



Non-Technical Summary

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1 INTRODUCTION

This report has been prepared to address the bespoke Environmental Permit (EP) application for the operation of the Mineral Processing Facility (MPF) and a schedule 5 request for more information response (received on 8th February 2022) at Hemerdon Mine. In addition to responding to the schedule 5, TW are also applying to change the operator’s name from Tungsten West Limited to Drakelands Restoration Limited.

In accordance with Environment Agency (EA) guidance this non-technical summary has been prepared to provide an explanation of exactly what is being applied for, the regulated facilities the key technical standards and control measures that will be implemented.

1.1 Site location

The Hemerdon Deposit is situated 6 miles northeast of the city of Plymouth in Devon, England (**Error! Reference source not found.**). It is readily accessible via sealed roads and between August 2015 and October 2018 was acting as an operational mine site under previous ownership.

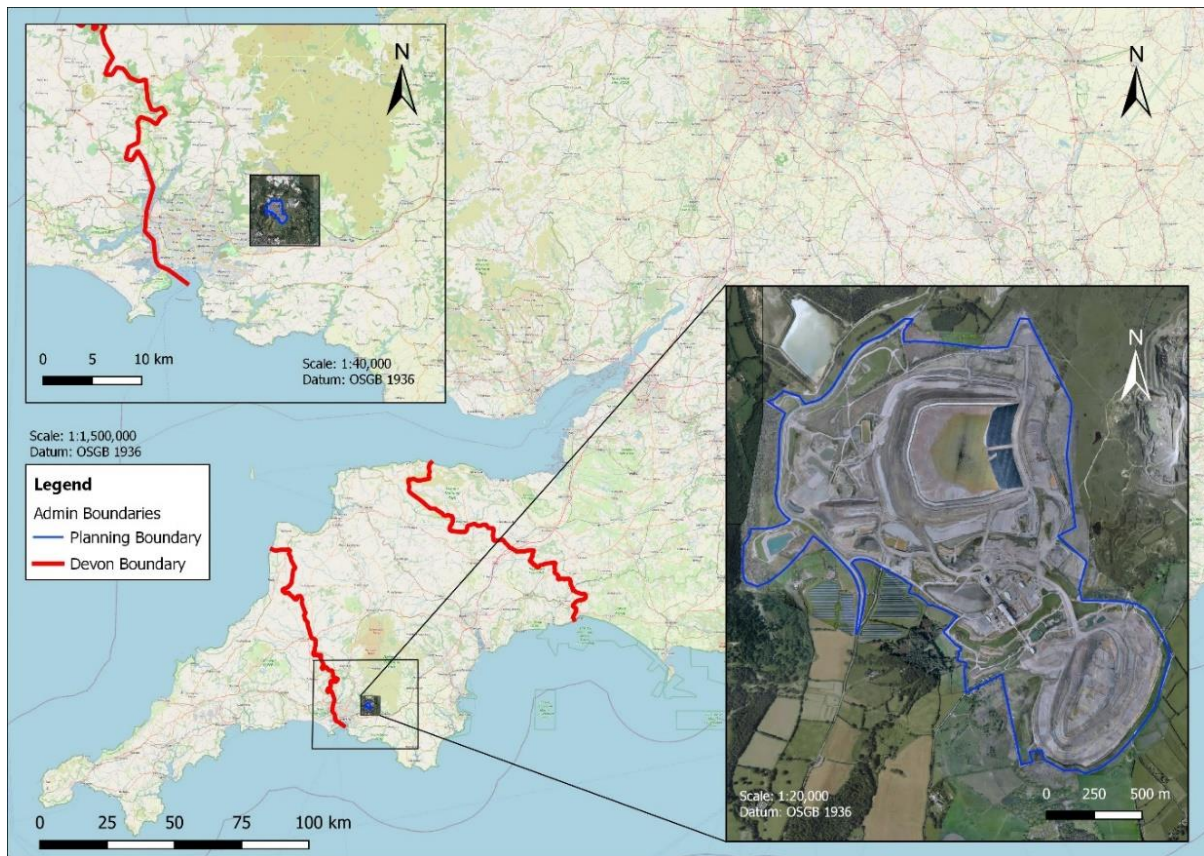



Figure 1 Hemerdon Mine location in SW England

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1.2 Site history

Tungsten West plc (Tungsten West) has taken ownership of the Hemerdon Mine as previously operated by Wolf Minerals (UK) Limited (Wolf). The property consists of the Hemerdon tungsten-tin mine formed of the asset base that was previously established, developed and operated by Wolf.

Tungsten West plc is the owner and operator of Hemerdon Mine. The company has three subsidiary companies, Drakelands Restoration Limited, Tungsten West Services Limited and Aggregates West Limited which all provide mining services to Drakelands Restoration Limited to operate Hemerdon Mine.

Due to the company becoming a public limited company the EP's on site will be held with Drakelands Restoration Limited, therefore a change in operator request is submitted with this application to change the operator from Tungsten West Limited (now Tungsten West plc) to Drakelands Restoration Limited for the operation of the MPF at Hemerdon Mine. All associated forms and fees are enclosed in appendix 8. Figure 2 below shows Tungsten West plc structure.

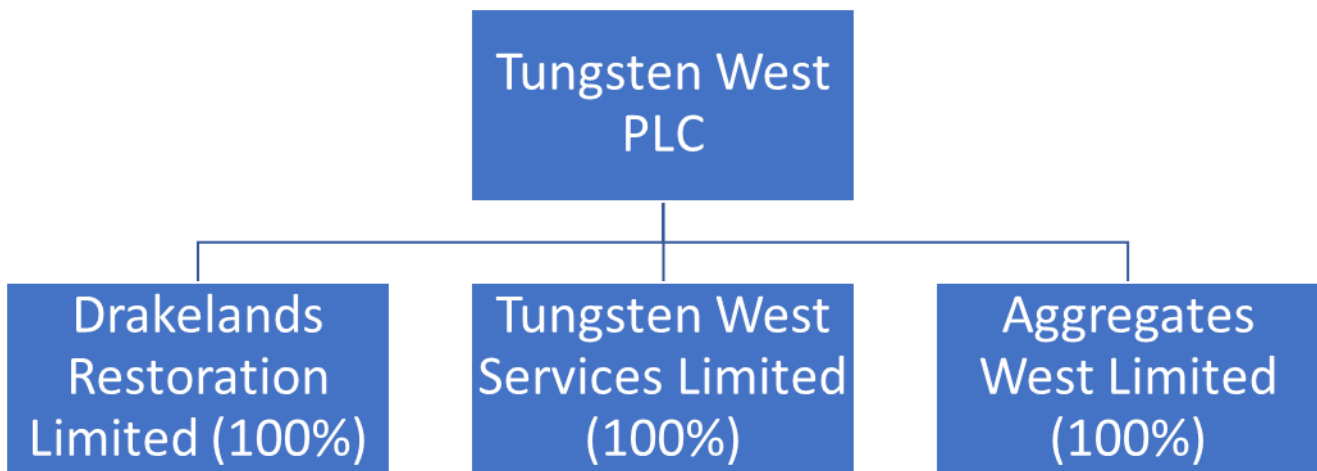


Figure 2 Tungsten West plc Structure

The site and general operations is regulated by the Mineral Planning Authority (MPA) under the extant planning permission (ref. 9/42/49/0542/85/3). Tungsten West has entered into a Lease (the Lease) with local land and mineral rights owners that entitles Tungsten West to work the mineral and hold certain rights at Hemerdon Mine.

The processing and mining waste activities fell under the Environmental Permitting Regulations and was regulated by two bespoke EP's, an installation and a mining waste EP in addition to several water licenses. The installation permit and mining waste permitted were rescinded during the receivership with agreement from the EA. It is Tungsten West's intention to resume mining by utilising the MWF and are currently in the process of re applying for the Mining Waste Facility (MWF) and MPF EP in order to recommence mining operations in 2023.

Table 1 outlines Tungsten West's current position on EP's.

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Table 1 Summary and status of Environmental Permits held by Tungsten West

Permit reference	Status
EPR/JB3209MD/A001	Hemerdon Mining Waste Facility (MWF) including a full license to discharge trade effluent at ED1 and ED2 – determination due December 2022.
EPR/AP3203ML/A001	Hemerdon Mineral Processing Facility (MPF) – currently in the process of being determined
EPR/QP3420XX	Smallhanger south flood attenuation tank discharge – operational
EPR/DB3290RH	Elford's Pond – operational
SW/047/0002/005	Loughter Mill Impoundment – operational
SW/047/0002/004	Loughter Mill Abstraction – duly made 10/12/21, determination due October 2022.
SW/047/0002/003	Tory Pond Impoundment – operational
SW/047/0002/001	Tory Pond Abstraction – duly made 10/12/21, determination due October 2022
EPR/WB3893DT/A001	Sewage treatment – operational
EPR/VB3191DN	Sealed Sources -operational
SW/047/0002/020	Pit Abstraction (dewatering) – duly made 13/07/22, determination due November 2022

Tungsten West has undertaken numerous technical studies the reason why the previous operation was unsustainable. The concepts for extracting tungsten and tin concentrates from a prepared mineral ore remain appropriate, however Tungsten West have identified opportunities to enhance extraction at Hemerdon. This includes the introduction of a new Primary Jaw Crushing and Secondary Cone crushing circuit and ore sorter stockpile and the introduction of X-Ray Transmission Ore Sorting.

This non-technical summary has been prepared to describe the details of the modifications to existing infrastructure to support an updated application for proposed activities at Hemerdon.

2 PROPOSED ACTIVITIES ON SITE

The proposed activities to be undertaken at Hemerdon include the following:

- Primary, secondary and tertiary crushing and screening of mineral ore;
- X-Ray transmission ore sorting;
- Dense media separation (DMS);
- Grinding, fines and floatation separation;
- Concentrate drying;
- Concentrate reduction;

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- Magnetic separation;
- Separation and tin concentrate drying; and
- A mining waste facility.

The facility will produce non-ferrous mineral concentrates that will be exported overseas for subsequent processing into non-ferrous metals. Mineral concentrates produced will comprise tungsten as Wolframite and tin as Cassiterite.

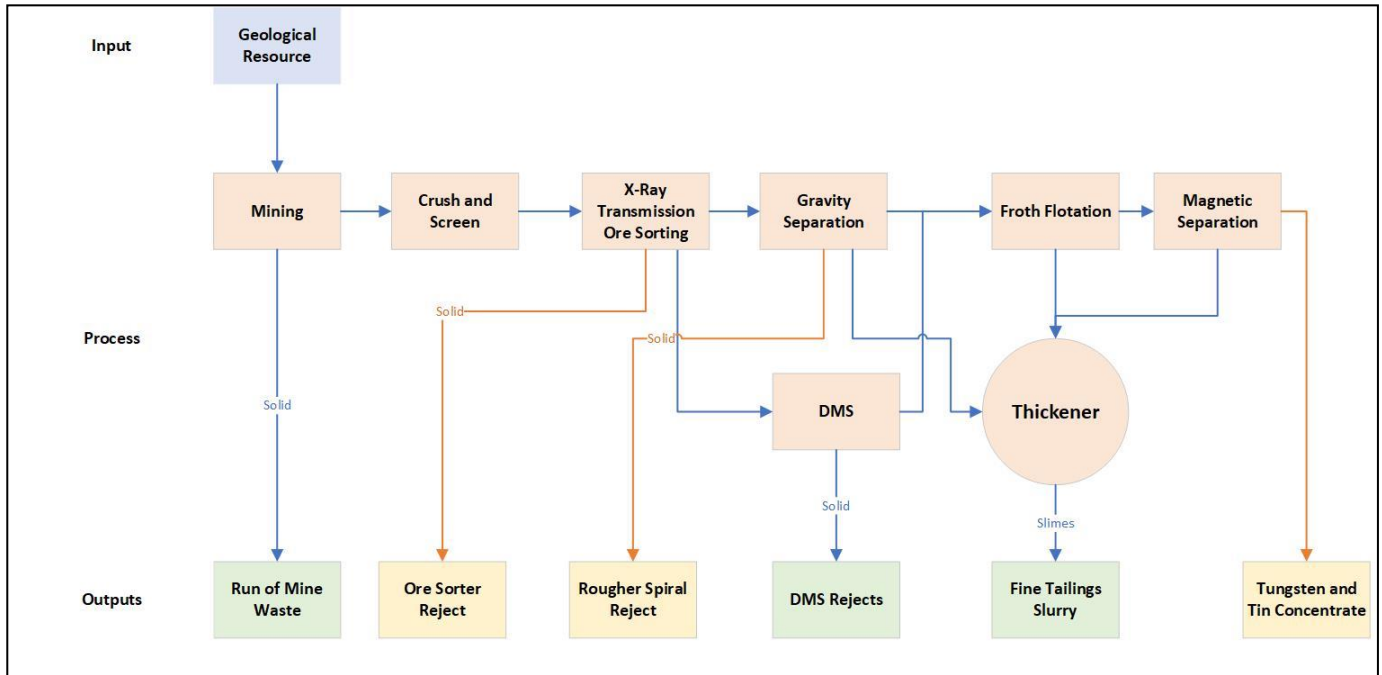



Figure 3 Tungsten West proposed process flow diagram

3 MINERAL PROCESSING FACILITY

The MPF will consist of the following unit operations, modifications to the proposed development is highlighted below in table 2.

Table 2 MPF unite of operation

Unit Operation	New/Unchanged from previous development
Run of Mine	New
Primary Crushing	New
Secondary Crushing	New
Ore Sorter Stockpile and Reclaim	New
Ore Sorting	New

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Tertiary Crushing	Unchanged – reduced duty
Deslime and Fines Gravity Separation	Unchanged – reduced duty
Dense Media Separation	Unchanged – reduced duty
Primary Milling	Unchanged – reduced duty
Pre-concentrate Milling	Unchanged – reduced duty
Floatation	Unchanged
Reduction Roasting	Unchanged
Low Intensity Magnetic Separation	Unchanged
High Intensity Magnetic Separation	Unchanged
Tin separation and concentrate drying	Unchanged
Concentrate Blending and Dispatch	Unchanged
Water Management and Treatment	Unchanged
Coarse Tailings Disposal	Unchanged – reduced duty
Fine Tailings Thickening and Pumping	Unchanged – reduced duty
Reagent Preparation and Dosing	Unchanged – reduced duty

The following sections describe the new/modified areas of the MPF in more detail.

3.1 RoM Pad


The new RoM pad will be located to the north of the tertiary crusher building in the vicinity of the old mining offices under Wolf's operation. Access will come directly off the haul road. The expected capacity of the new RoM pad is c. 50,000 tonnes.

3.2 Primary and Secondary Crushing

The existing primary and secondary hybrid roll crushers, within area 110, cannot reasonably crush hard (or 'fresh') Hemerdon ore. These rolls crushers are being replaced with a mobile jaw crusher complete with pre-screen and a secondary cone crusher in closed circuit with a screen. The new crushing circuit will be located to the northeast of the MPF, parallel to the haul road and is to be known as area 115.

The primary jaw crusher assembly will be mounted on a wheeled frame and include a grizzly screen to remove ore that is already at the correct size for secondary crushing, c.130mm, with the grizzly oversize being crushed through Metso Outotec's Nordberg C130 jaw crusher.

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For years 1 and 2, the feed rate to the pre-screen will average c. 600tph based on an operating time of 15 hours per day, from year 3 onwards the throughput is expected to increase to c. 800tph for the same daily operating time. Plant availability and the blasted stocks particle size distribution will cause deviations to this nominal throughput. The pre-screen is expected to remove a significant amount of tonnage from the jaw crusher. The table 3 below shows the expected tonnages to be crushed by the jaw crusher for each time period.

Table 3 Expected Tonnages - Jaw Crushers

Time Period	Total Feed tph	Pre Screen Undersize tph	Feed to Jaw Crusher tph
Year 1	600	422	178
Year 2	600	299	301
Year 3+	800	467	333

The screen undersize and jaw crusher product will be conveyed to a screen where the -80mm is removed and the +80mm is crushed through a GP300S cone crusher, also supplied by Metso Outotec. The crusher discharge will be conveyed back onto the screen in a closed circuit configuration. As with the jaw crushing configuration, it is expected that screen ahead of the cone crusher will remove a large quantity of the tonnage. These tonnages are presented in the table 4 below.

Table 4 Expected Tonnages - Screen

Time Period	Total Feed to Screen tph	Feed to Cone Crusher tph
Year 1	901	301
Year 2	907	307
Year 3+	1336	536

Area 110/120 of the existing MPF building will be made redundant and no longer operational with the primary and secondary mobile crushing becoming area 115.


Please see Appendix A and B of Tungsten West's crusher position statement.

3.3 Stockpile

A stockpile of c. 8000m³ will be constructed to store -80mm crushed feedstock ahead of ore sorting. This is to allow for suitable redundancy for crusher maintenance without the risk of the plant running out of feed. The stockpile is to be located between the new area 115 and the ore sorting area, to the north, northeast of the tertiary crusher building.

The stockpile will have 2000m³ of "live" capacity with a further 6000m³ of "dead" capacity which will require material to be pushed into the feeders with a dozer. The crushed ore will be reclaimed via 2 feeders located

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in a tunnel underneath the center of the stockpile, with the potential for an additional two feeders to be added in the future.

3.4 Ore sorting

The ore sorting infrastructure will be installed to the north, northeast of the existing area 130 building. This area will be known as area 125.

The ore sorter sizing screen will be fed via conveyor and consist of a double deck screen inside a standalone cladded building. The screen will be conducted wet, with the two coarser sizes, -80+30mm (known as cobble) and -30+10mm (known as pebble) being conveyed to two separate storage hoppers. The -10mm will be pumped to the tertiary crusher dewatering screen.

From each hopper (13.5m³ capacity) two conveyors each will draw material to a dewatering screen ahead of the 4 ore sorters. The machines are manufactured by TOMRA and are COM XRT 1200/B 2.0 models. The underflow from the dewatering screens will be pumped back to the tertiary dewatering screen via a sump pump. The oversize will feed the sorters at nominal feed rates shown in the table 5 below although upstream factors such as RoM particle size distribution and degree of kaolinization may cause deviations from the tonnages presented.

Table 5 Ore Sorter feeds

Time Period	Cobble Ore Sorter Feed tph	Pebble Ore Sorter Feed tph
Year 1	155	94
Year 2	186	108
Year 3+	267	131


The ore sorters will use compressed air to “fire” the accepts (tungsten and tin bearing rock) from the rejects (waste rock). The ore sorter accepts will be combined with the -10mm ore sorter screen undersize at the tertiary crusher dewatering screen. Waste rock will be conveyed to a stockpile for either disposal at the mine waste facility or for potential sale as aggregate.

3.5 Tertiary Crushing

The ore sorter accepts and -10mm ore sorter bypass material is combined at the tertiary dewatering screen, which will be housed in its own cladded building on the northeastern side of the tertiary crusher building. This screen will separate out the -0.8mm material and pump it into the existing fines feed storage tank with the asset code 160-TK-01.

The +0.8mm material will be conveyed using the existing 130-CV-05 (with extended tail and shortened head), to the tertiary sizing screen. On this screen the -8mm material will be removed and using a short shuttle conveyor, placed on to the existing, but extended 140-CV-06 and conveyed via 140-CV-07 to the DMS feed bin (140-BN-01). The screen oversize will be conveyed by the existing 130-CV-04 to the pre-existing tertiary crushers (2 x Sandvik CH 440) in a close circuit configuration.

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Expected tonnages through the tertiary crushers are shown below in table 6, however variations will be expected based on RoM particle size distribution, degree of kaolinisation and the ore sorter accept mass pull.

Table 6 Expected tonnages - tertiary crushers

Time Period	Tertiary Crusher Feed tph
Year 1	62
Year 2	106
Year 3+	133

3.6 Overall Crushing data

Table 7 and 8 below shows a comparison between the new Tungsten West operations and the previous Wolf operations.

The primary and secondary comparison shows that the inclusion of the pre-screening steps ahead of both the primary and secondary crushers significantly reduces the amount material that is crushed compared to Wolf's configuration where all material passed through both primary and secondary crushers whether size reduction was required or not.

The influence of the ore sorters rejecting the coarse waste is strongly evident with large reduction in tonnages to the tertiary crushers.


Table 7 Tungsten West and Wolf Minerals Comparison - Primary and Secondary crushers

Primary/Secondary Time Period	Tungsten West Total Crushed tph	Hours per Day (76% availability)	Wolf Minerals Total Crushed tph	Hours per Day
Year 1	479	15	1028	24
Year 2	609	15	1028	24
Year 3+	869	15	1028	24

Table 8 Tungsten West and Wolf Minerals Comparison - tertiary crusher

Tertiary Time Period	Tungsten West Total Crushed tph	Hours per Day	Wolf Minerals Total Crushed tph	Hours per Day
Year 1	62	24	581	24
Year 2	106	24	581	24
Year 3+	133	24	581	24

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3.7 Modifications to Existing Concentrator

Dense Media Separation

For years 1 and 2 of operations the dense media separation circuit will run with a reduced capacity and a maximum throughput of 90tph, compared to a nameplate maximum of 400tph under Wolf's operation (although this throughput was never required). To facilitate this change, the existing secondary dense media circuit will be converted to operate in a primary dense media through a series of piping changes and increasing the hydro cyclone size from 360mm to 420mm.

In year 3, following the replacement of the primary dense media floats screens, primary dense media will be recommissioned, and the secondary dense media circuit will revert to its original duty.

Reduction Roasting

Tungsten West intend to produce a lower grade concentrate from the MPF and as such will bypass the reduction kiln.


4 MPF PRE OPERATIONAL AND IMPROVEMENT CONDITIONS

Table 9 outlines and provides an update regarding the previous preoperational and improvement conditions held with the MPF permit under the previous operator Wolf. Conditions highlighted in red identify areas still requiring monitoring and reporting for sign off from the EA.

Table 9 MPF Improvement Conditions and Pre-operational Conditions - Wolf Minerals


Reference	Requirement	Tungsten West position update
IC1	The Operator shall undertake a study to investigate the variation in the arsenic content in the raw flue gas release from the reduction kiln and the efficiency of the kiln scrubber system in abating this emission. The study shall include reference to the quantity of arsenic absorbed by the scrubber reagent and the concentration in the final release of air. A written report on the findings of the study and identification of the key performance and control measures for the operation of the scrubber plant shall be submitted to the Environment Agency for approval.	<p>A report was produced by SLR Consulting and submitted to the EA in July 2016.</p> <p>The report was approved by the EA (confirmation email by Rob Argent 24th January 2017).</p> <p>Although Tungsten West will not be operating the kiln.</p>
IC2	The Operator shall undertake a study to investigate the release of any radioactive substance from the Primary Crushing Plant and the potential for entrainment of any radioactive substance supplied to the subsequent processing operations within the facility. The study shall have consideration of and make reference to Pre-Operational Condition PO1 And Improvement	A Radioactive Monitoring Programme was submitted to the EA in January 2015. It was agreed with the EA that this IC date completion will be 3 years from the completion of commissioning which is

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	condition IC5 of Mining Waste Facility permit. A written report on the findings of the study shall be submitted to the Environment Agency.	February 2018. The study was included within the 2017 Q4 compliance report. In conjunction with the MWF permit, Tungsten West are in the process of devising a new radioactive monitoring programme.
PO1	Prior to the commencement of commissioning, the Operator shall provide a written commissioning plan, including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include the expected durations of commissioning activities and the actions to be taken to protect the environment during commissioning. Commissioning shall be carried out in accordance with the commissioning plan as approved.	The written programme of commissioning was submitted to the EA in March 2015 and approved in April 2015. Tungsten West accept this preoperational condition might be included as a requirement again.
PO2	Prior to the commencement of commissioning the Operator shall update the onsite Emergency Plan (as reference in PO3 of Mining Waste Facility permit) to incorporate the additional risks and appropriate control measures introduced by the operation of the Mineral Processing Facility at the site. The updated Emergency Plan shall be submitted to the Environment Agency for approval.	An external and internal emergency plan has been provided and approved by the EA for the MWF permit (reference EPR/JB3209MD). Included in appendix 9 is an Emergency Preparedness and Response Plan which details all potential emergencies on site.
PO3	Prior to the commencement of commissioning, the Operator shall submit to the Environment Agency for approval a protocol for the sampling and testing of the filter cake produced by the Water Treatment Plant for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.	WM3 classification has shown that dewatered discharges from the water treatment plant is classified as non-hazardous. Subject to EA approval, the dewatered tailings will be reintroduced to the tailings stream and deposited within the Mine Waste Facility. The protocol was submitted to the EA in 2015 and approved by the EA in April 2015.
PO4	Prior to the commencement of commissioning the Operator shall supply a written report to the Environment Agency that includes an 'as installed' site	The site drainage plan was submitted to the EA in 2015 and was approved in June 2015 –

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	<p>drainage plan, an inventory of installed storage tank volumes and their associated bunding capacities for the infrastructure of the water treatment plant (WTP) and the process plant wet bunded area (PPWBA). The report shall also include a summary of the accident response plan for any significant accidental release from equipment in these areas.</p>	<p>Tungsten West confirm there have been no alterations to site drainage.</p>
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5 TECHNICAL ASSESSMENTS

Several technical assessments have been reviewed and updated to reflect the proposed changes to the MPF in response to the schedule 5, notice of request for further information received on 8th February 2022 to demonstrate that the proposed activities will not give rise to an unacceptable impact to the environment.

5.1 Environmental Risk Assessment

Previously a H1 Environmental Risk Assessment (ERA) was prepared and submitted as part of the original MPF permit application in 2014 by Wolf. Tungsten West re submitted this ERA as part of the MPF permit application in 2021. However, guidance on ERA's have been updated and changes proposed to the MPF, therefore, an updated ERA has been prepared to reflect these updates.

The ERA is included in Appendix 3 and has considered global warming, point source emissions to air, noise and vibration (including low frequency noise and infrasound), fugitive dust, odour, fugitive emissions and potential for accidents and incidents.

The ERA concludes that with the implementation of the risk management measures, potential hazards from the MPF are not likely to be significant and no further assessment is required.

5.1.1 Surface water management

Surface water management across the entire site will be managed by numerous EP's and discharge licences. In particular surface water management and discharge from the Smallhanger north flood attenuation tank is currently authorised under a Local Enforcement Position (LEP) which is currently active until 30th April 2022. TW are currently in the process of devising a discharge application which will be submitted to the EA in Q1 2023.


5.2 Best Available Techniques

A Best Available Techniques and Operating Techniques (BATOT) report was prepared and submitted as part of the original MPF permit application submitted in 2014 by Wolf. Tungsten West resubmitted the BATOT report as part of the MPF permit application in 2021. Subsequently, a revised BATOT is included in Appendix 2 to reflect the proposed changes to the MPF.

5.3 Noise Impact Assessment, BS4142

A Noise Impact Assessment (NIA) (BS4142) has been updated and included in Appendix 4. The NIA has been carried out in accordance with guidance contained in British Standards (full reference within the NIA). The assessment has been completed with background sound levels established from the results of sound surveys and a computer-based model of the MPF for both day-time and night-time periods.

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The NIA concludes that development sound will have no effect at distant noise sensitive receptors. In the worst-case and closest receptors, it would be largely unnoticeable, or just perceptible.

It has been concluded from the findings of this assessment that the range of noise impacts for the proposed employment use development are acceptable with respect to overarching and local requirements for planning and noise.

5.4 Air Emissions Risk Assessment

An Air Emissions Risk Assessment (AERA) was prepared and submitted as part of the original MPF permit application submitted in 2014 by Wolf. Tungsten West resubmitted the AERA as part of the MPF permit application in 2021. An updated AERA is included in Appendix 6 to account for the proposed changes to the MPF and evaluate any potential impacts and necessary mitigation measures required.

The AERA concludes that there are no predicted exceedances of Air Quality Assessment Levels for nitrogen dioxide, sulphur dioxide, particulate matter (PM₁₀ and PM_{2.5}) or arsenic at any of the receptor locations and there are no predicted exceedances of dust deposition benchmarks for the protection of amenity at any receptor location.

5.5 Low Frequency Noise

Low Frequency Noise (LFN) will be addressed under the separate schedule 5, notice of request for more information issued to Tungsten West on 16th February 2022.

6 KEY TECHNICAL STANDARDS

The following key technical standards are appropriate to the application and have informed the application documents:


- Environment Agency guidance for the following
 - Risk assessment for your environmental permit – March 2021
 - Air emissions risk assessment for your environmental permit – September 2021
 - Best Available Techniques: environmental permits – February 2016
- Best Available Techniques (BAT) Reference Document for non-ferrous metal industries – June 2016
- PGN3/16 (12) Statutory guidance for mobile crushers and screening – September 2012
- PGN3.08 (12) Statutory guidance for quarry processes – September 2012
- The Air Quality Standards Regulations 2010
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra – July 2007

7 MANAGEMENT

The operation of Hemerdon Mine MPF will be undertaken in accordance with Tungsten West's Integrated Management System that will include the requirements for energy, quality, occupational health, environment and safety into a comprehensive set of procedures. The objective is to ensure that operations at the MPF are undertaken without causing harm to human health or the environment.

The Integrated Management System ensures that appropriate technical management is in place at the MPF and that technical development and training of staff is provided.

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8 CONCLUSION

The overall conclusion from the technical reports undertaken as part of this schedule 5 response concludes that there is unlikely to be a significant environmental impact as a result of the MPF at Hemerdon Mine.

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