Report

THE ROYAL MINT®
THE ORIGINAL MAKER

Subject	Permit Variation Application Supporting Information
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1- Introduction

1.1 Background to the Variation Application

This document has been prepared by The Royal Mint Limited, Llantrisant, Pontyclun CF72 8YT, in support of a variation of its existing Part A (1) permit (KP3135KV) as required under Regulation 20 of The Environmental Permitting (England and Wales) Regulations 2016.

This application to vary the permit is being made by The Royal Mint to address the following:

- The Installation of a new Listed Activity (Direct Brass Plating Line), which is a S2.3A(1)(a) surface treatment of metals activity. The new activity is scheduled to come online, at the earliest, during January 2022. In January the plant is expected to operate at around 25% efficiency raising to 100% by May 2022.
  The location of the Direct Brass Line is in an existing repurposed building, and internally uses equipment expressly for the Direct Brass process, which has been updated from the previous Nickel Plating Line, which was also a S2.3A(1)(a) surface treatment of metals activity, formally located in the building.
  To clarify the change will be for the process which is different to that currently described but permitted activity remains the same.
- Introduction of a new treatment process for the destruction of cyanide effluent.
  The Royal Mint's current Environmental Permit has an existing listed activity of S5.3A(1)(b)(ii) for effluent treatment, from receipt of effluent until discharge to public sewer.
  The new treatment process will be an upstream activity prior to the effluent treatment plant that discharges to sewer.
- Increasing the scope of the boundary of the site to cover the installation of a directly associated activity (a minor combustion plant). The combustion plant will be operated under a separate permit by a separate operator Infinite Ltd, who have made a separate application to NRW reference PAN-014743.
  The Royal Mint will supply gas to the plant and receive directly all the energy and heat generated by the plant.
- A minor change that includes in boundary the full footprint of a visitor attraction building, which is not a directly associated activity.
- Formal removal of the metal casting process and the associated emission point A14. This is a current listed S2.2A(1)(b) melting and casting of metals activity.
- Formal removal of one of the Nickel Plating Lines a S2.3A(1)(a) surface treatment of metals activity, which will become the Brass Plating Line also a . S2.3A(1)(a) surface treatment of metals activity.
- With the installation of the above Direct Brass Plating Line and the Cyanide treatment line there will be an eventual decommissioning and removal of the following, currently operational, four listed activities, namely:
  - Zinc Plating Line 1- S2.3A(1)(a) surface treatment of metals activity
  - Copper Plating Line 2 - S2.3A(1)(a) surface treatment of metals activity
  - Copper Plating Line 3 - S2.3A(1)(a) surface treatment of metals activity
  - Cyanide Treatment Room 2 – part of the current S5.3A(1)(b)(ii) for effluent treatment activity.

- To address a number of minor operational changes that have been implemented within the Installation since the determination and issuance of the last permit variation.

1.1.1 Summary table of the permitted activity changes

The table below reflects table S1.1 as detailed in The Royal Mint's permit variation application number EPR/KP3134KV/V004 and where changes will be made:

Table S1.1 activities				
Activity Reference	Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity	Changes to be made
A1	S2.3A(1)(a)	Surface treatment of metals	From receipt of raw materials to despatch of finished products and waste	To remain but introduction of a changed activity.
A2	2.2A(1)(b)	Melting and casting of metals	From receipt of raw materials to despatch of finished products and waste	To be removed.
A3	S5.4A(1)(a)(ii)	Effluent treatment	From receipt of effluent until discharge to public sewer	Introduction of a new process upstream of final discharge.
Directly Associated Activity				
A4	Drainage of surface water	Handling of storage of site drainage prior to discharge of uncontaminated surface water into controlled waters		To remain
A5	Annealing and burnishing	From receipt of raw materials to despatch of finished products and waste		To remain
A6	Heat treatment of tool dies	From receipt of raw materials to despatch of finished products and waste		To remain
A7	Medium Combustion Plant	Electricity and heat to be used on site only		New activity

1.1.2 Site Changes

Non-contact cooling water: is still discharged directly to controlled waters under a single consented discharge for trade effluent discharge to surface water (River Ely) (W1). Due to operational and equipment changes, the flow rate of cooling water will now be reduced to a maximum of approximately 20 cubic metres per hour.

Nitrogen gas generator: One of the two nitrogen storage plants on site has been replaced by a Nitrogen gas generation unit with a directly connected storage tank.
This new system replaces the former system at the main chemical stores in the north-eastern portion of the site.

The nitrogen storage plant, located near the ancillary services buildings adjacent to the Melting, Rolling and Blanking Plant (Building 1), remains in operation but now only supplies nitrogen gas to equipment associated with die coating machines.

Both systems are maintained by a third party specialist contractor.

Gas oil storage tank: The previously notified tank, which was located in the north-eastern portion of the site adjacent to the main chemical stores, has been decommissioned and removed.
The replacement is a standalone Deso H2500DD Bunded (double skinned) Polyethylene Diesel Fuel Storage and Dispensing Tank (manufactured to OFTEC Standard OFS T100 ISS Jan 2102) with a storage capacity of 2500 litres this has been, located on the east side of the site.

Equipment associated with the tank such as valves, sight glasses and other ancillary equipment are contained within the secondary skin. The secondary skin has capacity to contain at least 110% of the maximum contents.

The tank has been installed on a concrete plinth and conforms to the Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations SI 2016.

2- BAT Summary

The below table to summarises the relevant BAT (as taken from chapter 5 of Surface Treatment of Metals and Plastics August 2006) and how the new / changed processes, its control measures, abatement etc. meet the BAT.

Requirement	Existing or Additional Measures
5.1.1 Management techniques	The Royal Mint has in place an existing environmental management system certified to ISO 14001 (2015). The new activities will be brought into the existing management system.
5.1.2 Installation design, construction and operation	Tanks, pipework and secondary containment of the new activities have been designed with consideration to volume, using construction techniques such as double skinned tanks or by situating them within contained areas. The equipment, containment etc. will be integrated into current regular inspection and test programmes. The size of the bund has been determined based on the principals of the Construction Industry Research and Information Association (CIRIA) guidance document "Containment systems for the prevention of pollution (C736F)". The activities are considered covered by existing emergency plans for potential accidents. Additionally, with regards to 5.1.2.1 Storage: Acids will be stored separately to cyanides and alkalis.
5.1.3 Agitation of process solutions	Agitation of process solutions – this occurs within the plating process by barrel rotation which is achieved by mechanical means. This avoids low pressure agitation, as this increases carbonate formation.
5.1.4 Utility inputs – energy and water	The Royal Mint has in place the Energy Management System certified to ISO 50001(2018) by BSI- this is used to monitor water and energy efficiency. During commissioning the optimum energy usage will be established but this will vary based on product and required plating thickness. Additionally, with regards to 5.1.4.4 Cooling: Controls are in place to to control the plating process, there is closed system cooling (as recognised in 2.12.1.3 Cooling of process solutions) evaporation and a cascading water rinsing system.

5.1.5 Waste minimisation of water and materials	Water usage is monitored monthly along with and against production tonnages. During commissioning the optimum water usage will be established. Process control measurements will be taken daily. The majority of the cyanide will be concentrated in the cyanide treatment plant (the ozone treatment process) and reused in the plating line, but it is a requirement to destroy some portion of the plating solution to prevent build-up of contaminants. Pre plating the cleaner rinse undertaken in tanks 6 & is a cascading cold water rinses to remove carried over cleaner prior to Acid electro etch. Post plating rinse – Within the plating line the process post plating, will be that the blanks are rinsed in Tank14 to Tank12 to remove excess plating solution (300 l/h input to triple cascade). Recovering water from rinsing solutions by one of the BAT techniques described in Section 4.7.8.
5.1.6 Materials recovery and waste management	Prevention – in plating minimisation of drag-out by maximising the drainage time between tanks will be determined. Drainage times should be in the region of 30 seconds for a barrel plant. Reduction – The introduction of the Direct Brass Line will lead to the eventual removal of the current two stage process, reducing potential for errors in process. Waste streams segregated, where possible, for easy of processing. Re-use, recycling and recovery, the chosen cyanide destruction method will actually be using separation as well as destruction where the majority of the cyanide will be concentrated in the cyanide treatment plant and reused in the plating line.
5.1.7 General process solution maintenance	Daily monitoring of the plating solutions will take place to maintaining them within established acceptable limits by the removal of contaminants. Critical control parameters will be established. Planned preventative maintenance will take place at determined frequency. Current operations are undertaken every 13 weeks.

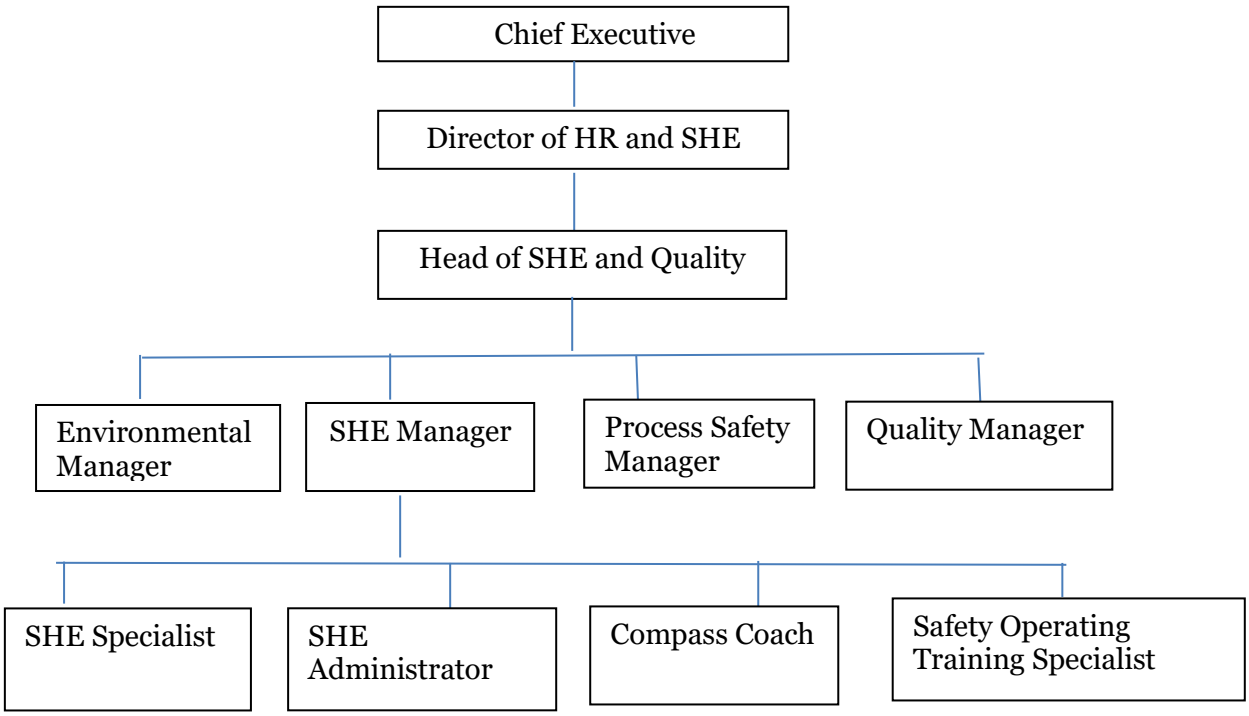
5.1.8 Wastewater emissions	There is separation of the individual waste streams prior to and following the initial treatment process. Cyanide will be pre-treated separately before effluent plant treatment. 4.16.4 Cyanide oxidation using ozone to remove the cyanides from wastewater. 4.16.7 Flocculation and precipitation of metals – This process exists in the current effluent treatment plant. The operating perimeters will be determined to minimise all water usage. 5.1.8.3 Discharging wastewater The existing process is and will remain batch discharge with prior checking for key parameters including pH, metals, cyanide. Discharges to public sewer will be in the range in Table 5.2 : CN free 0.01 – 0.2 mg/l Cu 0.2 – 2.0 mg/l Zn 0.2 - 2.0 mg/l
5.1.9 Waste	As in Section 5.1.6
5.1.10 Air emissions	The Sulphuric acid used in the process is to be extracted for health and safety reasons and minimise corrosion in the workplace. Cyanide extraction is also required. In the plating process edge exhausts (lip extraction) is employed. Exhaust before venting to atmosphere passes through two dedicated air scrubbers with fill materials and droplet separators. The limit on Hydrogen cyanide 5 mg/m^3, from - How to comply with your environmental permit Additional guidance for: The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07). The emission is determined to be below this limit.
5.1.11 Noise	Operation of the plating plant will be as the previous operation of the nickel plating line, for example managing delivery times. The externally located equipment, scrubber motors, have a limit of 111 – 114 dB at the point of operation but will not exceed this level at the site boundary.

5.1.12 Groundwater protection and site decommissioning	The Environmental Management System is in place to reduce the risk of ground water contamination. There is currently in place a Site Protection Monitoring Programme (SPMP) that monitors ground water condition this will be maintained. The decommissioning and closure methodology that shall be followed by The Royal Mint shall follow the hierarchy broadly defined below: 1. Reduction in process inventory and chemicals. 2. Production operations cease. 3. Isolation and making safe of all equipment and systems associated with plant. 4. Draining down and removal of all process fluids and materials. 5. Cleaning down and inspection of plant and equipment. 7. Ongoing monitoring and investigation as required through the Site Protection Monitoring Programme.
5.2 BAT for specific processes	
5.2.3 Barrel lines – drag-out reduction	Barrels are constructed from a smooth hydrophobic plastic and inspecting regularly (during loading operation and during the 13 week Planed Preventative Maintenance Programme) for worn areas, damage, recesses or bulges that may retain process solution. These barrels are as used in the previous Nickel Plating Process. Refer to 5.1.5 Waste minimisation of water and materials for drag out information.
5.2.5 Substitution for, and/or control of, hazardous substances	The use of less hazardous substances has been considered but as in 5.2.5.3 Cyanide - It is not possible to replace cyanide in all applications. The plating process is required to plate on to a steel substitute. The alternative of cyanide copper by acid or pyrophosphate copper have been found not to produce a coin with sufficient definition.
4.16.4 Cyanide oxidation	Cyanides can be removed from wastewater using different procedures: The use of ozone is recognised as BAT

3- Operational Control

3.1 Structure of Safety, Health and Environmental Management

The structure of the Safety, Health and Environmental management at The Royal Mint is shown within the figure below.



The Royal Mint operates and maintains a formal environmental management system which has been certified to meet the requirements of the International Standard BS EN ISO14001:2015.

A copy of the certification body's (BSI) current Certificate of registration has been included with the updated information, in line with Natural Resources Wales' request.

The installation of the proposed new Direct Brass Plating Line also requires The Royal Mint to make an additional notification under the Control of Major Accident Hazards Regulations 2015. As such The Royal Mint has undertaken a review of its COMAH safety report. The COMAH safety Report review has not identified any significant changes required to the current safety management practices on site.

The Royal Mint is in the process of developing, implementing and training out a series of process controls to ensure the safe management and operation of the new plant and equipment.

3.2 Direct Brass Plating Line

3.2.1 Introduction

The Direct Brass Plating Line is located within building 12 and replaces the Nickel-Plating Line 2, which was located in this building. The Nickel Plating Line was decommissioned during the later end of 2019 and early 2020 in line with the decommission plan submitted to the Environment Agency Wales now Natural Resources Wales.

The effluents produced by the Direct Brass Plating Line will be discharged to the site effluent treatment plant, via newly routed dual contained pipe runs.

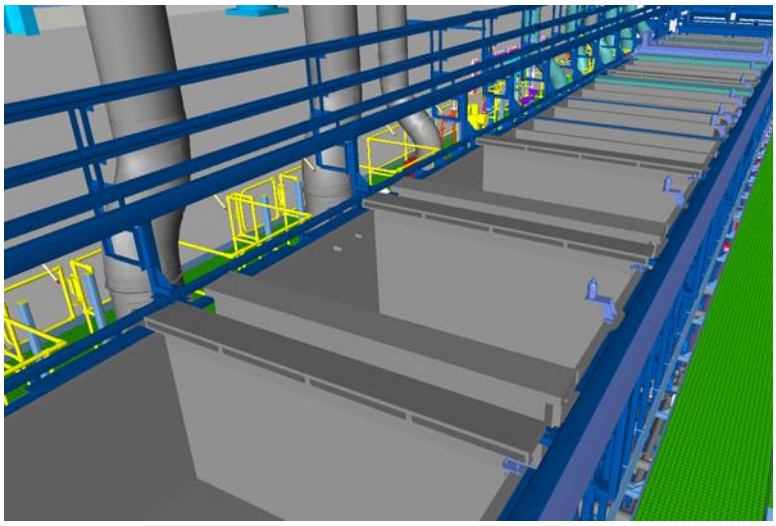
The details of Direct Brass Plating Line are provided within the sections below.

3.2.2 Brass Plating

Brass plating is a widely used form of alloy plating and its use at The Royal Mint will be to produce brass plated coinage for overseas markets. The Royal Mint process uses a barrel rotating operation that has been proven as in the former and existing nickel-plating processes on site.

Within the Surface Treatment of Metals and Plastics BREF (Surface Treatment BREF) and 'How to comply with your environmental permit. Additional guidance for: The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)', the technique deployed is a process with the following environmental concerns:

- Process tanks require fume extraction to remove generated aerosols. To address this lip extraction is to be deployed on the process baths and scrubbed before emissions to air (A9 and A10). The use of the lip extraction system will be maintained at the minimum level in order comply with COSHH Regulations and the same time maintain bath plating efficiency.



The extraction system consists of a belt driven extraction fan with soft start. Each drop leg of the extraction system has a motorised damper fitted to control the flow rate required.

- Effluent can be treated for pH, cyanide, and metals in a typical waste treatment plant with an initial cyanide oxidation step.

The treatment process to be adopted is a two-stage process. Firstly, oxidation through the use of ozone, process detailed later, then further treatment via the site's existing effluent treatment plant.

3.2.3 Direct Brass Plating Processing Sequence

Operation	Bath(s)	Comments
Load station		Blanks are loaded into the barrels on a barrel rig.

Blank Pre-treatment	3 to 5	The blanks are cleaned in a strongly alkaline solution for cleaning to remove cutting oils etc. A DC current is applied to Tank (Bath) 05 which results in oxygen evolution at the anode and hydrogen evolution at the cathode. The gas evolution reaction results in a scrubbing action which assists in the cleaning of the blanks.
Cleaner Rinse	6 & 7	Cascading cold water rinses to remove carried over cleaner prior to Acid electro etch.
Electro-etch	8	Sulphuric acid up to 20wt% is piped from the dilution plant to the dosing tank. Fresh additions are made to ensure pH remains at 1. The etching process takes approximately 5 - 7 minutes.
Acid Rinse	9 & 10	Following acid etching the metal blanks undergo cold water rinsing. Tank 10 is filled continuously with water to provide a cascade rinse into Tank 09, which dilutes and rinses acid solution from the blanks. Rinsing takes place approximately 4 - 7 minutes depending on denomination.
Transfer Station / Rinse Station	11	The barrel rig is lowered into recycle rinse Tank11 in order to be picked up by the second transporter. This tank is continually filled with recycled rinse water from the new cyanide treatment plant.
Brass Plating	15A to 22B	Plating occurs within 8 Tanks, comprising 16 plating stations. The tanks are approximately 6m³ working volume. The plating solution is circulated for temperature control and filtration. The plating time is dependant of plate thickness approximately 8 – 10 hours.
Cascading drag-out rinses	12 to 14	After plating, the blanks are rinsed in Tank14 to Tank12 to remove excess plating solution (300 l/h input to triple cascade). The revers sequence reflects the process in which tank 14 is the first drag-out rinse, followed by 13 and 12. Before transfer to Tank 11.
Unloading		Plated blanks are unloaded

2 plating tanks (4 plating stations) are connected to a pod tank, the line consisting of 4 pod tank systems in total (16 plating stations). Each pod tank has circulated transfers to / from the brass plating tanks (there are two recirculation systems, one for temperature control and another to filter the plating solution). The temperature of the plating solution is maintained at 55 ± 2°C by use of electrical heaters on start-up and a chilled water heat exchanger during rectification.

Pod tanks are where chemical additions are made under analytical control. The pod tanks are designed to facilitate solution heating, filtration, pumped circulation from the online tank and mixing of chemical additions.

3.2.4 Transporter Operation

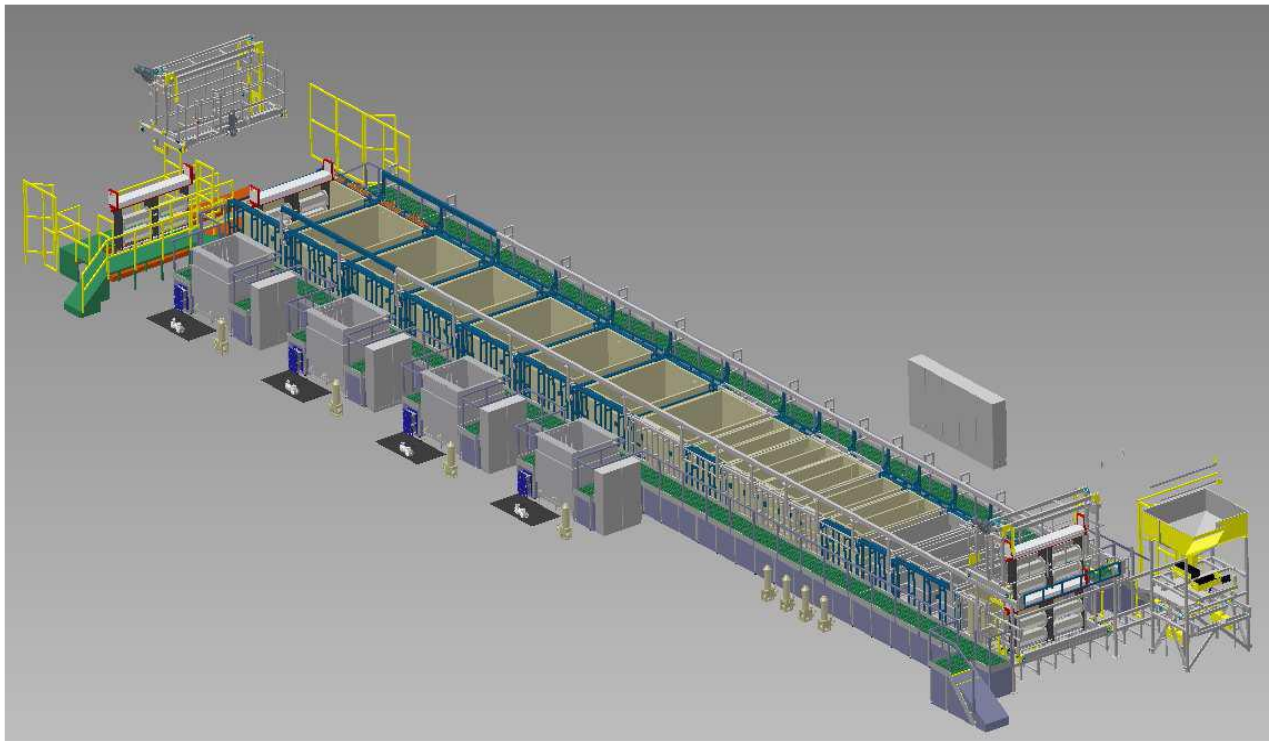
Two overhead transporters will provide horizontal movement and lifting/lowering of barrel rigs between process stations. The transporters will operate in specific areas, transporter 1 (T1) in the load, unload, and pre-treatment area (station 1 to station 11) and transporter 2 (T2) in the plating and barrel maintenance area (station 11 to station 32). Mechanical stops and software interlocks will prevent the transporters from operating outside these zones.

This ensures that incompatible chemistries cannot be carried over in the barrels and mixed in the process tanks.

The change-over point where the barrels will be 'handed over' between transporters is at station 11. Both transporters can enter station 11 but will be separated from one-another by coding software to prevent collision occurring.

3.2.5 Plant Overview

Three-Dimensional Plan of Proposed Direct Brass Line



3.2.6 Direct Brass Line

	Bath 3 Alkaline Clean	Bath 4 Alkaline Clean	Bath 5 Alkaline Clean	Bath 6 – 7 Rinse	Bath 8 Acid Etch	Baths 9 – 10 Acid Rinse	Baths 11 Rinse Transfer Station	Baths 12 – 14 Rinse	Baths 15A to 22B Direct Brass Plate
Substance(s)	Enprep 205 Alkaline clean	Enprep 205 Alkaline clean	Enprep 205 Alkaline clean	Counter-flow rinse (150 l/hr)	Sulphuric acid etch	Counter-flow rinse (600l/hr)	Counter-flow rinse (5000l/hr)	Drag-out	Brass plating baths
Size (cm)	280 x 87.5 x 141	280 x 87.5 x 141	280 x 99.5 x 141	280 x 65 x 141 280 x 72.5 x 141	280 x 80 x 141	280 x 65 x 141 280 x 72.5 x 141	280 x 65 x 140	280 x 65 x 141 280 x 72.5 x 141	280 x 200 x 141
Volume (Litres)	2773	2773	3154	4358	2536	4358	2179	6299	65000*
Solution depth (cm)	110	110	110	110	110	110	110	110	126
Freeboard (cm)	30	30	30	30	30	30	30	30	30
Temp (˚C)	55	55	55	Ambient	55	Ambient	Ambient	Ambient	55
LEV	Yes	Yes	Yes	None	Yes	None	None	None	Yes
Fugitive controls	None	None	None	None	None	None	None	None	None
Tank Construction	Stainless steel	Stainless steel	Stainless steel	PVC GRP	Celmar GRP	PVC GRP	PVC GRP	PVC GRP	Polypropylene
									*Includes associated pod tanks.

3.2.1 Plating Solution preparation and storage

The brass plating solution is prepared offline in a bulk solution for initial fill. Plating solution will be topped up via solids addition in the dissolution vessel within the Cyanide Treatment Plant (details of this plant can be found later in this submission) which can then be transferred to the appropriate pod tank via the condensate return line from the Cyanide Treatment Plant.

The pod tanks can also be pumped out to one or both of 2 newly installed plating solution storage tanks (of GRP construction) each of which are 40m^3 capacity. From the storage tanks solution can be pumped back to any pod tank or alternatively a connection is provided to empty the tanks to a vacuum tanker, where / if offsite disposal is required.

The storage tanks are fitted with level transmitters with high/low process alarms. An additional level switch is provided along with actuated valve on the inlet line to provide further overfill protection.

Each tank is fitted with a 30kW electrical immersion heater to maintain a temperature of 20°C and prevent crystallisation of the plating solution. The heater installation is compliant with RC45 and include an over temperature and low level cut out.

The storage tanks are located outside the Direct Brass Plating building in a bunded area, which also contains the Cyanide scrubber which emits to air via emission point A9. The size of the bund has been determined based on the principals of the Construction Industry Research and Information Association (CIRIA) guidance document "Containment systems for the prevention of pollution (C736F)".

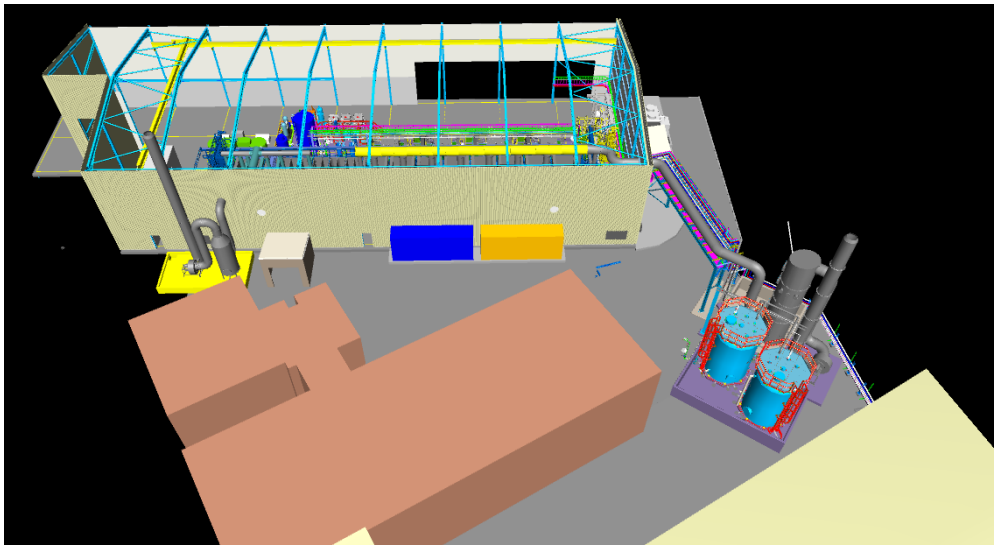
All external pipework has been designed, constructed and commissioned to ASME B31.3 – 2018 and The Royal Mint's internal procedures for pipe construction SMP 7.2.1 – Design and Selection of Piping Systems (a copy of the current version to be submitted with this application). The pipework is a CONTAIN-IT Plus Double Containment System Inner / Outer as the route is over permeable ground.

The pipework constructed from Polypropylene Homopolymer (PP- H) inner pipe and PE100DC outer pipe.

- Polypropylene H
  PP-H is used in engineering and tooling applications as if offers higher rigidity than the copolymer grade, PP-H has a marginally better maximum working temperature as well as better chemical stability. It is resistant to staining and has a low moisture absorption rate.
- PE100DC
  HDPE PE100 pipe is easy to install, light, flexible, corrosion-free and has a service life of up to 100 years. It can be jointed using butt fusion or electrofusion to create a leak-free pressure network.

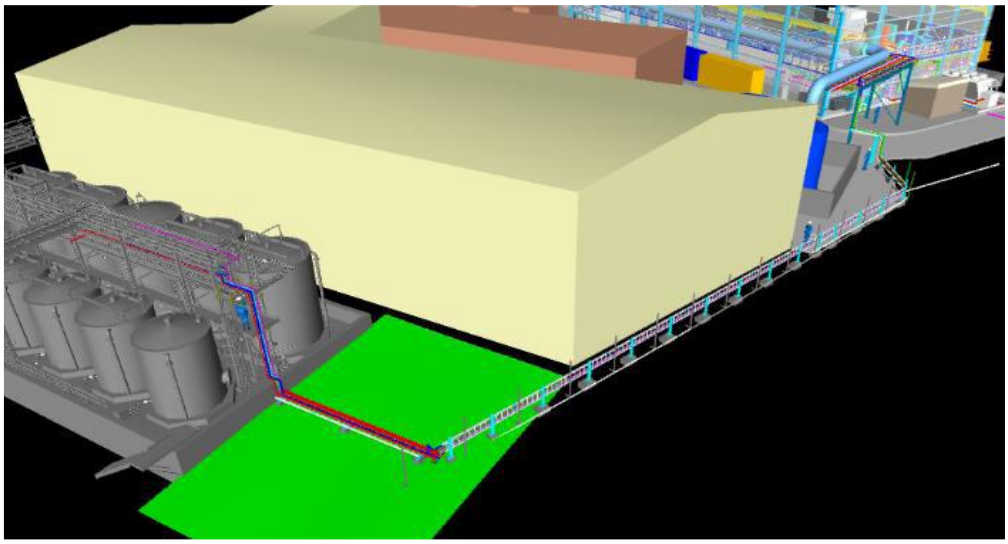
3.2.2 Location of the tanks plus emission points A9 and A10

See section 2.6.2 Emission Points to Air, and separately supplied site map, detailing the site location of the emission points.



3.2.3 Direct Brass Effluent Pipe Run External.

The below is a schematic of the route of external direct brass effluent transfer line to the existing site effluent treatment plant.



3.2.4 Secondary Containment Pipework

All external pipework has been design, constructed and commissioned to ASME B31.3 – 2018 The Royal Mint's internal procedures for pipe construction SMP 7.2.1 – Design and Selection of Piping Systems. The pipework is a CONTAIN-IT Plus Double Containment System Inner / Outer as the route is over permeable ground.

The pipework constructed from PP- H inner pipe and PE100DC outer pipe

The pipework deployed is dual containment pipe system providing a secondary containment pipe around the carrier pipe, which in the event of a leakage from the carrier pipe will safely contain the leaked media.

3.2.5 Effluent Treatment

Weak Acid Waste Stream from the Direct Brass Line is transferred to the Rinse Acid Tank T4 in the effluent treatment plant bund.

Strong Acid Waste Stream from the Direct Brass Line is transferred to the Strong Acid Tank T11 in the effluent treatment plant bund.

Weak Cleaner Waste Stream from the Direct Brass Line is transferred to the rinse Soap Tank T10 in the effluent treatment plant bund.

Flows from the new Cyanide Treatment Process are transferred to Tank T10 in the effluent treatment plant bund.

3.3 Cyanide Treatment Plant

3.3.1 Introduction

As part of the introduction of the Direct Brass Line a new Cyanide Treatment Plant is being installed.

Following an extensive review of the available processes The Royal Mint's chosen preference has been an ozone / UV treatment process.

3.3.2 Choice of Cyanide Destruction Method

In developing the Direct Brass Line, The Royal Mint commissioned an independent assessment, undertaken by Swansea University's Astute (Advanced Sustainable Manufacturing Technologies) Project Office on available treatment techniques for the destruction of cyanide.

The determination of the remediation method chosen was dependant on several factors, such as type of cyanide, cyanide concentration, cost, discharge limit, etc.

The selection list was narrowed further by including the following points:

- The waste stream contains mainly copper cyanide, this assumed that the total cyanide content is free cyanide and coper cyanide with some suspended solids.
- The current discharge limit, to sewer is 0.2 mg/l. The process should not only meet this target but an attempt should be made to reduce it further (economically) to safeguard against future tightening of environmental regulations.
- The Royal Mint prefers a remediation method that destroys cyanide rather than a separation method.
  The chosen method will actually be using separation as well as destruction. The majority of the cyanide will be concentrated in the cyanide treatment plant and reused in the plating line, but it is a requirement to destroy some portion of the plating solution to prevent build-up of contaminants.
- The preference is a destruction method that does not rely on toxic gases such as chlorine.
  At present, there are a number of potential major accident scenarios, within The Royal Mint's COMAH safety report, associated with our legacy cyanide treatment systems. The ozone technology will allow us to eliminate them on decommissioning of the legacy equipment (Cyanide Treatment Room 2 – part of the current S5.3A(1)(b)(ii) for effluent treatment activity).
  BREF 4.9.3 states 'AOX may be generated through chemical oxidation of cyanide in wastewater treatment with sodium hypochlorite and chlorine'. Use of the ozone process removes the potential for Cyanogen Chloride to be generated.
- The preference was to have a single remediation method.
- Many of the cyanide destruction methods produce ammonia. It was The Royal Mint's preference to fully break down the cyanide so that a new ammonia waste stream was not generated.

The determination process left only an oxidation or high temperature method as viable treatment approach. The high temperature method was not considered on the grounds of cost.

The oxidation method recommended, is in line with a recognised best available technique (EPR 2.07), namely using ozone (Surface Treatment BREF), for destruction of the cyanide, in an either a one or two reaction stage process dependant on the initial concentration of cyanide.

The ozone oxides cyanides to cyanates

$CN– + O3 \rightarrow CNO– + O2$

and then to carbonate.

$2\ CNO- + 3O3 + H2O \rightarrow 2\ HCO3- + N2 + 3O2$

The first stage of this process is very fast (less than 15 minutes with excess ozone and alkaline conditions), The second stage is slower and requires an excess of ozone for complete destruction of the cyanide.

The overall ozone consumption is in the region of 4 kg of ozone per kg of cyanide. It is calculated that the cyanide destruction process will take up to 1 day for the processing of 6.5m^3 of solution.

The ozone gas is highly reactive and therefore is manufactured in-situ. The gas is formed by passing dry air or oxygen through a small gap between two large flat metal electrodes. The generation of ozone is controlled by the ORP measurement.

The ozonation process is suitable for any strength of cyanide solution and combined with the associated ultraviolet treatment and peroxide dosing it will be able to treat even SAD (Strong Acid Dissociation) cyanide. The system has been designed for the expected amount of cyanide solution from the plant with a contingency to deal with additional volumes if required.

The main advantages of this process are:

- The reaction is relatively quick and irreversible.
- The production of the gas in-situ reduces transportation, storage and handling required by other chemical methods.
  ozone is generated on demand, there is no storage of hazardous chemicals required for the oxidation process.
- There are no harmful biproducts produced. It does not produce ammonia as a by-product, unlike the current cyanide destruction system that is in use by The Royal Mint.

3.3.3 Cyanide Treatment Plant Processing Sequence

The cyanide destruction process is a two-stage process. The second stage is dependent on the initial mass of cyanide as an excess of ozone is required for the second stage. Both stages are completed to prevent cyanates being transferred to the effluent treatment plant.

3.3.3.1 Stage One

Oxidation of cyanide using ozone.

$CN– + O_3 \rightarrow CNO– + O_2$

3.3.3.2 Stage Two

The cyanate, is then hydrolysed.

$2\ CNO- + 3O_3 + H_2O \rightarrow 2\ HCO_3- + N_2 + 3O_2$

This stage requires a long contact time.

The cyanide solutions will be collected and stored in a 7m³ buffer tank prior to transfer to the "working" tank.

In a batch process, a pump will recirculate the solution in the "working" tank through an injection venture, during this cycle the pH, oxidation / reduction potential (ORP) and temperature of the solution is monitored.

The generation of ozone is controlled by the Oxidation-Reduction Potential (ORP) measurement.

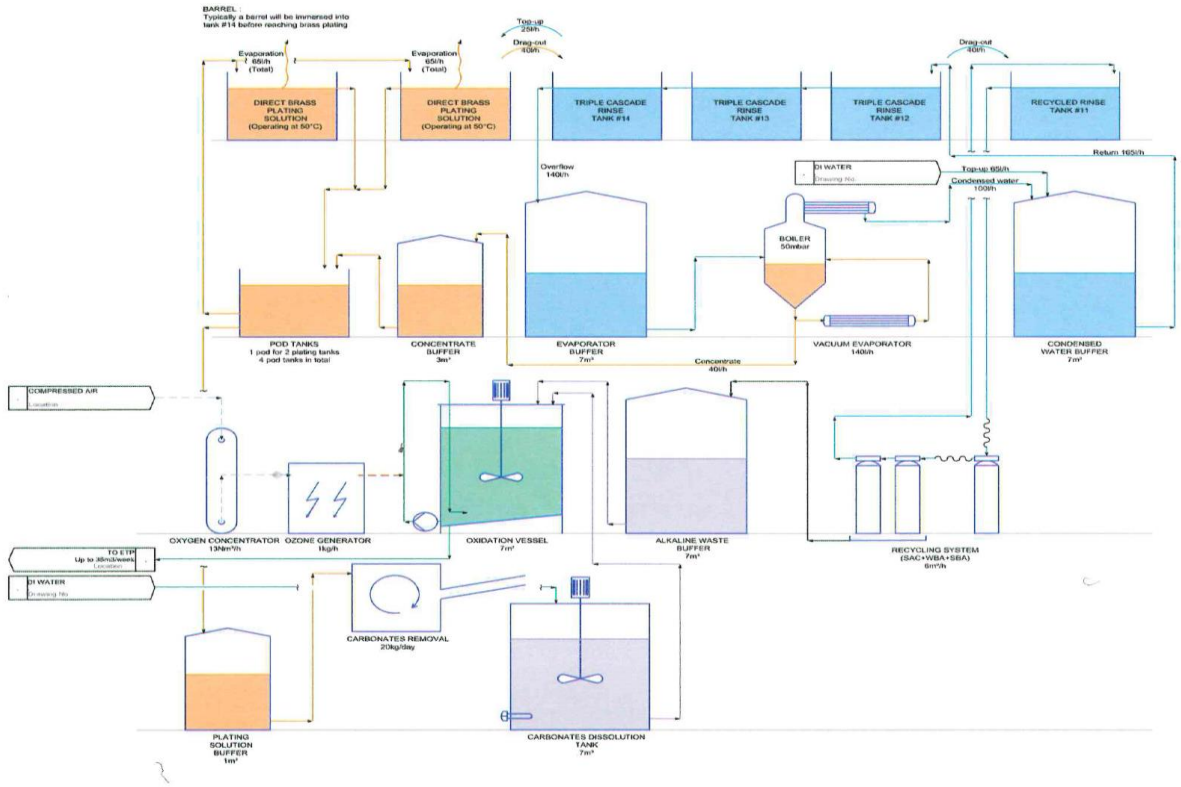
The concentration of ozone in the venture feed will be approximately 13%. Excess ozone will be destroyed by means of a catalytic ozone destroyer placed on the vent of the "working" tank. The vent from the ozone destroyer will vent to the main plant extraction system and to atmosphere via the cyanide scrubber (emission point A9).
The emissions from emission point A9 will be detailed later but the combination of emissions from the plant extraction and the ozone "working" tank, following scrubbing, will be in line with Best Available Techniques.

The overall ozone consumption is in the region of 4 kg of ozone per kg of cyanide. It is calculated that the cyanide destruction process will take up to 1 day for the processing of 6.5m³ of solution.

Once the oxidation reaction is complete the operator is informed by means of sounder device. The solution will then be sampled and analysed to confirm no cyanide is present.
The solution when free of cyanide is transferred to the Effluent Treatment Plant and specifically T10.

For safety and operational quality of the ozone, the generator is located in a dedicated ozone generation room. Oxygen and ozone levels are constantly monitored in the dedicated room.

3.3.4 Process Flow Diagram



3.3.5 Cyanide Treatment Line

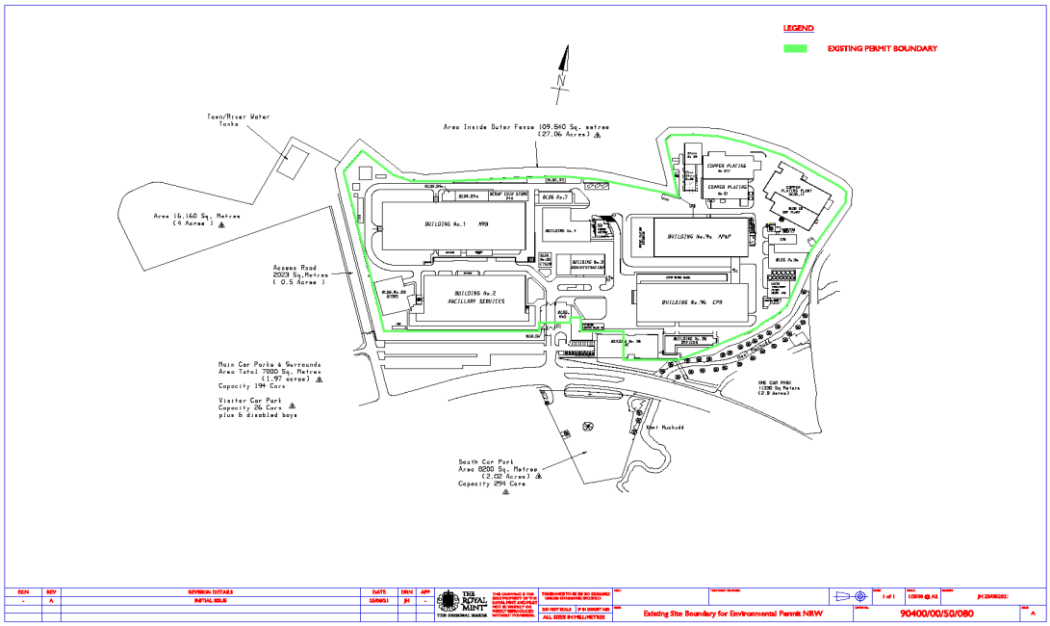
	Alkaline Regenerate Tank CT-332-01	Oxidation Tank CT-207-01
Substance(s)	Cyanide Solution	Cyanide solution in process of treatment
Volume	8m³	8m³
Temp (˚C)	Ambient	Ambient
LEV	No	Yes
Tank Construction	PE-100	HDPE
Bund Size	42.5m³	42.5m³

3.4 Site Boundary Increase

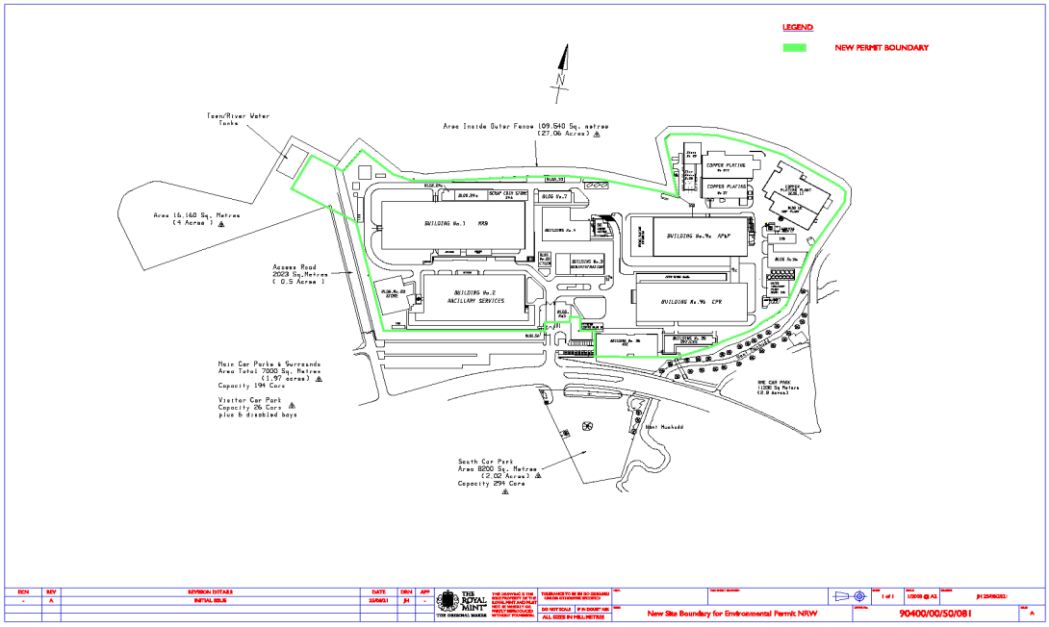
The Royal Mint proposes to extend the Installation boundary outside the existing security fence line to include an area to be occupied by a proposed Directly Associated Activity of a medium combustion power plant, which will be operated by separate company seeking a separate Environmental Permit.

There has also been a slight change to the south of the site to include in the boundary The Royal Mint Experience building, which was constructed as tourist attraction, not a directly associated activity. The Royal Mint Experience building passes through the middle of the existing boundary. The Royal Mint is prepared to take on the liability of any remediation associated with this change in the boundary as The Royal Mint already has the liability for any contamination in the land.

3.4.1 Existing Boundary.



3.4.2 Revised Boundary



Additional copies of these drawings will be supplied separately as part of the variation application.

3.4.3 Site Condition Report

As part of the submission The Royal Mint has included separately a copy of a site condition report produced by Ramboll for the operator of the minor combustion plant.

3.5 Decommissioned Areas

Following introduction of the Direct Brass Plating Line and the new Cyanide Treatment Plant, The Royal Mint will schedule the decommissioning and removal of the following currently operational processes:

- Zinc Plating Line 1
- Copper Plating Line 2
- Copper Plating Line 3
- Cyanide Treatment Room 2

The exact sequence and time plan is yet to be formulated but it is proposed that Natural Resources Wales will be provided with the plan and progress against the plan when this is in place and being implemented.

The decommissioning will follow the method described in section 2.10.11 - Closure and Decommissioning of this submission.

3.6 Emissions

3.6.1 Emissions to Air

The Direct Brass Plating Line modifies the following point sources emissions to air.

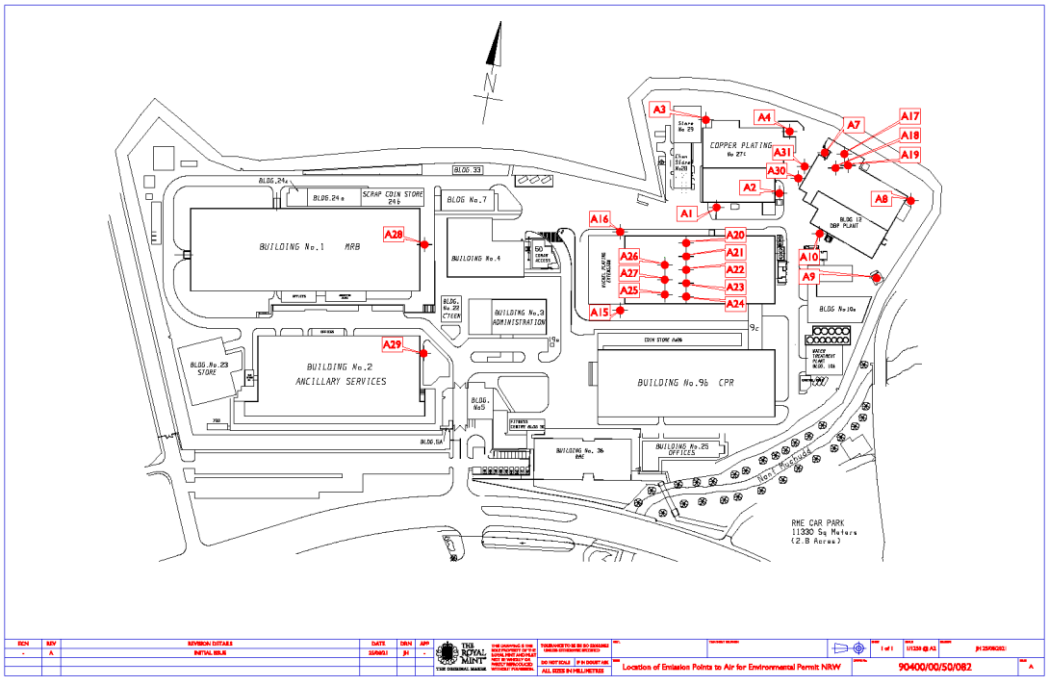
Emission Point	Source	Potential Pollutant	Abatement	Comment
A9	Direct Brass Line	Hydrogen Cyanide	Cyanide scrubber	Formally Nickel Plating Plant 2: Nickel scrubber
A10	Direct Brass Line	Sulphuric Acid Mist Sodium Hydroxide	Acid/Alkali scrubber	Formally Nickel Plating Plant 2: Acid/alkali scrubber

The Direct Brass Line will be installed with lip extraction and abatement for the purposes of maintaining an internal workplace atmosphere in compliance with COSHH OEL requirements.

The systems extract fume from above the baths via the use of a lip and hood extraction system. In the scrubbing unit ascending air is washed by multiple sprays of water (scrubbing agent) which is pumped down the column in a closed loop. Part of the tower is packed with high surface area polypropylene media which condense and gather most of the spray for return to the storage tank. In each case the air flow is passed through one or more mist eliminator stages which remove all remaining water droplets allowing for return to tanks. All scrubbed emissions are extracted to atmosphere.

All lip extraction and abatement systems are considered to meet the indicative BAT requirements.

3.6.2 Emission Points to Air



3.6.3 Emissions to Water

The new processes of Direct Brass Plating and Cyanide Treatment will introduce process feeds to the effluent treatment plant totalling approximately 1m³ per hour. These feeds are broadly comparable in volume with those generated by the Nickel Plating line that the Direct Brass Line replaces.

Comprising of:

- Strong Acid 40 l /hr
- Caustic rinse 160 l/hr
- Weak acid rinse 600l/hr
- Treated cyanide 50 l/hr

The treated effluents are discharged, under consent Ref No. TE409, to sewer for treatment at Welsh Water's Coslech sewage treatment works (STW).

3.6.4 Emissions to Groundwater

There remain no emissions to groundwater from any aspect of The Royal Mint's operations. All authorised releases from the site will be through Release Points S1 and W1.

3.6.5 Fugitive Emissions to Air

There will be no fugitive emissions to air as result of this variation.

3.6.6 Fugitive Emissions to Sewer and Water

There will be no fugitive emissions to controlled waters or sewer from the site as a result of this variation. The eventual decommissioning of the Zinc Plating Line, Copper Plating Line 2, Copper Plating Line 3 and Cyanide Treatment Room 2 will remove a number of key potential fugitive sources at the site.

The new activities will all be to recognised BAT standards and hence will have no potential for fugitive emissions.

Ongoing monitoring and reporting of the situation will take place as part of the ongoing Site Protection Monitoring Programme which is in place at the site. There is not expected to be any change to the current monitoring programme as a result of the new activities introduction.

3.6.7 Odour

There have been no odour complaints that have arisen from the current operation of the site.

The Brass Plating process to be introduced uses mostly exiting chemicals and there will be no increase in the pre and post treatment chemicals over and above those used in the previous Nickel-Plating Line, which has been replaced by the Direct Brass Line.

The cyanide materials totalling 65,000 litres will have a bitter almond odour but given the nature of the materials and the health and safety controls in place (the plant cannot run without the extraction and scrubbing operating) this odour will not be detected beyond the boundary of the site.

The ozone generated as part of the cyanide destruction process is considered to have a distinctive pungent odour and there will be approximately 40 Kg generated daily.
The following controls have been introduced to prevent ozone escaping:

- An ozone detection system is present in the ozone generation room plus in the in the extraction ductwork. The detection system is set at 0.1 ppm and the system upon activation stops the ozone generator and emits an audible alarm.

- All pipework from the ozone generator to the Oxidation Vessel is fully welded.

As the ozone will be contained within the cyanide solution, as part of the destruction process, which is enclosed and benefits from the abatement of the main extraction system, it is considered this will not to be detected beyond the boundary of the site.

From the above, it is not expected that there will be odour issues associated with the site as a result of this variation.

3.6.8 Emissions to Land

There will be no proposed direct emissions to land from any aspect of The Royal Mint's operations. The solid wastes produced will not change as a result of the change in activities and where produced will be transferred off site for treatment and disposal at permitted waste disposal operations.

3.6.9 Efficient Use of Raw Materials

The use of materials will be maintained at the lowest level possible, whilst still maintaining plating efficiency.

The installation of the Direct Brass Line and the Cyanide Treatment process will introduce a limited number of new chemicals to site, these will be stored in dedicated and existing storage areas based on the chemistry of the chemicals.
The change of process along with increased process control and process efficiency will have a significant benefit in relation to the specific use of raw materials. In addition, the removal of the existing Zinc and Copper Plating Lines will have secondary benefits to the overall material efficiency use on site.

The key raw materials associated with the Direct Brass Plating Line are:

- Brass plating solution
- Bronze X MV wetting agent
- Enprep 205 Special
- Sodium Hydroxide
- Copper Cyanide
- Sodium Cyanide
- Zinc Cyanide
- Sulfuric Acid
- Hydrochloric Acid

The Direct Brass Line will occasionally be used for copper plating only. For this process there is a requirement to use:

- Copper plating solution
- Potassium Cyanide
- Enprep 205 Special
- Sodium Hydroxide
- Copper Cyanide
- Sodium Cyanide
- Sulfuric Acid

The key raw materials associated with the Cyanide Treatment Line are:

- Ozone
- Hydrogen Peroxide
- Sodium Hydroxide

3.6.10 Expected Chemical Usage Directly Associated with the Direct Brass Line

Bronze X MV wetting agent -	600 litres annually
Copper Cyanide Powder –	2500 kg annually
Zinc Cyanide Powder –	2000 kg annually
Sodium Cyanide Briquettes –	250 kg annually
Potassium Cyanide Briquettes –	335 kg annually
Sodium Hydrogen Carbonate (Sodium Bicarbonate)	-1.6 tonne annually

3.6.11 Waste Storage and Handling

The installation of the new processes will not significantly change the nature of the wastes that will arise from the site, however due to the eventual removal of some activities the volume of waste generated is expected to reduce.

The key wastes that arise from the new processes are as follows:

- Waste process rinse water: transferred to effluent treatment plant for treatment and disposal;
- Spent plating and other cyanide solutions: transferred to the Cyanide Treatment plant for cyanide destruction then to effluent treatment plant for treatment and disposal; and.
- Process Wastes: off specification product which is collected and sold for recovery.

3.7 Energy Efficiency

The following have been introduced with the aim on increasing energy efficiency of the process:

- The process uses a closed loop cooling circulating water system.
- Automated control for DC rectifiers
- Automated control for process heating
- Automated flow dampers for fume extraction system
- Rinse recycling system to reduce chemical treatment and waste

3.8 Energy Use

The following section has been compiled using predicted extrapolated energy figures assuming the installation of the new processes. These figures are to be used for estimation purposes only.

3.8.1 Gas Usage

Initially there will be no change in natural gas usage as a result of the introduction of the new plating line.

With the decommissioning and removal of the following processes:

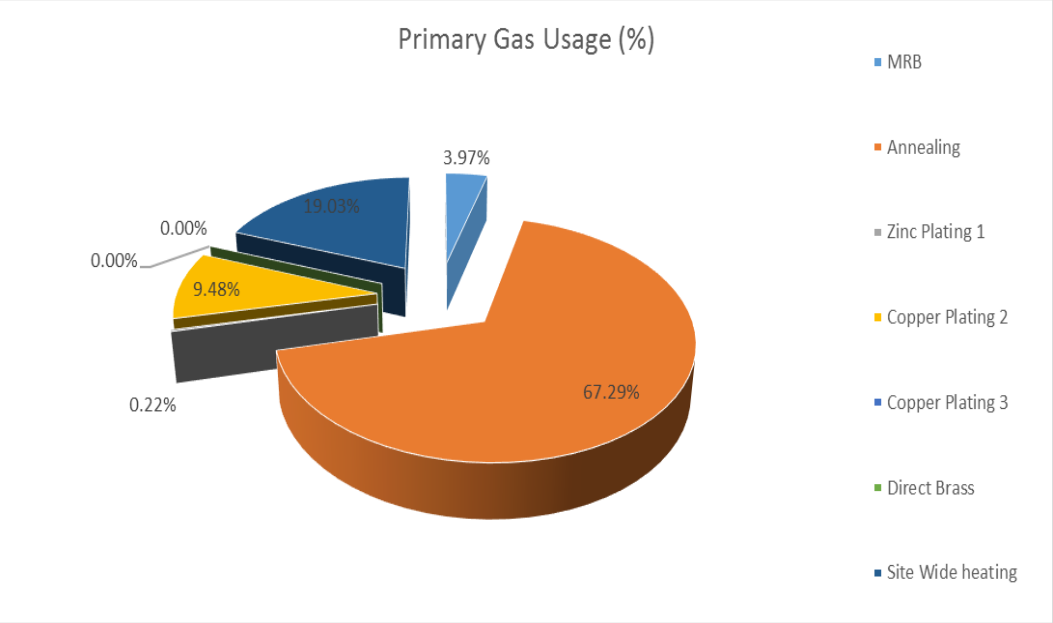
- Zinc Plating Line 1
- Copper Plating Line 2

There will be a small reduction in natural gas consumption approximately 10%.

With the introduction of the CHP plant The Royal Mint intends to purchase natural gas for the operator to consumed to produce the electricity that will be used by The Royal Mint.

Predicted Gas Usage		
Area	Primary Gas (MWh)	Primary Gas Usage (%)
MRB	881630	3.97%
Annealing	14957584	67.29%
Zinc Plating 1	49815	0.22%
Copper Plating 2	2107874	9.48%
Copper Plating 3	0	0.00%
Direct Brass	0	0.00%
Site Wide Heating	4231084	19.03%
TOTAL Kwh	22227986	100.00%

The nickel plating process does not use natural gas in the process. There is a limited amount of gas used for heating of the building but the volumes consumed are considered insignificant.



3.8.2 Electricity Usage

Initially, there is expected to be a slight, approximately 5%, increase in electrical energy use for the Direct Brass Line and the associated Cyanide Treatment plant.

With the decommissioning and removal of the following processes:

- Zinc Plating Line 1
- Copper Plating Line 2

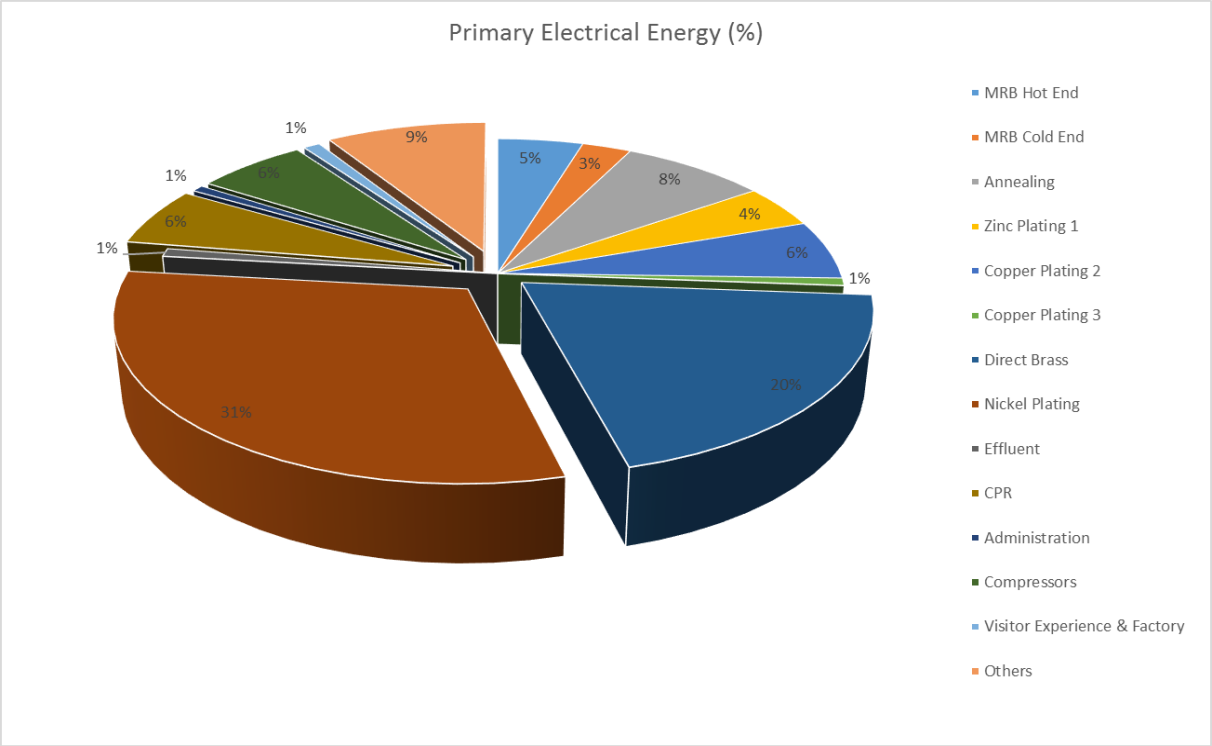
- Copper Plating Line 3

There will be a small reduction in electricity consumption approximately 10% from the current usage.

Predicted Electricity Use			
Area	Incoming Supply (MWh)	Primary Electrical Energy (MWh)	Primary Electrical Energy (%)
MRB Hot End	1484	3562	5%
MRB Cold End	855	2052	3%
Annealing	2527	3538	8%
Zinc Plating 1	1385	3324	4%
Copper Plating 2	1894	4546	6%
Copper Plating 3	236	566	1%
Direct Brass (Including Cyanide Treatment Process)	6325	15180	20%
Nickel Plating (Armour 1 and 2)	9846	23630	31%
Effluent Treatment Plant	256	614	1%
CPR	1894	4546	6%
Administration	205	492	1%
Compressors	1934	4642	6%
Visitor Experience & Factory	292	701	1%
Others	2841	6818	9%
Total To Site	31974	76738	100%

Conversion factor for delivered electricity to primary energy –

Primary Energy = electrical energy X 2.4 (as per the Resource Efficiency Physical Index).



3.9 Climate Change Levy and Energy Savings Opportunity Scheme

3.9.1 Climate Change Levy.

Under legislation introduced in the Finance Bill 2014, which introduced an exemption for the energy used in metallurgical and mineralogical processes. The Royal Mint withdrew from its in place Climate Change Levy agreement.

3.9.2 Energy Savings Opportunity Scheme

The Royal Mint is required to comply with the Energy Savings Opportunity Scheme and meets it compliance by holding accreditation to ISO 50001 (energy management) certification, which it has held since October 2014.

3.10 Accident Prevention and Control

The Royal Mint has been registered since 2002 with the Health & Safety Executive (HSE) and Natural Resources Wales under the COMAH Regulations 2005 (as amended). As such the site has a long established and mature Health and Safety Management System with associated Major Accident Prevention Plan (MAPP).

The installation of the Direct Brass Line will initially increase the working inventory of Cyanide based solutions stored and used on site. The longer-term plant will reduce the inventory with the decommissioning of the Copper Plating 2 and Copper Plating 3 Lines.
The exact timings for reducing the inventory will depend on the completion of the Direct Brass Line commissioning and availability of disposal sites for the disposal of the waste solutions.

The key risk to the environment relating to the installation remains an uncontrolled release of substances directly to the surface water system. There are no direct connections to controlled waters from the new processes but there still remains the potential for spillage, uncontrolled leakage and or contaminated fire waters etc. to be released to controlled waters under emergency condition via the surface water drainage system.

The secondary containment has been reviewed (see section 2.10.2 below) against CIRIA report C736 - Containment systems for the prevention of pollution to capture / minimise the risk of fire water runoff.

3.10.1 Procedures

The Royal Mint has existing procedures in place for reviewing the documents and processes related to incidents or accidents, which could lead to an impact on the environment. The operation of the new plating line is not expected to introduce significant changes in incident response, as the line is located in a building where an existing line was located and there is experience of handling the chemistry involved in the process.
Any changes identified will be covered by reviews of the accident management plan as outlined in the procedure supplied Emergency Preparedness and Response (SM&EMP 4.9). A copy of the existing management plan has been included in line with the additional information requested by Natural Resources Wales.

3.10.2 Secondary Containment Bunds

In reviewing the arrangements, in the event of the loss of primary containment, The Royal Mint applied the principals of the Construction Industry Research and Information Association (CIRIA) guidance document "Containment systems for the prevention of pollution (C736F)".

The assessment considered loss of primary containment in an incident that required firefighting methods to be applied.

The resulting risk assessment findings are included in the Direct Brass Plating 1 Line CIRIA - Bunds Risk Assessment document supplementing this document.

As a result of the assessment the following bunds have been constructed in reinforced concreate, in line with BAT and hydraulically tested before entering service:

- Main Process (Cyanide) Bund Capacity 136.5 m^3
- Pre-Treatment Bund Capacity 42.5 m^3
- Cyanide Treatment Plant Bund Capacity 42.5 m^3
- External Cyanide Storage Tanks & Cyanide Scrubber Bund (A9) Capacity 90 m^3
- Chiller Bund Capacity 5.6 m^3
- Acid Mist Eliminator Bund (A10) Capacity 3 m^3

3.11 Noise and Vibration

The location of the Direct Brass Line is in an existing repurposed building, and internally uses equipment expressly for the Direct Brass process, which has been updated from the previous Nickel-Plating Line, which was located in the building,
New scrubbers for both pre and process applications have been installed. The new scrubbers use equipment including motors that are designed to be as low noise emitting as possible. Expected noise level reports for the operation of the scrubbers are to be submitted with this application. The Royal Mint will have in place a planned prevention maintenance programme (PPM) that will be deigned to maintain the scrubbers correct operation.

Therefore, during normal operating conditions there are no potential emissions of noise or vibration that are considered to have the potential to impact the environment.

3.12 On Site Monitoring

3.12.1 Monitoring of Noise Emissions

There have been limited complaints (4 in total in over 10 years), with regards to noise from the site. Usually, a complaint is the result of equipment faults and are quickly resolved.
The incidents have been:

- Two failures of the silencer on a diaphragm pump on the Effluent Treatment Plant holding tanks.
- The volume of an onsite high-level alarm from the storm water containment system.
- A fault on a scrubber unit motor.

Following the above complaints there has been review and update to the relative maintenance programme as a result of these incidents.

Additionally, the choice and design of equipment for the Direct Brass Line has been such as to have low noise levels that will not lead to any increase in offsite noise impacts.

3.12.2 Monitoring of Odorous Emissions to Air

The potential for the new processes to emit an odorous emission has been assessed as low. The Royal Mint does not propose to undertake any routine monitoring.

3.12.3 Monitoring and Reporting of Emissions to Sewer

The introduction of the new processes is not expected to significantly change the emissions to sewer and monitoring will continue in line with current permit requirements.

3.12.4 Monitoring and Reporting of Emissions to Surface Water

The introduction of the new processes will not change the emissions to Surface Water and monitoring will continue in line with current permit requirements.

3.12.5 Water Abstraction Quality

The introduction of the new processes is expected to slightly reduce the volume of abstracted river water but it is not deemed to be a significantly reduction compared to changes that have occurred on the last 10 years.

3.12.6 Monitoring and Reporting of Emissions to Air

Local Exhaust Ventilation (LEV) Emissions Points A9 and A10 result from the lip and hood extraction systems on the Direct Brass Line.
The existing local exhaust ventilation systems have been historically sampled and proven to be insignificant. Improvement Programme Requirement IP14 on Environmental Permit VP3539SL (later KP3135KV) and Improvement Programme Requirements IP19, IP20 and IP21 on Environmental Permit KP3135KV have previously been submitted as evidence of the significance.

Given that the systems proposed to be installed are similar in design to and operation as the existing systems no routine monitoring is considered necessary.

Based on calculated data for the proposed new local exhaust ventilation systems the following emissions are considered likely to arise from emissions points A9 and A10.

Parameter	Emission Point A9	Emission Point A10
Copper	0.05 mg/Nm^3	N/A
Zinc	0.05 mg/Nm^3	N/A
Hydrogen Cyanide	< 1ppm v/v	N/A
Sulphuric Acid Mist	N/A	2.4 mg/Nm^3
Sulphur Dioxide	N/A	0.6 mg/Nm^3

The Royal Mint will maintain all existing management controls to ensure that the emissions from these systems remain insignificant:

- The LEVs are subject to the mandatory testing required under the COSHH regulations to ensure adequacy in extraction and control;
- All acid/alkali and cyanide scrubber units are maintained at the optimum working efficiency though a proactive PPM schedule;
- There are no significant process changes to the plant and equipment; and there are no significant raw materials or chemical changes that could alter the characteristics of the installation and its associated emissions.

In the event that any of the above management controls are breached, then The Royal Mint will formally notify and advise the Natural Resources Wales as required by schedule 5 of the permit.

The Royal Mint is proposing, following a period of commissioning, to undertake sampling of emission points A9 and A10 to verify the calculated data.

3.12.7 Monitoring and Reporting of Waste Emissions

Waste arising from daily site operations is segregated for separate collection and disposal at source. Data on the quantities of waste collected will be recorded as part of the site's environmental management system record keeping process. Duty of care transfer notes and hazardous waste consignment notes are completed and copies are retained on site for all wastes sent for off-site disposal.

It is expected that volumes of waste generated by the site will reduce following the decommissioning of the plants identified in the submission.

All waste data will be reported to Natural Resources Wales in accordance with Schedule 4, Table S4.3 Performance Parameters of the permit.

3.12.8 Monitoring of Process Variables

The Royal Mint will continue to report all process variables as required by Schedule 4, table S4.1 and S4.2.
Excluding Emission / Monitoring Point A14, which will be decommissioned as part of the application.

3.12.9 Environmental Monitoring (Beyond the Installation)

In similarity with the existing permit requirements, The Royal Mint does not propose to carry out any environmental monitoring (beyond the installation).

3.12.10 Reporting of Emissions

All emissions arising from the Installation shall be monitored and reported on in accordance with Schedules 3 and 4 of the existing permit.

3.12.11 Closure and Decommissioning

All of the plants that are scheduled for removal, shall be decommissioned in accordance with the relevant section of the closure and decommissioning plan submitted and agreed with Natural Resources Wales.

The decommissioning and closure methodology that shall be followed by The Royal Mint shall follow the hierarchy broadly defined below:

1. Reduction in process inventory and chemicals.

2. Production operations cease.

3. Isolation and making safe of all equipment and systems associated with plant.

4. Draining down and removal of all process fluids and materials.

5. Cleaning down and inspection of plant and equipment.

7. Ongoing monitoring and investigation as required through the Site Protection Monitoring Programme.

Each of the process lines scheduled for removal will follow the above generic assessment process. Prior to the formal decommissioning of the process lines a detailed decommissioning plan will be established by the Site Engineering Department which provides specific detail in all aspects of the plant. All contractors that are involved in the decommissioning of any process line will be required to provide detailed method statements and risk assessments that meet both the requirements of The Royal Mint and Natural Resources Wales and the records of decommissioning will be kept.

If it is preferred The Royal Mint will write a project specific Plant Closure Plan and submit to the NRW for approval at least 3 months before the commencement of the plant(s) decommissioning.

3.12.12 Multiple Operator Installations

Under the proposed variation the operation of the CHP will be a directly associated activity coming under the operational permit of another operator. The Royal Mint will purchase the gas fuel for the CHP and will receive the electricity generated and heat from the plant.

3.12.13 Transfers to Off-Site Effluent Treatment Plant

This Section does not apply to any aspect of The Royal Mint's operations as a result of the changes. All effluents are treated on site prior to release to the public sewerage system.

4- Emission Benchmarks

The applicable emission benchmarks associated with the installation are detailed within the sections below:

4.1 Emissions to Air

The changes bought about through the proposed variation works will initially increase the emissions released to atmosphere from the site. As existing processes are decommissioned then the emissions are expected to reduce.

The variation to emission points A9 and A10 will effectively replace the emissions from the decommissioned process lines.

At present there are a total of 22 identified authorised emission points to air.

It is proposed that following the requested permit variation and the plant decommissioning the following emission points will be in place.

Emission Point	Source	Pollutant Parameter	Sector Benchmark	Emission Releases
A9	DBP1 & CTP1 (Direct Brass Plating Line and Cyanide Treatment Plant. All cyanide Tanks)	Hydrogen cyanide	Hydrogen cyanide 5 mg/m³ How to comply with your environmental permit Additional guidance for: The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	<0. 1 mg/m³

A10	DBP1 (Direct Brass Plating Line, Tanks 03, 04, 05 & 08)	Sodium Hydroxide Sulphuric Acid	N/A	<0.01 mg/m³
A15	Armour Lines 1 and 2 (Nickel Plating Lines) Tanks 15 - 30	Nickel Sulphamate Nickel Chloride Boric Acid	2mg/m³ (Nickel) 2mg/m³ (Nickel)	<0.01 mg/m³
A16	Armour lines 1 and 2 (Nickel Plating Lines) Tanks 3, 4, 5, 8	Sodium Hydroxide Sulphuric Acid	N/A 5mg/m³	<0.01 mg/m³
A17-A27	Annealing Ovens Stacks 1-3	Products of combustion (NOx, CO)	200mg/mg³ (NOx) None Stated (CO)	<0.01 mg/m³
A28	Mill LEV Stack	Water Vapour Oil Mists	None stated	Not known
A29	Die Heat Treatment Ovens	Products of combustion (NOx, CO)	200mg/mg³ (NOx) None Stated (CO)	<0.01 mg/m³
A30	Trial Plating Plant, and Nickel Baths	Sulphuric Acid Nickel Sulphamate Nickel Chloride Boric Acid	N/A 2mg/m³ (Nickel)	<0.01 mg/m³
A31	Trial Plating Plant, Zinc Copper Cleaning Station Baths	Potassium Sodium Hydroxide Cyanide	N/A	<0.01 mg/m³

Benchmark values taken from: How to comply with your environmental permit Additional guidance for: The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)

4.2 Emissions to Water

The changes bought about through the proposed variation works will not significantly change the emissions released to controlled waters via authorised release point W1.

All emissions are the result of once through, non-contact cooling water and surface runoff only.

All emissions will be free of oil and have a conductivity of below 650 micro Siemens (µS/cm).

Substance	Sector Benchmark Concentration mg/l	Emission releases
Flow	NA	400 m^3/day
Temperature	As stated in permit	<30°C
Conductivity	NA	650 µS
Total Suspended Solids	50 mg/l	50 mg/l

4.3 Emissions to Sewer

The changes bought about through the proposed variation will not significantly change the emissions released to authorised release point S1 – Emissions to sewer.

The Royal Mint's current environmental permit has in place the following conditions on discharges to sewer at S1:

Substance	Sector Benchmark Concentration mg/l	Emission releases
Free Cyanide	0.2 mg/l	0.2 mg/l
Copper and its compounds	1.0 mg/l	1.0 mg/l
pH	Minimum 6 – Maximum 11	Minimum 6 – Maximum 11

These conditions will continue to meet by the introduction of the Direct Brass Plating Line.

The changes in process will not require the current Trade Effluent Discharge consent (Ref No. TE409) to be changed as the substances emitted will be in line with the current chemistry.

These remain as:

Substance	Sector Benchmark Concentration mg/l	Emission releases mg/l	Benchmark met
Cadmium	0.01	<0.01	Yes
Free Cyanide	0.2	< 0.2	Yes
Chromium VI	0.1	<0.01	Yes
Chromium, total	1.0	<0.1	Yes
Copper	1.0	<1.0	Yes
Nickel	1.0	<1.0	Yes
Zinc	2.0	< 1.0	Yes
BOD	As trade effluent consent	No parameters given on consent	Yes
COD	As trade effluent consent	500	Yes
Sulphate	As trade effluent consent	<1800	Yes
Iron	None stated	<1	Yes
Free Chlorine	None stated	<1	Yes

The preliminary consented emission limit values as defined by Dwr Cymru/ Welsh Water Trade Effluent Discharge Consent (Ref No. TE409) are therefore applicable to the site:

Maximum volume to be discharged per day = 673 m^3/day

Maximum flow rate = 36 m^3/hour or 10 l/sec

Total copper = 4 mg/l

Total Lead = 2 mg/l

Free Cyanide = 3 mg/l

Total Sulphate (as SO4) = 1800 mg/l

Ammonia (as N) = 15 mg/l

Over the last three years the site average discharge has been around 227 m^3/day. The discharge process is a batch process, so there will be no impact on the consented discharges.

4.4 Emissions to Land

There will be no emissions to land arising from the process.

5- Impact

The Environment Agency's Horizontal Guidance Note H1 – Environmental Assessment and Appraisal of BAT was completed as part of the original application.

At the time of the original assessment all process emission points were assessed and screened against the required parameters. Since the issuance of the site permit the site has carried out further impact assessment as part of Improvement Condition 14, Improvement Condition 20 and Improvement Condition 21. All findings have been reported to the Environment Agency / Natural Resources Wales as required.

Given the nature of these improvement programme works, in that no new significant pollutant sources are being introduced to the Installation, The Royal Mint believe that the overall impact of the site, following full implementation of the planned changes, will be reduced.

The Royal Mints justification for this approach is outlined below:

A number of the key emission sources will be removed from site;

- Zinc Plating Line1will be decommissioned and emissions from this source A1 and A2 will be removed.
- Copper Plating Lines 2 and 3 will be decommissioned and emissions from these sources A3, A4, A7 and A8 will be removed.
- The casting process has been shut down resulting a requirement to remove emission point A14.
- A9, A10 Nickel Plating Line 2 has been replaced by the Direct Brass Process. The replacement process has been designed to meet the most stringent emissions limits and will be significantly below the indicative sector BAT emission levels.
- No changes have occurred to the remaining identified significant emission sources on site.

The Royal Mint has commissioned an Air Quality Assessment, the report of which will be submitted as part of the variation application and using NRW criteria and professional judgement the maximum impact of the new pollution sources is considered not significant.

The impact of the new pollutant emissions on local habitat sites was also assessed and found to be negligible compared with relevant critical loads.

It is therefore considered that current and future operations at the site do not have an adverse impact on local air quality.