ENERGY AND CLIMATE CHANGE ENVIRONMENT AND SUSTAINABILITY INFRASTRUCTURE AND UTILITIES LAND AND PROPERTY MINING AND MINERAL PROCESSING MINERAL ESTATES WASTE RESOURCE MANAGEMENT

wardell-armstrong.com



ALTILIUM METALS LTD

BLACK MASS PROCESSESSING AND THE PRODUCTION OF CATHODE ACTIVE MATERIAL (CAM)

NON-TECHNICAL SUMMARY

APRIL 2024





DATE ISSUED:	APRIL 2024
JOB NUMBER:	BM12446
REPORT NUMBER:	0001
VERSION:	V1.0
STATUS:	Final

ALTILIUM METALS LTD

BLACK MASS PROCESSING AND THE PRODUCTION OF CATHODE ACTIVE MATERIAL

NON-TECHNICAL SUMMARY

MARCH 2024

PREPARED BY:

Dominiqua Drakeford-Allen Principal Waste & Resource Consultant

Doraly and the

REVIEWED BY:

Alison Cook

Technical Director

Alusen Cat

APPROVED BY:

Alison Cook

Technical Director

alunan Sat

This report has been prepared by Wardell Armstrong LLP with all reasonable skill, care and diligence, within the terms of the Contract with the Client. The report is confidential to the Client and Wardell Armstrong LLP accepts no responsibility of whatever nature to third parties to whom this report may be made known.

No part of this document may be reproduced without the prior written approval of Wardell Armstrong LLP.



Wardell Armstrong is the trading name of Wardell Armstrong LLP, Registered in England No. OC307138.

Registered office: Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom

UK Offices: Stoke-on-Trent, Birmingham, Bolton, Bristol, Bury St Edmunds, Cardiff, Carlisle, Edinburgh, Glasgow, Leeds, London, Newcastle upon Tyne and Truro. International Office: Almaty.

ENERGY AND CLIMATE CHANGE ENVIRONMENT AND SUSTAINABILITY INFRASTRUCTURE AND UTILITIES LAND AND PROPERTY MINING AND MINERAL PROCESSING MINERAL ESTATES WASTE RESOURCE MANAGEMENT



CONTENTS

1	INTRODUCTION	1
2	SITE LOCATION AND SETTING	2
3	PROPOSED ACTIVITIES	2
4	ENVIRONMENTAL PERMIT APPLICATION	3
5	ENVIRONMENTAL RISK AND MITIGATION MEASURES	4

DRAWINGS	TITLE	SCALE
BM12446-001-P0	Permit Boundary Plan	1:500 @ A2



1 INTRODUCTION

- 1.1.1 Altilium Metals Ltd have commissioned Wardell Armstrong LLP in preparing a permit application for their pilot facility, located at Estover Road, Plymouth.
- 1.1.2 Using state-of-the-art equipment, Altilium Metals Ltd have designed their innovative process to treat waste black mass from end-of-life lithium-ion Electric Vehicle (EV) batteries to recover the constituent materials via sequential hydrometallurgical processes, and subsequently use the recovered materials in the production of metal oxide, namely cathode active material, for trial-scale supply to manufacturers of new EV batteries.
- 1.1.3 The recovery of critical minerals such as lithium, graphite and cobalt, and the production of cathode active material (also referred to as 'CAM') fall within the scope of the Government's Critical Minerals Strategy, and the scheme will support a circular economy of critical minerals. Additionally, the processes also include minerals on the UK watch list, including manganese and nickel.
- 1.1.4 Enhanced pre-application advice was requested from the Environment Agency on 27th September 2023, prior to submitting the permit application. A meeting was held with Wardell Armstrong and Cath Terry on 9th November 2023, which resulted in agreement to proceed with submitting the application based on the proposed permit application outline set out in the Enhanced Pre-Application Advice Technical Note prepared by Wardell Armstrong.
- 1.1.5 The process was piloted under a Regulatory Position Statement granted by the Environment Agency for a site in Devon. Through the success of this trial, Altilium Metals Ltd are looking to expand the scale and further refine the processes at a new unit located in Plymouth. Further detail on the site location and setting is provided in Section 2.
- 1.1.6 A high-level summary of the proposed activities is provided in Section 3.
- 1.1.7 An overview of the contents of the permit application is provided in Section 4.
- 1.1.8 A summary of the key environmental protection measures which will be put into place is provided in Section 5.



2 SITE LOCATION AND SETTING

- 2.1.1 The address of the site is Unit 2 Plymbridge House, Estover Road, Plymouth, PL6 7PY.
- 2.1.2 The National Grid Reference (NGR) for the site is SX 51606 59801.
- 2.1.3 The site is wholly within a building, which is situated within Estover Industrial Estate, which has a number of existing commercial and industrial units. To the south and southwest is the town of Estover, and the nearest residential receptors are houses on Forget Me Not Lane, 380m to the northeast of the site.
- 2.1.4 Protected habitats are within close proximity of the site, including Plymbridge Lane and Estover Road Site of Special Scientific Interest, located near to the rear of the site building.
- 2.1.5 The site location and permit boundary are shown on drawing BM12446-001-PO.

3 PROPOSED ACTIVITIES

- 3.1.1 The site operations fall within two permittable activities, which are briefly described below, and further detail is provided in the Operating Techniques Report, including process flow schematics.
- 3.2 Waste Activity
- 3.2.1 The first phase comprises the treatment of hazardous black mass to produce raw materials, which will then be used for the second phase of inorganic chemical production.
- 3.2.2 Black mass will undergo acid leaching using chemicals to sequentially separate the "reactive" contents of the waste black mass feedstock from the "inert" contents.
- 3.2.3 It is expected that approximately 100 tonnes of black mass feedstock will be processed per annum (a maximum of 750kg per day).
- 3.2.4 The chemical treatment of hazardous waste below the capacity thresholds as specified in Section 5.3 of the Environmental Permitting Regulations (England and Wales) 2016 would therefore require this element of the process to be permitted as a waste activity.



3.3 Production of Inorganic Chemicals

3.3.1 The second phase of the activity is for the production of cathode active materials (CAM), a multi-metal oxide. It is expected that the production of these inorganic materials would be listed under Schedule 1, Section 4.2 Part A(1) (v) of the Environmental Permitting Regulations (England and Wales) 2016; as the production of inorganic chemicals comprising multi-metal oxides.

4 ENVIRONMENTAL PERMIT APPLICATION

- 4.1.1 A number of documents have been prepared to support the permit application and demonstrate that the environmental impact from the operations is minimised as far as possible. The permit application comprises of the following documentation:
 - Application forms;
 - o Part A
 - o Part B2
 - o Part B3
 - o Part B4
 - o Part F1
 - This Non-Technical Summary;
 - Operating Techniques Report;
 - Environmental Management System summary;
 - Amenity and Accident Risk Assessment;
 - Habitats Risk Assessment;
 - Best Available Techniques (BAT) assessment;
 - End of Waste Assessment;
 - Dust and Emissions Management Plan;
 - Site Condition Report;
 - H1 Screening Tool outcome and summary note;
 - Associated drawings.



- 4.1.2 The above listed documentation demonstrate that the site will be operated and managed in accordance with the relevant legislation and the Environment Agency guidance.
- 4.1.3 The facility is currently in the process of having the equipment (including abatement systems) fully commissioned. Therefore, the permit application will be updated with an emission point plan once the number of emission points is confirmed. To assess the environmental risk from the facility, worst case scenarios for the emissions to air have been used in the assessment, for example there will be a maximum of four stacks, so four stacks has been used in the H1 assessment (see H1 Summary Note).
- 4.1.4 Additionally, the required number of scrubbers is yet to be confirmed. Specific detail about the equipment, for example, pressure relief valves, and process sampling points will also be confirmed once finalised.
- 4.1.5 An indicative facility layout plan (BM12446-003 has been prepared to provide a summary of the equipment used for each phase of the process. This plan is indicative and will be subject to change once the number of scrubbers and emission points are confirmed.

5 ENVIRONMENTAL RISK AND MITIGATION MEASURES

- 5.1.1 As part of the environmental permit application process, an Amenity and Accident Risk Assessment has been prepared to fully assess the risk to the environment from the site activities, and the control measures which will be implemented to minimise these risks.
- 5.1.2 A Habitats Risk Assessment has also been prepared to assess the risk from the activities to nearby protected Habitats.
- 5.1.3 The site will operate in laboratory conditions using state-of-the-art equipment, wholly inside a building. The building comprises of impermeable surfacing with a sealed drainage system.
- 5.1.4 The H1 Screening Tool has been completed to assess the emissions to air.
- 5.1.5 Stringent waste acceptance procedures will be in place, and the site will only accept one specific waste stream, black mass in powdered form. Black mass will arrive in secure bags, to minimise the risk of escape of particles. Nevertheless, the risk must be



adequately controlled and a Dust and Emissions Management Plan has been prepared as part of the permit application.

- 5.1.6 All chemicals and reagents used in the process will be stored appropriately in accordance with their safety data sheets.
- 5.1.7 Overall, the innovative activities carried out by Altilium will enable the recovery of critical minerals. The hydrometallurgical recycling process can recover over 95% of the technology metals, for direct use in new batteries, saving over 50% of carbon emissions compared to mining virgin raw materials. Therefore the activities have a far-reaching positive environmental impact.



DRAWINGS



		DO NOT SCALE FROM THIS DRAWING
		<u>KEY</u>
		SITE BOUNDARY
V 02		
TO N		1
	$\langle // / / \langle$	1
		A FIRST ISSUE
		CLIENT
		ALTILIUM METALS LTD.
		PROJECT ACT 2,
		UNIT 2 PLYMBRIDGE HOUSE, ESTOVER ROAD, PLYMOLITH
		DRAWING TITLE
		PERMIT BOUNDARY PLAN
		DRG No. BM12446-001 REV SUIT. CODE
		DRG SIZE A2 1:500 DATE 13/10/23
		DRAWN BY CHECKED BY APPROVED BY LP LP
	© Crown Copyright and database rights 2024	armstrong
	Ordnance Survey 0100031673	

wardell-armstrong.com

STOKE-ON-TRENT

Sir Henry Doulton House Forge Lane Etruria Stoke-on-Trent ST1 5BD Tel: +44 (0)1782 276 700

BIRMINGHAM

Two Devon Way Longbridge Technology Park Longbridge Birmingham B31 2TS Tel: +44 (0)121 580 0909

BOLTON

41-50 Futura Park Aspinall Way Middlebrook Bolton BL6 6SU Tel: +44 (0)1204 227 227

BRISTOL

Temple Studios Temple Gate Redcliffe Bristol BS1 6QA Tel: +44 (0)117 203 4477

BURY ST EDMUNDS

Armstrong House Lamdin Road Bury St Edmunds Suffolk IP32 6NU Tel: +44 (0)1284 765 210 **CARDIFF** Tudor House 16 Cathedral Road Cardiff CF11 9L Tel: +44 (0)292 072 <u>9191</u>

CARLISLE Marconi Road Burgh Road Industrial Estate Carlisle Cumbria CA2 7NA Tel: +44 (0)1228 550 575

EDINBURGH Great Michael House 14 Links Place Edinburgh EH6 7EZ Tel: +44 (0)131 555 3311

GLASGOW

24 St Vincent Place Glasgow G1 2EU Tel: +44 (0)141 428 4499

LEEDS 36 Park Row

Leeds LS1 5JL Tel: +44 (0)113 831 5533

LONDON

Third Floor 46 Chancery Lane London WC2A 1JE Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE

City Quadrant 11 Waterloo Square Newcastle upon Tyne NE1 4DP Tel: +44 (0)191 232 0943

TRURO

Baldhu House Wheal Jane Earth Science Park Baldhu Truro TR3 6EH Tel: +44 (0)187 256 0738

International office:

ALMATY 29/6 Satpaev Avenue Hyatt Regency Hotel Office Tower Almaty Kazakhstan 050040 Tel: +7(727) 334 1310

