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RED INDUSTRIES LTD

WALLEYS QUARRY LANDFILL SITE

ENVIRONMENTAL PERMIT VARIATION APPLICATION 2018

REVIEW OF STABILITY RISK ASSESSMENT

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1. INTRODUCTION

1.1 Application Context

Red Industries Ltd (hereafter referred to as the 'Operator') own and operate Walleys Quarry, a non-hazardous landfill site. The company was issued an Environmental Permit (ref EPR/DP3734DC) to operate the landfill, in November 2016.

Walleys Quarry Landfill Site (hereafter referred to as the 'Site') is located in Silverdale, Newcastle under Lyme, Staffordshire, at National Grid Reference SJ831460. The Site is permitted to accept a variety of non-hazardous wastes, such as MRF residual waste, commercial, industrial and inert waste materials. The Operator is also permitted to accept stable non-reactive hazardous waste in the form of asbestos containing material, however no such hazardous waste is accepted at the Site.

By making this permit variation application the Operator proposes to increase the annual waste inputs at this site from 250,000 tonnes to 300,000 tonnes.

This proposal will not require a need to increase the overall landfill void capacity or the site footprint. There will be also no changes in the waste types which are already permitted for disposal at the Site nor the current engineering construction details.

2. REVIEW OF EXISTING STABILITY RISK ASSESSMENT

2.1 Background

The original permit application for the Site was made in May 2002 (BR9677) and determined in June 2005. Having reviewed the documentation provided to the Operator by the previous owner Tarmac it would appear that Appendix H of the Working Plan (Slope Stability Assessment) submitted in support of the original permit application is the only assessment of stability that underpins the design of the Site.

It is this document, Appendix H of the Working Plan (Slope Stability Assessment), that has been reviewed in relation to the proposed increase to the landfill waste input from 250,000 to 300,000 tonnes/annum.

2.2 Review

The advice received from the Environment Agency (EA) via the Pre-application Request (EPR/DP3734DC/V002) process was that a Stability Risk Assessment that covers the additional waste input on the landfill engineering structures would be required to be submitted as supporting information to the permit variation application. After checking via e-mail that the EA had not misunderstood the basis of the application, the following clarification was received from Francis Nwafar at the EA;

"Although your proposal is to increase the annual throughput and not the volume, we need to be satisfied that the proposed increase in waste input will not compromise the design of the landfill and the 'assumptions' that underline the design."

It is on this basis that we have reviewed Appendix H of the Working Plan (Slope Stability Assessment), checking the conceptual model and the assumptions made therein.

The conceptual model of a 1 in 3 slope for the liner and the engineered fill comprising the side slopes of the proposed landfill has not changed and is not anticipated to change for future side slope lining at the site.

If there were to be a future change to the geometry or material specification, then this would be addressed with a revised Slope Stability Risk Assessment (SRA) submitted along with the CQA Plan for the planned works to the Environment Agency (EA) for their agreement.

The rate at which waste is input into the site is not generally considered as part of the modelling for an SRA. However, as noted in the current Working Plan (Slope Stability Assessment) "the placement promptly of waste will improve the stability of the slopes both in the short term and long term".

On this basis the risks assessed in the current Working Plan (Slope Stability Assessment) are not altered by the rate at which waste is input into the site.

2.3 Conclusion

The proposed increase in waste input will not compromise the design of the landfill and the 'assumptions' that underline the design.

This review of the current Working Plan (Slope Stability Assessment) should suffice as supporting information to the variation application to increase the annual waste inputs at the site from 250,000 tonnes to 300,000 tonnes.

If there were to be a future change to the geometry or material specification, then this would be addressed with a revised Slope Stability Risk Assessment (SRA) submitted along with the CQA Plan for the planned works to the Environment Agency (EA) for their agreement.

Appendix 1

Slope Stability Assessment (Appendix of Working Plan March 2002)

APPENDIX H

SLOPE STABILITY ASSESSMENT

Appendix H

Slope stability assessment

1.1 Stability analyses have been undertaken on the short term and long term stability of the 1 in 3 slope of the liner and the engineered fill comprising the side slopes of the proposed landfill. The stability analyses of the slopes have been carried out using data obtained from site investigations and published information to model and characterise the soil comprising the side slope. The slope at the western half of the site have been identified as critical to the design of the landfill and are therefore analysed as the worst case.

1.2 The slope has been analysed for stability in the short term using undrained total stress soil strength parameters for cohesive soils and for stability in the long term using drained effective stress soil strength parameters from geotechnical testing of soils from boreholes drilled around the site. The time necessary for the behaviour of a cohesive soil to change from short term undrained behaviour to long term drained behaviour is dependent on the soil type and the permeability of the soil. It is likely that the behaviour of the slope will remain undrained during the period between constructing the slopes and placement of waste and hence the short term stability is relevant to the proposed development. A long term stability analysis has been conducted on the 1 in 3 slope where infilling delay is considered a possibility.

1.3 The low permeability seals to the landfill will comprise clay materials excavated from the quarry placed and compacted to an end product specification. It is considered that following excavation and weathering the clay will be a firm or firm to stiff cohesive material. It is stated in Table 4.2 of BS8004:1986 that a firm material typically will have undrained shear strength ranging between $50KN/m^2$ and $75KN/m^2$. For a firm to stiff cohesive material the typical undrained shear strength ranges between $75KN/m^2$ and $100KN/m^2$. For the analysis of short term stability an average value for the undrained shear strength (C_u) = $70KN/m^2$ and an undrained angle of friction ($Ø_u$) = 0^0 has been used. For the long term drained analysis a

conservative value of cohesion (c′) = 1KN/m^2 and an average angle of friction (Ø′) = 24^0 have been taken from geotechnical testing results of soils from boreholes drilled around the site (Appendix D).

1.4 It is assumed in the analyses conducted that groundwater will be maintained at a low level by drainage behind the engineered backfill and seals to ensure that hydrostatic pressure does not build up behind the low permeability seals. Following completion of filling it is assumed that subject to the agreement of the Environment Agency pumping will cease and the groundwater level will recover original levels. At this stage the slope will be fully supported by placed waste.

1.5 The factor of safety of a slope is defined as the balance between the disturbing and restoring moments due to the weight of the soil mass and its associated shear strength parameters. A slope is considered unstable where a factor of safety obtained in an analysis of a slope is less than unity. The Code of Practice for Earthworks BS6031 provides guidance on factors of safety appropriate for slopes taking into account factors such as the consequences of failure.

1.6 In BS6031 a factor of safety of 1.3 to 1.4 is recommended as an upper value, although this can be reduced to a value of 1.2 where the consequence of failure is considered less serious.

1.7 The slope stability analyses have been carried out using the Bishop Simplified method version 7.53(c) of the computer programme SLOPE licensed by GEOSOLVE.

1.8 The analyses show that the factor of safety of the 1 in 3 slopes in the short term is 15.0 and in the longer term is 1.38. The results of the analyses demonstrate an acceptable factor of safety. The placement promptly of waste will improve the stability of the slopes both in the short and long term. The results of the slope stability analyses are presented at Annex A.