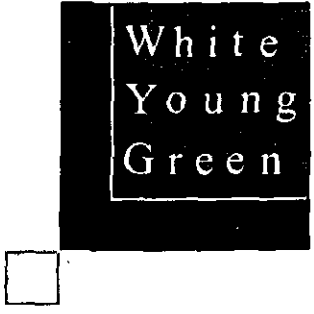


The logo for White Young Green is a black square containing the words "White", "Young", and "Green" stacked vertically in a white serif font. A thin white line separates the text from the right edge of the square. Below the main square is a smaller, empty white square.

White
Young
Green

RECLAMATION STRATEGY

**Rabbit Ings Reclamation Scheme
(Revision 1)**

**for
Carillion Civil Engineering
in partnership with Yorkshire Forward**

thinking beyond construction

RECLAMATION STRATEGY

**Rabbit Ings Reclamation Scheme
(Revision 1)**

for
Carillion Civil Engineering
in partnership with **Yorkshire Forward**

WHITE YOUNG GREEN ENVIRONMENTAL LIMITED				
REPORT: A039273 Reclamation Strategy Revision 1				
Issue: -		Prepared by:	Checked by:	Verified by:
No.	Date			
4	08.10.08			
		D Howes	D Howes	G Winder
		Associate	Associate	Regional Director
File Ref: O:\Engineer\Projects E5001 onwards\A039273 - Rabbit Ings\Reclam Strategy\Reclamation Strategy Revision 1.doc				
White Young Green Environmental: Newstead Court, Little Oak Drive, Sherwood Business Park, Annesley, Nottinghamshire, NG15 0DR Telephone 01623 684550, Facsimile 01623 684551 mailto:enviro.nottingham@wyg.com www.wyg.com				

This is a controlled copy

RECLAMATION STRATEGY

Rabbit Ings Reclamation Scheme (Revision 1)

for
Carillion Civil Engineering
in partnership with Yorkshire Forward

CONTENTS

	Page No.
0.0 RECLAMATION STRATEGY: SUMMARY	1
1.0 INTRODUCTION.....	3
1.1 Instruction.....	3
1.2 Scope of Services	3
1.3 Terms and Conditions	4
2.0 THE SITE	4
2.1 General.....	4
2.2 Site Location	4
2.3 Site Description	4
2.4 Proposed development	5
3.0 GROUND INVESTIGATIONS.....	6
3.1 Robinson Fletcher Consultants 1996	6
3.2 Scott Wilson, 2004	6
3.3 WYGE, 2008 [4]	7
3.4 WYGE, 2008 [5]	7
3.5 WYGE, 2008 [6]	8
4.0 GEOTECHNICAL ASPECTS	9
5.0 EXISTING RECLAMATION STRATEGY	10
5.1 Outline Strategy	10
5.2 Regulatory Responses.....	11
6.0 GEO-ENVIRONMENTAL ASSESSMENT.....	12
6.1 Screening Criteria	12
6.2 Soils: Quantitative Risk Assessment	12
6.3 Contamination Assessment	14
7.0 REMEDIATION WORKS	18
7.1 Former Royston Drift Mine Area	18
7.2 Sports Pitch Area	18
7.3 Colliery Tip	19
7.4 Surface Waters Protection	22
7.5 Certification of Imported Materials	23
8.0 DEMONSTRATION OF POLLUTION LINKAGE REMOVAL	24
9.0 SITE CERTIFICATION	25
10.0. REFERENCES.....	26

APPENDICES

APPENDIX A Report Conditions
APPENDIX B Drawings

Site Location Plan
Restoration Design: Draft Landscaping Plan
Drawing A039273/307 Proposed Earthworks Plan
Drawing A039273/308 Section Locations
Drawing A039273/309 Sections

Hotspot Location Plan

APPENDIX C Correspondence from Regulatory Authorities

0.0 RECLAMATION STRATEGY: SUMMARY

This Strategy document (Revision 1) has been amended to take into account the findings of supplementary ground investigations carried out by White Young Green Environmental (WYGE) in May and July 2008.

Reclamation of the Rabbit Ings site to Public Open Space (POS) with sports pitches and car parking is proposed. The client team of Yorkshire Forward / Wakefield Metropolitan District Council (WMDC) propose to reclaim the site, which will include re-grading and reclamation operations, to provide an open area for informal recreational space, including landscape and ecological enhancement works. Improved public access predominantly on the former spoil tip part of the site will be provided. In addition, platforms for formal playing pitches together with changing facilities and an informal play area to the south west have been proposed. In order to meet this objective, and to ensure the protection of human health, the Reclamation Strategy described in this report and summarised below is proposed.

- General site clearance of fly-tipped wastes, abandoned vehicles from the tip, etc.
- Excavation of all remaining colliery ground slabs within the former Royston Drift area area. Structures deeper than 1m will be left in situ. Concrete arisings to be crushed for use on site (eg. engineering fill; footpath construction).
- Further testing of tip materials proposed to be excavated for use as fill. Areas of cut to be tested at a rate of 1 sample / 5000m³. Two investigations were undertaken by WYGE in 2008 of proposed cut areas.
- Delineation of materials unsuitable for retention near to surface in POS (contamination 'hot-spots'), and excavation or cover of impacted material.
- Screening excavations throughout the POS area, analysis of materials considered suspect, and assessment of suitability for retention / requirements for remediation.
- If found to be necessary; treatment or disposal of contaminated spoil.
- Excavation of colliery spoil from the tip, as shown in Drawing A039273-307, for use at the southern flank of the tip to reduce slope angle to within acceptable limits of stability. Areas known to be contaminated by cokeworks effluent to be excluded from the cut area.
- Colliery tailings, found to contain potentially combustible proportions of coal, are to be excluded from materials exposed at the surface by excavations.
- Cut and fill operations as required within the southwestern areas proposed for sports pitch areas to create level areas as required and to raise levels sufficient to mitigate flooding / waterlogging.
- Placement of soils or soil making materials where required to mitigate ground conditions which are unsuitable for sustaining landscaping vegetation. Variations in thickness throughout the site are proposed, in order to meet the requirements of the landscape architect. Liming is not thought to be required, though specialist guidance will be sought. Soil cover is not required with regard to contamination isolation, but will further reduce exposure.
- In the sports pitch area, a minimum 300mm clean uncontaminated soil cover is required both to establish vegetation and to provide isolation of marginally contaminated made ground, which may be retained in situ beneath the pitches subject to drainage requirements. (In practice, levels will be raised using natural materials and the pitch areas provided with 600 mm subsoil and 200 mm topsoil).

- Monitoring of surface waters during and for a period after the works to ensure that adverse impacts do not occur.
- Imported soils and soils from existing on-site stockpiles to be tested for contamination at a rate of 1 sample per 500m³ at source. (In the event that a source of large quantities of soils for import is identified which is likely to be uncontaminated and homogeneous, a variation in the test frequency may be sought).
- A Validation Statement to be prepared on completion of the works, detailing the outcome of soils testing, movements of materials, off site disposals, geotechnical treatment, slope stability analysis, correspondence with regulators, etc.

It is recommended that this report should be submitted to the Environment Agency and to Barnsley MBC for their approval, founding on the previous agreements which have been reached by Scott Wilson on behalf of English Partnerships.

1.0 INTRODUCTION

1.1 Instruction

White Young Green Environmental Limited (WYGE) were commissioned by Carillion Civil Engineering in partnership with Yorkshire Forward to prepare a Reclamation Strategy for the site known as Rabbit Ings.

The primary aim of this report is to detail the proposed approach to the works that are necessary to realise the safe and suitable reclamation of the site in support of the POS and sports pitch reclamation proposals.

In preparing this reclamation strategy we have referred to the following reports and documents:

1. Scott Wilson, July 2003. Rabbit Ings Site, Barnsley. Desk Study Review (Draft). (Earlier ground investigation reports by Robinson Fletcher Consultants are appended)
2. Scott Wilson, March 2004. Rabbit Ings Site, Barnsley. Interpretative Report on Site Investigation (Draft)
3. Scott Wilson, September 2004. Rabbit Ings Site, Barnsley. Remediation Strategy Report (Draft)
4. White Young Green Environmental, 2008. Rabbit Ings Reclamation, Ground Investigation Factual and Interpretative Report.

The reports by Scott Wilson (SW) were prepared for English Partnerships. It is understood that these have been submitted to the local authority (Barnsley Metropolitan Borough Council) and to the Environment Agency, and that outline agreements for the reclamation strategy have been obtained.

Since Issue 1 of the Reclamation Strategy, two supplementary ground investigations have been undertaken by WYGE:

5. White Young Green Environmental, July 2008. Geo-Environmental Site Investigation (Tip Regrading Cut Area): Factual and Interpretative Report.
6. White Young Green Environmental, August 2008. Geo-Environmental Site Investigation (Tip Excavation Areas): Factual and Interpretative Report.

These investigations were carried out to assess the suitability of proposed 'cut' areas for the regrading works (both with regard to contamination and geotechnical characteristics). The August report [6] also included some further delineation of a known contaminated area.

1.2 Scope of Services

This report provides a reclamation strategy for the site, the main aims of which are as follows:

- To inform the Local Authority Planning Department that the remediated site will provide a site for POS development, with an area proposed for football pitches in the southwest.
- To ensure construction workers are not put at an unacceptable short term risk during the reclamation of the site due to the presence of hazardous materials.

1.3 Terms and Conditions

White Young Green Environmental Limited reserve the right to amend their strategy and recommendations in the light of further information that may become available. Attention is also drawn to the report conditions, included in Appendix A of this report.

2.0 THE SITE

2.1 General

A site location plan is included in Appendix B.

2.2 Site Location

The site is located off Lund Hill Lane, the B6248, 0.5km east of Royston, near Barnsley.

SITE ADDRESS	Off Lund Hill Lane, Royston
ACCESS DETAILS	Access from Lund Hill
NGR (Centre of Site)	SE 3820 1090

2.3 Site Description

The site as a whole comprises the disused colliery tip of Monckton Main Colliery; land formerly occupied by the Royston Drift Mine and a former recreation ground.

The colliery tip is partially vegetated, with areas of grass and sporadic trees. It is uncertain whether the vegetation is due to engineered restoration or is due to natural establishment. Substantial areas remain as unvegetated colliery spoil. The southern face of the tip features steep slopes with a history of recorded failures and slippages and presenting a potential safety hazard. Reduction of slope angles is proposed as a part of the reclamation works.

An area of land at the northwestern side of the site was most recently occupied by a part of Royston Drift Mine, and retains a number of areas of concrete hardstanding. An electricity substation was formerly present at the western boundary, though no evidence of this remains.

Land to the southwest was formerly occupied by a recreation ground, with undeveloped land to its north. Ground in this area has been ripped in an effort to prevent unauthorised vehicle access.

The site includes an area of land that was previously used for inert waste deposition to the north of the former drift mine and north west of the spoil tip. It is not within the scope of this Strategy to undertake any reclamation works within this area, though the provision of public access will be a part of the Scheme.

Site History

A detailed site history is presented in the Desk Study report by Scott Wilson (SW) [1].

In summary, the colliery tip was established in the mid- to late-1800's by Monckton Main Colliery and created by aerial ropeway tipping. The colliery (later operating as New Monckton Colliery) was closed in the 1960's when the Royston Drift Mine was opened, located within the northwestern zone of the site. It is assumed that the drift mine also utilised the Rabbit Ings tip, until its closure in 1990.

A coking works, currently operated by the Monckton Coke and Chemical Company, remains operational to the west of Lund Hill Lane. It is understood that effluent from the works was formerly disposed of into a lagoon or lagoons established on the colliery tip. An NCB Tip Plan dated 1979 identifies a lagoon near to the western tip crest as 'Effluent Lagoon', west of SW trial pit TP21. Lagoons tend to be transient features and it is possible that other locations may also have been used. It is understood that effluent disposal to the tip ceased in 1986.

The former recreation ground area is not believed to have been previously developed, though a sewage works was located at its northwestern edge.

Geology

The SW report [2] indicates the tip to comprise burnt and unburnt colliery spoil, tailings, coal fines, coke and sandstone cobbles / boulders, to a depth of up to 25m. Similar made ground was also proven at some locations outwith the area of the tip.

Alluvial drift deposits associated with Sandybridge Dike and its tributaries were identified along the southern boundary and toward the west, but are generally absent.

Solid geology comprises rocks of the Carboniferous Middle Coal Measures, a sequence of sandstones, coal seams and undifferentiated mudstones / siltstones. A sandstone unit, the Mexborough Rock, outcrops beneath the northern part of the site. Previous ground investigations have identified coal outcrops within the recreation ground and Royston Drift Mine areas.

Hydrology and Hydrogeology

Sandybridge Dike flows along the southern boundary of the site, with a number of small unnamed watercourses in the northern and western areas of the site. A pond formerly associated with the colliery / tip activity is located in the southwestern corner of the site and a number of areas of reedbeds are present between the toe of the tip and Sandybridge Dike and adjacent to the former recreation ground. A second pond is located in the northeast corner of the colliery tip.

The Coal Measures strata are identified by the Environment Agency as minor aquifers. The Mexborough Rock is likely to be significantly permeable, enhanced by mining-induced fracturing.

2.4 Proposed development

WMDC propose to reclaim the site, which will include re-grading and reclamation operations, to provide an open area for informal recreational space, including landscape and ecological enhancement works. Improved public access predominantly on the former spoil tip part of the site will be provided. In addition, platforms for formal playing pitches together with changing facilities and an informal play area to the south west have been proposed.

A Draft Landscaping Plan and Drawing showing proposed cut / fill areas are included in Appendix B.

3.0 GROUND INVESTIGATIONS

Previous ground investigations have been undertaken by Robinson Fletcher Consultants (RFC), 1996, and by SW, 2004. The earlier RFC investigation was utilised by SW in the design of the 2004 investigation. RFC reports are included within the Appendices of the SW Desk Study [1].

Three supplementary investigations were also undertaken by WYGE in 2008.

3.1 Robinson Fletcher Consultants 1996

The RFC investigation was based on the installation of 13 cable percussion boreholes and 81 trial pits, predominantly within the current reclamation scheme area but also extending northward into an area adjacent to Lund Hill Lane understood to have been utilised for opencast coal extraction and subsequently as an 'inert' landfill. The former recreation ground was not investigated. A more detailed summary is presented in the SW Desk Study.

Visual and olfactory evidence of contamination, typically tar odour, was noted at several exploratory locations. Strongest odours were associated with boreholes BHC and BHI, adjacent to the western tip crest and in the general vicinity of the 'effluent lagoon' identified by an NCB tip plan (see 2.3). Odours were identified at depths between 6.1 and 21m bgl at these locations. Some other olfactory evidence, typically described as 'slight tar odour', was noted in trial pits on the northwestern tip flank.

Chemical analysis identified elevated concentrations of 'coke works waste', characterised by PAHs and phenols, predominantly toward the western side of the tip. Leachability testing identified some potential for Controlled Waters pollution associated with phenols and sulphate.

Tar odours were noted in groundwaters at several locations, with groundwater being found predominantly in made ground. Consistent with soil testing results and olfactory evidence of contamination, elevated concentrations of potentially coke works derived contaminants were generally associated with the western area of the tip.

Assessment of RFC soils data was undertaken by SW, based on calculated 95% confidence limit values for all results, and taking into account depths of contaminants in impacted areas. It was concluded that where potentially significant concentrations of coke works contaminants were identified, these were at some depth, and human exposure was considered insignificant due to the absence of relevant pathways.

SW concluded that risks related mainly to Controlled Waters and to adverse effects on flora and fauna. Human health was not considered to be at significant risk, though combustion of coal within the tip was considered to be a possible concern. SW regarded the 1996 investigation as being insufficiently recent to permit further risk assessment, and a supplementary site investigation was undertaken in 2004. This investigation was targeted mainly at Controlled Waters issues.

3.2 Scott Wilson, 2004

The SW investigation was based on recommendations for further ground investigation, made in the SW Desk Study. The investigation was principally designed to address groundwater pollution issues in greater depth. The objectives of the investigation were stated as:

- Identification of groundwater flow and hydraulic connectivity between strata and surface water courses.
- Identification of groundwater contamination and soil contaminant source zones.
- Identification of surface water quality impact.

- Assessment of the requirements for soil ameliorants with regard to spoil acidity.

Fieldwork undertaken comprised 46 trial pits and 32 open hole rotary boreholes, with chemical testing of recovered soil, groundwater and surface water samples.

The investigation identified some potential for human health risks, notably due to direct contact with near-surface soils contaminated with benzo(a)pyrene. Within the proposed POS area, 15 of 48 soil results exceeded SW's preliminary 'open space' criterion (1.5mg/kg, based on the CLR10 'allotments' exposure scenario), with two statistical outlier locations identified in trial pit samples to the east and west of the tip. A single location was also identified as an outlier ('hot spot') location for naphthalene.

Risks to plant growth, specifically restoration planting, were also identified.

Risk associated with groundwater contamination was identified as being "significant but not considered to affect development". No significant impacts on surface water quality attributable to the site were identified, though there was some indication of an upstream source impacting one of the tributaries of Sandybridge Dike.

Reference was made to 'on-going gas monitoring'. There may be some potential for ground gas emissions (associated with shallow coal seams; mine entries; materials within made ground or migration from adjacent sites). Results of the monitoring were not available to WYGE.

3.3 WYGE, 2008 [4]

Supplementary ground investigation was undertaken by WYGE in February 2008 to further inform the reclamation strategy.

The objectives of the investigation were:

- To assess the area formerly occupied by a recreation ground, excluded from earlier investigations.
- To supplement existing data in the proposed POS areas.
- To investigate tip materials in the area of known historical colliery tailings lagoons with regard to contamination risk and coal content.
- No geotechnical appraisal was required as part of this ground investigation.

3.4 WYGE, 2008 [5]

Investigations were carried out of an area within the southeastern section of the colliery tip, identified as a proposed 'cut' area as a source of material for the slope re-grading works.

No soils contamination in excess of screening or site-specific criteria was identified either in material to be excavated for use as fill or in material which will be exposed by the excavation. Testing for volatile aromatic hydrocarbons ('BTEX') did not identify any significant risk.

Groundwater within the tip was found to be contaminated and unsuitable for discharge to water course.

The scope of the investigation did not include geotechnical aspects of the site reclamation. However coal fines were encountered within some of the boreholes and in order to assess the potential impact of this material on the initial reclamation strategy ring shear tests were carried out to assess the residual shear strength of the pressed coal fines. The results showed angles of residual shear resistance of between 25.5° and 33.5°. The presence of

pressed coal fines in close proximity to the surface in this area of proposed cut indicated that if this area were to be used as a source of fill then the slope may need to be over-excavated and placed as a re-engineered fill to ensure the long term stability of the slope.

It was recommended that a review of the earthworks strategy of the tip regrading should be undertaken to consider if other areas of the tip were more suitable for the excavation of materials to regrade the tip with the adoption of a slightly steeper slope angle of 1:2.5.

Groundwater, likely to be perched water within the tip, was found to be contaminated.

3.5 WYGE, 2008 [6]

Further to the earlier WYGE 'cut' investigation [5] which established that the proposed cut area was not geotechnically suitable without additional stabilisation works, a further investigation was carried out to locate other potentially more suitable source areas. Contamination testing for petroleum hydrocarbons, PAHs and BTEX was undertaken.

In addition, further investigation was undertaken in the vicinity of SW TP20, which had previously been identified as a contamination hot-spot possibly associated with cokeworks effluent discharge. A number of trial excavations were carried out, within the constraints imposed by the tip slope, in order to better delineate the area of contamination.

The investigations did not identify significant contamination except in the vicinity of the SW TP20 hotspot. In this vicinity, two locations were identified which did exceed remediation criteria, one due to petroleum hydrocarbons, the other benzo(a)pyrene. No significant concentrations of BTEX compounds were detected in any samples tested.

Due to the nature of pressed coal fines encountered, care was recommended to ensure that these materials are not left exposed at the surface. In areas where re-grading exposes coal fines, these materials should be further excavated to allow for a suitable depth of capping material to be placed.

4.0 GEOTECHNICAL ASPECTS

The scope of this Reclamation Strategy does not include geotechnical aspects of the site reclamation. Re-grading of currently unsafe colliery tip slopes is to be undertaken, and will be subject to suitable slope stability assessments. Geotechnical testing of excavated spoil for use as fill at the southern tip face and possibly elsewhere may be required if the encountered materials differ from those already assessed.

An assessment of the potential stability of the cut slopes has been carried out by Scott Wilson in their Interpretative Report of March 2004 (section 5.5, p53 - 56). The ground investigation carried out by Scott Wilson and AIG reported that the tip was predominantly made of colliery spoil, with isolated pockets of coal fines and burnt shale with groundwater at a deep depth within the tip.

SW carried out a number of drained large shear box tests to derive geotechnical parameters of the colliery spoil. These geotechnical parameters were used to assess the Factors of Safety (FoS) against failure for the assumed slopes. This report indicated that using published design charts and the derived geotechnical parameters that suitable factors of safety would be achieved for slopes designed at an angle of between 1v:2h (26.5°) and 1v:3h (18°), as part of this reclamation strategy a maximum design slope angle of 1v:2.5h has been adopted. As part of the validation report for the reclamation works a slope stability appraisal of the completed slopes should be included. This stability appraisal will be based on the parameters derived from the SW ground investigation and other published data.

No buildings are proposed as part of the reclamation scheme. It should be noted that due to the proposed POS development of the former Royston Drift Mine area of the site, foundations and other below-ground structures will be left in situ where these are present at greater than 1m below ground level and these may present development constraints to any future built development.

5.0 EXISTING RECLAMATION STRATEGY

5.1 Outline Strategy

An outline Remediation Strategy has previously been prepared by SW [3]. The SW strategy has previously been discussed with Barnsley MBC and with the Environment Agency, and their responses are included in Appendix C.

In summary, the SW strategy requires:

1. Excavation to design profile.
2. Sampling and testing of arisings.
3. Remediation as necessary of any materials considered to represent significant human health risks
4. Addition of soil ameliorants as required for the establishment of landscaping vegetation.

With the exception of the former Royston Drift, the proposed POS areas are not believed to have been previously developed, except for the placement of made ground and spoil tipping.

Treatment of deeper groundwater, which is believed to be contaminated by coal tars, is not proposed.

In addition, the SW strategy included proposals for the Royston Drift area, at that stage proposed for employment development but now included within the proposed POS area. Proposals for this area included:

1. Breaking up of remnant foundations, basements, tanks, service ducts etc. to full depth.
2. Processing of brick, concrete and stone arisings and removal of timber and steel.
3. Excavation works and testing.
4. Inspection of excavation base to confirm suitable ground conditions and absence of mine shafts prior to backfill and compaction.
5. Materials identified as unsuitable for use due to contamination to be treated as necessary
6. Incidental groundwater encountered during excavations to be contained pending testing, treatment / disposal.

Although this strategy will generally apply, removal of deeper foundations will not be required for open space reclamation, and compaction of replaced material to a construction specification will not be necessary.

Testing at Source:

Testing, both chemical and geotechnical, was proposed to be undertaken concurrently with excavation to assess suitability for use and identify any materials requiring treatment.

Chemical test results were to be assessed based on Risk Based Target Concentrations (RTCs), to be derived on a site specific basis and consequently less conservative than the use of the CLR 10 'allotment' scenario as applied by SW in the preliminary assessment.

Testing was proposed prior to bulk excavations, to determine the lateral and vertical extent of contamination and enable the classification of materials. Testing would be supplemented by the provision of a specialist banksman at the point of excavation.

Point of Deposition Testing:

Geotechnical testing of re-engineered material will be required within the development area.

Chemical testing was proposed within the upper 1m of fill to confirm compliance with risk based target concentrations.

Monitoring:

Monitoring of surface water, groundwater and gas emissions was proposed during the bulk excavation works and during the subsequent year.

5.2 Regulatory Responses

Copies of correspondence are included in Appendix C.

Environment Agency:

Agreement has been obtained from the EA that the investigations undertaken by SW were sufficient to characterise the site. Consequently no further investigation was undertaken by WYGE with regard to groundwater assessment.

The Environment Agency concurred that provision should be made for the containment and treatment of perched water if encountered and for suitable controls regarding discharge / disposal.

A programme of groundwater / surface water quality monitoring during and immediately after the works was required, the details of which are to be agreed.

Barnsley MBC:

It was noted that the chemical testing suite utilised by SW (and previously by RFC) omitted arsenic, commonly associated with colliery spoil. Investigation and assessment of arsenic was required as a part of subsequent assessment.

A request was made for further details of the human health risk assessment modelling utilised by SW to derive 'soil guideline values', particularly for naphthalene, benzo(a)pyrene, phenol and free cyanide.

With the exception of these issues, the proposed works were considered acceptable to the Council.

So far as WYGE are aware, these two issues have not been addressed in further correspondence between SW and the local authority.

In addition, the Barnsley MBC Contaminated Land Officer has since expressed some concerns regarding the possible presence of volatile organic compounds (particularly benzene, toluene, ethylbenzene and xylenes, 'BTEX', which may be associated with coke works effluents. Supplementary testing for BTEX has been incorporated into the Reclamation Strategy.

The outstanding regulatory issues are addressed in the Strategy now proposed.

6.0 GEO-ENVIRONMENTAL ASSESSMENT

The assessment of geo-environmental (contamination) constraints is described in detail in the WYGE Ground Investigation Factual and Interpretative Report [4].

Note that this assessment excludes the former inert landfill north of the Royston Drift Mine area, which does not form a part of the scheme.

6.1 Screening Criteria

Initial screening assessment of soil analysis results with regard to potential human health risks was undertaken using WYGE Threshold Screening Values, TSVs. These were derived in accordance with the UK framework set out in the most recent CLR (Contaminated Land Report) documents. CLR10 describes four standard land use scenarios:

- residential with plant uptake;
- residential without plant uptake
- allotments
- commercial and industrial.

For initial screening purposes, the 'residential without plant uptake' scenario criteria have been utilised in all areas. These are considered highly conservative, due to the inclusion of very young receptors (0-6 year old children); daily exposure to contaminated soils; the inclusion of indoor exposure pathways and other exposure parameters which do not apply at this site. However, as conservative criteria, they are considered useful in identification of contaminants which might be of concern and require more detailed consideration.

Screening of all data identified the following contaminants as being of potential human health concern:

- Arsenic
- Naphthalene
- Acenaphthylene
- Acenaphthene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Petroleum hydrocarbons (TPH)

Potentially combustible materials (residual coal in mine spoil; coal content of lagoon tailings) was also identified and may present risks to the reclamation.

6.2 Soils: Quantitative Risk Assessment

Although the 'residential without plant uptake' generic quantitative criteria are considered a useful conservative screening approach, there are significant differences in the exposure scenario in POS and sports pitch use when compared with the 'residential' scenario. More detailed consideration of the exposure model was undertaken to derive site specific assessment criteria. Significant differences, all of which would be expected to result in an increase in the concentrations considered acceptable, include:

- The 'residential' default scenario assumes outdoor dermal exposure of a 0-6 year old child for 130 days per year and oral exposure (via dust and vapour) 365 days per year (CLR10, Table 4.3). Outdoor exposure is assumed for 3 hours / day. It is considered unlikely that any exposed individual would access the POS areas of the Royston Mine or Colliery Tip reclamation for more than a few hours in any day, and daily visits are not likely. A conservative assessment might allow for 1 hour per visit, 2 days per week, averaged over the year. Consequently, the exposure frequencies for soil (ingestion and dermal contact) have been reduced to 104 days / year and the time outdoors (associated with the site) reduced to 1 hour / day.
- The 'residential' model includes indoor exposure, via vapour intrusion and dust exposure. Unlike garden soils, tracking of site soils into the domestic environment is unlikely to be significant. Assessment of vapour risk in the outdoor environment also requires differing exposure assessment methodology.
- The residential model includes for exposure of very young children, whose low body weight results in potentially increased significance of exposure. Children in the lower age ranges would not be exposed at the site due to differences in use relative to the residential scenario. No account has been taken of this in the site-specific quantitative assessment.
- Some exposure of unvegetated soil is assumed in the default model. The establishment of grass is proposed, likely to reduce airborne dust entrainment and dermal contact. No correction has been included.

A RISC Workbench model was run, utilising the input exposure, soil characteristic and toxicity parameters as used in the generic residential model with the exception of reduced exposure times and frequencies (104 day / year; 1 hour / day), and utilising the outdoor air inhalation model. An outdoor air 'box length' of 100m was assumed, considered a conservative assessment of the potential volatile contaminant source zone dimension.

Site specific assessment criteria (SSAC) for the POS areas were derived for the contaminants of concern as presented in Table 6.1. In addition, as benzene concentrations were identified in a small number of samples in the WYGE investigations [5,6] for 'cut' areas in excess of the 'residential' criterion, a benzene SSAC was also derived.

As carbon band (TPH CWG) data are not available for hydrocarbons, a tentative screening criterion for human health using 'residential' criteria and based on the composition of diesel was utilised (described in 6.2.1, Geo-Environmental Site Investigation Factual and Interpretative Report). Whereas SSACs were derived for other contaminants using the RISC Workbench model, this has not been undertaken for total hydrocarbons results. Although the tentative assumptions regarding hydrocarbons carbon band composition could be utilised in the model, it was considered that assessment should be based on carbon band data where applicable. However, utilising only the correction for exposure frequency (104 days in place of 365) would permit a pro rata increase in the tentative residential screening criterion (630mg/kg) to 2210mg/kg.

Table 6.1 Site Specific Human Health Assessment Criteria, POS

Contaminant	Site Specific Assessment Criterion, mg/kg
Arsenic	130
Acenaphthene	6000
Acenaphthylene	73
Benzo(a)anthracene	60
Benzo(a)pyrene	6
Naphthalene	370
Total Petroleum Hydrocarbons	2210
Benzene	3.1

These criteria are considered suitable for those areas of the site proposed for informal POS access. Due to the greater soil dermal contact and ingestion inherent in the sports pitch use, the exposure assumptions in CLR10 for the residential scenario may be low in this case. To ensure that no significant risk to human health is created, it is recommended that soils consistent with uncontaminated material should be utilised for the upper 300mm, for which the 'residential' generic criteria are considered suitable.

6.3 Contamination Assessment

Former Royston Drift Mine Area

Statistical analysis was undertaken for each contaminant for which the maximum concentration recorded exceeded the screening criterion. The calculated 95% Upper Confidence Limit value (95% UCL) is compared with the Site Specific Assessment Criterion, SSAC, in Table 6.2

Table 6.2: Assessment of Contaminants of Concern, Royston Drift Mine

Contaminant	No. of results	SSAC, mg/kg	Outlier samples	95% UCL, mg/kg	Maximum, mg/kg
Arsenic	11	130	None	26.5	46
Benzo(a)anthracene	16	60	None	3.48	9.7
Benzo(a)pyrene	16	6	None	2.98	8.3
Naphthalene	16	370	None	12.8	31.0

All 95% UCL values were below the SSAC. Although the maximum concentration for benzo(a)pyrene exceeded the SSAC, this was part of a single statistical population (not an outlier) and consequently no remedial action is indicated.

Four of 11 WYGE samples exceeded the 630mg/kg TPH screening criterion, maximum 1300mg/kg, though none exceeded the tentative 2210mg/kg POS SSAC.

No WYGE combustibility testing (loss on ignition) results indicated potential combustion risks in the Royston Drift Mine area.

Sports Pitch Area

Statistical analysis was undertaken for each contaminant for which the maximum concentration recorded exceeded the screening criterion. In this case, the calculated 95% Upper Confidence Limit value (95% UCL) is compared with the generic Residential screening criteria in Tables 6.3a and 6.3b.

**Table 6.3a: Assessment of Contaminants of Concern, Sports Pitch Area
(Natural Ground)**

Contaminant	No. of results	TSV, mg/kg	Outlier samples	95% UCL, mg/kg	Maximum, mg/kg
Arsenic	9	20	None	8.7	13
Acenaphthylene	19	1	None	0.39	0.5
Acenaphthene	19	12	None	0.49	1.4
Benzo(a)anthracene	19	7.8	None	0.39	0.45
Benzo(a)pyrene	19	1.4	None	0.39	0.5
Naphthalene	19	5.6	None	2.0	5.6

**Table 6.3b: Assessment of Contaminants of Concern, Sports Pitch Area
(Made Ground)**

Contaminant	No. of results	TSV, mg/kg	Outlier samples	95% UCL, mg/kg	Maximum, mg/kg
Arsenic	8	20	None	23.6	30.0
Acenaphthylene	13	1	SW TP41, 0.5m (4.2mg/kg)	0.35	0.5
Acenaphthene	13	12	SW TP41, 0.5m (18.0mg/kg)	1.4	4.4
Benzo(a)anthracene	13	7.8	None	3.6	7.9
Benzo(a)pyrene	13	1.4	None	3.9	12.0
Naphthalene	13	5.6	None	17.6	51.0

Outlier data which exceed the SSAC are shown **bold**. Where outliers are identified, these data are removed before calculation of the 95%UCL and maxima.

Table 6.3a summarises results for samples of natural ground within the Sports Pitch area. All 95%UCL values, and all maximum concentrations with the exception of naphthalene, were below the Residential screening criteria. Natural ground is consequently considered uncontaminated, and potentially suitable for placement at or close to the surface within the sports pitch area.

Table 6.3b identifies one sample, SW TP41, 0.5m, identified as a statistical outlier ('hot spot') for the PAH compounds acenaphthene and acenaphthylene. Concentrations of both compounds exceeded the screening criteria. In the general data population, 95%UCL values for arsenic, benzo(a)pyrene and naphthalene exceeded the Residential TSV. Made ground within this area is consequently considered to be marginally contaminated with regard to the proposed sports pitch development and unsuitable for retention close to surface where significant skin contact and ingestion pathways may exist. Made ground materials present are consequently likely to require cover by clean soils, preventing human exposure pathways, or removal from this area of the site. All materials tested, including the identified outlier, were within the SSAC for the POS areas, and relocation to these areas would also be acceptable.

Two of 8 WYGE made ground samples exceeded the 630mg/kg TPH screening criterion, maximum 1400mg/kg. None exceeded the POS tentative TPH criterion, 2110mg/kg.

No WYGE combustibility testing (loss on ignition) results indicated combustion risks in the Sports Pitch area.

Colliery Tip

Statistical analysis was undertaken for each contaminant for which the maximum concentration recorded exceeded the screening criterion. The calculated 95% Upper Confidence Limit value (95% UCL) was compared with the Site Specific Assessment Criterion, SSAC in Table 6.4

Table 6.4: Assessment of Contaminants of Concern, Colliery Tip

Contaminant	No. of results	SSAC, mg/kg	Outlier samples	95% UCL, mg/kg	Maximum, mg/kg
Arsenic	19	130	None	110	260
Acenaphthylene	57	73	SW TP14, 3.4m (3400mg/kg) SW TP20, 0.5m (190mg/kg) SW TP26, 2.5m (51mg/kg) WYGE TP28, 1.7m (11.0mg/kg) SW BH11a, 8m (5.8mg/kg)	0.55	3.3
Acenaphthene	57	6000	SW TP20, 0.5m (13,000mg/kg) SW BH11a, 8m (2,900mg/kg)	26.3	230
Benzo(a)anthracene	57	60	SW TP14, 3.4m (1,600mg/kg) SW TP20, 0.5m (130mg/kg) SW TP26, 2.5m (63mg/kg) SW BH11a, 8m (28mg/kg) WYGE TP28, 1.7m (17mg/kg)	1.55	4.5
Benzo(a)pyrene	57	6	SW TP14, 3.4m (1,700mg/kg) SW TP20, 0.5m (150mg/kg) SW BH11a, 8m (48mg/kg) SW TP26, 2.5m (25mg/kg)	1.42	6.5
Naphthalene	57	370	SW TP14, 3.4m (9500mg/kg) SW TP26, 2.5m (600mg/kg) SW TP20, 0.5m (450mg/kg) WYGE TP28, 1.7m (190mg/kg)	19.8	110

All 95% UCL values exclusive of outlier data were below the SSAC.

Outlier data which exceed the SSAC are shown **bold**. Most locations were identified as outliers for a number of PAH compounds, a total of 5 locations being identified as outlier positions. All except WYGE TP28, 1.7m, exceeded the SSAC criterion for at least one determinand. Remedial action would consequently be considered necessary should materials represented by these samples be present at or close to the existing surface, or be exposed by excavation works.

Two of 20 WYGE samples exceeded the 630mg/kg TPH screening criterion, maximum 10,000mg/kg (TP28, 1.7m). This single result was the only one to exceed the tentative POS SSAC for hydrocarbons, 2210mg/kg.

Eight of 24 WYGE loss on ignition results exceeded the combustibility criterion. Of these, 7 related to materials consistent with lagoon tailings (soft to firm black clay, often with identifiable coal fragments). The proportion of samples identified as combustible is biased due to preferential selection of materials identified as lagoon tailings (and likely to contain a higher coal content than the general body of colliery spoil). In general, colliery spoil was found unlikely to be combustible. Although the clay nature of tailings reduces the risk of combustion due to restricted availability of oxygen, it would be prudent to avoid these materials being exposed at the surface. In addition to combustibility, tailings are likely to be more susceptible to run-off of suspended solids if exposed at the surface.

7.0 REMEDIATION WORKS

7.1 Former Royston Drift Mine Area

Assessment of the Royston Drift Mine area, utilising Threshold Screening Criteria and Site Specific Assessment Criteria, has not identified contamination requiring remedial action for POS land use.

Based on currently available site investigation data, only the provision of a suitable thickness of clean soils for the establishment of landscape planting, predominantly grass is recommended. Typically, 300mm of clean soil or soil making materials are considered suitable for the establishment of shallow rooted species, though the requirements of a specialist soil scientist / landscape architect should be considered. Any areas which are proposed for deeper rooted species (trees) may require a thicker growing medium.

Although the proposed soil cover is not considered a necessary protective measure with regard to human health exposure, the provision of cover will reduce the exposure of POS users to minimal levels. All pathways (dermal contact, ingestion, inhalation of dust and vapour) will be effectively removed. Although some long-term mixing with underlying made ground materials may take place due to natural processes (burrowing animals, soil invertebrate activity, etc.), the area is unlikely to be dug once landscaping vegetation is established, hence substantial mixing is not likely. Steep slopes are not present in this area, hence the risk of creation of gullies within the cover soils by rainwater run-off exposing the underlying soils is not significant.

Data is currently available based on a sampling point separation of approximately 50m (SW and WYGE investigations combined). A significant proportion of this area of the site is beneath concrete hardstanding, and it is possible that localised areas of contamination may exist which are not currently apparent. In accordance with the draft reclamation strategy prepared by SW, it is proposed that on-going inspection of excavations will be required throughout the works, utilising an experienced banksman. Any materials which are considered suspect, for example due to visible or odour evidence of contamination, should be separately stockpiled and tested before re-placement. The stockpile area should be bunded or otherwise protected from the risk of run-off / leaching of contaminants to surface waters in the event of rainfall.

As testing has been undertaken at approximately 50m centres, and materials tested were found to be broadly similar (no outlier contamination data were identified), it is not proposed to undertake further routine testing in this area.

7.2 Sports Pitch Area

Due to the potential for dermal contact and ingestion of soils at rates in excess of the generic residential model, soils with which users of the sports pitches may be in contact should be consistent with uncontaminated natural soils. Once pitches are established it is unlikely that substantial disturbance of surface soils by digging would take place, and a 300mm clean soil cover is considered sufficient provided that the underlying material does not exceed the contaminant concentration criteria derived for POS use elsewhere within the site. It is possible however that pitch construction requirements may require a greater thickness of clean cover, depending on drainage requirements. The proposed 300mm minimum thickness is a pragmatic

value based on expected use of the pitches. Models such as the BRE 'Cover Systems for Land Regeneration' assume that active digging of the cover soils will take place and so are not appropriate in this case.

Natural ground tested within the Sports Pitch area was found to be uncontaminated and potentially suitable for use as a cover material. However, it is likely to require improvement to be suitable for grass growth with regard to nutrient and organic matter content, and drainage characteristics have not been assessed. In the absence of significant quantities of clean topsoils at the site, it is recommended that suitable soils are identified and imported from elsewhere. Consideration of validation testing of imported soils is included in 7.5.

Made ground exceeded the Residential ('uncontaminated') criteria for arsenic, benzo(a)pyrene and naphthalene, and is consequently unsuitable for retention within the upper 300mm. However, all materials tested complied with the POS SSAC, including one sample which was identified as an outlier for the PAH compounds acenaphthylene and acenaphthene. Existing made ground would consequently be suitable for retention beneath the proposed minimum 300mm cover (or such thickness as is dictated by drainage or other pitch construction constraints).

The car park plateau is proposed to be located in an area of cut, on natural ground. No contamination constraints apply in this area.

Ground investigation has been carried out at approximately 50m spacing and the likelihood of localised contamination is low, in the absence of historical contaminative activity. No further contamination testing is recommended in this area, though as described in 7.1, excavations will be inspected on a continuous basis for visible or olfactory evidence of potentially suspect materials.

7.3 Colliery Tip

Investigation of the colliery tip has identified 5 locations as statistical outliers ('hot spots') for contamination by PAHs and petroleum hydrocarbons:

SW	TP14, 3.4m
SW	TP20, 0.5m
SW	TP26, 2.5m
SW	BH11a, 8m
WYGE	TP28, 1.7m

In each case, results for at least one contaminant of concern exceeded the POS criteria and materials represented by these samples are considered unsuitable for exposure at or close to the surface of the restored tip. Although no samples from shallower strata were tested except at WYGE TP28, log descriptions suggest that overlying material was not significantly contaminated, with odours reported only from the tested strata. In the case of SW TP20, the impacted material was identified by a 'strong hydrocarbons odour' at only 0.4m bgl. All others were covered by at least 1m of material which did not give specific indication of contamination risk.

With the exception of the identified outliers, all other results were within the screening TSV or SSAC criteria and retention at or close to the surface does not represent a significant human health risk.

Provision of suitable growing media for the establishment of landscape planting, predominantly grass, is proposed. Requirements vary depending on the proposed vegetation type, ranging from the incorporation of 50mm green waste into the upper 100mm of spoil in areas planned for neutral grassland, to 600mm subsoil and 200mm topsoil in sports pitch areas. With the exception of the sports pitches, where greater exposure potential requires a more conservative approach, clean cover has not been identified as a requirement of the reclamation. The provision of clean imported soils and soil-making materials would however have some potential benefit in further reducing exposure to contaminants.

In areas of amenity and species rich grassland, where public access is likely to be of most significance, the placing of 300mm of clean subsoils are proposed. Although some long-term mixing with underlying made ground materials may take place due to natural processes (burrowing animals, soil invertebrate activity, etc.), the area is unlikely to be dug once landscaping vegetation is established, hence substantial mixing is not likely. All pathways for public exposure to mine spoil (dermal contact, ingestion, inhalation of dust and vapour) will therefore be minimal.

Due to the oxidation of pyrite minerals, colliery spoil tips are commonly acidic, resulting in conditions unsuitable for planting and the potential for acidic run-off of elevated metals content. However, samples tested by WYGE from the tip area identified a pH range between pH4.7 and 9.6, mean pH7.1. Based on the mean value, no neutralisation of acidity would be a requirement for the establishment of planting. Specialist guidance will however be sought to confirm whether liming or other treatment is required with regard to the detailed planting strategy.

The remediation of contaminated materials within the body of the tip, which do not present any human health risks in the absence of relevant pathways, is not a part of the reclamation strategy. However, it is necessary to ensure that near-surface soils exceeding contamination criteria for human health, where there may be significant pathways, do not represent any on-going risk.

Although the location of only a single cokeworks effluent disposal lagoon is known (targeted by WYGE trial pit TP28), contamination consistent with this material has been identified at other locations, notably those identified as hot spots above. Whether these relate to other cokeworks effluent disposal locations or to leaching / migration from the known lagoon is uncertain. Four of the five hotspot locations are clustered toward the western face of the tip (SW TP20, TP26, BH11A and WYGE TP28) and might reasonably be expected to be associated with migration from the known lagoon or others in the nearby area. SW TP14 was located at the western extremity of the tip, and is assumed to represent a different source zone. It is however apparent that further hot spot areas might exist within the tip which have not as yet been identified by ground investigations. The sampling location separation is variable within the tip area, but in some areas is greater than 100m.

The potential for contamination by volatile organic compounds (BTEX) has been assessed within possible cut areas. Concentrations were minimal and vapour inhalation by public open space users is not considered a significant exposure pathway.

7.3.1 Soil Testing

As proposed by SW, further soil testing is recommended as part of the earthworks strategy:

i. Areas of cut

Materials from areas of cut will be utilised as fill to reduce the angle of tip slopes, and possibly to raise levels within the Sports Pitch area.

A proposed area of cut had previously been identified within the southeastern section of the tip, approximately 300m x 150m and to a maximum depth of 10m from current level. The cut area has been selected to avoid known areas of colliery tailings lagoons (based on former NCB records) and did not include any of those areas identified as hotspots.

Sampling and testing of this material was undertaken at a rate of one sample per 5000m³ (equivalent to one sample per 50m grid square over a 2m thickness) and analysis for PAH, TPH and BTEX undertaken. Results are assessed in Section 3.4 above. Further testing was carried out on additional areas identified as possible sources of fill.

It is recommended that, should other areas of potential cut be identified which have not been tested and assessed, these should also be sampled at the 1:5000m³ rate and tested as above for PAH, TPH (>C6-C40) and BTEX, with provision for TPH CWG carbon band analysis should TPH (total) exceed 1000mg/kg. Results should be assessed based on the derived SSAC or WYGE Residential screening criteria.

Samples will be obtained by mechanical excavator or boreholes, to represent the cut area, prior to any bulk excavations being undertaken.

In addition to the proposed sampling regime, bulk excavations will be supervised and any materials indicating potential contamination by appearance or odour stockpiled pending supplementary testing.

ii. Remaining area of tip

WYGE are currently aware of only a single hot spot location at less than 1m below the existing tip surface (identified by SW TP20, but since confirmed to extend to include WYGE 2008 locations TT01 and TTP3). It is however possible that other areas might exist. Within those areas of the tip which are proposed for landscape planting but which are not otherwise impacted by the reclamation (slope stability) works, a 50m grid of exploratory locations is proposed. These will be excavated to 1m bgl, utilising either a wheeled excavator or, in areas where slopes may prevent this, using hand tools or a portable auger.

It has been demonstrated that materials exceeding POS SSAC values are identifiable by appearance or odour. Consequently, it is not proposed to analyse all samples. All samples will be examined for visible or odour evidence of contamination and any considered suspect will be analysed for PAH and TPH, with TPH CWG banding conditional, as above. In any areas where evidence of contamination is identified, additional exploratory locations will be tested to establish the extent of the impacted area.

7.3.2 Remediation of 'hot spot' areas:

Where 'hot spot' areas are identified within 1m of the tip surface which exceed the SSAC criteria, remediation will be required. Currently, only the vicinity of SW TP20 is known, but others may be identified by the testing programme above. The extent of any hot spots will be delineated by supplementary testing.

Remediation is proposed either by clean cover or excavation. Clean cover is the preferred option, increasing the thickness of uncontaminated material overlying the hot-spot material to a minimum of 1m of low permeability material containing a substantial fraction of clay / silt (for example, typical clean, weathered colliery spoil).

A Hotspot Location Plan is included in Appendix B which shows the boundary of the area on the west flank of the tip including SW TP20 to be treated as a contamination 'hot spot', due to the presence of contamination exceeding 'open space' criteria within the upper 1 metre. The boundary of the defined hot spot has been based on a combination of contamination testing results and visible or odour evidence of contamination from trial excavations. Locations shown red (TP20, TT01 and TTP3) identify locations at which contamination has been proven by analysis, other references to 'contamination' being based on observations. Of the three proven locations, TTP3 to the northeast may represent a discrete source area as the contamination was differently characterised, but has been included within a single hotspot area. The identified area will receive 700 mm of clean colliery spoil fill and 300 mm of clean imported soils or 950mm spoil with 50mm green waste, and planted as grass only, with no tree planting. A proposed canter track passes over TP20, aligned to follow an existing shelf to avoid any cut. The track will be constructed using 700 mm of clean spoil and 325 mm track construction material. Cover thickness will be tapered to meet the levels of soil cover applied outside the hotspot area.

Should cover be unacceptable due to level, drainage or landscaping constraints, excavation and re-placement, treatment or off-site disposal will be considered. Unless very heavily contaminated materials are encountered in the excavation of 'hot spot' areas (such as visible organic free product), placement of the materials within the body of fill in the slope remediation area is proposed. These works will therefore re-profile soils which will not require any further treatment in order to utilise them as part of the site reclamation. In line with the Environment Agency document "The Definition of Waste: developing greenfield and brownfield sites", April 2006, it is considered that the soils are not waste materials and therefore that there will be no requirement

for either waste management licensing or for any exemptions.

If very heavily contaminated materials are encountered (based on visible evidence) and are to be excavated, off site disposal to a suitably licenced waste facility, or possibly on site treatment, will be required at the discretion of the Engineer). As the main contaminants of concern are PAHs, biological degradation rates are likely to be relatively slow and on site bio-treatment may not be suitable. If the volumes of material identified for remedial action prove sufficient for on-site treatment, this will require to be undertaken in accordance with relevant mobile treatment or other applicable waste management licensing / environmental permitting.

Excavated materials will be replaced by soils sourced from elsewhere within the tip.

7.3.3 Combustibility

Materials with high coal content, typically lagoon tailings, will not be left exposed at the surface. None are known on the present tip surface, but cut areas may expose historical tailings lagoons which are not recorded by the available plans. Investigations of candidate cut areas by WYG [5,6] have exposed high coal content materials tentatively identified as pressed coal fines, including areas which had not been identified as lagoons on available NCB tip plans. If encountered, tailings will be covered by at least 1m of lower coal content spoil material (or such other quantity as may be required for geotechnical reasons).

7.4 Surface Waters Protection

The reclamation strategy includes for the reduction of slope angles at the southern edge of the tip. Currently, there is evidence of rainwater causing wash-out gullies in this area. Appropriate design will be required to ensure that soil cover does not become eroded in this way, though unless 'hot spot' areas are exposed, no significant health risk would result. There is however the potential for run-off of suspended solids and potential impact on the adjacent Sandybridge Dike. A settlement pond is to be provided to intercept drainage during the works.

Perched waters might be encountered in excavations, which may be contaminated (particularly if water is found within the colliery tip). It is noted that WYGE investigations [5] did identify some perched water, found to be contaminated by metals (copper, nickel and zinc) and TPH and unsuitable for discharge to surface water courses. Any such water encountered will not be discharged directly to surface water courses. Appropriate methods of control will be required to allow waters to be retained and tested to assess a suitable disposal route (to surface waters with the agreement of the Environment Agency; to local sewer subject to the agreement of the sewerage utility, or off site by tanker).

7.4.1 Surface Water Quality Monitoring

To ensure that the works do not impact on the quality of Sandybridge Dike and its tributaries to the west of the tip, a programme of water sampling and testing will be implemented.

Water samples will be obtained on two occasions prior to commencement of the works and subsequently at monthly intervals continuing until 2 months beyond completion. Samples will be obtained from:

- upstream of the site boundary - Sandybridge Dike and its 2 tributaries to the west;
- downstream within the site boundary of individual watercourses;
- Sandybridge Dike downstream of the site, below the confluence of all relevant watercourses.

All samples will be tested at an accredited independent laboratory for:

Ammoniacal nitrogen
pH
Sulphate
Total Petroleum Hydrocarbons
PAHs (US EPA 16)
Phenol Index
Suspended solids

Results will be made available on site for inspection by the regulatory authorities. Results will be reviewed monthly for any evidence of pollution which may be attributable to the site works, and investigation of any concerns undertaken.

Environmental inspections will be undertaken on a regular basis by the supervising engineer throughout the works. Any evidence of surface water pollution or risks of pollution associated with unsatisfactory practice will be reported promptly to the Contractor for remedial action.

7.4.2 Groundwater Protection

As discussed elsewhere, it has previously been agreed with the Environment Agency that, although there is evidence of pollution of groundwater in the vicinity of the site, remediation is not a requirement of this scheme.

The scheme is however likely to have a small net benefit with regard to on-going impact on groundwater quality. The exclusion of spoil which is more significantly contaminated by cokeworks effluent from the near surface would be expected to reduce the rate of leaching of organics and the ongoing source contaminant loading. The application of soil cover and establishment of vegetation may marginally reduce infiltration by transpiration and stabilisation of the tip surface.

The removal of concrete ground slabs within the Royston Drift area will lead to some increase in infiltration through made ground in this area. Contaminant concentrations in the made ground currently beneath the slabs have however been demonstrated to be typical of colliery spoil, and the impact is not anticipated to be significant.

7.5 Certification of Imported Materials

The import of soils / soil making materials will be required as a medium for the establishment of landscaping plants and for sports pitch areas.

All soils identified for import will be tested at source, at a rate of 1 sample per 500m³. All samples will be tested for the following suite:

Total metals (As, Cd, Cr, Pb, Hg, Se, Cu, Ni, Zn)
pH
PAHs (US EPA 16)
TPH (C6-C40)

(In the event that a source of large quantities of soils for import is identified which is likely to be uncontaminated and homogeneous, approval for a variation in the test frequency may be sought).

Soils for import should generally comply with criteria for Residential gardens, though some flexibility may be acceptable for soils destined for use in POS areas only.

Testing will be undertaken by an independent laboratory holding UKAS and MCERT accreditation. A suitable audit trail will be established to ensure that material as tested is as supplied. Records of testing results and source information will be retained for inclusion in the Validation Report.

Some soils which are proposed for use within the scheme are present in stockpiles within the sports pitch and southwestern colliery tip area. The suitability of these soils, which have not been

tested to date, will be confirmed prior to use, based on the testing regime for imported soil.

8.0 DEMONSTRATION OF POLLUTION LINKAGE REMOVAL

Table 8.1 demonstrates that each of the potential pollutant linkages, based upon the classic source-pathway-receptor model will be satisfactorily addressed by the proposed remediation scheme.

Table 8.1 Mitigation of Pollutant Linkages

Receptor	Potential Risk	Mitigation
Human Health *	Inhalation	Potential for airborne dust entrainment reduced by cover with clean soil and by establishment of vegetation. Vapour inhalation risk of very low significance due to low concentrations of slightly volatile contaminants (some PAHs) and absence of built development proposals. Removal / treatment of any hot-spot areas will precede application of restoration soils. Off site disposal likely.
	Skin contact	As above. The Sports Pitch development is more sensitive due to greater skin contact potential. An 'uncontaminated' soil cover is a requirement in this area.
	Ingestion	As above
	Irradiation	N/A
Buildings	Fire and explosion Chemical attack on building materials and services	No built development is included in the reclamation scheme, with the exception of car park hardstanding and possible associated drainage.
Natural Environment	Phytotoxicity (prevention or inhibition of plant growth)	The provision of clean soil cover in required areas will mitigate any phytotoxic risk for new planting. Ground investigation has not identified likely concerns, though existing soils are likely to be nutrient deficient and physically unsuitable.
	Pollution of surface water features	Recontouring of the tip and soil cover will reduce the risk of suspended solids wash-out. Discharge of perched water encountered during the works to be controlled.
	Groundwater	Previous liaison with the Environment Agency has concluded that remediation of groundwater is not an economic objective of the reclamation. Removal of near-surface hotspots will reduce leaching potential and the scheme is expected to have a small net beneficial impact.

* it should be noted that the transient risks to construction workers will be addressed by the adoption of appropriate health and safety measures in accordance with the Health and Safety at Work etc. Act 1974 and regulations made under the Act including for example the COSHH Regulations.

9.0 SITE CERTIFICATION

An integral part of the remediation strategy that is proposed for the site involves suitable monitoring of the works to ensure they are undertaken as specified.

A suitably experienced engineer should supervise the remediation works on a full time basis.

The Engineer will maintain records of the works to include the following:

- i) Record sheets to include a summary of the day's or week's activities
- ii) Date and weather conditions
- iii) Plant, personnel and visitors present
- iv) Aspects relating to health and safety, environmental control and variations to the original strategy/specification
- v) Type(s) and volume(s) of any soils (or waters) removed from site for disposal, or imported
- vi) Details and records of the location, extent and depth of any excavations
- vii) Record of any correspondence with the regulatory authorities, environmental incidents, complaints and mitigation.
- viii) Validation results
- ix) Photographic records as required

The log that will be maintained for the works shall be made fully available to the Local Authority (Barnsley MBC) and the Environment Agency at all reasonable times.

On satisfactory completion of each phase of the works WYGE will provide a 'Certification' or 'Validation' statement that will be based upon the site log. This report shall comprise relevant site records and stand as certification that the remediation works have been carried out in accordance with the agreed remediation strategy. The 'Validation Statement' or 'Completion Statement' will describe and set out the following:

- i) A summary and background to the works, referring to all the site investigation reports, remediation target reports, etc and the "Remediation Strategy"
- ii) A summary of the remediation works undertaken to address the identified risks – including any unforeseen contamination encountered during the works
- iii) Details of relevant correspondence with the Local Planning Authority and the Environment Agency
- iv) Details of validation test results, including a plan showing the sampling locations and the extent of hotspot contamination removed from the site
- v) Details of the fate of any excavated material
- vi) Details of the validation and suitability of any imported soil materials for the clean cover
- vii) Slope stability assessment of the "as built" slopes"
- viii) Confirmation that the requirements of the regulatory bodies have been met

10.0. REFERENCES

1. Scott Wilson, July 2003. Rabbit Ings Site, Barnsley. Desk Study Review (Draft).
2. Scott Wilson, March 2004. Rabbit Ings Site, Barnsley. Interpretative Report on Site Investigation (Draft).
3. Scott Wilson, September 2004. Rabbit Ings Site, Barnsley. Remediation Strategy Report (Draft).
4. White Young Green Environmental, 2008. Rabbit Ings Reclamation, Ground Investigation Factual and Interpretative Report.
5. White Young Green Environmental, July 2008. Geo-Environmental Site Investigation (Tip Regrading Cut Area): Factual and Interpretative Report.
6. White Young Green Environmental, August 2008. Geo-Environmental Site Investigation (Tip Excavation Areas): Factual and Interpretative Report.

APPENDIX A
Report Conditions

WHITE YOUNG GREEN ENVIRONMENTAL

APPENDIX A - REPORT CONDITIONS

RECLAMATION STRATEGY

This report is produced solely for the benefit of Carillion Civil Engineering in partnership with Yorkshire Forward and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on referenced site inspections, study of readily accessible referenced records, the physical investigation as detailed, information supplied by those parties noted in the text, the evaluation presented, stated consultations with regulators and with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. The test results that are available can only be regarded as characterisation but likely representative sample assessed against current UK and other text referenced guidelines. The impact of our assessment on other aspects of the development requires evaluation by other involved parties. The possibility of the presence of contaminants not revealed by this research and works, perhaps in higher concentrations, elsewhere on the site cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies have unpublished, often more stringent objectives. This report is prepared and written for the purpose stated in the report and should not be used in a different context without reference to WYGE. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If surrounding migrating pollution or contamination (past or present) exists, this can only practically be better assessed following extensive off site intrusive investigations and monitoring.

APPENDIX B

DRAWINGS

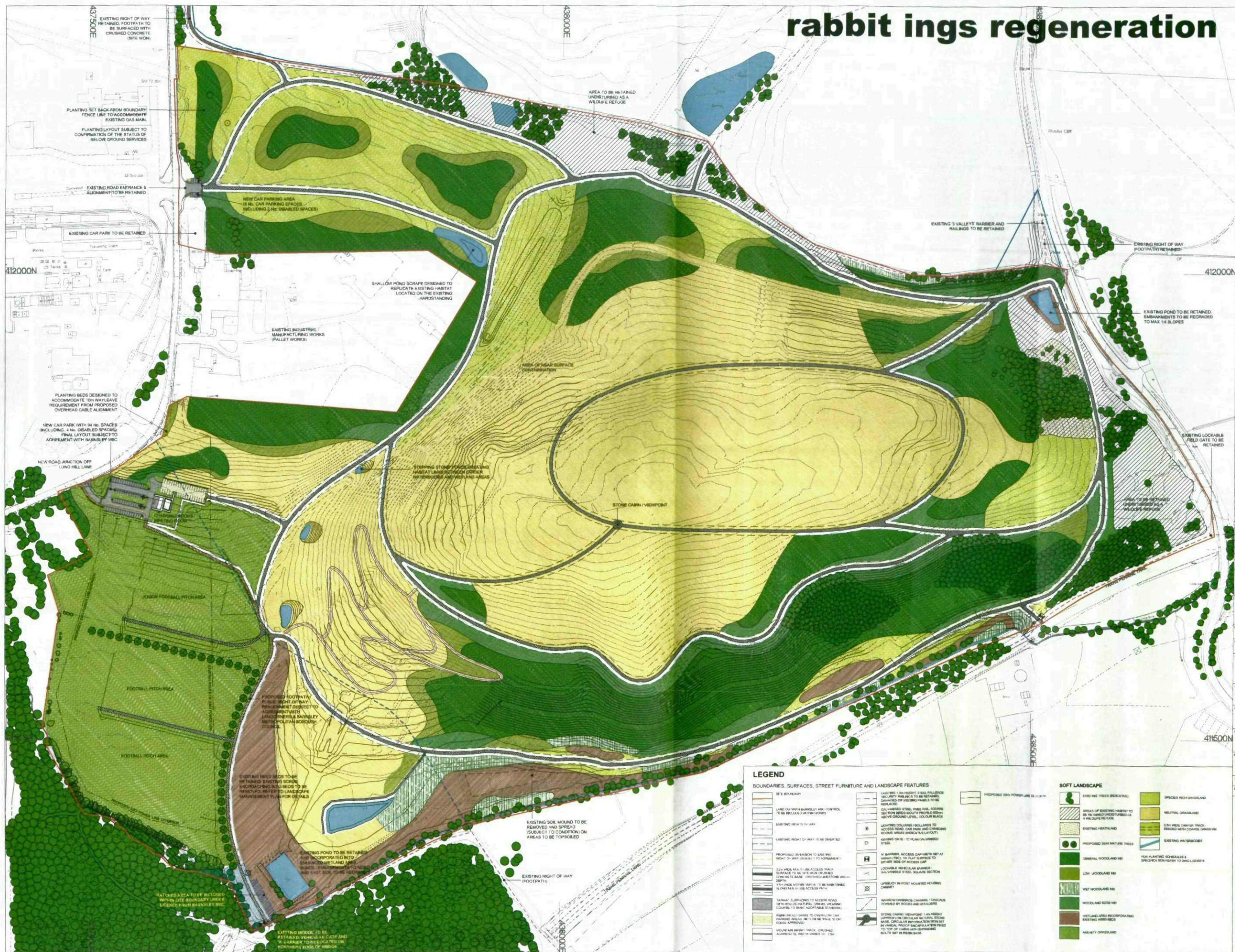
- Site Location Plan
- Restoration Design: Draft Landscaping Plan
- Drawing A039273/307 Proposed Earthworks Plan
- Drawing A039273/308 Section Locations
- Drawing A039273/309 Sections
- Drawing Hotspot Location Plan

FIGURE 1:
SITE LOCATION PLAN



Restoration Design: Draft Landscaping Plan

rabbit ings regeneration

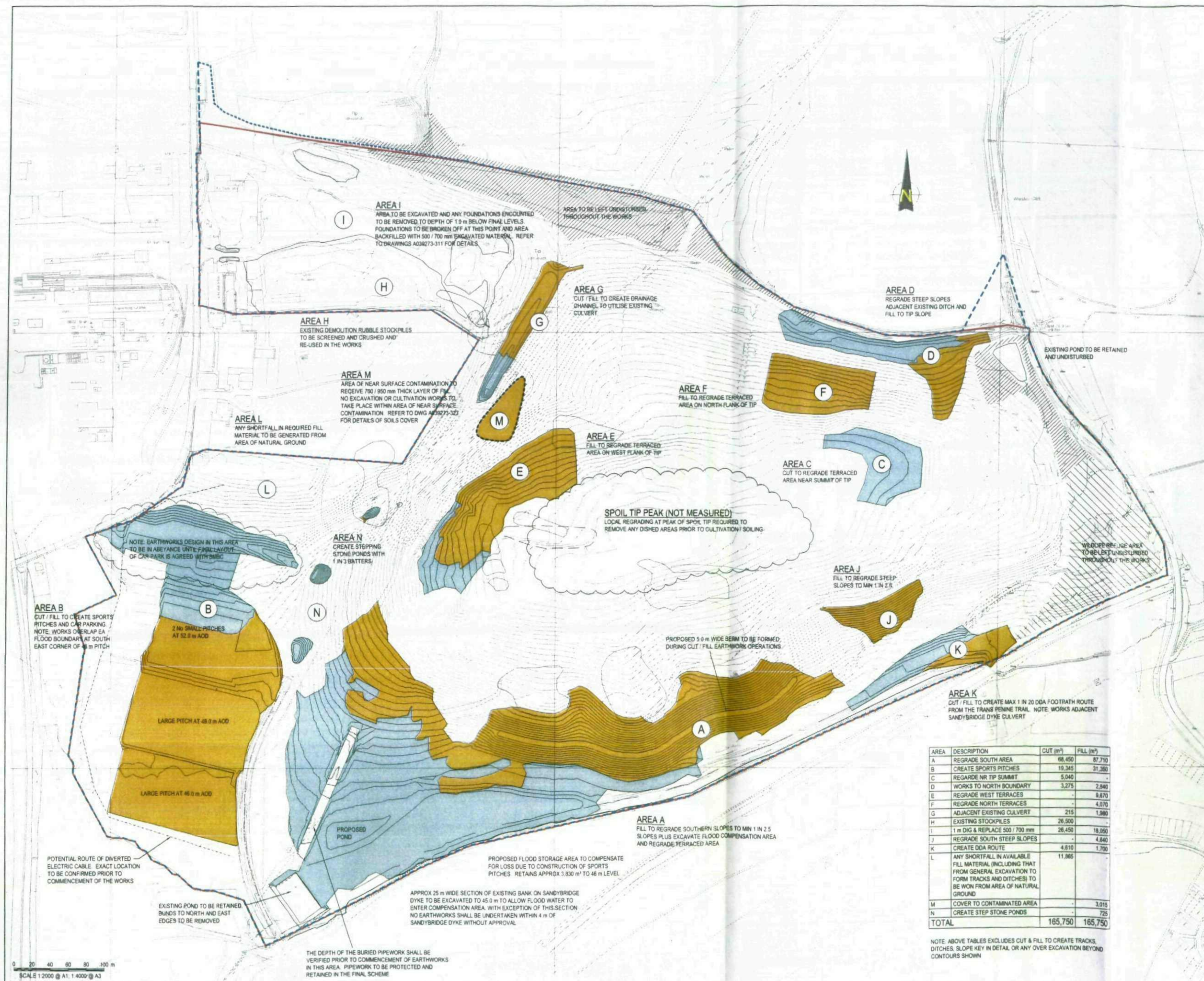


REVISIONS	DATE	BY	CHKD	DATE
A - Alterations to general layout including access and parking areas to accommodate the track	10/10/16	MC	MC	10/10/16
B - Alterations to site boundary including access and parking areas	10/10/16	MC	MC	10/10/16
C - Alterations to landscape scheme track alignment and adjacent parking areas	10/10/16	MC	MC	10/10/16
D - General changes to track use access tracks and parking areas	10/10/16	MC	MC	10/10/16
E - Proposed access routes to west of the area of existing habitat located on the existing hardstanding	10/10/16	MC	MC	10/10/16
F - Additional Alterations, Proposed planting to improve boundary	10/10/16	MC	MC	10/10/16

COPYRIGHT OF THIS DRAWING AND ITS CONTENTS REMAINS WITH THE FARNINGHAM MCCREADIE PARTNERSHIP LIMITED. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM FARNINGHAM MCCREADIE PARTNERSHIP LIMITED.	
PROJECT	RABBIT INGS REGENERATION
CLIENT	CITY OF WAKEFIELD MCC / YORKSHIRE FORWARD
JOB REF	A039273
DRAWING NUMBER	L(92)0016
REVISION	F
DRAWING TITLE	Hard & Soft Landscape Proposals
PROJECT STAGE	INFORMATION
SCALE	1:1250
DATE DRAWN	10/10/16
CHECKED BY	MC

FARNINGHAM MCCREADIE PARTNERSHIP	
Town Planning	
Landscape Architecture	
Architecture	
Urban Design	
Transportation	
Masterplanning	
Minerals & Waste Management	
4 Chantry Tower	Tel: 0115 925 5000
CONQUANTON	Fax: 0115 925 5001
EN11 1PA	Email: info@fmc.co.uk

- **Drawing A039273/307 Proposed Earthworks Plan**



- GENERAL NOTES**
- DO NOT SCALE. ALL DIMENSIONS ARE IN MILLIMETRES.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT CONTRACT DRAWINGS.
 - THE CONTRACTOR SHOULD SITE CHECK ALL EXISTING DIMENSIONS SHOWN. ANY DISCREPANCIES ON THIS DRAWING IDENTIFIED BY THE CONTRACTOR SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION ON SITE.
 - THE CONTRACTOR SHALL CONFORM TO ALL STATUTORY AUTHORITY REQUIREMENTS, CHECKING WITH THE EMPLOYER/CLIENT TO IDENTIFY BOTH BELOW GROUND AND OVERHEAD SERVICES. CONTRACTOR TO FULLY COMPLY WITH ALL COM, H&S AND PARTY WALL ACTS THAT ARE CURRENT. ALL BS REFERENCES ARE TO CURRENT EDITIONS.
 - ALL TEMPORARY WORKS FOR FORMWORK, EXCAVATIONS ETC., TO BE THE DESIGN RESPONSIBILITY OF THE CONTRACTOR.
 - ALL LEVELS ARE IN METRES (A.O.D.)

- SURVEY NOTES**
- THE SURVEY INFORMATION USED IN THE PREPARATION OF THE DRAWING IS NOT WARRANTED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THIS SURVEY INFORMATION PROVIDED.
 - DRAWING BASED ON SURVEY PROVIDED BY DEREK BROOK DATED APRIL 2008.
 - ALL SITE INVESTIGATION DATA IS PROVIDED FOR INFORMATION ONLY. THE CONTRACTOR SHALL VERIFY PRIOR TO COMMENCEMENT OF THE WORKS.
 - THE LOCATION AND VALUE OF THE ORDNANCE SURVEY BENCH MARKS (OBM) WHICH SHALL BE USED AS THE DATUM FOR THE PROJECT IS SHOWN ON THIS DRAWING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CONFORMATION OF THE ASSIGNED VALUE FROM THE ORDNANCE SURVEY.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING TEMPORARY BENCH MARKS FOR USE IN SETTING OUT THE WORKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING ON A REGULAR BASIS, THE VALUE OF THE TBM(S) RELATIVE TO THE OBM.

- EARTHWORK NOTES**
- REFER TO SITE SERVICES DRAWING A039273-305 PRIOR TO COMMENCEMENT OF EXCAVATION WORKS.
 - REFER TO DRAWING A039273-308 & 309 FOR EARTHWORK SECTIONS.
 - EXCAVATED MATERIAL TO BE RE-USED AS FILL SHALL BE FREE FROM ALL DELETERIOUS MATERIAL.

- KEY**
- EXISTING SITE FEATURES**
- REGENERATION BOUNDARY
 - - - SITE APPLICATION BOUNDARY
 - CONTOURS AT 1.0 m INTERVALS
 - EXTENTS OF NEAR SURFACE CONTAMINATION
 - EXTENTS OF SLURRY LAGOONS (TAKEN FROM HISTORIC NCB PLANS)

- PROPOSED SITE FEATURES**
- CONTOURS AT 1.0 m INTERVALS
 - AREA OF CUT
 - AREA OF FILL

Reproduced from Ordnance Survey Digital Data by permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office. © Crown Copyright. All rights reserved. Reference number 100017603.

PLANNING ISSUE

E	Ecology constraints added / minor rev to volumes	LA	T	SM	SM	28/08/08
D	Earthworks scheme revised	LA	SM	SM	SM	06/06/08
C	Soils stockpiles shown / Quantities modified	LA	PB	PB	PB	08/04/08
B	Cut & fill on Southern flank modified	LA	PB	PB	PB	04/04/08
A	Cut & fill areas modified + contaminated area added	LA	PB	PB	PB	14/03/08

REV	DESCRIPTION	BY	CHK	APP	DATE
-----	-------------	----	-----	-----	------

Supported by

English Partnerships

carillion

NEWSTEAD COURT, LITTLE OAK DRIVE
SHERWOOD BUSINESS PARK
ANNESLEY, NOTTINGHAMSHIRE
NG15 0DR

TEL: +44 (0)1623 884 500
FAX: +44 (0)1623 884 550
e-mail: nottingham@wyg.com

Project: A039273

RABBIT INGS REGENERATION

Drawing Title:
PROPOSED EARTHWORKS LAYOUT

Scale	A1	Drawn	Date	Checked	Date	Approved	Date
1:2000	ATF	03/08	03/08	LA	03/08	KB	03/08
Project No.	Office	Type	Drawing No.	Revision			
A039273	51	C&S	307	E			

© WYG Group Ltd SHEET SIZE: A1 LANDSCAPE

AREA	DESCRIPTION	CUT (m³)	FILL (m³)
A	REGRADE SOUTH AREA	68,450	87,710
B	CREATE SPORTS PITCHES	19,345	31,350
C	REGRADE NR TIP SUMMIT	5,040	-
D	WORKS TO NORTH BOUNDARY	3,275	2,840
E	REGRADE WEST TERRACES	-	9,870
F	REGRADE NORTH TERRACES	-	4,070
G	ADJACENT EXISTING CULVERT	215	1,980
H	EXISTING STOCKPILES	26,500	-
I	1 m DIG & REPLACE 500 / 700 mm	26,450	18,050
J	REGRADE SOUTH STEEP SLOPES	-	4,840
K	CREATE DDA ROUTE	4,810	1,700
L	ANY SHORTFALL IN AVAILABLE FILL MATERIAL (INCLUDING THAT FROM GENERAL EXCAVATION TO FORM TRACKS AND DITCHES) TO BE WON FROM AREA OF NATURAL GROUND	11,985	-
M	COVER TO CONTAMINATED AREA	-	3,015
N	CREATE STEP STONE PONDS	-	725
TOTAL		165,750	165,750

NOTE: ABOVE TABLES EXCLUDES CUT & FILL TO CREATE TRACKS, DITCHES, SLOPE KEY IN DETAIL OR ANY OVER EXCAVATION BEYOND CONTOURS SHOWN

- **Drawing A039273/308 Section Locations**



- GENERAL NOTES**
1. DO NOT SCALE. ALL DIMENSIONS ARE IN MILLIMETRES
 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT CONTRACT DRAWINGS
 3. THE CONTRACTOR SHOULD SITE CHECK ALL EXISTING DIMENSIONS SHOWN. ANY DISCREPANCIES ON THIS DRAWING IDENTIFIED BY THE CONTRACTOR SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION ON SITE
 4. THE CONTRACTOR SHALL CONFORM TO ALL STATUTORY AUTHORITY REQUIREMENTS, CHECKING WITH THE EMPLOYER/CLIENT TO IDENTIFY BOTH BELOW GROUND AND OVERHEAD SERVICES. CONTRACTOR TO FULLY COMPLY WITH ALL CDM, HAS AND PARTY WALL ACTS THAT ARE CURRENT. ALL BS REFERENCES ARE TO CURRENT EDITIONS.
 5. ALL TEMPORARY WORKS FOR FORMWORK, EXCAVATIONS ETC. TO BE THE DESIGN RESPONSIBILITY OF THE CONTRACTOR.
 6. ALL LEVELS ARE IN METRES (A.O.D.)
- SURVEY NOTES**
1. THE SURVEY INFORMATION USED IN THE PREPARATION OF THE DRAWING IS NOT WARRANTED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THIS SURVEY INFORMATION PROVIDED
 2. DRAWING BASED ON SURVEY PROVIDED BY DEREK BROOK DATED APRIL 2008
 3. ALL SITE INVESTIGATION DATA IS PROVIDED FOR INFORMATION ONLY. THE CONTRACTOR SHALL VERIFY PRIOR TO COMMENCEMENT OF THE WORKS.
 4. THE LOCATION AND VALUE OF THE ORDNANCE SURVEY BENCH MARKS (OBM) WHICH SHALL BE USED AS THE DATUM FOR THE PROJECT IS SHOWN ON THIS DRAWING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CONFORMATION OF THE ASSIGNED VALUE FROM THE ORDNANCE SURVEY
 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING TEMPORARY BENCH MARKS FOR USE IN SETTING OUT THE WORKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING ON A REGULAR BASIS. THE VALUE OF THE BENCH MARKS (OBM) RELATIVE TO THE OBM.
- EARTHWORK NOTES**
1. REFER TO SITE SERVICES DRAWING A039273-305 PRIOR TO COMMENCEMENT OF EXCAVATION WORKS.
 2. REFER TO DRAWING A039273-309 FOR EARTHWORK SECTIONS.
 3. EXCAVATED MATERIAL TO BE RE-USED AS FILL SHALL BE FREE FROM ALL DELETERIOUS MATERIAL.
- KEY**
- EXISTING SITE FEATURES**
- - - REGENERATION BOUNDARY
 - SITE APPLICATION BOUNDARY
 - CONTOURS AT 1.0 m INTERVALS
 - EXTENTS OF NEAR SURFACE CONTAMINATION
 - EXTENTS OF SLURRY LAGOONS (TAKEN FROM HISTORIC NCB PLANS)
- PROPOSED SITE FEATURES**
- CONTOURS AT 1.0 m INTERVALS
 - AREA OF CUT
 - AREA OF FILL

Reproduced from Ordnance Survey Digital Data by permission of Ordnance Survey © on behalf of the Controller of Her Majesty's Stationery Office. © Crown Copyright. All rights reserved. Reference number 100017803.

PLANNING ISSUE

B	SECTION 8-8 OMITTED. CONTAMINATED AREA REVISED. NOTES RE CAR PARK ADDED	LA	SM	SM	09.10.08
A	SECTION LOCATIONS ADDED	LA	SM	SM	05.06.08
REV	DESCRIPTION	BY	CHK	APP	DATE

Supported by

English Partnerships

carillion

NEWSTEAD COURT, LITTLE OAK DRIVE
SHERWOOD BUSINESS PARK
ANNESLEY, NOTTINGHAMSHIRE
NG15 3DR

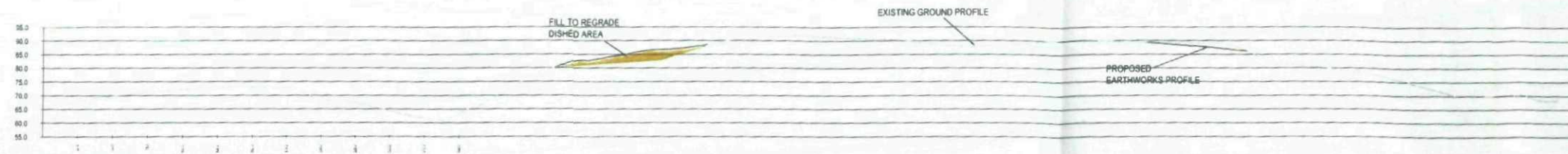
TEL: +44 (0)1623 884 550
FAX: +44 (0)1623 884 550
e-mail: nottingham@wyg.com

Project: A039273
RABBIT INGS REGENERATION

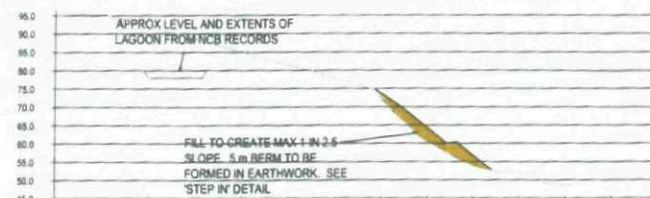
Drawing Title:
PROPOSED EARTHWORK SECTION LOCATIONS

Scale	A1	Drawn	Date	Checked	Date	Approved	Date
1:2000	ATF	03.08	LA	03.08	KB	03.08	
Project No	A039273	Office	51	Type	C&S	Drawing No	308
Revision							B

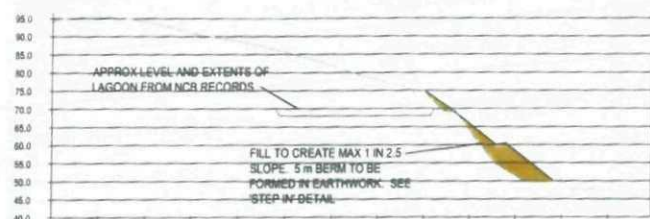
Drawing A039273/309 Sections



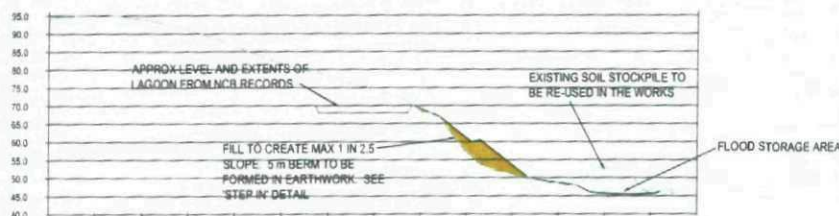
SECTION 13-13



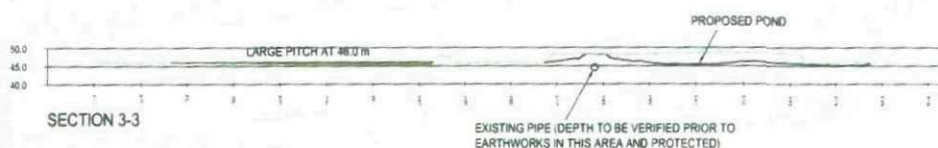
SECTION 8-6



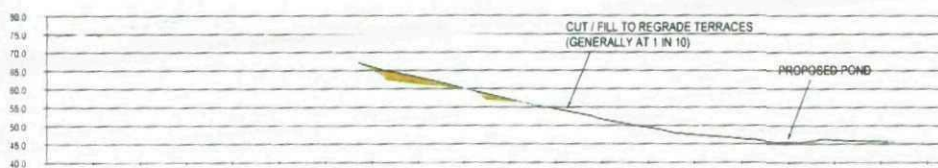
SECTION 5-5



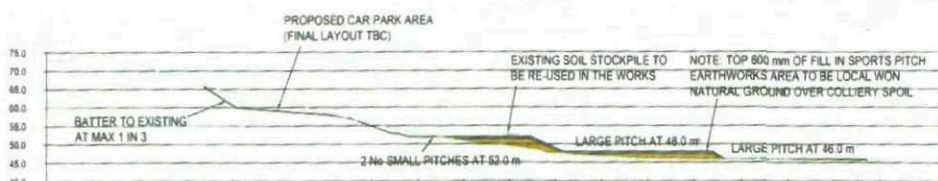
SECTION 4-4



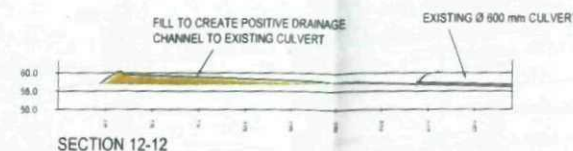
SECTION 3-3



SECTION 2-2



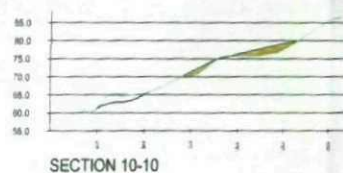
SECTION 1-1



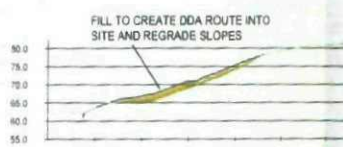
SECTION 12-12



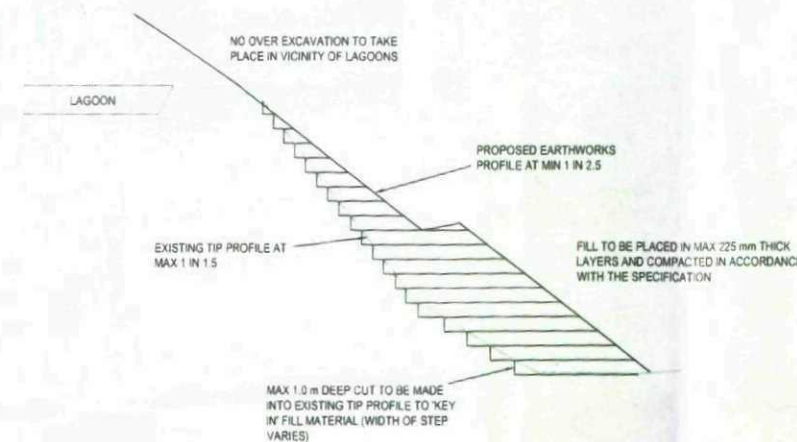
SECTION 11-11



SECTION 10-10

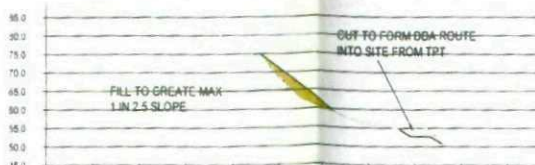


SECTION 9-9



TYPICAL SECTION SHOWING STEP IN DETAIL FOR PLACEMENT OF FILL ON STEEP SLOPES (NTS)

SECTION 8-8 - OMITTED



SECTION 7-7

GENERAL NOTES

- DO NOT SCALE. ALL DIMENSIONS ARE IN MILLIMETRES.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT CONTRACT DRAWINGS.
- THE CONTRACTOR SHOULD SITE CHECK ALL EXISTING DIMENSIONS SHOWN. ANY DISCREPANCIES ON THIS DRAWING IDENTIFIED BY THE CONTRACTOR SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION ON SITE.
- THE CONTRACTOR SHALL CONFORM TO ALL STATUTORY AUTHORITY REQUIREMENTS, CHECKING WITH THE EMPLOYER/CIENT TO IDENTIFY BOTH BELOW GROUND AND OVERHEAD SERVICES. CONTRACTOR TO FULLY COMPLY WITH ALL CDM, HAS AND PARTY WALL ACTS THAT ARE CURRENT. ALL BS REFERENCES ARE TO CURRENT EDITIONS.
- ALL TEMPORARY WORKS FOR FORMWORK, EXCAVATIONS ETC., TO BE THE DESIGN RESPONSIBILITY OF THE CONTRACTOR.
- ALL LEVELS ARE IN METRES (A.O.D.)

SURVEY NOTES

- THE SURVEY INFORMATION USED IN THE PREPARATION OF THE DRAWING IS NOT WARRANTED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THIS SURVEY INFORMATION PROVIDED.
- DRAWING BASED ON SURVEY PROVIDED BY DEREK BROOK DATED APRIL 2008.
- ALL SITE INVESTIGATION DATA IS PROVIDED FOR INFORMATION ONLY. THE CONTRACTOR SHALL VERIFY PRIOR TO COMMENCEMENT OF THE WORKS.
- THE LOCATION AND VALUE OF THE ORDNANCE SURVEY BENCH MARKS (OBM) WHICH SHALL BE USED AS THE DATUM FOR THE PROJECT IS SHOWN ON THIS DRAWING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CONFORMATION OF THE ASSIGNED VALUE FROM THE ORDNANCE SURVEY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING TEMPORARY BENCH MARKS FOR USE IN SETTING OUT THE WORKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING ON A REGULAR BASIS. THE VALUE OF THE TBM(S) RELATIVE TO THE OBM.

EARTHWORK NOTES

- REFER TO SITE SERVICES DRAWING A039273-305 PRIOR TO COMMENCEMENT OF EXCAVATION WORKS.
- REFER TO DRAWING A039273-308 FOR EARTHWORK SECTION LOCATIONS.
- EXCAVATED MATERIAL TO BE RE-USED AS FILL SHALL BE FREE FROM ALL DELETERIOUS MATERIAL.

Reproduced from Ordnance Survey Digital Data by permission of Ordnance Survey © on behalf of the Controller of Her Majesty's Stationary Office. © Crown Copyright. All rights reserved. Reference number 100017803.

PLANNING ISSUE

REV	DESCRIPTION	LA	SM	SM	09.10.08
A	SECTION 8-8 OMITTED. STEP IN DETAIL ADDED	LA	SM	SM	09.10.08

Supported by



NEWSTEAD COURT, LITTLE OAK DRIVE
SHERWOOD BUSINESS PARK
ANNESLEY, NOTTINGHAMSHIRE
NG15 0DR

TEL: +44 (0)1623 684 500
FAX: +44 (0)1623 684 550
e-mail: nottingham@wyg.com

Project: A039273

RABBIT INGS REGENERATION

Drawing Title:

PROPOSED EARTHWORK SECTIONS

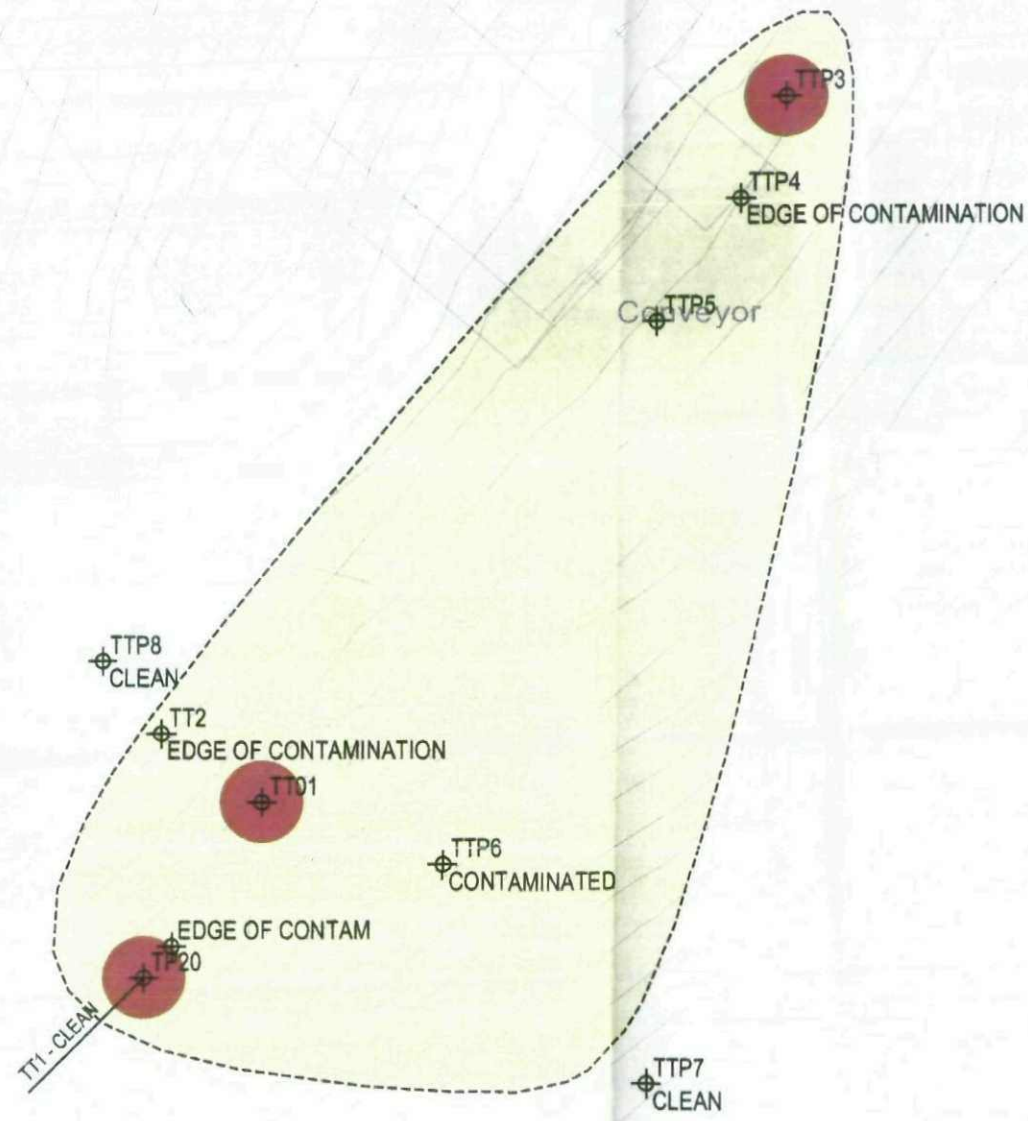
Scale	A1	Drawn	Date	Checked	Date	Approved	Date
1:2000	ATF	03.08	LA	03.08	KB	03.08	
Project No	Office	Type	Drawing No	Revision			
A039273	51	C&S	309	A			

© WYG Group Ltd

SHEET SIZE: A1 LANDSCAPE



Hotspot Location Plan



KEY

- SITE BOUNDARY
- TT1 TRAIL PIT / TRENCH LOCATION AND REFERENCE
(SITE OBSERVATIONS NOTED - VISUAL AND ODOUR)
- HOT SPOT - SAMPLE EXCEEDING SPECIFIED CRITERIA
- LIMIT OF CONTAMINATION - AREA TO BE TREATED IN
ACCORDANCE WITH RECLAMATION STRATEGY

GENERAL NOTES

1. DO NOT SCALE.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL
OTHER RELEVANT CONTRACT DRAWINGS

Reproduced from Ordnance Survey Digital Data by permission of Ordnance Survey ©
on behalf of the Controller of Her Majesty's Stationery Office. © Crown Copyright. All
rights reserved. Reference number 100017603

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	CHK	APP	DATE
-----	-------------	----	-----	-----	------

Supported by



NEWSTEAD COURT, LITTLE OAK DRIVE
SHERWOOD BUSINESS PARK
ANNESLEY, NOTTINGHAMSHIRE
NG15 0DR

TEL: +44 (0)1623 684 500
FAX: +44 (0)1623 684 550
e-mail: nottingham@wyg.com

Project: A039273
RABBIT INGS REGENERATION

Drawing Title:
HOT SPOT LOCATION PLAN
WEST FLANK OF TIP

Scale	A4	Drawn	Date	Checked	Date	Approved	Date
1:500	LA	LA	Sept 08	DH	Sept 08	DH	Sept 08
Project No.	Office	Type	Revision	Drawing No.	Fig	Revision	
A039273	51	C&S			Fig 1		

© WYG Group Ltd

SHEET SIZE: A3 LANDSCAPE

APPENDIX C

Correspondence from Regulatory Authorities

**Environment Agency
Barnsley MBC**

Our ref: CL-1997-16
 Your ref: D101846
 Date: 20 July 2004

Ged Sojka
 Scott Wilson
 St James Buildings
 Oxford Street
 Manchester
 M1 6EF

Job	
Original	<i>[Signature]</i>
Enclosure	
23 JUL 2004 <i>[Signature]</i>	
Action	
S. W MANCHESTER	
Copy	
Copy	
Copy	
Copy	
Copy	



ENVIRONMENT
AGENCY

Dear Ged

Rabbit Ings Site Restoration, Royston, Barnsley

I have reviewed the Draft Interpretative Report on Site Investigation, dated March 2004 prepared by Scott Wilson for English Partnerships in relation to current legislation regarding controlled waters and my comments are as follows.

1. I consider that the site conditions have been adequately characterised.
2. In spite of the importance of the Mexborough Rock as a potential future groundwater resource, I agree that the costs of large scale groundwater remediation would probably outweigh the potential environmental benefits.
3. However, provision should be made for treatment or disposal of any contaminated perched groundwater encountered during restoration works.
4. I also agree that groundwater quality/levels and surface water quality monitoring should be continued to confirm the above assessment, particularly during and immediately after the restoration earthworks are undertaken. The monitoring programme and its completion criteria are still to be agreed.
5. I understand that some treatment of contaminated soil may be required (for example by ex-situ bioremediation) and should any further unexpected contamination be encountered during site excavations, then this additional material should be incorporated into the soil treatment or disposal programme.

Yours sincerely

John Barber

John Barber
 Hydrogeologist/Technical Specialist Contaminated Land
 Direct dial: 0113 213 4650. Email: john.barber@environment-agency.gov.uk

Environment Agency
 Phoenix House, Global Avenue, Leeds, LS11 8PG
 Tel: 0113 244 0191 Fax: 0113 213 4609



BARNSELEY

Metropolitan Borough Council

Regulatory Services

Assistant Director : Michael G. Hanson, DCA, FTSI
Central Offices, Kendray Street, Barnsley. S70 2TN.

My Ref: JSC/94999

Your Ref: D101846/01TC/BMBC_01

Date: 17 June 2004

Enquiries To: Mr J Scott

Dial Direct: (01226) 772456

Fax: (01226) 775699

Dear Sir

Re Rabbit Ings Site, Royston, Barnsley

Following the submission of the Site Investigation report and our subsequent meeting, I have the subsequent comments to make regarding proposed works.

In general, most of the proposed works are acceptable to the Council with regards to minimising future risks to human receptors. However, a few areas within the report require further work/information to support your conclusions.

Arsenic

The chemical testing suite that has been adopted is targeting on those chemicals found in coke works effluent. From our experiences, one of the chemicals of concerns found within colliery spoil waste is arsenic. As part of the further work proposed we would require that the investigation of the arsenic level on the site be undertaken, assessed against the proposed end use.

Site Specific Soil Guideline Values

Within the report, soil guideline values have been derived for the public open space scenario, using a modified allotment end use. Before we can accept these figures, further information is required on how these figures have been generated. This information should include the CLEA reports generated during the modelling exercise.

The SGVs for Naphthalene, Benzo(a)pyrene, Phenol and Free Cyanide, derived for the Commercial end use of the site also require further explanation.

Water Quality Issues

As we discussed within the report and our meeting, the receptor at most risk from the contamination within Rabbit Ings is that of controlled waters. As the regulator with the responsibility of implementing Part IIA of the Environmental Protection Act 1990, we have to consider the possibility of controlled water being affected. However, as with any case where controlled waters may be affected, we will take the recommendations of the Environment Agency as to the appropriateness of the proposed remediation works.

Mr G Sojka
Scott Wilson
St James's Building
Oxford Street
Manchester
M1 6EF

Job	
Original	Colin Bantles
Enclos	
Action	
21 JUN 2004	
Copy	
Copy	
Copy	

ENVIRONMENT AND DEVELOPMENT DIRECTORATE

Remediation Proposals

Within the report, you have indicated the presence of a plume of contaminated groundwater within the Mexborough Rock strata, but the cost of remediating this would be 'prohibitively expensive'. As I highlighted within the meeting, further information is required on the costs of all the possible remediation schemes to allow consideration of this conclusion.

Restoration Works and Validation

Once all of the proposed works have been agreed with all parties, we will expect to see further information on the procedures that will be adopted during the restoration works to validate the project. This will include any procedures undertaken during the restoration works to deal with the contaminated material, along with the validation work to confirm the remediation objectives have been achieved.

Should you wish to discuss this correspondence further, please don't hesitate to contact me; you may also contact the Unit Manager, Mr Ken Eastwood, on (01226) 772482.

Yours sincerely



John Scott
Contaminated Land Officer



BARNSELEY
Metropolitan Borough Council

Regulatory Services

Assistant Director: Ken Eastwood, BSc (Hons), MCIEH
PO Box 602, Barnsley, S70 9FB.

My Ref:	JSC/Rabbit Ings	Your Ref:	Date:	12 May 2008
Enquiries To:	Mr J Scott regulatoryservices@barnsley.gov.uk	Dial Direct: (01226) 772468	Fax: (01226) 775699	

Dear Sir

Re Rabbit Ings Reclamation

Further to your correspondence regarding the reclamation works at the above site, I have reviewed the proposals and have the following comments to make.

My concerns regarding exposure to BTEX compounds relate to the proposed use of the site, public open space. The fact that no assessment of any BTEX contaminants causes me concern, as we are unable to state whether the material within the former lagoon areas will pose an unacceptable risk to people using the site. As you have stated, any exposure to the BTEX contamination would only be via outdoor inhalation exposure, and any exposure would be on a less frequent than a residential scenario. Whilst I would have preferred to have seen BTEX sampling within the former lagoon areas, you have stated that if odours were encountered during your investigations, VOC testing would have been undertaken. Having reviewed your borehole and trialpit records, and those in previous site investigation reports, no odours were detected in these areas, which would indicate very low levels of BTEX contamination.

With regards the proposal to extend the testing criteria for excavated material to include BTEX analysis, I would agree this is a acceptable approach to ensure that only suitable material is redistributed.

You have stated that further investigations are proposed to include 'material beyond the excavation which will remain close to the surface'. Could some further clarification be provided on the exact nature and locations of these further investigations.

Any further sampling should be compared to a suitable site specific clean up targets for BTEX contamination. It is stated you will use a 'residential criteria', but there are no details of what these are. Please could these be included within the remediation strategy.

Whilst I appreciate the proposals to use in house targets for a residential scenario, these may be over conservative. As such, it may be necessary to use a DQRA model to generate suitable site specific remediation targets for the BTEX contaminants.

David Howes
White Young Green
Newstead Court, Little Oak Drive
Sherwood Business Park
Annesley, Nottinghamshire
NG15 0DR

CUSTOMER SERVICES & NEIGHBOURHOODS DIRECTORATE

Within your correspondence, you have stated my concerns regarding exposure to construction workers. Whilst this is something we consider as part of any remediation works, this was not my main concern. As I stated above, as a regulator I have to consider whether the site will be suitable for the proposed use after the works are completed. Thus I was concerned about outdoor inhalation of organic contaminants to people using the site as public open space. Any exposure to construction workers is addressed through HSE's Occupational Exposure Limits, and it would be good practice to include VOCs as part of any list of potential exposure contaminants.

Should you wish to submit the further information I have requested prior to revising the reclamation strategy, or have any queries, please don't hesitate to contact me.

Yours faithfully



John Scott
Contaminated Land Officer