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Our Ref: A190707

Date: 16th June 2020

RE: A190707 Hornsey Gas Works, Stabilisation Trials

Dear Jack

We are pleased to provide the amended conceptual design model to reflect the latest Leachate Acceptance Criteria (LAC) as provided by Atkins in 5192204_F3_CWDQRA Report – February 2020. New LAC criteria has been modelled against 16 day leaching datasets (F1-F8) for the optimum 9 No. mix designs (MD1, MD4, MD5, MD7, MD10, MD11, MD13, MD16 and MD17) identified within CEG Report A190707.

Introduction

Re-modelling of the optimum 9 No. mix designs (MD1, MD4, MD5, MD7, MD10, MD11, MD13, MD16 and MD17) has been undertaken for direct comparison to updated LAC provided by Atkins within 5192204_F3_CWDQRA Report – February 2020: Table 5.3. The CDM model prepared for the subject site follows the same technical basis as presented in CE Geochem Report A190707 - section 7. All inorganic compounds reported above analytical detection limits in one or more leaching fractions have been modelled under the CDM and are available for inspection in Appendix A. LAC values under the revised DQRA are now limited to sulphate and ammonium.

As shown in Figure 1, all optimum mix designs investigated in this study are predicted to produce satisfactory performance for sulphate with no exceedances of compliance targets from any of the sample matrices included in this study with sulphate source term concentrations up to 3433 mg/kg. Furthermore the deployment of hydraulic binders at the site are likely to enforce solubility constraints on sulphate release. From a geochemical perspective, the addition of Ca bearing binders such as CEM I, will promote precipitation of gypsum as the solubility controlling phase. Theoretically this will provide additional retardation against sulphate leaching.

Diffusive flux calculations, as shown in Figure 2, for ammonium (ammoniacal nitrogen) provided satisfactory performance in all sample matrices with no exceedances of compliance targets for TP517 2.2m, TP517-513 and TP514 at average source term concentrations of 153 mg/kg, 557mg/kg and 17 mg/kg respectively.

Linear interpolation of treatability windows for ammonium based on modelled peak porewater concentrations from diffusive flux simulations is presented in Figure 3. As can be seen from inspection of Figure 7.3, there is a strong linear correlation between ammonium source term concentrations and predicted pore water concentrations with a linear regression statistic of 0.9952. The treatability window for CEMI applications for ammonium is shown where the red dotted line intersects the linear regression line at the 10.3 mg/l compliance target, which corresponds to an ammonium source term concentration of 1254 mg/kg. All test work composites lie within the treatability window for CEMI applications for ammonium, which agrees with the diffusive flux calculations presented in Figure 2.

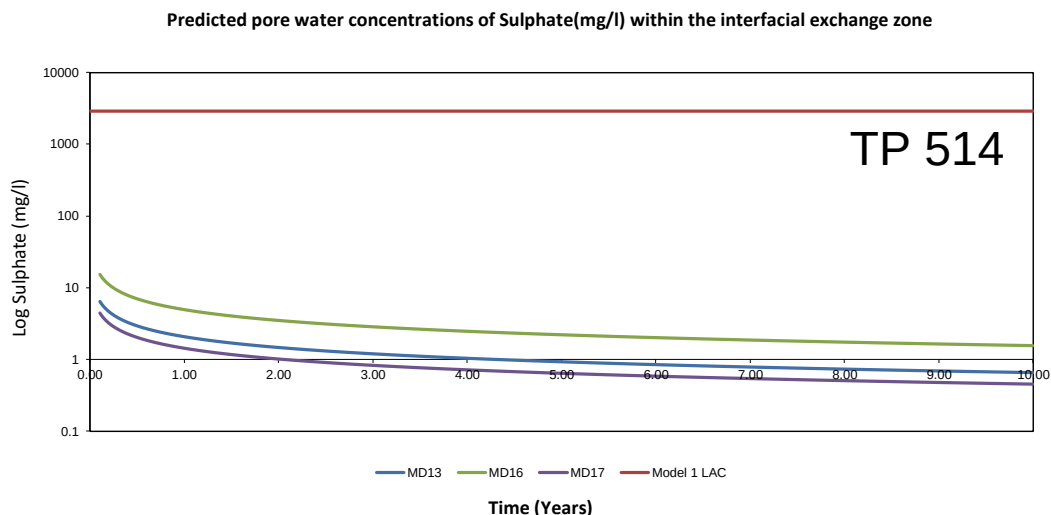
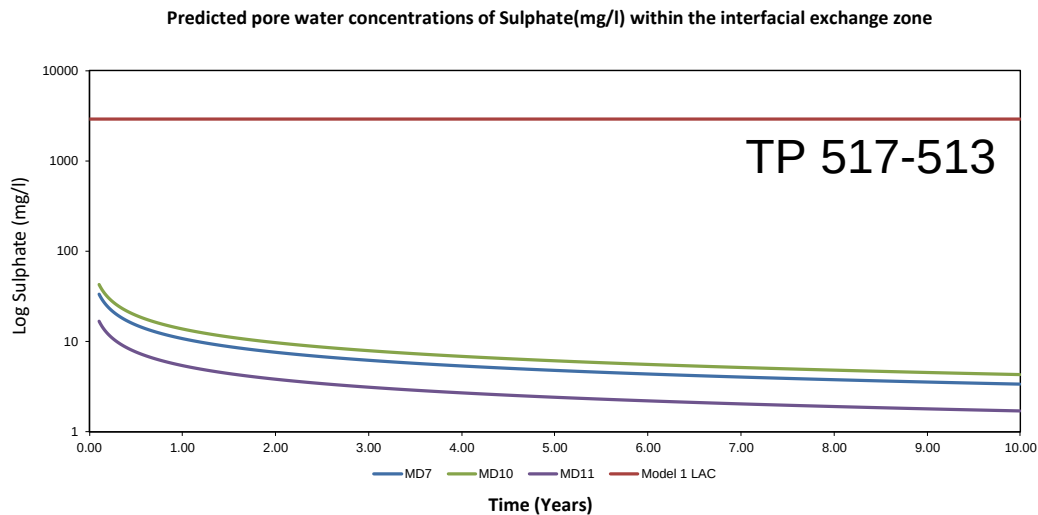
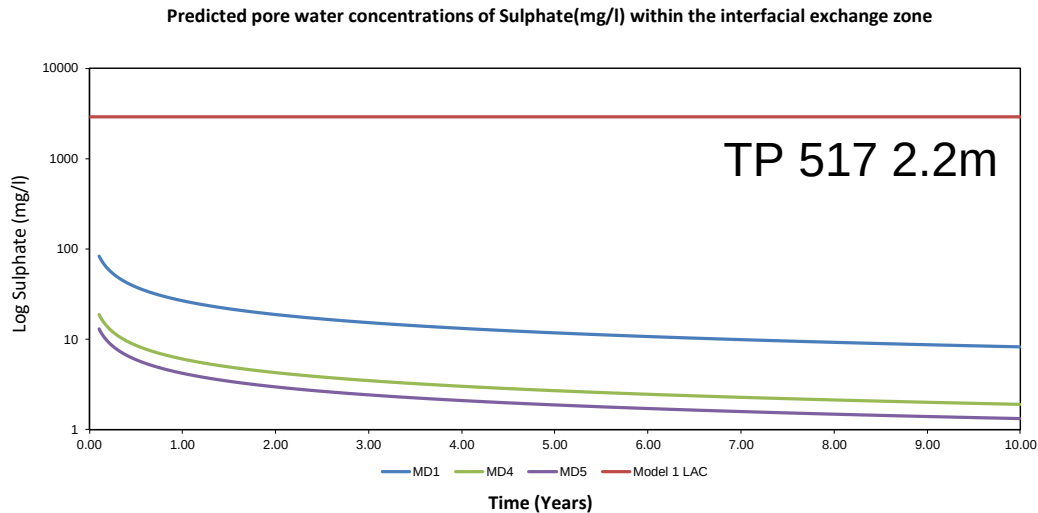


Figure 1 Predicted pore water concentrations of sulphate for mix designs manufactured using test work samples TP 517 2.2 m (top), TP 517/513 (middle) and TP 514 (bottom). Note logarithmic scale. Leaching trajectory plots for other contaminants are presented in Appendix A.

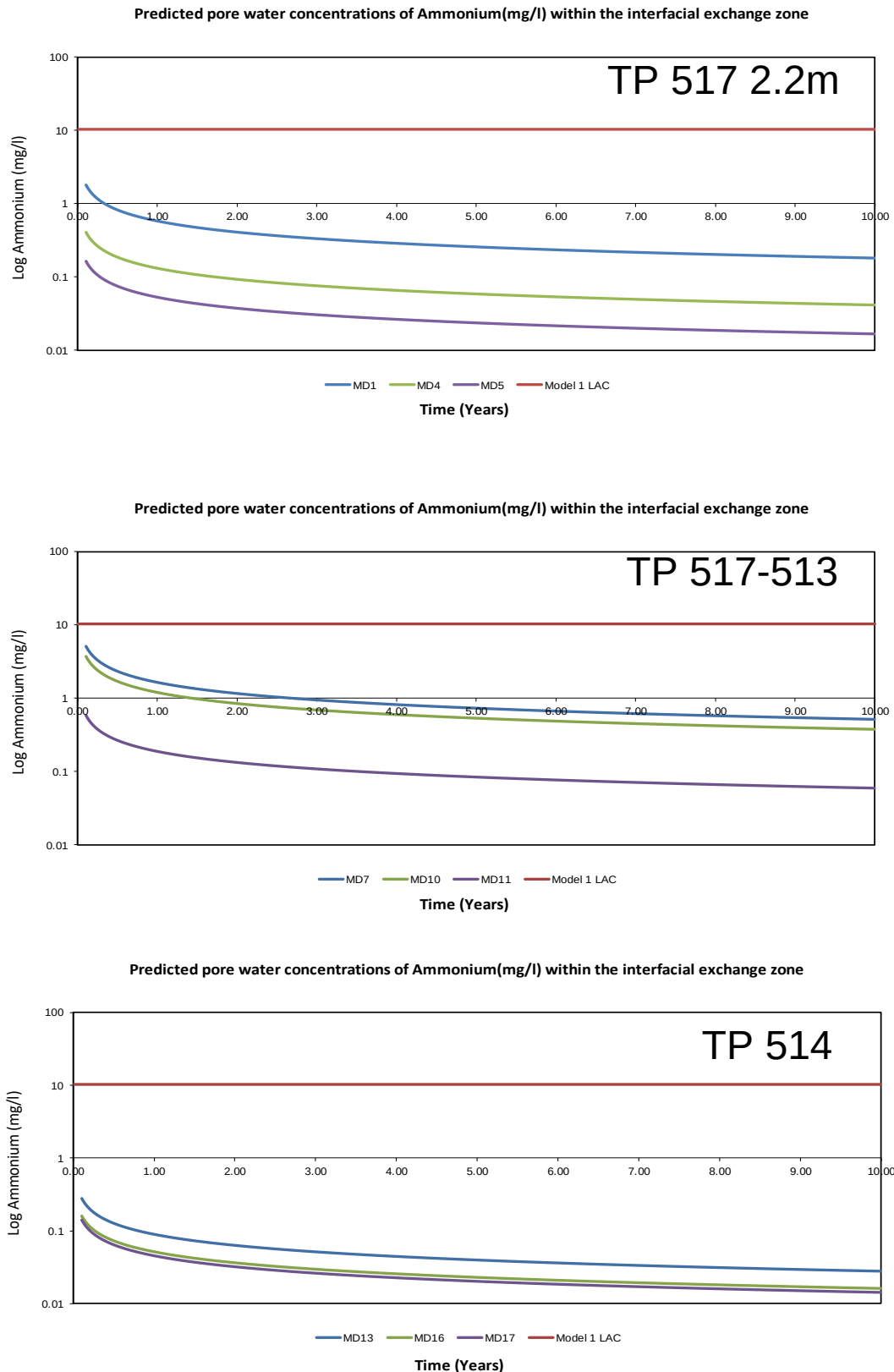


Figure 2 Predicted pore water concentrations of ammonium for mix designs manufactured using test work samples TP 517 2.2 m (top), TP 517/513 (middle) and TP 514 (bottom). Note logarithmic scale. Leaching trajectory plots for other contaminants are presented in Appendix A.

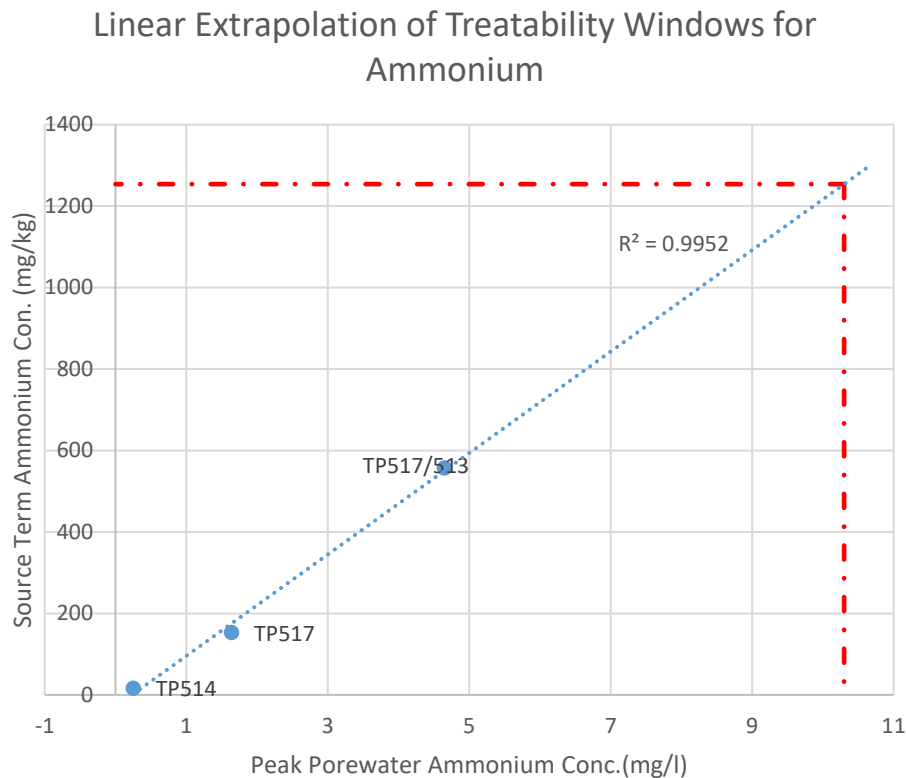


Figure 3 Linear extrapolation of ammonium treatability windows.

Based on the interpretation of Figure 3, we recommend that CEMI may be considered the optimum mix design for treatment of ammoniacal nitrogen concentrations in site soils up to 1250 mg/kg.

Conclusions & Recommendations

Based on the results of the bench-scale trials remodelled to the latest Leachate Acceptance Criteria (LAC), CE Geochem recommend that a 5% CEMI mix design may be considered as suitable for general deployment at the Hornsey Gas work site as all mix designs comply with remedial objectives. 5% CEMI mix designs provide a suitable treatment option for site soils containing ammoniacal nitrogen up to 1250 mg/kg as defined by the treatability window plot presented in Figure 3 of this report.

In closing, we also wish to draw your attention to the experimental conditions under which the leaching trajectories were derived. All tank testing datasets relate to monolithic specimens under constant immersion that are subjected to sequential replenishment with de-ionised water. This latter condition ensures the maximum diffusion gradient is re-established during each tank exchange. In the opinion of CE Geochem, these conditions lead to conservative estimates of mass flux rates.

We trust that this report will be satisfactory for the purpose of evaluating the remedial efficacy of stabilisation works under the revised remedial objectives for the Hornsea Gas Works site. Should you have any queries however, or wish to discuss any of the data or interpretations presented within this report further, please do not hesitate to contact the undersigned.

Yours Sincerely



Dr Jamie Cutting
Environmental Geochemist

For and on behalf of **CE Geochem Ltd.**

Enc. Appendix A Conceptual Design Model

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