their UK business. In case of NUS 8: Impact on their turnover in the UK, but unlikely to cause them significant damage on our own. If others are also refused extension, this would be a major blow to their UK business.
	Plastic components	There are a small number of plastic moulders	UK	In case of NUS 6 & 3: A small loss of turnover as turnover dropped, but very limited In case of NUS 8: Some turnover loss to them as overall turnover dropped, but this would not be particularly significant for any one player

	Type of material and service	Supplier	Country	Impacts in case of the most likely non-use scenario
	Energy	Energy is supplied via brokers	UK	In case of NUS 6 & 3: Minor impact due to chrome line stopping, but minimal impact on the supplier In case of NUS 8: Samuel Heath has a high electricity usage due to machining and tank heating so this would stop, but in the grand scheme of energy providers SH usage would not be significant for them.
	Metals	Samuel Heath buys metals from some stockists and from [redacted] direct	UK EU[redacted]	In case of NUS 6 & 3: There would be a smaller loss of turnover for the stockists as turnover dropped and some parts may end up being sourced outside the UK if plating moves outside the UK, so there would be a reasonable sized impact on UK stockists. In case of NUS 8: Loss of turnover for all of the suppliers. The[redacted] supplier is large and would weather the loss, however, some of the UK stockists would lose a reasonable amount of business from their local depots which could affect how they view the viability of the depot.
	Other raw materials	Samuel Heath has a large number of suppliers in the UK covering all sorts of component parts.	UK	In case of NUS 6 & 3: A limited impact on other suppliers as turnover dropped In case of NUS 8: A handful may be significantly affected by losing our business, but it is difficult to say if they would go out of business as a result.
Services	Logistics	[redacted]		In case of NUS 6 & 3: Unlikely to have any significant impact In case of NUS 8: Unlikely to have any significant impact
	Maintenance	Local contractors in the area and across the UK	UK	In the NUS 6 &3: A small number of suppliers reliant on SH for plating support work would lose significant turnover and could affect their viability. In case of NUS 8: A few of them are quite reliant on SH and would lose a significant chunk of turnover, which could affect their viability, particularly where they only have a few employees.
	IT & administrative support		UK	In case of NUS 6 & 3: Suppliers would feel a very minor impact In case of NUS 8: Suppliers will be impacted, but their viability will not be affected

***Table 15**: Main impacts on the suppliers of Samuel Heath in the case of NUS 8 and NUS 6 & 3*

7. Economic impacts of a non-granted authorisation

7.1. Loss of turnover and EBITDA in case of NUS 8 (site closure)

The socio-economic assessment includes the impacts on the applicants in terms of turnover and EBITDA losses, decommissioning costs, as well as social costs of unemployment. Foregone profits in terms of loss of turnover and EBITDA are relevant in case of NUS 8 (site closure). The reference turnover taken into account in this assessment is the annual turnover based on 2017-2019 data. The data of 2020 were not used for the assessment considering that the $CrO_3$4UK applicants' sales fell due the special COVID 19 pandemic context. The total annual turnover associated to the products related to the use of chromium trioxide is [redacted] (i.e. approximately [redacted] over the 10 years review period). Detailed values are provided in the following table. For use 2, in line with the non-use scenario, in the socio-economic assessment, profit losses are calculated and presented over the requested 10-years review period.

Turnover (£ million)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
QPP	[redacted]													
Borough	[redacted]													
Aalberts	[redacted]													
Samuel Heath	[redacted]													
TOTAL	[redacted]													
TOTAL (range)	40-50	30-50	30-50	30-45	30-50	30-50	40-60	50-70	50-70	50-70	50-70	50-70	50-70	50-70

***Table 16**: Turnover associated to products related to the use of chromium trioxide for plating*

EBITDA (Earnings before Interest, Taxes, Depreciation, and Amortisation) is used as a financial indicator for foregone profit in case of closure of the businesses. The foregone EBITDA is provided in the following table.

In the event of a refused authorisation, two companies (Borough and QPP) will immediately close their plants and businesses. The total loss of annual EBITDA is approximately [redacted] (public range £0.1 million - £1.2 million). The total foregone EBITDA over the period is approximately [redacted] (public range £5 million - £12 million). The following table includes the economic impacts in terms of EBITDA losses for these two companies.

EBITDA (£ k)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
QPP	[redacted]													
Borough	[redacted]													
TOTAL	[redacted]													
TOTAL (range)	100-900	100-900	100-900	200-900	500-900	500-900	400-900	700-1000	700-1000	800-1200	800-1200	800-1200	800-1200	800-1200

***Table 17:** Foregone EBITDA of the etching use (Use 2) for the applicants*

As described in the section on non-use scenario, in case of a non-granted authorisation, at least initially, Aalberts and Samuel Heath would seek to outsource the plating activities. Therefore, in the short run, only the electroplating lines will be prematurely dismissed due to outsourcing. The resulting loss of residual

value of this equipment will be very limited hence it has not been quantified. After some time (months/years), due to knock on effects, there could be a decline in business related to other products ranges. Ultimately this could even lead to closure of the plant, there could be a need to dismantle the plant and sell off machinery or the whole plant, as it became unused. However, since these decommissioning costs will not occur immediately, they were not quantified.

In the worst-case scenario in case of knock-on impacts due to outsourcing and leading to closure of plants, in addition to the EBITDA losses for QPP and Borough, foregone EBITDA for Aalberts and Samuel Heath should be included in the assessment of the socio-economic impacts of a non-granted authorisation. This would correspond to an annual range of [redacted] (i.e. to a total of [redacted]) However, to be conservative, due to the high level of uncertainty associated to the worst-case scenario, these losses have not been included in the assessment (see table below).

EBITDA (£)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Aalberts	[redacted]													
Samuel Heath	[redacted]													
TOTAL	[redacted]													
TOTAL range	2-3M	2-3M	2-3M	3-4M	2-3M	3-4M	3-5M	3-5M	4-6M	4-6M	4-6M	4-6M	5-7M	5-7M

***Table 18**: Foregone EBITDA of the plating use (Use 2) for the worst-case scenario (NUS 8) for Aalberts and Samuel Heath*

7.1.1. Decommissioning costs and sale value of the plant in case of NUS 8

If the authorisation is not granted to the CrO3 4UK applicants, there will be high decommissioning costs associated to end the production of chrome plated components. These costs include the cost to dismantle the production facility, decommissioning specific equipment for the manufacturing of chrome plated components, cost of building refurbishment, chemical clearance and land clean-up.

It is expected that, in a sale, the plants and its inventory would only generate a low or no sale value, as the plants were designed for specific needs of the applicants (uses, buildings and volume of parts to be produced). However, some machines (e.g. injection moulding machines, CNC machines) can be resold and will have a certain market value. In the assessment of the economic impacts, the expected resale value of equipment has been subtracted from decommissioning costs associated to the closure of the plant. In all cases, it would cost more to dismantle the existing plants that what would be generated from the sale of equipment.

The total value of decommissioning costs over the requested period is equal to [redacted] (i.e. approximately in the range [redacted] per year). The total decommissioning costs under the worst case for Aalberts and Samuel Heath have not been monetised, but they are expected to be substantial. The following table summarises the decommissioning costs and sale value associated to the closure of the applicants' plants.

Applicants	Total decommissioning costs	Expected resale value of equipment	Total net costs
QPP	[redacted]	[redacted]	[redacted]
Borough	[redacted]	[redacted]	[redacted]
TOTAL	[redacted]	[redacted]	[redacted]

***Table 19**: Summary of decommissioning costs for NUS 8*

If an authorisation is not granted, Aalberts and Samuel Heath would have to close the plating lines and start outsourcing. Therefore, there will be some costs of decommissioning the plating lines of Aalberts and Samuel Heath. These costs, that have to be added to the costs of decommissioning the plants by QPP and Borough, are detailed below in section 7.4.

In the worst-case scenario for Aalberts and Samuel Heath there would also be decommissioning costs. However, as for the foregone EBITDA, to be conservative, due to the high uncertainties, these losses have not been included in the socio-economic assessment of the impacts of a non-granted authorisation.

It should be emphasised that this approach adopted by the applicants is very conservative as it is anticipated that there will be initial costs to dismantle the plating line and, most probably, in the medium term, there would be costs associated with plants being closed.

7.2. Economic impacts for QPP

In case of continued use of chromium trioxide, QPP expects a growth of its business through the next three years from large contracts on the [redacted] models that started production in [redacted].

During the last three years (2019-2021), the average annual turnover of QPP has been approximately [redacted]. In case an authorisation was not granted, the loss in yearly turnover forecasted for the years 2022-2024 is expected to be [redacted]. Therefore, the non-granted authorisation would entail the immediate shutdown of the business.

7.3. Economic impacts for Borough

In case an authorisation was not granted for the use of chromium trioxide in plating, the annual loss of turnover for Borough is expected to be [redacted]. Borough's business related to Use 2 represents about [redacted] of the products sold to EU, while [redacted] of the products sold to the UK.

7.4. Impacts of closing plating lines (NUS 6) and outsourcing (NUS 3)

The following costs are relevant for Aalberts and Samuel Heath in case of closure of the plating lines and outsourcing plating activities:

- decommissioning costs due to the closure of the plating lines
- one-off costs to identify CMO partners and establish new partnership relationships (identification and selection, project work time, consultants, samples, tests, etc)
- layoff of workers directly related to the plating activities (and associated social costs)
- additional transport and logistic costs due to outsourcing (not quantified as they depend on the distances)

Additionally, economic loss would prevent continuing the R&D currently focused on Cr(VI) substitution.

	Aalberts	Samuel Heath
Decommissioning costs of the plating line	[redacted]	[redacted]
One-off costs to identify CMO partners and establish new partnership and cost to set up new plating jigs and materials handling (stillages, etc)	[redacted]	[redacted]
Additional transport, logistic and plating cost due to outsourcing	Substantial but not quantified as these costs increases depend on the distances	Substantial but not quantified as these costs increases depend on the distances Most probably transportation and logistics would uplift of [redacted] on cost base for chrome plating, leading to an equivalent price increase to cover the costs.

***Table 20**: Impacts due to closure of plating lines (NUS 6) and outsourcing (NUS 3)*

One-off costs to identify CMO partners and establish new partnership amount to [redacted] (range £200k-£400k over the period (i.e. approximately in the range £20K - £40K per year). The total decommissioning costs over the period for the four applicants amount to [redacted] (range £1M - £3M) (i.e. approximately in the range £150K - £300K per year). The social costs associated to the layoff of workers directly related to the plating activities are detailed below in section 8.

7.5. Economic impacts for Aalberts

The products that are currently chrome-plated at the Doncaster site are essential profit contributors for Aalberts' business.

In case of a non-granted authorisation, the most likely non-use scenario for Aalberts would initially be to outsource (NUS 3). However, under an outsourcing scenario, Aalberts' profitability would be significantly affected and further reduced if customers would prefer resourcing a complete product portfolio from only one supplier. These knock-on effects would end up in additional revenue losses from the missed sales of other products.

Customers purchase a bundle of products which also includes non-chrome plated items. The full product offering has commercial appeal rather than just selecting individual items and customers are incentivised to buy the whole basket of products. If the customer cannot source chrome plated items Aalberts' commercial proposition would be weakened. They too will potentially lose their competitiveness in the market as the remainder of the product bundle will not be available to them at the same level of commercial terms.

Without the profitability from the products plated with chromium trioxide, most likely the profits from other product ranges would not be sufficient to cover the overheads and fixed costs of the Doncaster site. Therefore, a complete and permanent shutdown of the business (NUS 8) might become inevitable in case of major knock-on effects on Aalberts' other products due to the non-use scenario of outsourcing.

Aalberts	2019	2020	2021
Annual turnover related to products plated with CrO3	[redacted]	[redacted]	[redacted]
Annual turnover associated to the entire site (including products not related to CrO3)	[redacted]	[redacted]	[redacted]
CrO3 annual turnover related to total turnover	[redacted]	[redacted]	[redacted]
EBITDA related to products plated with CrO3	[redacted]	[redacted]	[redacted]
EBITDA associated to the entire site	[redacted]	[redacted]	[redacted]
CrO_3 EBITDA related to entire site	[redacted]	[redacted]	[redacted]

***Table 21**: Aalberts annual turnover associated to chrome-plated products*

7.6. Economic impacts for Samuel Heath

One-off cost to identify a CMO and establish a partnership relationship, additional logistic and transport costs due to outsourcing, as well as social costs of unemployment. Plating using chromium trioxide represents [redacted] of Samuel Heath's turnover. Whilst no non-use scenario looks particularly viable for Samuel Heath, in the short to medium term, most likely, outsourcing all of the chrome plating would be the only possible and best-case option.

To continue as a supplier in its market, Samuel Heath will need to keep chrome plated parts in its product portfolio. However, in the short-term outsourcing would still present extreme difficulties for Samuel Heath and carry very large risks for the company. Samuel Heath does not believe that outsourcing would be sustainable due to heavy losses of turnover associated to the inability to use chromium trioxide but also from the loss of turnover coming from other products as customers will move to other suppliers. In fact, customers require these products and, in case they could not get them, they will undoubtedly lean towards other manufacturers if it was not on offer from Samuel Heath.

To outsource plating activities, Samuel Heath would initially look for platers in the UK, but UK companies would also require an authorisation to continue using chromium trioxide for plating. Therefore, if these UK platers do not hold an authorisation, there would be no other option than resourcing plating services from outside the UK. Currently Samuel Health is not aware of any Cr(III) platers in the UK that can meet its requirements.

If Samuel Heath would lose [redacted] of the turnover that depends on chromium trioxide ([redacted] of total turnover), there would be a halo effect on products with other finishes. In fact, if chromium trioxide could not be offered, some customers might not be interested anymore in purchasing products with other finishes, as they will have to switch to other suppliers for buying chrome-plated products. As a consequence, [redacted] additional loss can be expected for the chrome-free business that, in the long term, would entail a complete and permanent closure of the business. In this reasonable worst-case situation of important knock-on effects, the most likely non-use scenario would become NUS 8.

The following table shows the economic losses expected by Samuel Heath.

Samuel Heath	2023	2024	2025	2026
Loss of chrome business	[redacted]	[redacted]	[redacted]	[redacted]
Knock on effect on other business	[redacted]	[redacted]	[redacted]	[redacted]

***Table 22**: Economic losses for Samuel Heath*

7.7. Environmental impacts of transport in case of outsourcing

Due to additional need of transportation, that implies higher consumption of fuel, the outsourcing of plating activities will entail negative impacts on the environment that will affect the UK society, as well as those of other countries. However, due to the uncertainties related the distances of the source of outsourcing, a quantification of these environmental impacts is very difficult and the estimate would be uncertain. Therefore, these impacts are not included in the assessment. This has to be considered as a conservative approach since it underestimates the societal impacts.

8. Social impacts for the workers of the applicants (Use 2)

Out of [redacted] (750-850) workers of the four applicants, the complete closure of businesses of at least two applicants as well as the outsourcing by the other two applicants will entail the dismissal of [redacted] (300-650) employees, who are currently working in moulding, production, inspection and administration at the applicants' sites. The range of workers who would lose their jobs is based on current employment situation and does not include the expected future new jobs that would have been created by the applicants under the continued use scenario.

Following the ECHA methodology[4], the social costs of unemployment are monetised taking into consideration the value of lost output/wages during the period of unemployment, the cost of acquiring a new job, recruitment costs, the scarring costs and the positive value of leisure time during the period of unemployment.

The guidance provided by ECHA notes that tax rate of the country, average salary and default value for job lost should be taken into account when calculating the social impacts. Because of the 'scarring' effect, the default value for one job lost needs to be included in the calculations. The total costs of social impacts are calculated with the formula provided by ECHA:

Social impact = jobs lost **x** average annual salary **x** (1 – employer tax rate) **x** default value for one job loss

[4] ECHA, 2016 (b), and Dubourg, 2016.

	Number of current workers	Number of workers who would be dismissed
QPP	[redacted]	[redacted]
Borough	[redacted]	[redacted]
Aalberts	[redacted]	[redacted] people who are involved to the products requiring chromium trioxide at this site plus [redacted] people working in logistics, quality control, packing, palletizing, unpacking and inspection.
Samuel Heath	[redacted]	[redacted] Initially workers directly involved in the plating activities due to the partial closure (NUS 6) for outsourcing (NUS 3) will be dismissed
TOTAL	[redacted] **(750-800)**	[redacted] **(300-650)**

***Table 23**: Current number of workers and number of workers who would lose their jobs*

The monetised social impacts related to the loss of employment of its workers would amount to [redacted] (public range £25 million - £62 million) in total over the review period, i.e. approximately [redacted] per year (public range £2.5 million - £6.2 million). The social impacts would be felt locally in the nearby areas of the facilities.

8.1. Social impacts for the workers of QPP

QPP is a small employer in Birmingham but has many employees who have worked in the company for more than 10 years, some their whole working life. Currently [redacted] people work at the QPP's site in Birmingham. This number reflects the current situation, however, based on expected future growth QPP will require more workers in the coming years.

In case an authorisation is not granted to the applicants for Use 2, instead of hiring new workers, [redacted] workers of QPP will be made redundant. Consequently, these jobs will be lost and no other workers will be hired. In addition, other jobs will be at risk for QPP's suppliers and customers. Reducing the staff is not a desired outcome and to mitigate this QPP would aim to secure new work with existing or new customers. A potential impact is that many workers may have to be retrained due to the specialist nature of the business or be moved to less skilled positions with lower wages.

8.2. Social impacts for the workers of Borough

Since the core business of the company relies on chrome plating, if an authorisation is not granted, due to the closure of the business, all [redacted] (public range 80-100) employees who are currently working in moulding, production, inspection and administration, will lose their jobs.

8.3. Social impacts for the workers of Aalberts

At the Doncaster site, currently [redacted] people are employed, out of which [redacted] work directly in the inhouse chrome plating activities. As described in the section of the non-use scenario for Aalberts, if an authorisation for the use of chromium trioxide for plating is not granted, activities for chrome-plating would need to be completely outsourced. In this case, at the Doncaster site, there would be immediate

redundancies of [redacted] directly involved workers plus [redacted] additional people working in supporting roles such as logistics, quality control, packing, palletizing, unpacking and inspection.

A loss of sales and a loss of profitability of the site are predicted as a result of having to outsource the chrome plating activities. This is because of the significant contribution of these products to the whole profitability of the site. In fact, without these products, the remaining sales and profit cannot sustain the cost of running the factory. As there would be no production of other products, realistically, at the Doncaster factory, further [redacted] jobs would be lost ([redacted] jobs in total) in support, sales and management functions across the whole business.

At the Doncaster site, only people working in the office in functions such as finance, marketing, R&D, etc. would remain. People involved in distribution, who are based at a different site, will also keep working.

8.4. Social impacts for the workers of Samuel Heath

Out of the [redacted] people who work at the Birmingham site, Samuel Heath would initially dismiss 8 workers directly involved in the plating operations. Then, if turnover falls, over the following years Samuel Heath expects to have to dismiss an additional [redacted] workers in machining, polishing, assembly, supervision, production management, design, sales and administration. In the medium to long term, in case of knock-on effects on the sales of other products due to unviability of the business the rest of the initial [redacted] workers would likely be dismissed.

8.4.1. Social impacts after knock-on effects on Aalberts and Samuel Heath

The following table illustrates the total social impacts of unemployment for the four companies under the intermediate medium-term situation for Aalberts and Samuel Heath when the knock-on effects start to become significant and the two companies have to dismiss a large part of their workers.

	Number of current workers	Number of workers who would be dismissed
Aalberts	[redacted]	[redacted]
Samuel Heath	[redacted]	[redacted] if turnover falls, over the following 3 years an additional [redacted] workers would be dismissed ([redacted]) (operators, production management, supervision sales, design, engineering, administration and support)
TOTAL	[redacted] **(530-610)**	[redacted] **(340-420)**

***Table 24**: Intermediate case for Aalberts and Samuel Heath with knock-on effects*

The table below shows the social impacts in terms of unemployment for all four companies under the worst-case situation in which the knock-on effects on Aalberts and Samuel Heath oblige these two companies to shut down their sites and dismiss all their workers. In the worst-case scenario 777 (750-800) persons would lose employment.

	Number of current workers	Number of workers who would be dismissed
QPP	[redacted]	[redacted]
Borough	[redacted]	[redacted]
Aalberts	[redacted]	[redacted]
Samuel Heath	[redacted]	[redacted]
TOTAL	[redacted] (750-800)	[redacted] (650-750)

***Table 25**: Worst case with QPP, Borough, Aalberts and Samuel Heath in NUS 8*

To be extremely conservative, these social impacts have been monetised by the applicants but the values were not included in the socio-economic assessment of the non-use scenario.

9. Impacts on distributors

The applicants have assessed the reactions and the associated socio-economic impacts on their distributors, in the event of the authorisation not being granted, based on the available information related to what products they supply to their distributors.

Typically, in the UK and in other countries, the applicants' chromed and non-chromed products are distributed to the end users and via either UK distributors who sell to local merchants or directly to the OEM customers. In the case of the applicant having companies in other countries (Aalberts), products can also be sent to distributors by these companies or directly from the UK warehouse.

In the non-use scenario, due to shutdown of production sites, the distribution of the applicants' products will be stopped and UK distributors will have to find an alternative supplier. The applicants' UK distributors will no longer be able to fulfil their orders, potentially damaging the relationship with their customers. To avoid a loss of business, UK distributors will look elsewhere to find a supplier that can supply similar products to be distributed. However, it can be expected that, in the short run, given the time needed as well as the difficulties to rapidly find alternative supplies of chrome-plated goods with similar prices, availability or quality, UK distributors might suffer temporarily supply shortages with the associated loss of business and revenues.

	Company	Number or percentage of distributors	Country
QPP	Not relevant as distribution is done directly by QPP to customers		
Borough	[redacted]	Main distributors	[redacted]
Aalberts		[redacted] of Aalberts distributors [redacted] of distributors [redacted] of distributors	[redacted]
Samuel Heath		[redacted] of distributors [redacted] of distributors	[redacted]

***Table 26**: Main distributors of the applicants*

In the case of the two applicants who would outsource, even if the applicants will try to keep using the same distribution channels for their products, as outsourcing will lead to price increases and longer lead times, distributors and retailers may be forced to move to other suppliers. Due to the high level of uncertainty, impacts on distributors have not been monetised nor included in the assessment of the socio-economic impacts of the NUS.

10. Impacts on customers

The applicants supply plating on plastics and metal components in the UK to a range of customers in the automotive, sanitaryware, medical, domestic appliance, brewery, drinks, white goods, display, and electronics sectors. In general, if an authorisation is not granted, UK customers that integrate the applicants' components into their products, would be more or less affected with supply gaps before identifying replacement products by other suppliers outside of the UK, thus entailing profit and job losses. Due to the high level of uncertainty, such impacts on customers are not monetised.

The following sections describe the impacts of the non-use scenario on the applicants' customers in various sectors. Finally, the last paragraph summarises in a table the impacts of the non-use scenario for each sector.

10.1. Automotive sector

Before COVID, there was a shortage of capacity for plating on plastic (POP) in the marketplace leading to growth and a healthy prospect for companies to invest. When the market post COVID returns to normality with supply of components not being as restricted as it is today (semi-conductors, raw materials such as certain types of plastics), there will again be a shortage of suppliers leading to price increases, product shortages and loss of output from the OEMs' in the UK.

Automotive plastic parts must deliver technical functionalities e.g. easy cleaning, durability, light weight, etc. Using weight-saving automotive components manufactured from plastic instead of metal entails several environmental and sustainability benefits such as a reduction of fuel consumption and the vehicles' carbon footprint. With the move to electric vehicles the weight reduction from metal to plastic will be a driver for further increase in demand for all vehicles, including premium vehicles.

Moreover, the plastic components must ensure high appearance qualities to interior and exterior elements of serial production and spare parts. Different finishes (i.e. shiny, semi-shiny, hard-wearing bright, matt or matt silvery black or gold) are requested by automotive manufacturers, and expected by the final customers, the vehicle buyers. For instance, bright chrome can highlight exterior design elements of automotive models while satin chrome is used to brighten the automotive interiors.
Plating with Cr(VI) provides plastic components for the automotive sector ensures both the required functional characteristics and the requested aesthetics that allow automotive manufacturers to differentiate their models on the market.

The UK Automotive Trade Report[5] (2021) for the Society of Motor Manufacturers and Traders (SMMT) forecasted that the UK automotive volumes will increase by 37% to 2025. In case an authorisation was granted, this expected growth will likely increase the applicants' sales of automotive parts.

[5] SMMT, 2021.

If an authorisation is not granted for plating, the two applicants (QPP and Borough) that work for the automotive sector will be unable to satisfy the customers' high functional and aesthetic requirements with the consequent closure of their businesses (NUS 8). If the desired standards cannot be achieved, UK automotive Tier I companies and OEMs, that rely on parts supplied by the applicants, will face short to medium-term supply bottlenecks.

With no other POP in the UK for the automotive sector, the applicants plating services will be moved away by affected OEMs and by their sub tier suppliers to qualified POPs (outside of UK) that can still ensure the current production requirements and specification by continuing using chromium trioxide. These suppliers could be either European companies that have already been granted a REACH authorisation for a sufficient period or other competitors most likely in Far East countries that may not be as much regulated. This defeats the object of Brexit, i.e. making the UK more self-sufficient and encouraging growth in the UK manufacturing sector, as well as the UK Government's levelling up agenda.

In case of closure of the businesses of the two applicants, given the very complex and highly integrated automotive sector, many UK actors along the whole automotive supply chain (Tier I suppliers, sub-contractors, OEMs, etc) will have to coordinate to ensure that they use the same plating systems to achieve the same or similar colour to ensure harmonisation across the whole product range.

Plastic components plated with an alternative substance or with chromium trioxide by a new supplier or for implementation into specific vehicle programs will require validation by OEMs. These re-approvals and a close collaboration between the suppliers of plastic components and their customers, including activities such as audits, trials of different parts and evaluation of the results.

Some of these UK actors might face serious impacts with potential plant closures and possible major losses of jobs as plating work is moved out of the UK. As the level of impacts along the UK supply chain is very uncertain, such impacts have not been quantified.

10.1.1. Automotive sector for QPP

For more than five decades, QPP has chrome-plated plastic components for many of the world's leading automotive marques. The main automotive customers of QPP are [redacted]. For instance, QPP's parts are on every vehicle of [redacted]. The total sales of QPP to the UK automotive segment is [redacted]. Automotive sales in [redacted] is expected grow with the launch of new vehicles that will push volumes up by [redacted].

As multiple QPP's parts are on almost every vehicle of [redacted], in the short term, these companies will face major difficulties to avoid production line stoppages and keep production going. Production interruptions would lead to millions of pounds of lost revenue and possible closure of plants throughout the UK for a short period of time (estimated minimally 1-3 months). This is due to extended times for moving to other suppliers of chromium plated parts around the world, requiring testing and approval of parts, some of which are safety critical such as, for instance, alarm reflectors, TRV control valves, door handles for cars. Without the turnover from the automotive sector, QPP will be unable to reduce its fixed cost base to a low enough level to remain in business for any extended length of time. Moreover, not being able to meet supply contracts, would mean potential lawsuits against QPP from OEMs, with associated costs and likely drive closure of the business. QPP will be liable for production downtime at the OEM's. Costs vary from [redacted] which would close the company financially in a short space of time.

10.1.2. Automotive sector for Borough

Borough is a Tier II supplier of chrome-plated plastic components for Tier I and OEM customers for many of the world's leading automotive brands. To ensure components designed for plating achieve the highest quality possible, Borough has developed its own injection-moulding capability with a range of different equipment in its facility. Selective plating is now possible thanks to investments in two-shot moulding machines, which ensure only the component that need chroming receive the plating, thus reducing the volumes of chromium needed. The un-plated plastic remains free to flex as required.

Borough supplies [redacted] with moulded and chrome plated plastic parts for the manufacture of [redacted] in [redacted]. [redacted] is the biggest customer of Borough and its loss would lead to financial distress that would have a fatal impact on Borough's business. Failure to supply [redacted] would cause [redacted] production line stoppage and potentially to halt half of [redacted] vehicle production (with economic losses and jobs lost). [redacted] will have to find and qualify alternative supply of chrome plated parts from competitors outside of the UK, most likely from a European supplier holding a REACH authorisation or from countries that are less regulated. As a consequence, there would be losses of jobs in the UK, as jobs will be transferred to the EU [redacted].

Securing supplies from outside of the UK would add to [redacted] logistics, transport and permits costs and would increase the carbon footprint of the final products. It has to be noted that the contract with [redacted] foresees that Borough would have to maintain a supply to [redacted], even if unable to do so. Therefore, to fulfil the contract, Borough will have to arrange for another supplier and will have to bear the cost associated to the change.

Borough expects that OEMs will qualify alternative (e.g. Cr(III)-derived) coatings over the longer term as technology continues to develop and deliver better performance. Regulatory pressure on Cr(VI)-based coatings provide an ongoing driver for the development of alternatives that are acceptable in the marketplace. Considering the numerous customers involved in the approval process and the different (interior and exterior) coated components, it is expected that the last OEM approvals will be obtained towards the end of the review period. In fact, quality approvals by customers take months (up to a year) during which Borough will be highly impacted in economic terms.

The total sale of Borough to the UK automotive segment is [redacted] and the UK automotive volumes are expected to increase by [redacted] to 2025.

10.2. Sanitaryware (QPP)

The hard chrome of sanitary products provides functional benefits in terms of health and safety and aesthetic character related to the different colours of the finishes. QPP has around [redacted] of the UK sanitaryware market of plated parts (bathroom, shower components, sanitary ware, water conservation). The sanitary segment represents [redacted] of total QPP sales to the UK.

The main QPP customers in the sanitary sector are two shower manufacturers, [redacted]. QPP is a key supplier of these two main customers offering them specialised work that cannot be easily replaced by other suppliers. If they would lose QPP as supplier, with very few companies being able to offer the same services, in the short to medium term, [redacted] will face major shortages and will soon run out of parts. As a consequence, they will be unable to supply their own main customer base, house builders and do it yourself (DIY) outlets. All work for both industries would leave the UK and, as a result, the end users will buy alternative products from outside of the UK putting additional manufacturing jobs as risk in the UK as well as their associated supply base.

Aside the two major customers, in the sanitary market, QPP provides shower and sanitaryware products as well as moulding. plating, painting and assembly work to a number of other UK customers. In case of a non-granted authorisation, many of these smaller UK customers of are likely to close due to their inability to resource from outside of the UK and their size and volume of work that might be insufficient to be of interest for other platers on plastics.

10.3. Sanitaryware (Borough)

Currently, Borough's customers in the sanitaryware sector supply the whole UK with products that comply with hygienic standards by the use of Cr(VI) plating in environments that are wet atmosphere and vigorous cleaning with cleaning agents. Borough is able to respond to customers' functional requirements and design, promptly.

Without Borough's current capability, to meet their criteria, customers would need to resource parts in Europe or further afield (China). This would add problems to Borough's customers in terms of lead time, stock building and time needed to respond to market changes. In fact, most likely, other suppliers will not be able to deal with rapid changes on the market and respond to these in time as Borough currently does. Therefore, in conclusion, in case an authorisation was not granted, Borough's customers would be put in a position that would threaten their supply chain.

10.4. Sanitaryware (Samuel Heath)

There would be an immediate impact on customers for taps, bathroom accessories, showers and doors and windows. Customers for large contract orders would be left without a supplier in the short term and would need to find alternative suppliers, leaving a hole in their supply chain and potentially higher costs. This would cause irreparable damage to reputation and significant delays to their project

Many existing customers for smaller orders would be able to find alternative suppliers, but would be affected by longer lead times and also may not be able to get the one-stop-shop service they can get covering bathroom and hardware products. There are limited options for UK suppliers at this end of the market and it is decidedly possible customers would need to source these products from competitors in Europe or RoW. US based customers would use other option in the US, Europe and the RoW.

If many other suppliers in the UK are affected by the same issue, there could be a shortage of quality plating capacity available for outsourcing. Having to send this abroad would further complicate and slow down the supply chain as well as driving up the cost.

10.5. Plumbing, heating valves and fittings market (Aalberts)

If Aalberts' production site in Doncaster closes, UK customers of heating valves and fittings would likely have to resource sub-standard performance products from non-UK suppliers (from the EU or the rest of the world). As EU-based companies are only temporarily covered by the CTAC sub Use 3 authorisation only for two additional years (until 2024), there would be no benefit of moving to an EU based company without any certainty on their future authorisation. If an authorisation was not granted, there would be significant disruption in product supply which would impact the wider construction, plumbing and heating market.

The arguments on logistics and Net Working Capital (NWC) justify not moving the chrome plating operation. This would increase the supply chain burden on these customers adding significant costs and environmental impacts.

10.6. White goods (QPP)

QPP supplies several Tier I companies that then supply the major cooker and domestic appliance manufacturers in the UK. The chrome plated components are included in various types of cooker knobs, buttons and rings as well as parts that fit onto washing machines, coffee machines and other household products.

Many domestic appliances' customers are small niche suppliers of cooker handles, bar fittings, sink assemblies and other products. It is likely that many of these small companies will be unable to source products from outside of the UK as they would either not have the expertise to know how to import and export their products or would not have a sufficient demand to interest the large POP manufacturers from outside of the UK. In some cases, the cost of transport would make the product uneconomical and would lead to many of them closing.

10.7. Domestic appliances (Borough)

Customers in the market of domestic appliances rely on Borough's processing of parts for cooker controls, radiators, where aesthetic designs. These parts are created in plastic mouldings and consequently plated for hygienic reasons. The non-use scenario would mean OEMs buying from Far East, cutting out Borough's immediate customers and potentially putting their businesses at risk.

10.8. Brewery (QPP)

QPP supplies parts that are fitted to beer fonts and taps to many major beer manufacturers. Non-use of chrome will have a less of an immediate impact upon customers as they will simply make do for longer with the taps and pumps already in place. However at some point replacements will be required and sourcing from a non UK/European supplier will be problematic due to the reduced supplier options, not to mention components will be significantly more expensive in a sector where many pubs are already closing weekly due to demand/competition from supermarkets etc. Many of the pumps and taps contain systems to produce condensation and the "cold effect" without chrome this will not work on a moulded or painted part so there will be significant cost for replacement pump units as well as chrome.

10.9. Display (QPP)

Chromed parts are supplied to display/signage companies that provide services for many UK and international brands. These include badges for car show rooms both internally and externally, cosmetics displays for retail outlets, major international awards trophies such as for MTV awards, and other branded point of sale displays and dispensers. Electroplated chrome gives durability, scratch resistance and the "cold touch" effect of metal at a cost (which could not be achieved by a metal part either due excessive cost or weight constraints). For outside applications, in particular chrome plated parts provide a resistance to the elements, acid rain, temperature fluctuation and discolouration that cannot be matched by plastics/paint/vacuum metallised components. Customers would be facing the challenge of unplanned replacement costs, restricted supply lines and increased component costs supplied at longer timescales – all of which would have an impact on their competitiveness and long term future of their business.

10.10. Electronics industries (QPP)

QPP supplies to house security companies high volumes of components that are used within Passive InfraRed sensor (PIR) alarm sensors. Moreover, QPP supplies to commercial and retail markets chrome-plated EFI and RFI shielding for computer and electronic devices as well as parts for installation into handheld measuring devices and l door switches. In all these components, the plating with chromium trioxide is used to provide functional characteristics which would become unavailable in the short term. Assuming a supplier could be found outside of Europe/UK, this would occur at increased cost, longer supply times and uncertain quality of products that still require chrome plated parts to function if there is no ready alternative.

10.11. Medical sector (Borough)

In April 2020, during due to COVID 19 pandemic, Borough was contacted by [redacted] company to urgently produce components for lifesaving ventilators vital for patients affected by COVID. Therefore, during the first lockdown, to participate to the common effort to save lives, Borough partially reopened its plant and started this production. Functionally, the electroplating with chromium trioxide of mouldings components assembled inside ventilators is crucial to ensure hygiene and high resistance to guarantee the air flow required to help patients breathing.

The production has continued since then and the ventilators are now also used to treat Chronic obstructive pulmonary disease (COPD). The medical customer manufacturing these lifesaving ventilators would likely be the most affected downstream user of Borough as these ventilators are designed and certified with Borough's chrome plated parts and supplied with warranties for 10 years that required extensive testing.

If Borough stopped to supply these components, this ventilator manufacturer would have to find another supplier and to change regulatory required certifications that were granted with Borough's chrome-plated components. Therefore, to stop Borough's production would jeopardise and compromise the approvals and supply of these lifesaving medical products. At least temporary, this would raise serious health concerns for patients in the UK and worldwide. The medical device customer has communicated and underlined 'the criticality of this component for the assembly of life saving ventilators.

10.12. Drinks sector (Borough)

Borough chrome-plates parts for dispensing equipment for producers of non-alcoholic (soft) and alcoholic drinks such as beers, ciders and whiskies for premium drink brands. Dispensers internally plated with chromium trioxide ensure highest hygiene. Drinks dispenser systems need to be easily cleaned and in case of substitution with Cr(III), cleaning products, even sweat, can deteriorate the surface, and reduce hygiene over time. Moreover, internal plating with chromium trioxide guarantees over time the olfactory experience of the drink.

In addition, plating the external side with chromium trioxide enhances the visual impacts of dispensing systems and impulse sales by attracting buyers. All this is achieved by using Cr(VI) for the etching step and the final coating.

Dispensing equipment for alcoholic and non-alcoholic drinks with parts plated by Borough represents a significant industry within the UK (and world's) leisure and hospitality sector. Therefore, the closure of Borough's business will entail impacts on UK customers purchasing dispenser equipment of soft and alcoholic drinks chrome-plated by Borough, mainly in terms of additional costs, loss of sales and corporate

image of the brand. In fact, for Borough's customers, the non-use scenario would entail the need of redesigning parts in metal. This would not be acceptable in economic terms as well as because it would represent a retrograde step, still subject to the need to use Cr(VI) final coating.

For non-negotiable designs, options would be to transfer to suppliers outside Europe, perhaps to the far east, leading to extended supply chains and long response times, with added demands for stockholding warehouses to meet call off /production schedules.

10.13. Summary of the impacts on the various sectors

The following tables summarise the most likely non-use scenarios and the potential socio-economic impacts for different sectors for Use 2.

	Most likely non-use scenario main impacts on customers	Socio-economic impacts
Automotive	OEM customers and their sub-suppliers will start to resource chrome plated products from outside the UK, either Europe (from an authorised supplier) or the Far East.	Plant closure, non-availability of replacement products Warranty claims for non-supply of Cr(VI) created colour replacements.
Sanitary ware	Part will be sourced from outside UK/EU. Some adaptation of the market over time	Warranty issues with colour difference and poorer corrosion alternative.
Domestic appliances	Part will be sourced from outside UK/EU. Some adaptation of the market over time	Warranty issues with colour difference and poorer corrosion alternative.
Display	Parts will have to be sourced from outside the UK as there will be no UK suppliers	This may lead to some major signage contracts being placed to EU suppliers rather than UK based due to extended and more expensive supply chains
Brewery	Parts will have to be sourced outside of the UK as there will be no UK suppliers	Most companies in this sector are small niche business with little or no experience of sourcing product outside of the UK. The volume of work and type of parts supplied are not likely to be of interest to many European suppliers. This is likely to cause major issues for many of our customer base leading to possible closure and loss of jobs.
Electronic equipment	Parts will be sourced from outside UK/EU Some adaptation will be needed	Warranty issues with colour difference and poorer corrosion alternative

***Table 27**: Most likely non-use scenario for customers - Use 2*

11. Impacts on final consumers

Final consumers of the different products could be impacted in terms of higher prices, inferior quality, reduced availability deriving from closure of the applicants UK business or from outsourcing the chrome plating activities.

The increase of costs due to supplying from outside of the UK will trickle down along the supply chain to the final consumers in terms of higher prices. However, this consumer's surplus loss (i.e. the benefits for

the consumers in terms of prices but also availability and quality) has not been included in the SEA assessment as there is a potential risk of double counting the negative impacts of the non-use scenario. This risk might come from the fact that, for instance, the increase of the final prices has already been included in the losses for the producers either in terms of foregone EBITDA (for NUS 8) or in the additional costs of NUS 3 that are finally passed to the end users. In case of the selected non-use scenarios, competitors outside the EU would be able to increase production to cover the UK market.

In addition, the final consumers may be affected in several other ways, e.g. in terms of lower or more difficult availability, by lower durability, lower quality or non-uniform finishes of the final products. These losses of consumer's surplus in terms of limited availability and lower quality have not been included in the SEA assessment of the non-use scenarios.

12. Impacts on competitors

The applicants have competitors in the UK, as well as in the EU and in the rest of the world. If an authorisation is not granted, due to closure of the businesses of Borough and QPP the customers of these two companies will have to turn to competitors either in the EU (in case they hold a REACH authorisation) or in other countries with often lower regulatory requirements. If competitors outside UK gain market share, there will be net societal losses for the UK as UK companies would lose profit/EBITDA in favour of non-UK companies and UK workers would lose their jobs in favour of other workers who would be employed elsewhere.

In the cases of Aalberts and Samuel Heath, at least initially, competitors will not be able to take the market as the two applicants will continue their businesses by outsourcing, even if with higher costs. In case the knock-on effects will oblige Aalberts and Samuel Heath to close, then competitors would be able increase their market shares and the UK would suffer net societal costs.

	Competitors	Country
QPP	[redacted]	UK
	[redacted]	EU
	[redacted]	Far East
Borough	[redacted]	UK
	[redacted]	EU
	[redacted]	EU
	[redacted]	EU
	[redacted]	EU
	[redacted]	EU
	[redacted]	EU
	[redacted]	Far East
Aalberts	[redacted]	UK
	[redacted]	UK
	[redacted]	UK
	[redacted]	UK
	[redacted]	UK
	[redacted]	EU
	[redacted]	EU
	[redacted]	EU

	Competitors	Country
Samuel Heath	[redacted]	UK
	[redacted]	UK
	[redacted]	UK
	[redacted]	EU
	[redacted]	EU

***Table 28**: Main competitors of the applicants*

13. Wider economic impacts

Major macro-economic impacts on the UK are not expected, hence such impacts have not been assessed.

14. Societal impacts

For Use 2, the UK societal costs of non-use resulting from $CrO_3$4UK applicants' assessment are summarised in the table below.

Description of major impacts	Monetised/quantitatively assessed/qualitatively assessed impacts
Monetised impacts	**£ over 10 years**
Economic impacts due to investment and/or additional production costs related to the adoption of an alternative	Not quantified
Producer surplus loss due to ceasing the use applied for	£5M - £12M
Decommission costs	£1M - £3M
Loss of residual value of capital	Not quantified
Additional costs for transportation	Substantial in case of outsourcing but not quantified
Social cost of unemployment	£25M - £62M
Spill-over impact on surplus of alternative producers	Not quantified
One off cost for establishing a partnership with a CMO in case of outsourcing	£0.1M - £0.4M
Sum of monetised impacts	£31.1M - £77.4M over the review period
Additional quantitatively assessed impacts	**Over 10 years**
Avoided CO2 emissions	Not quantified
Other quantitatively assessed impacts	Not quantified
Additional qualitatively assessed impacts	**Over 10 years**
Consumer surplus loss (e.g. because of inferior quality, higher price, reduced quantity)	Not quantified

Description of major impacts	Monetised/quantitatively assessed/qualitatively assessed impacts
Other qualitatively assessed impacts	High impacts for Aalberts and Samuel Heath in case of closure (worst case) Potential socio-economic impacts on the UK suppliers of chromium trioxide, raw materials, energy, logistic and other services Potential socio-economic impacts downstream on UK OEMs customers and final consumers Environmental impacts

***Table 29**: Societal costs of non-use of chromium trioxide in Use 2*

Societal costs of non-use £ over 10 years		Risks of continued use £ over 10 years	
Monetised impacts	For the applicants: EBITDA loss: £5M -£12M annualised over the period Decommissioning costs: £1 - £3M over the period Social cost of unemployment £25M - £62M over the period One-off cost for establishing a partnership with a CMO in case of outsourcing: £0.1M - £0.4M over the period	**Monetised excess risks to directly exposed workers**	£113,514 - £160,779
Additional quantitatively assessed impacts	Number of workers at the applicants' sites	**Monetised excess risks (inhalation + oral) to the general population (including indirectly exposed workers)**	£25,099 - £35,382
Additional qualitatively assessed impacts	Foregone profits along the upstream and downstream supply chain of the applicants	**Additional qualitatively assessed risks (per year)**	Not available
Summary of societal costs of non-use	EBITDA loss, decommission costs, social costs and one-off costs for outsourcing: £31.1M - £77.4M	**Summary of risks of continued use**	£138,613 - £196,162 lower and higher bounds over the 10-year review period

***Table 30**: Combined societal costs of non-use and risks of continued use for Use 2*

15. Benefit-Cost ratio

15.1. Combined assessment of impacts for Use 2

The aggregated societal benefits of the continued use of chromium trioxide for plating including profit loss, decommissioning costs and social costs are expected to be in the range £31.1.M - £77.4M over the period, while aggregated monetised health impacts of the use applied for are £138,613 - £196,162 (lower and

upper bounds over the review period requested by the applicants). Therefore, for Use 2, over the 10 years, the benefits outweigh the risks at least 100 times (this is a very conservative estimation taking into account the lower values for the negative impacts and the higher bound for the human health impacts).

16. Uncertainty analysis for Use 2

The ECHA guidance on SEA[6] proposes an approach to conduct an uncertainty analysis. This approach provides three levels of assessment of uncertainties: qualitative, deterministic and probabilistic. The ECHA Guidance further indicates that the level of detail and dedicated resources to the assessment of uncertainties should be proportionate to the scope of the SEA.

As the socio-economic impacts for Use 2 outweigh the (worst-case) health impacts of the continued use by a factor of at least 100 times, performing a systematic (but qualitative) analysis of uncertainties is sufficient. This analysis of the key parameters that might potentially challenge the quantitative results of the SEA and of the human health assessment helps to determine the key uncertainties, their level of magnitude (low, medium, high) as well as their direction (under- or over-estimation). In those cases, in which the variability and quality of the available input data, given the associated uncertainties, required to make some assumptions, the applicants have applied a conservative approach by overestimating human health impacts of the continued use scenario and by underestimating the socio-economic impacts of the non-use scenario.

	Details	Level of uncertainty (L/M/H)	Direction of the uncertainties (Underestimation and overestimation)
Human health impacts	Exposure levels	Medium	Potential overestimation since holidays, bank holidays and illnesses are not taken into account
	Number of people exposed at local level	Medium	Potential overestimation for the local population as PEClocal (distance only 100 m from the point source) for total local exposure calculation
Socio-economic impacts	Quantities used	Low	
	Market/EBITDA growth	Medium	Underestimation as higher production volume and associated profits might occur if unforeseen contracts will be placed in the future
	Costs of raw materials	High	Conservative estimation of costs is based on previous experience however the war in Ukraine is affecting business as Russia is a key supplier of energy (Oil), palladium and nickel metal
Substitution plan timelines	Phase 1 - dentification of potential alternatives	No uncertainty	N/A (already complete)
	Phase 2- Process development Phase 3 - Acceptance/ approvals Phase 4 - Scale-up to production	Low	Timelines have been based on the best-estimated scenario

[6] ECHA, 2011.

	Details	Level of uncertainty (L/M/H)	Direction of the uncertainties (Underestimation and overestimation)
	Phase 5 - Transition to alternative	Medium	Review period potentially underestimated if automotive OEMs will not accept move to alternative during existing contracts rather than just for new contracts) Review period potentially underestimated if automotive OEMs will accept move to alternative before what can be expected

***Table 31**: Uncertainties regarding human health impacts and socio-economic impacts*

17. Information for the length of the review period for Use 2

The length of the requested review period was determined taking into consideration the conclusions reported in the CSR, AoA and Substitution Plan, based on ECHA's guidance for setting review periods[7].

For Use 2, a review period of 10 years, until 30 June 2032 is foreseen to be necessary for the four applicants in order to fully substitute chromium trioxide for plating (Use 2). The Cr(VI) technology will be gradually phased out in conjunction with the implementation of the Cr(III) process but this will require passing through several phases as indicated in the Substitution Plan.

As described in the CSR, AoA, SEA and the Substitution Plan, the following points are to be taken into consideration:

- The four applicants are important UK companies, selling their products in the UK and exporting outside the UK. It is the UK Government's ambition to promote and achieve a competitive advantage on the global stage in UK-made, high-end products and to secure the country's position as one of the highest-productivity major automotive producers in Europe[8].

- The products plated by the applicants are of high quality and require the continued use of chromium trioxide. As the applicants operate in a competitive market, any downgrade of the product quality will hamper the current market shares, instigate losses with subsequent likely closure of the applicants' businesses. Non-UK competitors who are still able to use chromium trioxide will be able to enter and gain markets.

- The applicants have constantly and actively been working and investing to find suitable alternatives for plating to give customers the highest quality products (see Analysis of Alternatives).

- The applicants will have to perform many complex, resource- and time-consuming tasks in order to successfully substitute their plating processes to transition to a Cr(VI)-free process for the electroplating of plastic substrates (see Substitution Plan).

- Any potential alternative is required to pass testing and requalification/certification processes in order to comply with high customer specifications, namely in the automotive and sanitary sectors.

[7] ECHA, 2013 (b).

[8] HM Government, 2022, at pages 58 and 54 respectively.

The implementation of the alternative is possible only when it is technically and economically feasible for the applicants as well as for their customers.

- The non-use scenarios of the applicants (NUS 8 closure of the businesses for Borough and QPP and NUS 3 outsourcing for Aalberts and Samuel Heath) will entail considerable negative socio-economic impacts along the supply chains of several UK sectors.

- Health risks for workers from the use of chromium trioxide are kept at a minimum as the production processes at the applicants' sites are highly automated, a range of engineering controls are employed and directly exposed workers wear appropriate PPE (see Chemical Safety Report).

- Modern wastewater treatment, exhaust ventilation and filter systems are able to strongly reduce the amount of Cr(VI) reaching the environment that might represent a potential exposure risk for the general population.

- Finished products do not contain any Cr(VI) and are not harmful to end users nor to the environment.

In conclusion, for Use 2, the socio-economic benefits of the continued use of chromium trioxide for the applicants outweigh human health risks by a factor of over 100. For the above-mentioned reasons, for Use 2 a review period until 30 June 2032 is requested for the transition to a Cr(VI)-free alternative for electroplating metal and plastic substrates for automotive, sanitary, plumbing/heating and many other applications.

18. SEA Conclusions for Use 2

Chromium trioxide is listed in Annex XIV of REACH and its sunset date has now passed. However, the transitional provisions under Article 127GA of UK REACH have extended the sunset date to 30 June 2022 for the applicants, as a GB-based downstream users covered by an AfA further up their supply chain made under EU REACH.

This Application for Authorisation concerns the use of chromium trioxide by the $CrO_3$4UK applicants at their UK production sites for the electroplating (Use 2) of components for sanitary, automotive, heating, plumbing and other applications.

The applicants use chromium trioxide to apply a durable and protective coating with unmatched aesthetics as a final layer on top of metal and plastic substrates. This is an essential process to ensure that finished products perform optimally under reasonably foreseeable conditions of use and achieve a specific aesthetic appearance to satisfy customer demands and expectations.

If authorisation is not granted, QPP and Borough would most likely have to close their businesses (NUS 8). This would entail high socio-economic impacts:

- decommissioning costs, less the sale value, are estimated to be in the range £1M - £3M over the requested 10 years review period. This range includes the decommissioning costs for the plants of QPP and Borough as well as decommissioning costs for plating lines of Aalberts and Samuel Heath.
- foregone profits (estimated to be £5M - £12M over the review period).
- loss of all jobs (social costs monetised in the range of £25M - £62M).

Moreover, the closure of QPP and Borough would entail significant impacts on other UK actors along the applicants' supply chains. Other UK actors along the supply chain, mainly suppliers of raw materials (such

as chromium trioxide, plastics, etc.) and services as well as certain customers would face socio-economic impacts:

- economic losses (not monetised).
- jobs at risk (not quantified).

If authorisation is not granted, at least initially, Aalberts and Samuel Heath would most likely close the plating lines (NUS 6) and outsource plating activities (NUS 3). The following costs are expected for Aalberts and Samuel Heath in the NUS 3 (outsourcing):

- decommissioning costs due to the closure of the plating lines (included in the total range of decommissioning costs.
- layoff of workers directly related to the plating activities (included in the total social costs).
- one-off costs to identify CMO partners and establish new partnership relationships project work time, consultants, samples, tests, etc monetised in the range of £0.1M - £0.4M over the period.
- additional transport and logistic costs due to outsourcing (not quantified given the uncertainties concerning the distances from the CMO).

If outsourcing has negative knock-on effects on other product ranges, Aalberts will have to close the plant while Samuel Heath would have to shut down the plant and end its business. In this case (NUS 8), the impacts would be those described above for QPP and Borough and their supply chains.

On the other hand, the risks of continued use of chromium trioxide are the following:

- health impacts on directly exposed workers at the applicants' sites (monetised to £113,514 - £160,789 over the period).
- health impacts by inhalation and oral route on the local population including indirectly exposed workers (monetised at £25,099 - £35,382 over the period).

The analysis of alternatives, the substitution plan and the socio-economic analysis demonstrate that:

- There are **no suitable alternatives available** with the same function and similar level of performance that are technically and/or economically feasible for the applicants before the end of the requested review period.

- Considerable **R&D efforts** have been, and continue to be, undertaken to investigate suitable alternatives to chromium trioxide that will provide similar performance. The four applicants have been proactive and have started the process to substitute chromium trioxide. They are committed to continuing the substitution efforts. According to the current state of investigations, the full development and implementation of an alternative for chromium trioxide will take at least until mid-2032.

- The applicants are submitting a **substitution plan** consistent with the analysis of alternatives and the socio-economic analysis and credible for the review period requested.

- The **benefits of continued use outweigh the risks of continued use** of chromium trioxide by a considerable degree (more than 100 times) and this situation is not likely to change during the review period requested.

- The uncertainty analysis shows that the applicants **applied a conservative approach** and that the remaining uncertainties do not challenge the conclusions of the applicants' assessment.

- To complete the proposed substitution, a **review period until 30 June 2032** is required (10 years after the date of the submission of this Application for Authorisation).

References

Dubourg, R., 2016. *Valuing the social costs of job losses in applications for authorisation*. Chester: The Economics Interface Ltd. Available from https://echa.europa.eu/documents/10162/17086/unemployment_report_en.pdf

ECHA (European Chemicals Agency, 2011. *Guidance on the preparation of socio-economic analysis as part of an application for authorisation* [Version 1, Jan 2011]. Available from https://echa.europa.eu/documents/10162/23036412/sea_authorisation_en.pdf/aadf96ec-fbfa-4bc7-9740-a3f6ceb68e6e

ECHA (European Chemicals Agency), 2013 (a). *Risk Assessment Committee (RAC) Application for authorisation: establishing a reference dose response relationship for carcinogenicity of hexavalent chromium (RAC/27/2013/06 Rev.1)*. Helsinki: ECHA. Available from https://echa.europa.eu/documents/10162/13579/rac_carcinogenicity_dose_response_crvi_en.pdf/facc881f-cf3e-40ac-8339-c9d9c1832c32

ECHA (European Chemicals Agency), 2013 (b*). SEAC/20/2013/03 Setting the review period when RAC and SEAC give opinions on an application for authorisation*. Helsinki: ECHA. Available from: https://echa.europa.eu/documents/10162/13580/seac_rac_review_period_authorisation_en.pdf/c9010a99-0baf-4975-ba41-48c85ae64861

ECHA (European Chemicals Agency), 2016 (a). *Valuing selected health impacts of chemicals: Summary of the Results and a Critical Review of the ECHA study.* Helsinki: ECHA. Available from https://echa.europa.eu/documents/10162/13630/echa_review_wtp_en.pdf/dfc3f035-7aa8-4c7b-90ad-4f7d01b6e0bc

ECHA (European Chemicals Agency), 2016 (b). *SEAC's approach for valuing job losses in restriction proposals and applications for authorisation SEAC/32/2016/04*. Helsinki: ECHA. Available from https://echa.europa.eu/documents/10162/13555/seac_unemployment_evaluation_en.pdf/af3a487e-65e5-49bb-84a3-2c1bcbc35d25

HM Government, 2022. *The Benefits of Brexit: How the UK is taking advantage of leaving the EU*. London: HMSO. Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1054643/benefits-of-brexit.pdf

SMMT (Society of Motor Manufacturers and Traders), 2021. *UK Automotive Trade Report 2021*. London: SMMT. Available from https://www.smmt.co.uk/reports/uk-automotive-trade-report/

Concordia House
St. James Business Park
Grimbald Crag Court
Knaresborough
North Yorkshire
HG5 8QB
United Kingdom

Tel: +44 (0)1423 799 633
Email: sue.bullock@tsgconsulting.com
Web: www.tsgconsulting.com

Suite C, 2nd Floor
The Atrium
St. Georges Street
Norwich
NR3 1AB
United Kingdom

Tel: +44 (0)1603 558442
Email: enquiries@rpaltd.co.uk
Web: https://rpaltd.co.uk