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REMEDIATION STRATEGY

URBAN GROUP (YORK) LIMITED

PROPOSED RESIDENTIAL DWELLINGS

NEWSOME ROAD

NEWSOME

HUDDERSFIELD

HD4 6LS

Project No: 20-967

Prepared By:

Phil Brown

Date: 11th June 2021

Approved By:

John Ditchburn

Date: 11th June 2021

The information and / or advice contained in this Remediation Strategy is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared to collate information relating to the physical, environmental, and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and / or sketches contained within the report, and / or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.

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APPENDICES

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1.0 Introduction

June 2021

As requested by Urban Group (York) Limited, following the results of previous Geoenvironmental Appraisals (detailed below) a Remediation Strategy (RS) has been prepared for the proposed residential development of an area of land off Newsome Road, Huddersfield. The site is currently occupied by 2 rectangular mill ponds with an area of rough grassland / vegetation to the southeast.

The proposed development will comprise 22 no. residential dwellings with associated private gardens, soft landscaping and parking / highway infrastructure.

The ground conditions and potential contamination issues associated with this site have been investigated and assessed through the completion of previous intrusive works. The following documents have been used to aid the completion of this RS and should be read in conjunction with this report:

- Sirius Geoenvironmental Appraisal (GA) Report Ref: C1247, March 2007.
- Arc Environmental Ltd Phase 2 Ground Investigation Report (GIR) Report Ref: 20-467, August 2020.
- Arc Environmental Ltd Letter Report; 'Mill Pond Sampling & Screening', Ref 20-967.01L, January 2021.
- Arc Environmental Ltd Letter Report; 'Hazardous Ground Gas Risk Assessment Addendum Report', Ref 20-467.01L, April 2021

2.0 Site Details

Table 2.1

Site Name & Address:	Land off Hart Street and Newsome Road, Newsome, Huddersfield HD4 6LS
National Grid Reference:	414448, 414795 (representative for the centre of the site).
Site Description:	The north-western 'two thirds' of the site are occupied by two rectangular mill ponds. These are separated by a thin strip of land covered in rough vegetation. The south-eastern third of the site is level rough grassland. Numerous mature trees lie along the southwestern boundary of the site, with occasional trees along the remaining site boundaries.
Site Boundaries:	Northeast – Hart Street beyond which lies housing, Southeast – Newsome Road beyond which lies housing, Southwest – Naomi Road beyond which lies housing and Northwest – Housing.
Site Location plan:	See Appendix I.
Layout plan (existing):	See Appendix I.
Layout plan (proposed):	See Appendix I.
Client:	Urban Group (York) Ltd.
Design Consultant:	Arc Environmental Ltd.
Project Type:	The proposed development is to comprise the construction of 22 no. residential dwellings with private gardens, areas of soft landscaping and associated highway infrastructure and parking. CLEA classification = <i>Residential with home grown produce</i> .
Preliminary Remediation Statement:	It is proposed to pump and treat existing water from the mill ponds and then undertake ex-situ treatment (soil stabilisation) of the silt / sludge prior to replacing the stabilised material within the resultant pond excavations as a basal engineered fill. Following this, as part of the wider site remedial earthworks, further suitable engineering fill will be placed and compacted above the stabilised soil to the required design formation level. In addition to the above stabilisation works, where impacted soils (disturbed / reworked topsoil) remains in-situ or is placed as part of the remedial earthworks, then a minimum 600mm thick clean capping layer including a suitable topsoil growing medium and should be placed in all affected gardens and soft landscaped areas.

3.0 Scope of Works

This RS has been prepared generally in accordance with EA (Environment Agency) guidance for Land Contamination Risk Management (LCRM: October 2020) which replaces CLR11: Model Procedures for the Management of Land Contamination, in order to provide a framework for establishing the most appropriate remediation option(s) for this site, based upon the findings of the previous investigation works. This RS can be used to support the current planning application for the proposed development, and allow the Design team, Principal Contractor and chosen sub-contractors to incorporate the necessary remediation works into the overall development design and construction works.

The information contained in this RS is limited to the areas of the site as indicated on the existing and proposed development layout plans attached in Appendix I. The validation of the implementation of the RS will be dealt with in a final Validation Report, once all the remediation works have been completed.

It is understood that due the current layout and site features (2 mill ponds) and following the remedial works, some subsequent earthworks will be required in order to achieve a suitable development platform. This is likely to include both the re-use of suitable site-won materials as well as the import of additional materials in order to achieve final design levels across the site.

It is not the intention of this report to provide recommendations or specific details for the earthworks or specialist soil stabilisation elements of the proposed enabling works (including dust suppression, odour control etc). It is the responsibility of the Principal Contractor and chosen specialist sub-contractors to produce detailed Method Statements, Specifications and Risk Assessments for these elements which should be agreed with the Local Authority (LA), as required, prior to implementation on site.

Table 3.1

Client:	Urban Group (York) Ltd.
Project Type:	Proposed residential development.
CLEA End-use Classification:	Residential with home grown produce.
Scope of Previous Intrusive Investigation Works:	2007 (Sirius) 7 no. mechanically excavated trial pits (TP1 and TP7) 2020 Investigation (Arc Environmental Ltd) 7 no. windowless sampling boreholes (WS01 to WS07) 2 no. rotary boreholes (RBH01 and RBH02) 2 no. mechanically excavated trial pits (TP01 and TP02) 2021 Investigation (Arc Environmental Ltd) Confirming the depth of 2 no. mill pond features and recover samples of the pond water and basal silt for analysis.
Reporting:	Remediation Strategy detailing the remedial measures and verification methods.

Following the previous ground investigation works undertaken to date, the following supplementary works were recommended:

- Production of a Remediation Strategy and Verification Plan (and agreement with the regulatory bodies and the warranty provider).
- Production of a Materials Management Plan (MMP) relating to re-use and import of soils at the site.
- Remediation and mitigation work.
- Verification of the earthworks, remediation and mitigation works.

4.0 Environmental Setting

A summary of the Environmental Setting of the site, included within the Sirius 2007 GA, is detailed below:

- The known former uses of the site only include allotment gardens and mill ponds. Such past land uses are considered unlikely to give rise to extensive ground contamination.
- No superficial / drift deposits were recorded on published BGS plans.
- The site is underlying by The Stanningley Rock, a sandstone of the Carboniferous Upper Coal Measures.
- No superficial / drift deposits were recorded on published BGS plans.
- The Stanningley Rock is Secondary Aquifer – *‘fractured or potentially fractured rocks, which do not have a high primary permeability. Although these aquifers will seldom produce large quantities of water for abstraction, they are important both for local supplies and in supplying base flow to rivers’.*
- There are no known groundwater abstractions within 500m of the site.
- The nearest watercourse to the site is an unnamed watercourse c.400m to the northeast.
- There are no licensed surface water abstractions within 500m of the site, the closest being 691m to the southeast of the site.
- There are no licensed discharge consents within 500m of the site.
- The site is considered to lie within a **low-risk** environmental setting, taking account of the underlying geology and the proximity of the nearest watercourse.

5.0 Review of Ground Conditions & Contamination Assessment

5.1 Summary of Ground Conditions: -

From the previous intrusive ground investigation works carried out, topsoil (disturbed / reworked) was recorded to depths of between c.0.30m to c.0.90m below current ground level (bcgl), generally comprising a clayey gravelly sand or sandy gravelly clay.

The underlying residual soils comprised initially soft (low strength) becoming firm and stiff (medium and high strength) clay with occasional cobbles to a maximum depth of 2.80m bcgl. Sandstone overlying mudstone solid deposits were encountered from c.2.00m, to a maximum proven depth of 20.00m bcgl, and no coal seams were encountered.

With regard to the mill pond themselves, the standing water was recorded to be between 3.33m (eastern mill pond) up to 3.49m (western mill pond) deep, below which a basal silt was evident ranging in thickness from 0.15m (eastern mill pond) to c.0.33m (western mill pond).

5.2 Summary of Level 1 Risk Assessment: -

From the results of the contamination screening carried out and the Level 1 Risk Assessment, for the site area out with the mill ponds, it was concluded that the disturbed / reworked topsoil below the site has been locally impacted by Arsenic, Lead and PAH species which exceed the critical concentrations chosen for this site and therefore, remedial measures would be necessary to protect the end users.

Representative samples of the basal silt from the mill ponds recorded elevated concentrations of heavy metals (Lead), hydrocarbon contamination (PAH's and TPH's) and some limited semi-volatile organic compounds.

The water samples recovered from the mill ponds did not appear to have been significantly impacted with the basal silts effectively accumulating the contaminants.

5.0 Review of Ground Conditions & Contamination Assessment (Cont'd)

5.2 Summary of Level 1 Risk Assessment (Cont'd): -

The results of Hazardous Ground Gas Risk Assessment (HGGRA), indicate that the site / development is within Characteristic Situation 2 (CS2) / Amber 1. Therefore, appropriate ground gas protection measures are required.

In addition, following the mill pond sampling and screening, the risk of volatile contamination being present within the silt found on site cannot be discounted and if these materials are to remain on site, the gas protection measures will require upgrading. A suitable membrane giving protection against ground gases and hydrocarbons should be installed to fully dismiss the potential risks to the end user.

6.0 Remediation Strategy

As discussed within previous reports referenced within Section 1, the remedial options for the site can be divided into the following 2 areas:

- Area A - site area containing the impacted reworked / disturbed topsoil (out with the mill ponds).
- Area B - mill ponds containing water and basal silt.

With regard to Area A then, depending upon proposed finished design levels, the simplest and most expedient remedial option is to either install a clean cover capping system below all areas of soft landscaping or to fully remove the impacted soils from all areas of gardens and soft landscaping. Where buildings and areas of hardstanding are proposed then the source-pathway-receptor pollutant linkage will not exist and the made ground can remain insitu with no requirement to incorporate clean cover materials.

When considering Area B, then given the limited thickness of the impacted basal silts and the subsequent thickness of engineered fill that will be required to achieve the finished design levels, it is proposed to pump, treat (as necessary) and discharge the existing water and then undertake ground improvement (e.g., cement / lime stabilisation), of the silt, in order to essentially 'lock-in' the recorded contamination and also provide a geotechnically suitable basal engineering 'starter layer'.

6.1 Principles of Protection (Area A): -

6.1.1 Removal of Impacted Soils: -

If during the ground preparation works, the impacted soils (disturbed / reworked topsoil) is wholly removed from within areas of private gardens / soft landscaping then any contamination *sources* and future dermal contact, ingestion or migration *pathways* will be removed, and the risk posed to end users is in turn negated. The removed deposits will require removal from site to an appropriate waste disposal facility if they cannot be re-used on site under buildings or permanent hardcover.

6.1.2 Clean Cover: -

Where proposed earthworks and final site levels do not allow the complete removal the disturbed / reworked topsoil from proposed gardens and soft landscaping areas, then the most suitable remedial option is the installation of a clean cover system.

6.0 Remediation Strategy (Cont'd)

6.1 Principles of Protection (Area A) (Cont'd): -

6.1.2 Clean Cover (Cont'd): -

A clean cover system is designed to remove the pathway element of the *source-pathway-receptor* from the pollutant linkage. When considering the levels recorded the use of a simple clean cover system (BRE Guidance for Clean Cover Systems) would not be appropriate and therefore a more robust clean cover system is proposed. The design of the clean cover system should comprise a minimum thickness of 600mm (including a minimum 150mm of suitable clean topsoil) and is required in all gardens and soft landscaped areas. The provision of clean cover will not be necessary below areas of hardstanding (i.e. roads and under buildings).

6.1.3 Re-use of Existing Site Materials: -

Given the nature of the impacted soil within Area A (described predominantly as a disturbed / reworked topsoil) it is unlikely this can be re-used as general fill, due to its envisaged poor geotechnical properties.

Where natural strata (typically residual soils recovered as sandy gravelly clay) is excavated as part of any proposed earthworks or as a result of the creation of foundations and drainage excavations (Areas A & B), then these materials can be considered to be suitable for use within any areas of private gardens and soft landscaping, providing these materials are inspected and are free of any anthropogenic debris and visual & olfactory evidence of fuel, oils, ash, etc. Confirmatory contamination screening will be required to confirm the suitability of these materials.

6.1.4 Unforeseen Contamination and 'Watching Brief': -

Site awareness during the construction phase should be vigilant to identify any areas of unforeseen or unknown areas of significant contamination which could be encountered during the proposed works and all future construction works. Details of the appropriate course of action undertaken to deal with these materials should be provided to the LA prior to carrying out any remediation.

6.2 Principles of Protection (Area B): -

6.2.1 Mill Pond Water: -

As noted in Section 5.2, previous testing of the existing waters contained within the mill ponds have not returned any significantly elevated concentrations indicating that the basal silts have effectively accumulated the contaminants.

Consequently, it is proposed to pump, treat (as required) and then discharge the waters into existing drainage system under a discharge consent obtained from Yorkshire Water.

6.2.2 Insitu physical / chemical treatment (soil stabilisation / solidification): -

Once the waters are removed from the mill ponds, then the basal silts (between c.0.15m and c.0.33m in thickness) will be subject to soil stabilisation by a specialist sub-contractor.

Soil stabilisation is the term used for several chemical ground improvement techniques that involve the addition of proprietary dry binders, commonly lime or cement. The process alters the physical properties of the soils so that it is fit for a specified purpose (e.g. creating a working platform or a suitable basal engineering fill).

6.0 Remediation Strategy (Cont'd)

6.2 Principles of Protection (Area B) (Cont'd): -

6.2.2 Insitu physical / chemical treatment (soil stabilisation / solidification) (Cont'd): -

By mixing reagents with the soil, which causes physical and chemical changes, the process locks in the contaminants in the treated soil permanently preventing them from leaching.

The stabilised soils will be subsequently placed and compacted back into the base of the former mill pond footprints before final design levels are achieved with further placement and compaction of suitable engineering fill materials in accordance with an approved Earthworks Specification. As part of earthworks within Area B, proposed gardens and areas of soft landscaping will still require an adequate thickness of texturally and chemically suitable topsoil and subsoil to act as a growing medium for future planting.

6.2.3 Unforeseen Contamination and 'Watching Brief': -

During the soil stabilisation process, should any areas of previously unrecorded significant contamination are encountered, then the specialist sub-contractor should advise on the appropriate course of action required to deal with these materials and this should be discussed and agreed with the LA prior to implementation.

6.3 Implementation of Remediation Strategy: -

Prior to the commencement of the site works and in conjunction with the Principal Contractor, the appointed groundworker and specialist sub-contractors, should prepare and submit suitable methodologies for the implementation each respective element of the Remediation Strategy as given above.

This should be submitted to Arc Environmental Ltd. for approval a minimum of 1 month before commencing remediation works, to ensure that the methodology will meet the requirements of the Remediation Strategy and allow for any amendments that might be required.

6.3.1 Methodology for Removal of Impacted Soil (Area A): -

- To remove the impacted soil, this will need to be carefully excavated in layers (c.150mm – c.200mm thick) by a dedicated mechanical excavator (i.e. Backhoe Excavator or 360o Tracked Excavator) down to the natural superficial deposits.
- Following removal, samples of the exposed natural superficial formation will be taken to allow validation laboratory testing to be undertaken. The sampling frequency and location of the testing will be dependent upon the area / size and volumes of soils removed. The results should be compared to appropriate and current Level 1 Risk Assessment Values for a Residential end-use to ensure these meet the criteria. At least 7 workings days should be allowed between samples being taken and confirmation being provided by Arc Environmental Ltd that the remediation works have been satisfactorily completed.
- During all the remedial works, care should be taken to avoid any potential cross-contamination, i.e. cleaning of machines buckets following contact with impacted materials, care taken to ensure plant does not 'track' across any areas where the impacted materials are present at surface.
- Validation works will comprise site attendance, photographic records and validation sampling to confirm that all contamination which potentially poses a significant risk has been removed from the areas of soft landscaping have been removed from site to a suitably licensed facility. The above information including all results will be compiled within a Validation Report following the completion of these works.

6.0 Remediation Strategy (Cont'd)

6.3 Implementation of Remediation Strategy (Cont'd): -

6.3.2 Methodology for Clean Cover: -

- The clean cover system should comprise a minimum thickness of 600mm (including a minimum 150mm topsoil) of texturally and chemically suitable soil.
- Any materials brought on to site, for use as part of the clean cover system, should be texturally suitable and tested for human health assessment prior to delivery to site. The testing scope and frequency is detailed within Section 7.2 of this report. The results of all the testing should be sent to Arc Environmental Ltd, a minimum of 1 week before delivery to site.
- Copies of all delivery tickets / transfer notes should be retained for inclusion within the Validation Report. Each ticket should include the date, time, volume and source details.
- To confirm the suitability of these materials utilised as part of the clean cover system, validation screening will also be required as part of the remediation works following emplacement and / or importation onto site with a testing frequency of at least one every three plots.

6.3.3 Mill Pond Water (Area B): -

- Waters from the mill ponds will be treated on site, as necessary, for subsequent disposal to the foul sewer
- The Principal Contractor or chosen sub-contractor will be responsible for obtaining all necessary permits, licenses and consents for discharge to the foul sewer.
- Waters pumped from the mill ponds or any excavations should be stored in a holding tank, treated as necessary and chemically tested prior to disposal.
- Any discharges to foul sewer should be recorded in relation to date, time, quantity and quality.

6.3.4 Soil Stabilisation / Solidification (Area B): -

Following removal of the mill pond waters, a chosen specialist sub-contractor will undertake an assessment of the basal silt materials and advise on the implementation of a suitable stabilisation mix.

To ensure the best treatment performance is achieved the soil structure must first be integrated with and broken down by with powdered lime, cement, or similar, to maximise contact between the soil matrix and the binding agents. Over the duration of the remediation process, the specialist sub-contractor shall undertake periodic characterisation and testing, in order to assess the quality and effectiveness of the treated material. This should include:

- Visual assessment of the material, to assess the efficacy of the additive mixing and distribution throughout the soil matrix.
- Thermal characterisation of the material to assess the level of exothermic reaction during material addition.
- Laboratory leachate testing on representative samples to determine the effectiveness of the stabilisation method.

The results of all field characterisation and performance testing should be submitted to Arc Environmental Ltd. for review within 48 hours upon receipt of results.

6.0 Remediation Strategy (Cont'd)

6.3 Implementation of Remediation Strategy (Cont'd): -

6.3.5 Unforeseen Contamination & Watching Brief: -

As well as site awareness by the Principal Contractors and chosen sub-contractors, a Geo-Environmental Engineer from Arc Environmental Ltd, should carry out site visits during the proposed remedial works / earthworks and should be informed immediately if potential unknown or unforeseen contamination has been encountered.

Should previously undiscovered contamination be identified or suspected the LA should be notified immediately and no further works shall be carried out in the affected area until appropriate mitigation is identified has been agreed.

6.3.6 Risk Assessment (Construction Workforce): -

When considering the potential risks to the construction workforce, it will be necessary to ensure that the appropriate level of protection is provided, and these should be detailed in the site health and safety management scheme (designed by the Principal Contractor), during all construction activities.

These measures should include appropriate PPE / RPE and good site practice, and the results of all the contamination screening undertaken (all results contained within the previous reports) can be used when assessing the required level of protection (based on the acute exposure risk). For further guidance reference should be made to the Health and Safety Executive (HSE) document EH40/2005 Workplace exposure limits.

7.0 Validation Requirements

In order to ensure that all elements of the Remediation Strategy are properly implemented, validation works, will be completed confirming that each element of the remediation works has been completed. The validation works will comprise the following:

7.1 Removal of Impacted Soils (Area A): -

Where it is proposed to remove the impacted soils in their entirety from areas of gardens and soft landscaping, the validation works will comprise site attendance and sampling, to confirm the impacted soils have been removed from site and the resultant formation levels do not represent a potential risk to human health. The frequency of testing required will be dependent upon the extent and depth of the excavation and the nature and volume of materials removed.

The results should be compared to appropriate and current Level 1 Risk Assessment Values for a *Residential* end use, (contained within Table 7.1 and dependant on the Soil Organic Matter (SOM) percentage), and the results compiled within the final Validation Report following the completion of the development, where applicable.

Copies of all consignment / transfer notes should be retained for inclusion within the Validation Report. Each ticket should include the date, time, destination of soil, volume and destination (licensed facility) details.

Where the impacted soils are wholly removed from below areas of proposed gardens and soft landscaping then no formal clean cover system will be required although finished design levels will need to be achieved with textually and chemically suitable soils. The area where the made ground is wholly removed should be surveyed and clearly marked on a plan to assist with future soil management on the site.

7.0 Validation Requirements (Cont'd)

7.2 Clean Cover Validation (Area A): -

Where impacted soils are not completely removed from gardens and areas of soft landscaping, and a clean cover system is required, validation will comprise site attendance and photographic evidence to confirm the minimum thickness and construction of clean cover has been attained.

The areas of private gardens and soft landscaping where clean cover is required should also be surveyed and clearly marked on a plan to assist with future soil management on the site.

Validation screening will be undertaken on all materials brought onto site (both prior to delivery and following emplacement if deemed necessary) for the areas of gardens and soft landscaping to ensure they are suitable for use on this site. The number of samples screened for pre-importation testing will be dependent upon the final volumes brought to site and the origin of the imported materials.

Once the source of imported materials has been determined, the sampling regime will be agreed with the LA. Arc Environmental Ltd propose to adopt the Yorkshire & Lincolnshire Pollution Advisory Group (YALPAG) 'Verification Requirements for Cover Systems', Version 4.1 May 2021, with the sampling frequency as follows:

- Greenfield / Manufactured Sourced Topsoil / Subsoil – The suite of screening will include heavy metals, speciated PAH's and asbestos. Sampling frequency should be 1 per 100m³ to 1 per 250m³ (minimum 3 samples).
- Brownfield Sourced Topsoil / Subsoil – The suite of screening will include heavy metals, speciated TPH's, speciated PAH's and asbestos and any additional analysis depending on history of donor site. Sampling frequency should be 1 per 50m³ to 1 per 100m³ (minimum 6 samples).

The results should be compared to appropriate and current Level 1 Risk Assessment Values for a Residential end use, (contained within Table 7.1 (on the following page) and dependant on the Soil Organic Matter (SOM) percentage).

In addition, samples should also be tested in accordance with the Specification for Topsoil (BS3882:2015) and / or Specification for Subsoil and Requirements for Use (BS8601:2013). The frequency should be minimum 1 sample per source.

To confirm the suitability of these materials utilised as part of the clean cover system, validation screening will also be required as part of the remediation works following emplacement and / or importation onto site with a testing frequency of at least one every three plots.

Copies of all delivery tickets should be retained for inclusion within the Validation Report. Each ticket should include the date, time, volume and source details.

7.0 Validation Requirements (Cont'd)

7.2 Clean Cover Validation (Area A) (Cont'd): -

Table 7.1 - (Assessment Criteria for Imported Soils & Site-Won Soils)

Analyte	Critical Conc. (C _c) mg/kg			Analyte	Critical Conc. (C _c) mg/kg		
Metals/Metalloids				Speciated PAH's (Cont'd)	1% SOM	2.5% SOM	6% SOM
Arsenic	37 ⁽¹⁾			Fluoranthene	280 ⁽¹⁾	560 ⁽¹⁾	890 ⁽¹⁾
Cadmium	11 ⁽¹⁾			Fluorene	170 ⁽¹⁾	400 ⁽¹⁾	860 ⁽¹⁾
Chromium III	910 ⁽¹⁾			Indeno(123cd)pyrene	27 ⁽¹⁾	36 ⁽¹⁾	41 ⁽¹⁾
Chromium VI	6 ⁽¹⁾			Naphthalene	2.3 ⁽¹⁾	5.6 ⁽¹⁾	13 ⁽¹⁾
Copper	2,400 ⁽¹⁾			Phenanthrene	95 ⁽¹⁾	220 ⁽¹⁾	440 ⁽¹⁾
Lead	200 ⁽²⁾			Pyrene	620 ⁽¹⁾	1,200 ⁽¹⁾	2,000 ⁽¹⁾
Nickel	130 ⁽¹⁾			Speciated TPH	1% SOM	2.5% SOM	6% SOM
Selenium	250 ⁽¹⁾			Aliphatic EC5-EC6	42 ⁽¹⁾	78 ⁽¹⁾	160 ⁽¹⁾
Zinc	3,700 ⁽¹⁾			Aliphatic EC6-EC8	100 ⁽¹⁾	130 ⁽¹⁾	530 ⁽¹⁾
Cyanide	34 ⁽³⁾			Aliphatic EC8-EC10	27 ⁽¹⁾	65 ⁽¹⁾	150 ⁽¹⁾
Asbestos	None Present			Aliphatic EC10-EC12	130 ⁽¹⁾	330 ⁽¹⁾	760 ⁽¹⁾
Speciated PAH's	1% SOM	2.5% SOM	6% SOM	Aliphatic EC12-EC16	*1,100 ⁽¹⁾	*2,400 ⁽¹⁾	*4,300 ⁽¹⁾
Acenaphthene	210 ⁽¹⁾	510 ⁽¹⁾	1,100 ⁽¹⁾	Aliphatic EC16-EC35	*65,000 ⁽¹⁾	*92,000 ⁽¹⁾	*110,000 ⁽¹⁾
Acenaphthylene	170 ⁽¹⁾	420 ⁽¹⁾	920 ⁽¹⁾	Aliphatic EC35-EC44	*65,000 ⁽¹⁾	*92,000 ⁽¹⁾	*110,000 ⁽¹⁾
Anthracene	*2,400 ⁽¹⁾	*5,400 ⁽¹⁾	*11,000 ⁽¹⁾	Aromatic EC5-EC7	0.087 ⁽⁴⁾	0.17 ⁽⁴⁾	0.37 ⁽⁵⁾
Benzo(a)anthracene	7.2 ⁽¹⁾	11 ⁽¹⁾	13 ⁽¹⁾	Aromatic EC7-EC8	130 ⁽¹⁾	290 ⁽¹⁾	660 ⁽¹⁾
Benzo(a)pyrene	2.2 ⁽¹⁾	2.7 ⁽¹⁾	3.0 ⁽¹⁾	Aromatic EC8-EC10	34 ⁽¹⁾	83 ⁽¹⁾	190 ⁽¹⁾
Benzo(b)fluoranthene	2.6 ⁽¹⁾	3.3 ⁽¹⁾	3.7 ⁽¹⁾	Aromatic EC10-EC12	74 ⁽¹⁾	180 ⁽¹⁾	380 ⁽¹⁾
Benzo(ghi)perylene	320 ⁽¹⁾	340 ⁽¹⁾	350 ⁽¹⁾	Aromatic EC12-EC16	140 ⁽¹⁾	330 ⁽¹⁾	660 ⁽¹⁾
Benzo(k)fluoranthene	77 ⁽¹⁾	93 ⁽¹⁾	100 ⁽¹⁾	Aromatic EC16-EC21	260 ⁽¹⁾	540 ⁽¹⁾	930 ⁽¹⁾
Chrysene	15 ⁽¹⁾	22 ⁽¹⁾	27 ⁽¹⁾	Aromatic EC21-EC35	*1,100 ⁽¹⁾	*1,500 ⁽¹⁾	*1,700 ⁽¹⁾
Dibenz(ah)anthracene	0.24 ⁽¹⁾	0.28 ⁽¹⁾	0.30 ⁽¹⁾	Aromatic EC35-EC44	*1,100 ⁽¹⁾	*1,500 ⁽¹⁾	*1,700 ⁽¹⁾

NOTE:

- * Although the assessment values above are used to determine the risks to Human Health based on UK assessment criteria, a more conservative value of 1,000mg/kg should be utilised to prevent importation of Hazardous Waste.
- Total TPH concentrations (EC5-EC44) should not exceed 1,000mg/kg.
- Furthermore, pre-delivery screening results of any imported materials should be classified using HazWasteOnline™ software in accordance with the 'Guidance on the Classification and Assessment of Waste (1st Edition 2015) – Technical Guidance WM3, Version 1.1 June 2018' to ensure these materials are not Hazardous Waste.
- The values given above are based on assessing the risk to Human Health. It should be noted that imported topsoil materials should also be assessed against Potentially Phytotoxic Elements as detailed in Table 1 in BS3882:2015 – 'Specification for Topsoil'.

(1) = LQM S4UL's (2014 & 2015) – Residential with home-grown produce, (2) = CL:AIRE C4SL's – Residential with home-grown produce, (3) = ATRISKSOIL SSV.
(4) = LQM S4UL's (2014 & 2015) – Residential with home-grown produce value for Benzene

7.3 Soil stabilisation / Solidification Validation (Area B):-

As well as continued field characterisation and testing during the remediation works, a final sampling regime to confirm the effectiveness of the stabilised material, with regard to potential leachate generation, should be undertaken prior to the placement of any engineering fill to achieve final design levels.

The proposed sampling regime and frequency should be submitted to Arc Environmental Ltd for review at least 1 week prior to the implementation of the testing.

In addition to the above, regular site visits will be carried out by a suitably qualified Geo-Environmental Engineer from Arc Environmental Ltd to monitor the progress of the treatment including photographic records, site notes, etc.

7.0 Validation Requirements (Cont'd)

7.3 Soil stabilisation / Solidification Validation (Area B) (Cont'd): -

As noted in Section 6.2, while identified contamination within Area B will be placed and compacted at depth below engineering fill, any proposed gardens and areas of soft landscaping will still require an adequate thickness of texturally and chemically suitable topsoil and subsoil to act as a growing medium for future planting. Confirmatory contamination screening may be required to confirm the suitability of any materials used. Recourse to Arc Environmental Ltd should be made if re-use of site-won soils is proposed for further advice with regard to testing scope and frequency.

7.4 'Watching Brief' (Areas A & B): -

Any potential unforeseen contamination issues highlighted during the 'watching brief' and steps taken to deal with any unforeseen contamination will be discussed within the final Validation Report.

7.5 Validation Report: -

Following completion of the required remediation works, a final Validation Report will need to be submitted to the LA confirming all the works undertaken and verification that the Remediation Strategy has met all the requirements for the development of this site, including all details relating to the watching brief, and identification and remediation of any unforeseen or unknown ground contamination (if present). The production of this report will also allow the LPA to discharge any outstanding planning conditions associated with land contamination on this site prior to development commencing.

END OF REPORT

APPENDIX I

Aerial Photograph

Existing Site Layout Plan

Proposed Development Layout Plan



ARC ENVIRONMENTAL LTD

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e-mail: admin@arc-environmental.com
web: www.arc-environmental.com

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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LEGEND	
	APPROXIMATE SITE BOUNDARY

rev.	date	amendments		drawn	chckd

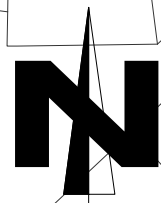
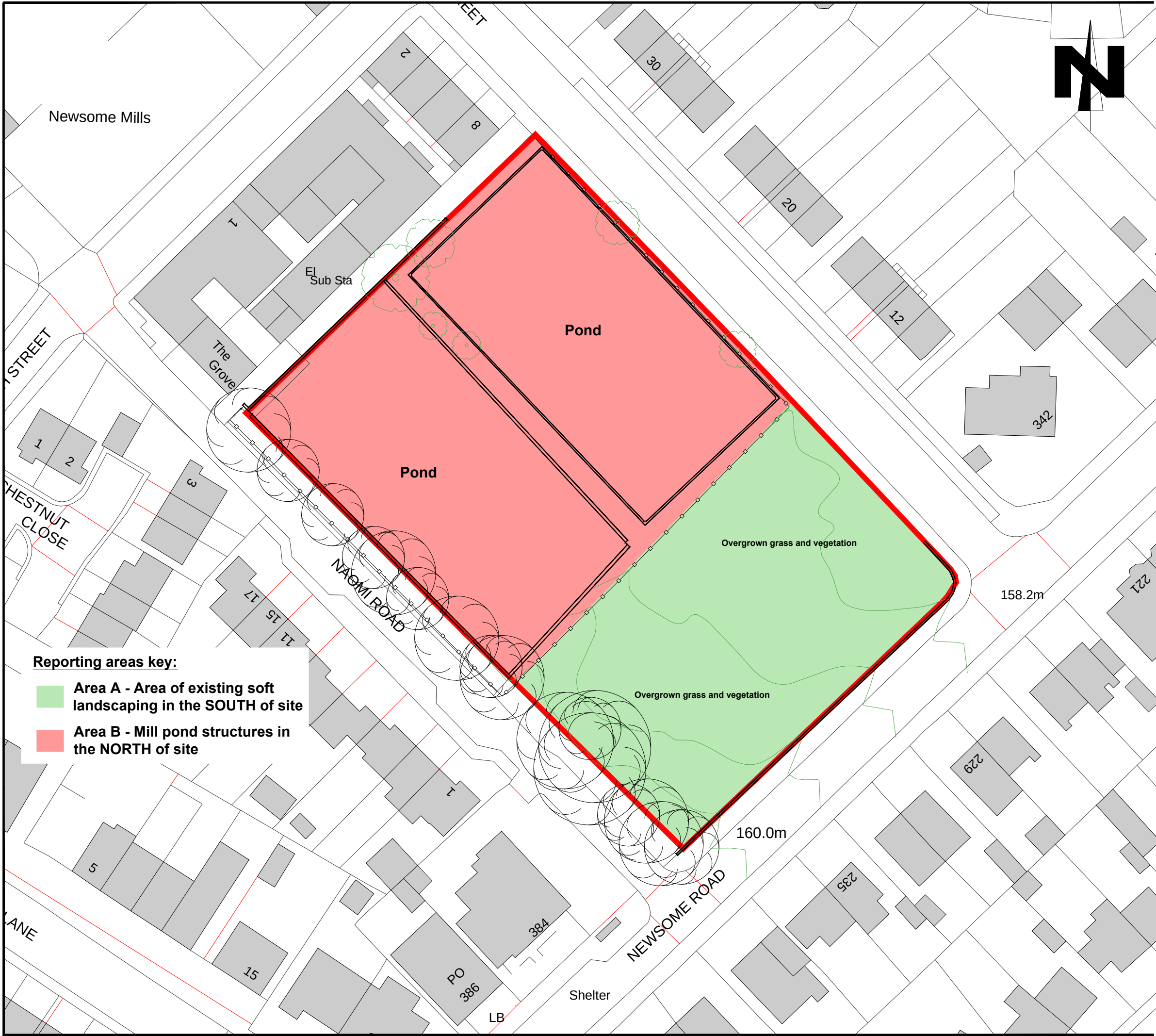
Client:	URBAN GROUP (YORK) LIMITED
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Project Title:	Proposed Residential Development
	Hart Street, Off Newsome Road
	Newsome, Huddersfield, HD4 6LS

Drawing Title:	Aerial Photograph
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Scale at A3:	Date:	Drawn by:	Approved by:
NTS @ A3	10.06.21	P.D	P.B

Job Ref:	Drg no:	Rev:
20-967	—	—



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rev.	date	amendments		drawn	chckd

- Reporting areas key:**
- Area A - Area of existing soft landscaping in the SOUTH of site
 - Area B - Mill pond structures in the NORTH of site

Client:	URBAN GROUP (YORK) LIMITED		
Project Title:	Proposed Residential Development		
	Hart Street, Off Newsome Road		
	Newsome, Huddersfield, HD4 6LS		
Drawing Title:	Existing Site Layout Plan		
Scale at A3:	Date:	Drawn by:	Approved by:
NTS @ A3	10.06.21	P.D	P.B
Job Ref:	Drg no:	Rev:	
20-967	-	-	



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LEGEND	
	APPROXIMATE SITE BOUNDARY

rev.	date	amendments	drawn	chkd

Client:

URBAN GROUP

Project Title:
Proposed Residential Development
Hart Street, Off Newsome Road
Newsome, Huddersfield, HD4 6LS

Drawing Title:
Proposed Development Layout Plan

Scale at A3: 1:500 @ A3	Date: 22.07.21	Drawn by: P.D	Approved by: P.B
Job Ref: 20-967	Drg no: —	Rev: —	