RESTORATION OF FINNINGLEY QUARRY
Finningley Quarry
CLOSURE & AFTERCARE MANAGEMENT PLAN

STATUS: FINAL NOVEMBER 2018

173263/CAP

## **CONTENTS**

- 1.0 INTRODUCTION
- 2.0 RESTORATION PROFILE & DRAINAGE
- 3.0 STABILITY
- 4.0 POLLUTION CONTROL INFRASTRUCTURE
- 5.0 RISK ASSESSMENT
- 6.0 RECORDS

#### **DRAWINGS**

1805-03-001 Restoration Plan (approved)

173263/D/004 Restoration Plan

173263/D/005 Restoration Proposal Cross Section Plan

173263/D/006 Drainage Plan

#### **APPENDIX**

Appendix A Testing Requirements

Appendix B Risk Assessment

#### 1.0 INTRODUCTION

#### Overview

- 1.1 This Closure & Aftercare Management Plan (CAP) describes the management and monitoring of the site once all waste deposit has been completed. The Plan has been developed in accordance with the standards of the Environment Agency (EA)<sup>1</sup>. The Operator is Tetron Finningley LLP.
- 1.2 The landfill operation includes:
  - Import, of circa 621,940 tonnes of wastes for disposal or restoration; of this
  - Disposal in the land raise activities of circa 192,804 tonnes;
  - Construction Quality Assured geological separation layer and capping of circa 367,830 tonnes; and
  - Placement of circa 61,304 tonnes of restoration soil and aggregate.
- 1.3 Material for recovery and use on site comprises of the following:
  - Subsoil of 2 m thickness (80 %); overlain by;
  - Top soil of 0.5 m thickness (20 %).
- 1.4 The site will operate under a Bespoke Permit. The primary purpose of the site is to restore a mineral works using waste. The restoration will take approximately 3 years.
- 1.5 The site operations will include the temporary storage and deposit of SNRH waste (comprising of inert soils and asbestos). The waste will be placed and compacted to allow restoration of the land to create an engineered feature for future agricultural land use in accordance with the Planning Permission. Construction of the geological liner, the capping layer and parts of the final formation will utilise site derived non-waste materials.
- 1.6 The purpose of this plan is to outline the following:
  - overview of the sensitivities at the site;
  - the closure and after care operations:
  - pollution control measures to be put in place on closure;
  - how the site will be managed and monitored during the subsequent aftercare phase;
  - a risk-based completion criteria which will show the site is in a satisfactory state for permit surrender.
- 1.7 This plan will be reviewed annually during the restoration works and at least every 4 years following cessation of all activities.

<sup>&</sup>lt;sup>1</sup> Environmental Permitting Regulations: Inert Waste Guidance Standards and Measures for the Deposit of Inert Waste on Land

#### 2.0 RESTORATION PROFILE AND DRAINAGE

- 2.1 The site will be constructed in line with the approved permit drawings. The site will be progressively restored during the infilling. Once the waste has been placed to its final level it will be surveyed to ensure that it achieves the required stability. Following completion of the landfilling, the waste will be covered by a CQA capping layer and soils as required in the restoration, to minimise water ingress into the waste, potential for erosion and to permit the seeding to occur as early as potential in the programme. The final seeding and planting is not detailed within this report.
- 2.2 The waste deposited at the site will be compacted to ensure that it is stable. The waste will be finished and compacted to 2.5 m below final restoration level. The site will be completed with 0.5 m of capping layer and 2 m of restoration cap sub-soil and top soil.
- 2.3 The capping is a human health cap to prevent fibre spread. The top and subsoil will be placed over the restoration cap. The soil quality must be protective of the groundwater and human health. The combined environmental standards are presented in Appendix A.
- 2.4 The majority of soils will be imported for direct placement or be manufactured through the permitted Soil Management Area to the north west (Ref: EPR/ EPR/NB3039RM). All soils will be imported and placed directly or processed will be tested at a frequency of 1 test per 1000 cu m against the parameters set out in Appendix A.
- 2.5 Following the placement of each material type, the cap, sub-soil and top soil it will be lightly ripped to remove compaction. The operator will aim to minimise tracking over the soil surface. This is to reduce compaction. The top soil will then be placed carefully over the restored materials.
- 2.6 Following the placement of each layer an inspection will be undertaken to ensure that all material complies with the specification and oversize and any observed detritus is removed.
- 2.7 The drainage design is presented in drawing 173263/D/006. The site drainage design has been approved by Doncaster County Council.

#### 3.0 STABILITY

- 3.1 The waste will be well compacted during placement and the land raise activities. No significant settlement is anticipated. Prior to the placement of the restoration clays and soils the Construction Quality Assurance engineer will review the placed waste and associated testing results to ensure the design parameters are attained the risk of rotational slippage is minimised.
- 3.2 Following the completion of the restoration, a site inspection and topographical levels will be recorded at pre-determined locations, to ensure there are no signs of instability and that the waste mass is stable and not moving. The survey will be undertaken every 2 years until the site is surrendered.

#### 4.0 POLLUTION CONTROL INFRASTRUCTURE

Groundwater and leachate monitoring

- 4.1 During the landfilling, restoration and closure phases, monitoring of the groundwater will be undertaken at boundary on a routine basis. The frequency of each phase and the parameters are set out in Table 4.1.
- 4.2 The waste will be fully characterised through the importation process. No leachate monitoring at the site will occur following restoration.

Table 4.1 Groundwater monitoring	Table 4.1 Groundwater monitoring						
Determinant	During landfilling	Post completion					
Dissolved Organic Carbon	Quarterly	Quarterly for 2 years then					
Total Dissolved Solids		TBC with the EA					
Arsenic (total)							
Barium (total)							
Cadmium (total)							
Chromium (total)							
Copper (total)							
Mercury (inorganic)							
Nickel (total)							
Lead (total)							
Molybdenum (total)							
Antimony (total)							
Selenium (total)							
Zinc (total)							
Chloride (total)							
Fluoride (total)							
Sulphate (as SO4)*							
Phenols (total)							
BTEX (TPH C5-C10)							
TPH Speciated (Aliphatic / Aromatic)							
PCB							
PAH Speciated 16							

4.3 The results will be assessed against the baseline values and appropriate agreed standards. In the unlikely event of a sustained deteriorating trend in the boreholes the Environment Agency will be notified and additional monitoring and remedial controls assessed.

#### Ground Gas monitoring

- 4.4 The existing site is currently an open quarry void. As such, no landfill gas monitoring has been undertaken prior to infilling. Off-site landfill gases will not be monitored. The potential for landfill gas to be generated in significant quantities, to pose a risk to nearby properties is considered low.
- 4.5 After restoration phase is completed, in-waste monitoring probes will be installed into the waste deposit. The post restoration monitoring points will be installed at a frequency of circa 2 boreholes per hectare.
- 4.6 Ground gas monitoring will be in accordance with the Landfill Gas Risk Assessment
- 4.7 Following 2 years of monitoring, the requirement for, and frequency of, ground gas monitoring will be agreed with the Environment Agency.

#### Surface water

4.8 There is no direct pathway to surface water. No surface water management or monitoring system is considered necessary. The surface drainage will be in accordance with the Surface Water Management Strategy and maintenance plans.

#### 5.0 RISK ASSESSMENT

5.1 The post-restoration site has been assessed in the context of the baseline setting. The resulting matrix and associated mitigation is presented in Appendix B.

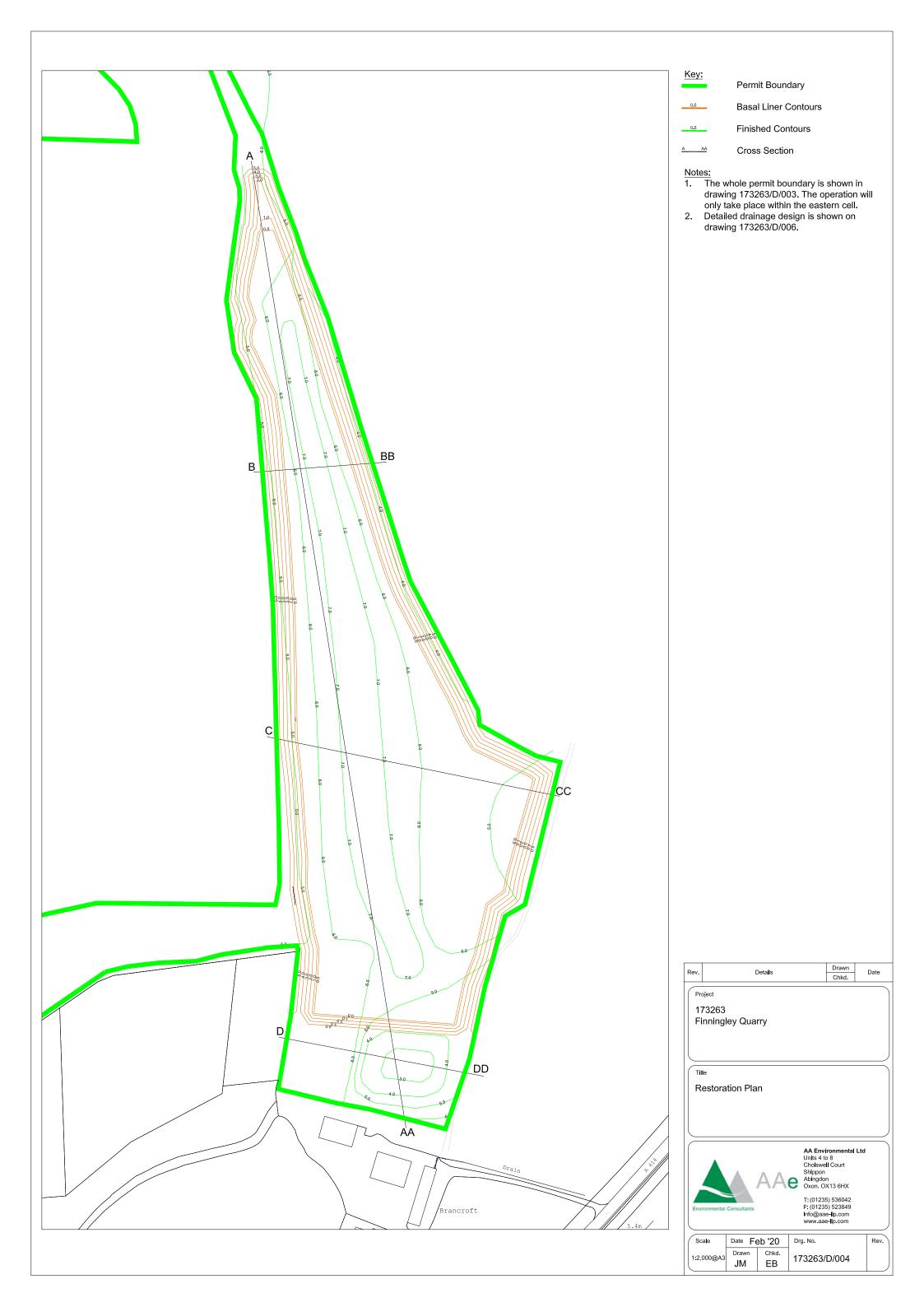
#### 6.0 RECORDS

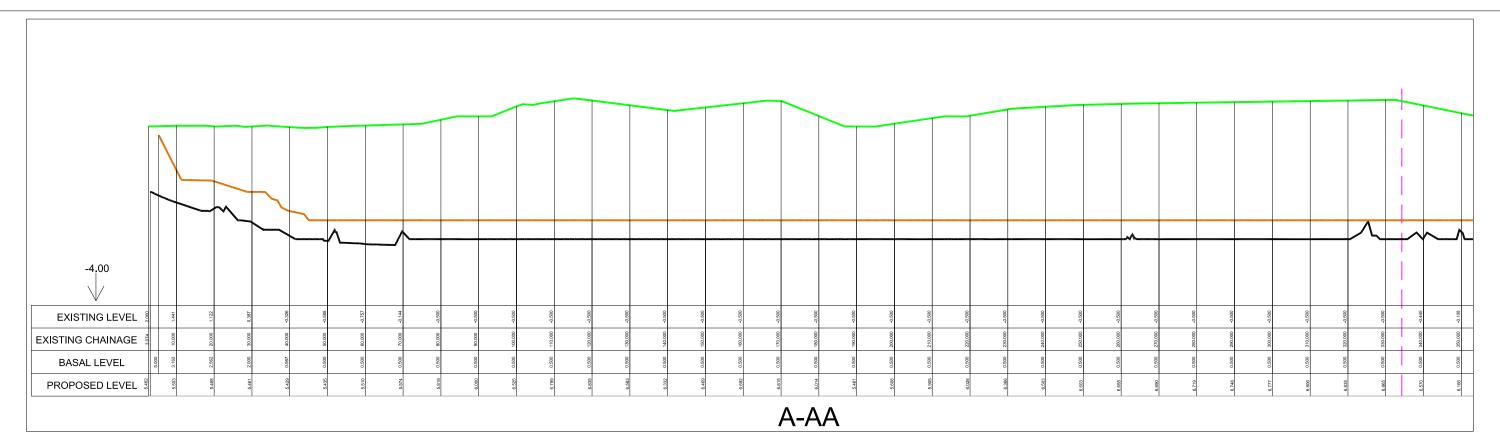
- 6.1 All records required by the Permit will be held by the Operator. The operator will keep all records relating to the site at the main office.
- 6.2 Following the completion of the restoration, all survey plans will be maintained and kept accessible.
- 6.3 A copy of the Permit, all management plans and the supporting documents, will be kept available on site for reference when required by all site staff carrying out work under the requirements of the Permit.
- The CAP will be reviewed at least every four years. Other triggers for the review of the plan would include any proposed changes to the phasing of the landfill.

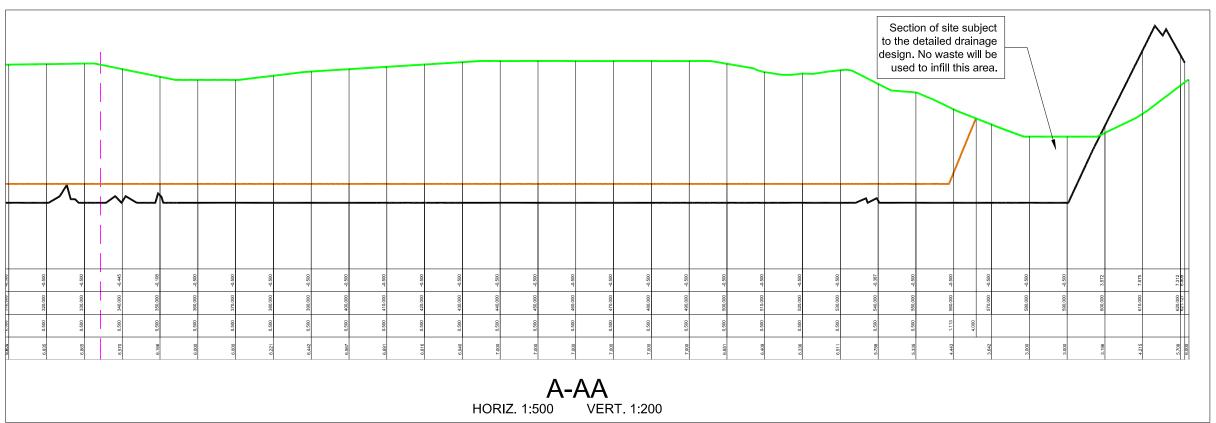
# **Drawings**

AA Environmental Limited Finningley Quarry
173263 Finningley LLP









Notes
1. Cross section A-AA is shown on the Restoration

Plan drawing reference 173263/D/004.

2. Detailed drainage design is shown on drawing 173263/D/006.

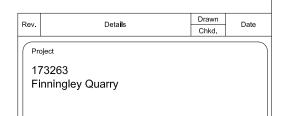
Existing ground level

Basal liner level

<u>Key</u>

Proposed final restoration level

Cross section reference divider

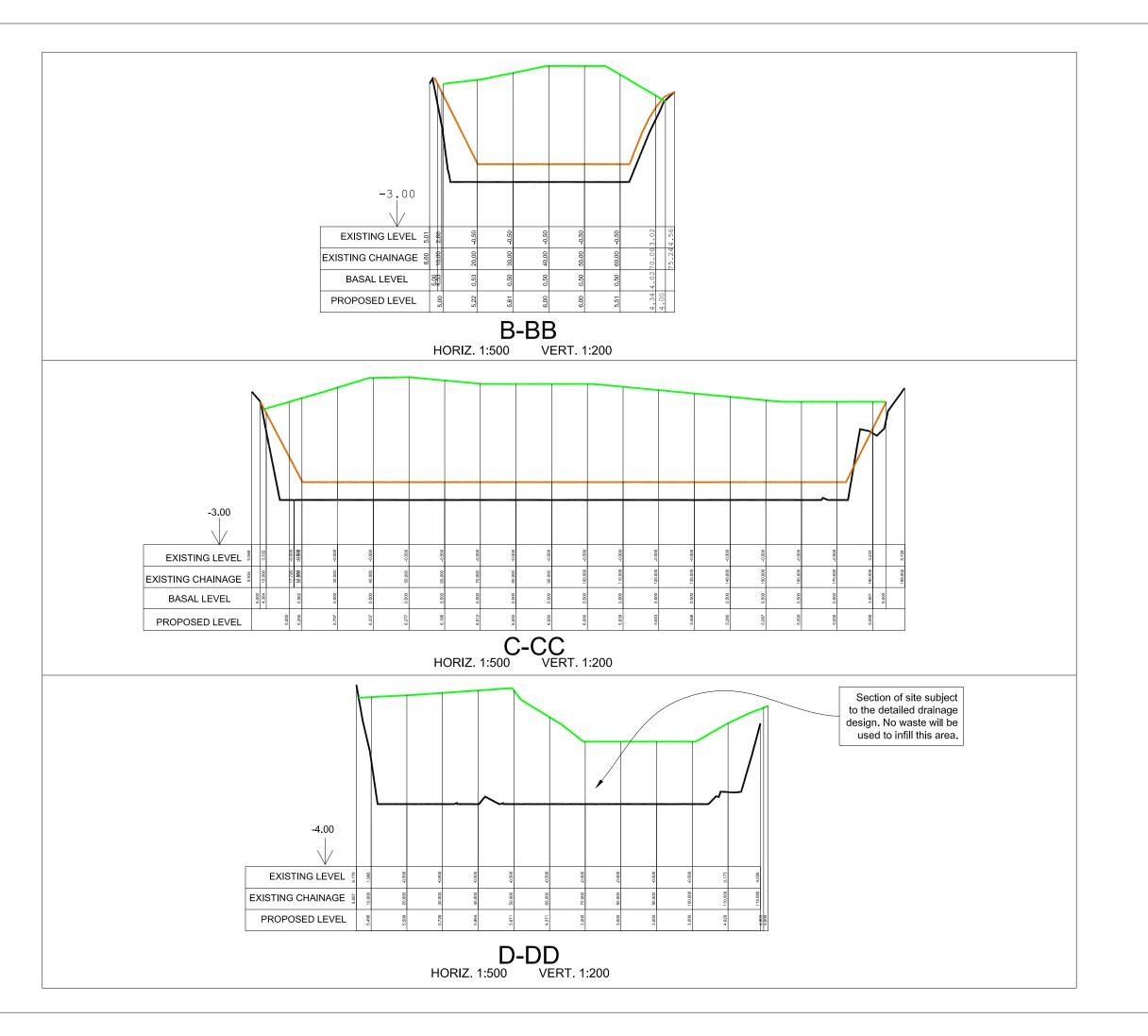


Cross Section Plan A-AA



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Scale	Date Fe	eb '20	Drg. No.	Rev.	
1:1,000@A3	Drawn	Chkd.	173263/D/005A		l
1.1,000@AS	JM	EB	173203/D/003A		



Key.

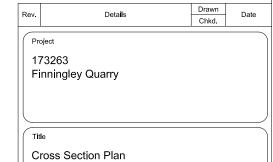
Existing ground level

Basal liner level

Proposed final restoration level

#### Notes:

- 1. Cross section A-AA is shown on the Restoration Plan drawing reference 173263/D/004.
- 2. Cross section D-DD does not show a basal geological separation layer because no waste is to be deposited in this area. For detailed drainage design see drawing 173263/D/006.



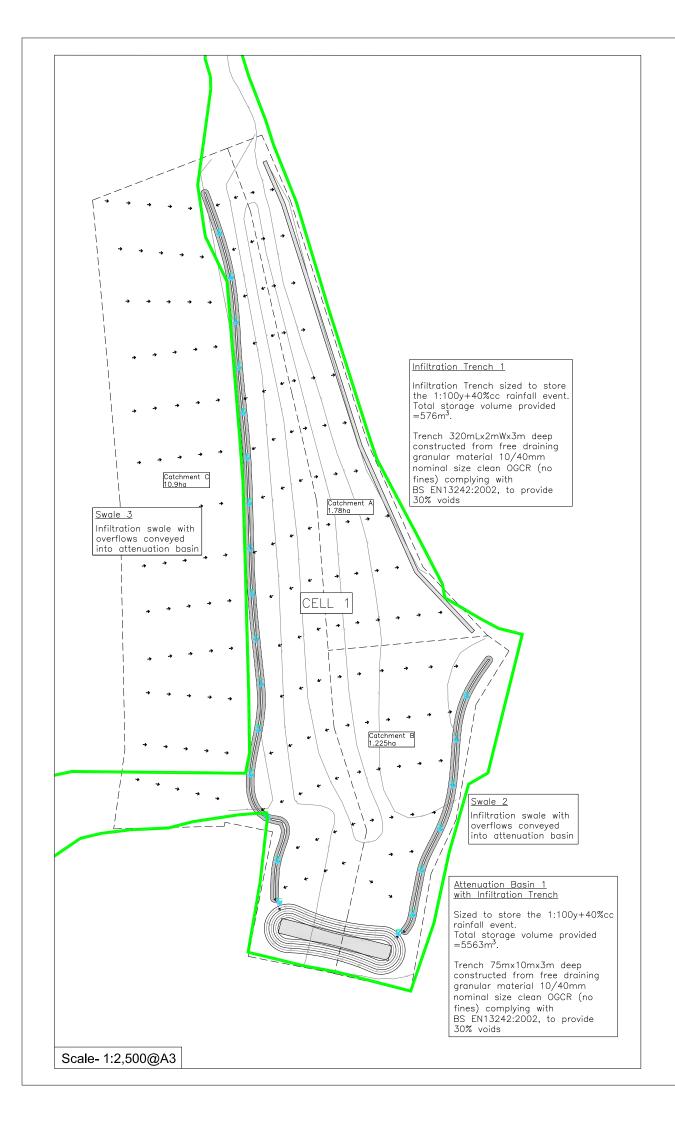


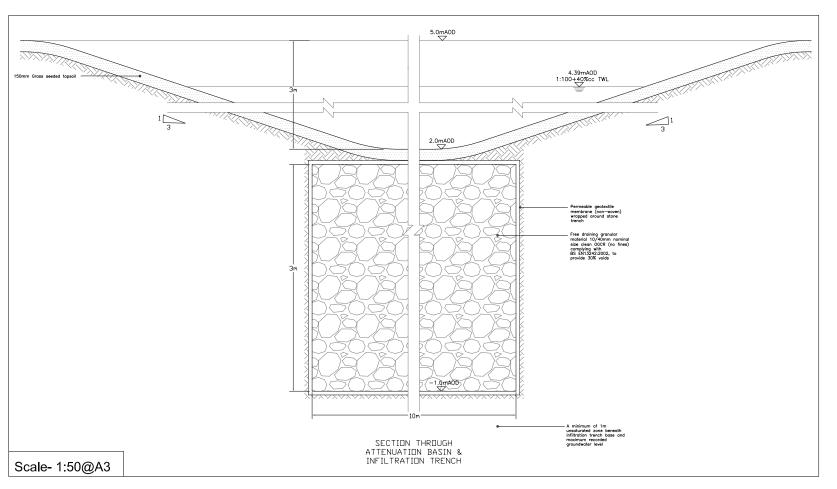
B-BB, C-CC and D-DD

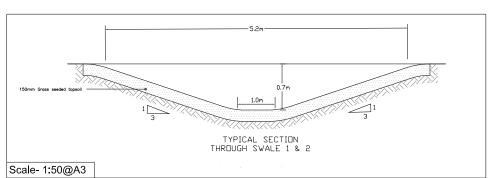
AA Environmental LLP Carriage House Office Guydens Farm Garsington Oxford OX44 9AZ

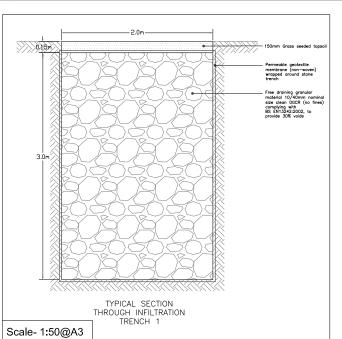
T:(01865) 361859 F:(01865) 361867 Info@aae-**Il**p.com www.aae-**Il**p.com

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1:1,000@A3	Drawn	Chkd.	173263/D/005B	
1.1,000@A3	JM	EB	173203/D/003D	









### Key:

Permit Boundary

#### Notes

1. Proposed drainage taken from MJA Consulting Ltd drawings 'Cell 1 Surface Water Drainage Strategy', March 2019 (Ref: 5982:01P) and 'Full Restoration Surface Water Drainage Strategy', March 2019 (Ref: 5982:02P).





Scale Date Feb '20 Drg. No. Drawn Chkd. 173263/D/006 JM EΒ

## **Appendix A TESTING REQUIREMENTS**

A.1 Waste acceptance& groundwater protection: To demonstrate acceptability, all materials will be tested in accordance with Table A1.

Table A1 Waste Acceptable Criteria

Table A1. Waste Accept Determinant	WAC Leachate Criteria (LS=10l/kg) (mg/kg)	Solid results (mg/kg)	Notes
Arsenic (total)	0.5		
Barium (total)	20		
Cadmium (total)	0.04		
Chromium (total)	0.5		
Copper (total)	2.0		
Mercury (inorganic)	0.01		
Nickel (total)	0.4		
Lead (total)	0.5		
Molybdenum (total)	0.5		
Antimony (total)	0.06		
Selenium (total)	0.1		
Zinc (total)	4.0		
Chloride (total) 1	800		
Fluoride (total)	10		
Sulphate (as SO4) 1	1000		
Phenol (total)	1.0		
TDS <sup>1</sup>	4000		
DOC	500 <sup>2</sup>		
TOC		3% w/w <sup>2</sup>	
BTEX (TPH C5-C10)		6	BTEX concentration must not exceed the soils total value
TPH Speciated (Aliphatic / Aromatic)		500	Speciated TPH concentrations must not exceed soils total value
PCB		Not permitted	
PAH Speciated 16		100	Speciated 16 PAH concentration must not exceed soils total value
VOC / SVOC / Pesticides / Herbicides	material. If found to be pr assessment should be contaminants which are pr	esent (above the limit of decarried out to determine	on knowledge of the source etection), a quantitative risk e thresholds for identified ers. No import permitted until

A.2 Human health assessment. All soils within the top 0.6 m of the restoration must meet the human health limits as defined in Table A3; as well as the standards in A1. The standards are based upon the public open space (residential) values available from the Environment Agency, DEFRA Level 4 Screening Values and LQM/CIEH Generic Assessment Criteria. Cyanide level has been set at the Atrisk residential cyanide limit.

<sup>1.</sup> The values of TDS can be used instead of CI or SO4.

<sup>2.</sup> TOC may be superseded by DOC. TOC, LOI & DOC will not apply to soils used in the restoration

**Table A2. Human Health Criteria** 

Parameter	Human Health limit (top 1 m)				
	(units mg/kg)				
Arsenic	79				
Cadmium	120				
Cyanide (total)	34 (Atrisk Soils –	Residential Threshold)			
Chromium VI	7.7				
Chromium	1500				
Copper	12000				
Lead	630				
Inorganic Mercury	120				
Nickel	230				
Selenium	1100				
Zinc	81000				
Aliphatic (5-6)	570000				
Aliphatic (6-8)	600000				
Aliphatic (8-10)	13000				
Aliphatic (10-12)	13000				
Aliphatic (12-16)	13000				
Aliphatic (16-35)	250000				
Aliphatic (35-44)	250000				
Aromatic (5-7 benzene)*	72	TPH limited to 500			
Aromatic (7-8 toluene)	56000	mg/kg total			
Aromatic (8-10)	5000				
Aromatic (10-12)	5000				
Aromatic (12-16)	5100				
Aromatic (16-21)	3800				
Aromatic (21-35)	3800				
Aromatic (35-44)	3800				
Naphthalene	4900				
Acenaphthene	15000				
Acenapthylene	15000				
Fluorene	9900				
Anthracene	74000				
Fluoranthene	3100				
Phenanthrene	3100				
Pyrene	7400	PAH limited to 100			
Benzo(a)anthracene	29	mg/kg			
Chrysene	57				
Benzo(b)fluoranthene	7.1				
Benzo(k)fluoranthene	190				
Benzo(ghi)perylene	640				
Benzo(a)pyrene	5.7				
Dibenzo(ah)anthracene	0.57				
Indeno(123-cd)pyrene	82				
Total Phenol	760	Limited to 1 mg/kg			

A.3 Sub-soil and topsoil characteristics: All soils within the top 0.6 m must meet the multi-purpose parameters as defined in Table A3, in accordance with BS 8601 and BS3882. This is to ensure potential phytotoxic elements are not present in the soil.

Table A3. Topsoil and sub-soil characteristics

Potentially phytotoxic	Multi purpose and specific purpose subsoils					
elemtns (by soil pH) (mg/kg dry solids)	Soil pH < 6	Soil pH 6 - 7	Soil pH > 7			
Zinc (Nitric acid extractable	< 200	< 200	< 300			
Copper (Nitric acid extractable)	< 100	< 135	< 200			
Nitrogen (Nitric acid extractable	< 60	< 75	< 110			
Other Contaminants						
< 2 mm	<	0.5%.				
	Not applicable in areas fenced off from public access.					
sharps	0 in 1 kg air dried Not applicable in areas f	d soil. Sharps <0.5 senced off from publ				

# Appendix B Risk Assessment

AA Environmental Limited Finningley Quarry 173263 Fetron Finningley LLP

Hazard	Receptors	Harm	Pathway	Probability of Exposure	Consequence	Magnitude	Justification	Risk Management	Residual Risk
Odour	Residential within 75 m to the south.  Recreational land use within 50 m to the north east.	Nuisance and loss of amenity value.	Atmospheric (fugitive). Air transport then inhalation.	Low	Medium	Medium	Waste types placed will predominantly be from construction sites and will not include odour generating wastes (putrescible waste).	Controls on the type of waste streams accepted.  Waste will be capped by a 0.50 m thick clay cap.	Very Low
Ground gas	Residential within 75 m to the south.  The surrounding land is predominantly agricultural land.	Nuisance and loss of amenity value.	Atmospheric (fugitive). Air transport then inhalation.	Low	Medium	Medium	Waste types placed will predominantly be from construction and demolition activities and will not include odour generating wastes (putrescible waste).	Controls on the type of waste streams accepted.  Waste will be capped by 0.50 m thick clay cap.  Monitoring will be undertaken in accordance with the CAP.	Low
Noise	Residential within 75 m to the south.  Recreational land use within 50 m to the north east.  The surrounding land is predominantly agricultural land.	Levels of noise that cause loss of amenity and nuisance to users and residents in the locale.	Airborne.	Low	Medium	Medium	Once finished levels have been achieved, all plant machinery will demobilise from the site.	No requirement for plant machinery once closed. Area restored to farmland / public open space.	Very Low
Dust	Residential within 75 m to the south.	Harm to human health, respiratory irritation and illness.	Airborne then inhalation and/or deposition.	Low	Medium	Low	Once finished levels have been achieved, all plant machinery will	Seeding and vegetation will be undertaken to ensure no windblown	Very Low

AA Environmental Limited 173263

Hazard	Receptors	Harm	Pathway	Probability of Exposure	Consequence	Magnitude	Justification	Risk Management	Residual Risk
	The surrounding land is predominantly agricultural land.  Deciduous woodland priority habitat to the east of the site.	Nuisance – deposition on cars.					demobilise from the site.	mobilisation of fugitive dusts.	
	A614 public highway circa 110 m to the south east.								
Surface water run off	Austerfield drain is situated approximately 410 m east of the site boundary.	Passive leaching to ground or existing land drains, from contamination or spillages on hardstanding surface and directly entering drainage system.	Land then surface water drainage systems.	Low	High	Medium	Proposed drainage will be in accordance with 173263/D/006  Controls on the types of restored soils accepted.	Series of swales and an attenuation pond will be constructed to minimise overland flow and potential mobilisation of silts.  All catchments will be vegetated to minimise erosion.	Low
Infiltration of surface water runoff to soakaway.	Potentially isolated and localised groundwater underlying site.	Pollution to aquifer.	Land infiltration through free draining sub soil and topsoil.	Medium	High	Low	Proposed drainage will be in accordance with 173263/D/006.  Controls on the types of restored soils accepted.	Series of swales and an attenuation pond will be constructed to minimise overland flow and potential mobilisation of silts.	Low
							Controls on the types of wastes accepted – not anticipated to generate leachate.	All catchments will be vegetated to minimise erosion.	

Hazard	Receptors	Harm	Pathway	Probability of Exposure	Consequence	Magnitude	Justification	Risk Management	Residual Risk
								Monitoring to be in accordance with the CAP.	
Direct physical contact / exposure to waste deposit	Human health, fauna, and flora.	Bodily harm.	Direct contact.	Low	High	High	Inert and asbestos containing waste will be sealed beneath a clay cap. Breaking pathway for asbestos containing material . to potentially cause risk to human health.	Waste deposit will be capped by 0.5 m of compacted clay.  Waste will be covered by approximately 2.0 m of restoration soils.  Restoration soils will comply to Appendix A of the CAP.	Low
Loss of stability	Humans and livestock.	Bodily harm to humans or livestock.  Loss or damage of geological strata.	Slippage of waste and restoration soils mass.	Low	High	High	All waste and restored soils will be compacted upon placement to minimise void space.	Once placed and compacted, the areas will be seeded / vegetated as soon as practically possible.  A topographical survey will be undertaken every 2 years before surrender to monitor mass movement.	Low