



SHADBOLT
ENVIRONMENTAL

2585 – Former Houghton Colliery

Remediation Strategy

For Hellens Land

Issue V3

October 2022



SHADBOLT
GROUP

2585 – Former Houghton Colliery

Remediation Strategy

Project Reference: 2585

Client	For Hellens Land
Our Reference	2585 – Former Houghton Colliery
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Checked by	Mike Taylor
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1.0 CONTRACTURAL ARRANGEMENTS

REFERENCE	COMPANY NAME	CONTACT	TELEPHONE
EARTHWORKS CONTRACTOR	TBC	TBA	TBA
ENGINEER	Shadbolt Group	Mike Taylor	0191 478 3330
CLIENT	Hellens Group	Simon Thorpe	0191 418 0020

Shadbolt Group were commissioned by Hellens Group to act as their geo-environmental consultant to produce a Remediation Strategy which describes the physical works required in order to construct a suitable development platform within Former Houghton Colliery site.

The purpose of this Earthworks Strategy is to describe the physical remedial works that will be undertaken at the site, highlight the supervision that will be undertaken by **The Shadbolt Group** and describes the validation works to be undertaken to enable the site to be developed on a more assured basis.

The specification must be read in conjunction with the following documents.

1. 2585 - Newbottle Street, Houghton Le Spring, Revised Desk Top Study Assessment, Version 2, For Hellens Land, July 2022.
2. 2585 - Newbottle Street, Houghton Le Spring, Ground Investigation Interpretive Report and Groundwater Risk Assessment Version 3 For Hellens Land, September 2022.
3. 2585 -Newbottle Street, Houghton Le Spring, Foundation Works Risk Assessment, Version 3, For Hellens Land, October 2022.
4. All relevant construction design documents reports pertaining to the site

*The proposed development layout is presented in **Appendix B**.*

2.0 SITE INFORMATION

2.1 General

The site is located to the south of Newbottle Street (A182), northeast of Houghton le Spring town centre. The site is an irregular, elongated plot orientated roughly northwest to southeast with an area in the order of 3.35ha.

The approximate National Grid Reference (NGR) for the centre of the site is **433840,550400**.

A general site location plan of the site is presented as Figure 1 and an aerial photograph as Figure 2.

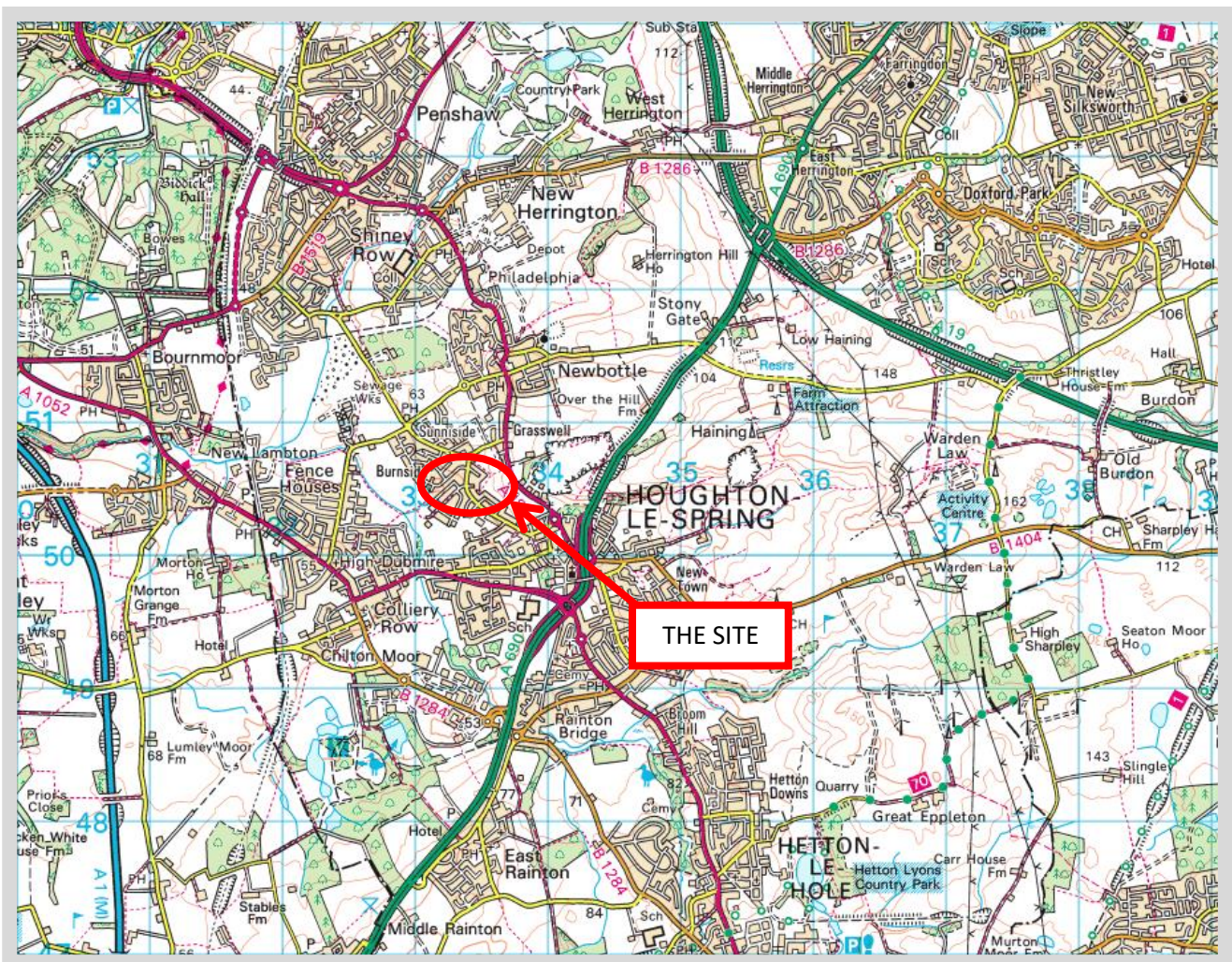


Fig. 1 – General Site Location Plan

2.2 Site Description

An initial site walkover was undertaken by TSG in March 2018.

The site comprises a large terrace of maintained grassland bound by slopes to the northeast and southwest. In the north of the site the slope up to Newbottle Street is taken up by a stone-faced retaining wall in the order of 4m tall along the boundary with a storage yard to the rear of the adjacent petrol filling station.

Stands of Japanese Knotweed were noted at the top of the northern end of the retaining wall and along the crest of the slope to the north.

The embankments at the fringes of the site are planted with small trees with the main body of the site comprising grass with a central ridge of rough grass / vegetation along the line of a former fence of which some components still remain. 2 No. roughly circular areas are not grassed, and concrete is visible; these broadly align with given location of shafts recorded by the Coal Authority which have been capped at the surface.

The boundary along Newbottle Street is fenced with close boarded timber fencing up to a pair of billboards adjacent to a van hire depot and petrol filling station at the northern end of the site.

Vehicular access is available via a track leaving a service road to the rear of the petrol filling station but is blocked by a boulder placed along the perimeter of additional grassland extending to the north of the site.

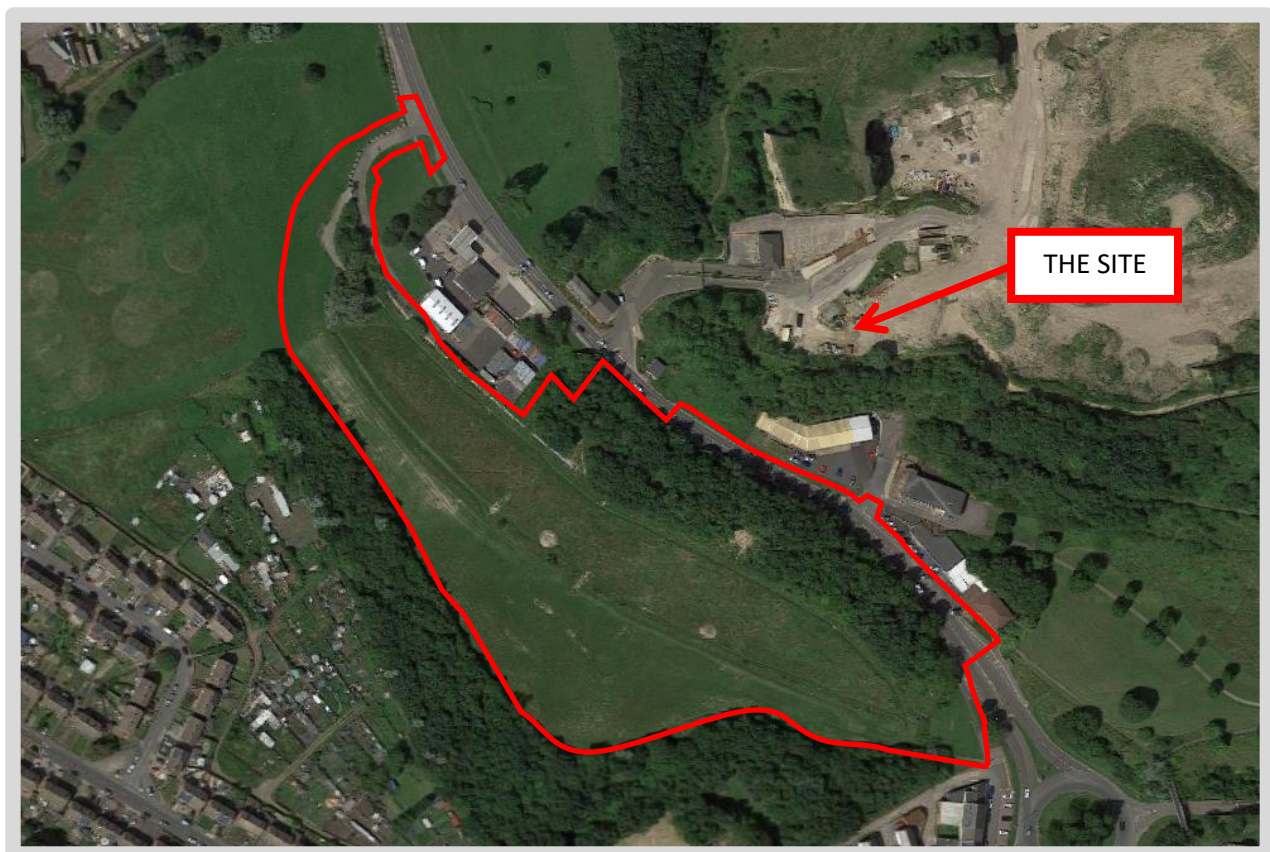


Fig.2 – Aerial Photograph Showing Development Area

3.0 HISTORICAL LAND USE

The site has been developed through much of the mapped history by the Houghton Colliery and associated infrastructure including railway sidings and reservoirs. Following the closure of the colliery in 1981 the site was cleared and has remained as grassed open space to the present day.

Many towns in the surrounding area were reasonably well established in the earliest mapping with the colliery and adjacent limestone quarry providing local employment opportunities. Residential areas were developed through the early 20th century with large developments in the 1940s and 1960s/70s. Extraction at the quarry has ceased and in recent times been repurposed as a landfill site and is now being considered for redevelopment.

Key Areas of Concern

From earliest mapping in 1857 the on-site Houghton Colliery with the associated railway lines, gas works to the south and Houghton Quarry and the associated limekilns to the north are the most potentially contaminative historic activities.

Between 1857 and 1897 the tipping of spoil to the north and east of the site and the presence of mine shafts on-site cause potential concern.

Between 1897 and 1920 the labelled chimneys on-site are indicative of further potential pollution.

Between 1920 and 1939, the labelled tanks at the gas works pose a key area of concern.

Between 1958 and 1969 the mapped electrical substation at Houghton Quarry, the garage to the north and the disused tip to the north-west are key potential contaminative features.

Between 1970 and 1979 the garage developed ~20m to the east of the site poses some cause for concern. Tanks labelled within the southwest corner of the site.

1990s demolition of the former colliery, capping of the mineshafts and infilling of the railway sidings.

4.0 GROUND CONDITIONS

The ground conditions encountered at the site are summarised in the following sections and reference should be made to 2.

- 2585 - Newbottle Street, Houghton Le Spring, Ground Investigation Interpretive Report and Groundwater Risk Assessment Version 3 For Hellens Land, September 2022.

4.1 Made Ground.

Made Ground was encountered in all exploratory holes undertaken across the site to a depth of up to 11m and generally comprised of dark grey, reddish, brown, CLAY with varying amounts of sand, gravel and cobbles (slag, sandstone, shale, brick, concrete, mudstone). The soils have been interpreted as typical of colliery spoil / demolition materials encountered on former colliery sites. Made Ground was typically 3-10m in thickness.

4.2 Topsoil

No Topsoil was encountered on site.

4.3 Superficial Deposits

Superficial deposits were recorded in 16 No. of the exploratory holes and generally comprised Glacial Till comprising stiff, grey, brown gravelly Clay and laminated Clay. The gravel was typically fine to coarse angular sandstone. The deposit was typically 3-10m in thickness.

Superficial glacial clays were encountered within all rotary cored boreholes with the exception of RC01, RC02, RC11 and RC12 and was encountered at depths of between 6.4m bgl and 19.8m bgl.

4.4 Solid Deposits

Solid geology was encountered during the works within all 6 No. rotary open boreholes and 12 No. rotary cored boreholes as Red/Brown weathered Mudstone or Grey Yellow Sandstone / Mudstone. Whilst potential limestone bedrock was noted within the rotary open boreholes (drillers description) the rotary cored boreholes have confirmed that solid geology encountered beneath the site is Sandstone and Mudstone and no limestone was encountered.

Bedrock was encountered between 3.1m bgl and 14.8m bgl. Possible bedrock was encountered within the base of BH10 at 16.2m bgl. Bedrock was subsequently proven to the full depth of RO-02 at 21m bgl. Interbedded Limestone and Sandstone was encountered within RO-04 and RO-05 underlain by Mudstone and Sandstone respectively.

The rotary cored boreholes encountered sandstone, mudstone and siltstone from depths ranging from 5.39m bgl to 19.8m bgl and extended to a maximum depth of 25m bgl (where the majority of the rotary cored boreholes terminated).

As stated above, no deposits of limestone were encountered during the drilling of the rotary cored boreholes.

4.5 Groundwater

Groundwater strikes was encountered in 9 No. of the cable percussion boreholes (CP-01, CP-02, CP-03, CP-05, CP-06, CP-07, CP-11, CP-15 and CP-17) ranging in depth from 3.10m bgl to 10.6m bgl during drilling – considered to be isolated perched water within either the Made Ground or the Superficial deposits.

No groundwater was encountered during the drilling of the rotary open boreholes in April 2020., however the use of water flush inhibits the recoding of the water strikes / water table.

During the drilling of the rotary cored boreholes occasional perched water strikes were reported within the Made Ground and the shallow superficial deposits, with the water table being reported generally at 13-16m bgl at a level of 52-54m aOD. Groundwater has been recorded within all the shallow monitoring wells within the Made Ground / superficial (typically as a small volume collected with the base of the installation) with the highest groundwater level recorded at 4.50m bgl. It should be noted that groundwater levels will vary seasonally.

During the groundwater sampling visits limited groundwater was encountered within the cable percussion boreholes suggesting collection of water within the wells rather than a consisted perched water table (the boreholes were either purged dry during sampling or contained insufficient sample for testing).

Where shallow groundwater was encountered this was generally encountered as perched water above the underlying low permeability clays. The borehole logs and monitoring data suggest that the upper perched ground water is isolated from the lower deep groundwater within the underlying rock where the low permeability clays are present (the clays are absent towards the eastern part of the site in the vicinity of the proposed petrol filling station).

The more recently installed rotary cored boreholes have been monitored and sampled on 3 No. occasions. The deep hydraulic gradient reported at the suggest that groundwater flow at the site appears to lie between 57.97maOD to 54.51m aOD. but with a general hydraulic gradient to the southwest from the northeast (broadly in line with the anticipated hydraulic gradient

4.6 Ground Obstructions / No Recovery / Voids

9 No. cable percussion boreholes encountered obstructions from 1mbgl to 8.5m bgl in the form of buried boulders and concrete. (Please see the exploratory logs for further information).

Poor core recovery was noted within the majority of the Rotary Cored boreholes (no loss of flush) and a void was noted within RC04 at between 5.0 and 6.5m bgl.

Poor recover was considered to be a result of destructive weathering of the underlying bedrock.

4.7 Observed Contamination

No significant visual or olfactory evidence of contamination was recorded during the site investigation works with the exception of ash, brick and concrete fragments observed as part of the Made Ground clay matrix. A very faint hydrocarbon odour was noted from TP-19 (subsequent laboratory analysis did not reported elevated concentrations of contaminants). It should be noted that TP301 was excavated within the same location as TP-19 during the most recent ground investigation works and no evidence of hydrocarbon contamination was noted.

No mobile hydrocarbon contamination was observed or noted during any phase of the ground investigation works. No Light Non-Aqueous Phase Liquids (LNAPL) or Dense Non-Aqueous Phase Liquids (DNAPL) were observed / recorded during all phases of ground investigations works and groundwater monitoring

4.8 Reported Contamination

4.8.1 Soils Contamination

In total 70 No. soil samples were submitted for testing for a suite of common contaminants during the several phases of Shadbolt Group ground investigations.

The laboratory chemical results have reported concentrations of potential contaminants to be within / below SE TSVs for a Commercial end use (human health criteria).

Soils analyses undertaken which reported concentrations above laboratory detection limit but beneath the human health criteria for a commercial enduse included heavy metals and metalloids, Cyanide, sulphate, Total Petroleum Hydrocarbons, Polyaromatic Hydrocarbons, occasional VOCs and SVOCs.

The potential for soils contamination to impact groundwater resources is dictated by the leachability of the soils located at the site and the potential for the soils to come into contact with water.

4.8.2 Leachate Contamination

Leachate analysis undertaken on soils (17 No.) retrieved from the site has reported low concentrations of contaminants below the laboratory detection limits and compared to Threshold Values for Groundwater. However, several contaminants were reported to be slightly elevated when compared to Threshold Values as shown in the table below.

Analyte	Concentration ug/l	EQS Surface Water (ug/l)	Multiple of Threshold	UK Drinking Water Standards (ug/l)	Multiple of Threshold	Location / Strata
Fluoranthene	1.1	0.0063	x 174	N/A		TP209 @ 1.5m bgl (Made Ground)
	0.01		1.6			RC01 @ 4.76-4.89m bgl (Made Ground)
	0.03		4.8			RC05 @ 9.4-9.5m bgl (Glacial Till)
	0.01		1.6			RC06 @ 5.0-5.2m bgl (Glacial Till)
Benzo (b)fluoranthene	0.6	N/A	N/A	0.1 (sum of 4)	x6	TP209 @ 1.5m bgl (Made Ground)
	0.13				1.3	RC08 @ 6.5-6.6m bgl (Made Ground)
Benzo(a)pyrene	1.8	0.0017	x1058	0.01	x180	TP209 @ 1.5m bgl (Made Ground)
	0.06					RC08 @ 6.5m -6.6m bgl (Made Ground)

Table 4.8.1 - Leachate Analysis Above TSVs Summary Table

4.8.3 Groundwater Contamination

No significant groundwater strikes were encountered during the initial ground investigations and insufficient groundwater was encountered initially within the cable percussions monitoring standpipes to retrieve representative samples.

However recent monitoring off the boreholes has enable the retrieval of water samples from BH01, BH02, BH03 and BH10 and RC01 to RC12. The remainder of the cable percussion boreholes remained dry.

Analyte	Concentration ug/l	EQS Surface Water (ug/l)	Multiple of Threshold	UK Drinking Water Standards (ug/l)	Multiple of Threshold	Location / Response Zone
Selenium	11.5 - 60.01	N/A	N/A	10	x1 – x6	BH01, BH04 and BH10 (all Made Ground / Glacial Till - Elevated concentrations reported during 3 No. monitoring visits)
Naphthalene	7.7	2	3.85	N/A	N/A	RC12 (Visit No.1) - Sandstone
Benzo(b)fluoranthene	7.7	N/A	N/A N/A N/A N/A	0.1	x77	RC12 (Visit No.1) - Sandstone
Benzo(k)fluoranthene	4.3	N/A	N/A	0.1	x43	RC12 (Visit No.1) - Sandstone
Benzo(ghi)perylene	3.0	N/A	N/A	0.1	x30	RC12 (Visit No.1) - Sandstone
Indendo(123CD) pyrene	3.8	N/A	N/A	0.1	x38	RC12 (Visit No.1) - Sandstone
Benzo(a)pyrene	0.4 0.04 7.2	0.00017	x 2352 x 235 x 42352	0.01	x40 x400	BH10 (1 st monitoring visit only) RC11 (Visit No. 2) – Sand RC12 (Visit No.1) - Sandstone
Fluoranthene	0.2-0.3 0.03 0.12, 0.07 15, 0.03 1.3	0.0063	x47 x33 x19 x5 x2380 x33 x206	N/A	N/A	BH01, BH02, BH03 (1 st monitoring visit) RC08 (visit No.3) RC11 (Visit No.2 and 3) – Sand / Sandstone RC12 (Visit No.1 and 3) – Sandstone RC07 (visit No.3)

Table 4.8.3- Groundwater Analysis Above TSVs Summary Table

All other chemical analysis results, including BTEX, VOCs, PCBs and PAHs were reported to be below the laboratory detection limits “with the exception of several VOC’s” i.e., di-n-butyl phthalate, bis(2-ethylhexyl) ester, bis(2-ethylhexyl) phthalate and chloroform.

The leachate analysis table and the groundwater analysis table show elevated leachable hydrocarbons in the soils whilst elevated selenium and hydrocarbons were recorded within the groundwaters.

As such, it appears that the deep groundwaters have been slightly impacted with dissolved phase PAH hydrocarbons, in places but appears to be isolated to individual borehole rather than site wide.

The Ground Investigation Interpretive Report and Groundwater Risk Assessment concluded that

- When the site is developed most of the site will be covered with hardstanding's, buildings with formal drainage and therefore the potential for rainwater to percolate through the site and for contaminants to leach into solution and migrate towards the Principal Aquifer and / or local watercourses will be further significantly reduced. All soils placed at the site would be to an end product specification to achieve at least 95% of maximum dry density and less than 5% air voids thus reducing the potential for contaminants to leach into solution.
- Although it is considered that the existing ground conditions at the site does not pose a significant risk to future site users and the environment it is considered that a remediation strategy and foundation work risk assessment should be undertaken at the site to ensure that the site can be developed on a more assured basis.

5.0 REMEDIATION SPECIFICATION

Extent and Scope of Works

This specification relates to proposed earthworks at the site known Former Houghton Colliery, to prepare the site for a residential development.

In summary, the earthworks to be undertaken in parcels across the site will comprise.

- Stripping of vegetation and placement into stockpile for offsite disposal.
- Cut and fill works to the required levels (approximately 23,000m³)
- Treatment and/or removal of previously unidentified hotspots.
- Removal of previously unidentified contaminated liquids.
- Appropriate geotechnical and chemical laboratory analysis.
- Appropriate in-situ geotechnical analysis.
- Drilling of groundwater monitoring boreholes
- Environmental Monitoring of Boreholes

The works will be undertaken to provide finished site levels as designed by Portland Consulting Limited to provide a suitable development platform and strategic drainage for the development; namely.

- 2020011-002-1 Retail Development, Newbottle Street, Houghton Le Spring Bulk External Works Sheet 1
- 2020011-002-1 Retail Development, Newbottle Street, Houghton Le Spring Bulk External Works Sheet 2

The Indicative Cut and Fill Model for the site is shown on.

- 2020011-000-1 Retail Development, Newbottle Street, Houghton Le Spring Bulk Earthworks Sheet 1
- 2020011-000-1 Retail Development, Newbottle Street, Houghton Le Spring Bulk Earthworks Sheet 2

It should be noted that based on the cut and fill model the underlying rock will not be exposed during the remediation works.

All fill placed at the site will be to an engineered end product specification to achieve at least 95% maximum dry density and not more than 5% air voids (using the modified Proctor rammer weight of 2.5kg).

Care should be taken to ensure that rainfall or surface waters are effectively shed from the surface and drained away to appropriate temporary holding tank / sump. These surface water runoffs would require to be discharged under consent to an appropriate drainage system or alternatively tanked offsite.

Surface waters shall not be allowed to pond, and any drainage channels should be lined with low permeability clay and maintained to ensure free flow. The low permeability clay to be utilised will be clean / non-contaminated.

Temporary storage ponds are to be utilised / created on site to temporarily store waters encountered during the excavations prior to discharge under consent. The Contractor is to ensure that any required temporary discharge consents are in place prior to discharge of waters. Testing of waters will be required, and agreement sought from NWL / EA prior to discharging under consent.

Earthworks Contractor's Programme

The Earthworks Contractor's programme shall take full account of the conditions of the Main Contract for the proposed phasing of the overall site work, and other activities taking place on the site. This programme shall be agreed prior to the commencement of the Works.

The Control of Noise, Vibration and Mud/Dust Nuisance

The Earthworks Contractor shall comply with the recommendations for practical measures to reduce noise set out in BS5228: Parts 1, 2 and 4.

The Earthworks Contractor shall take all reasonable measures to prevent any dirt or foreign matter being deposited upon or falling upon any public or private highway or access. Where any such material is on any such highway or access, the Earthworks Contractor shall forthwith remove the offending material at his own expense and clean the surface of the highway or access to the satisfaction of the Main Contractor and/or Engineer and/or the Highway Authority.

The Earthworks Contractor shall take all reasonable measures to prevent dust nuisance from being generated by construction traffic, earthworks etc. It is likely that an environmental monitoring system will have to be established on site. The contractor is to make allowances for discussions with the local authority on this matter and complying with any requirements set out.

Traffic Safety and Management

The Earthworks Contractor shall comply in all respects with Chapter 8 of the Traffic Signs Manual for works on or affecting the public highway and/or any private roads forming the highway access to/from the site. The Earthworks Contractor should obtain all necessary consents from the Local Highway Authority for works on the public highway.

On-site accesses and haul routes should be provided and maintained by the Earthworks Contractor in such a manner so as not to endanger either the user, those working in the vicinity of such accesses, haul routes and/or the Works.

Private and Publicly Owned Services

No services are known to be present within Former Houghton Colliery

However, prior to commencing work the Earthworks Contractor shall obtain copies of all available services records and excavate trial pits to locate as necessary.

During the progress of the works the Earthworks Contractor shall (as / if required):

- Take all measures reasonably required by any Public or Statutory Authority for the full protection of its sewers, drains, pipes, mains, cables or any other apparatus, and shall afford proper facilities to accredited representatives of such authorities for access as may be necessary for inspection, repair, renewal or removal of any such apparatus.
- Temporarily support any sewers, drains, pipes, mains, cables or other services

- affected by the works.
- Take responsibility for ensuring that all hydrant covers, stop tap boxes, manhole covers, and the like are raised or lowered to suit the finished levels of the road and footway, margin or verge.
 - Comply with the requirements to utilities providers on all matters relating to services; and indemnify the Client and the Engineer against any claim arising in consequence of the operations.

During the progress of the works the Earthworks Contractor shall provide an alternative service, in full working order to the satisfaction of the owner of the service and the Engineer before any privately-owned service for water, electricity, etc. passing through the site and affected by the works, is cut or disconnected.

Trial pits shall be excavated by hand as necessary in order to verify the position of known existing services to be retained.

Damage to Property

The Earthworks Contractor shall ensure that all precautions are taken in order to avoid any damage to existing property arising from the Works and shall be responsible for the same in the event that any damage should arise from his failure to exercise due care.

Any adjacent structures, services and the like shall be inspected prior to commencement of the Works for evidence of existing defects and, if necessary, a dilapidation survey shall be carried out by the Earthworks Contractor prior to works commencing on site. A re-inspection shall take place on completion of the Contract to verify that no damage or deterioration of said structure, service or apparatus has occurred as a result of the Works. A schedule of the findings of this re-inspection shall be circulated to all parties concerned for their records.

The Earthworks Contractor shall execute the works with care so as to avoid damage to existing structures and drains or other services to be retained.

All fences, trees, paths, shrubs, grassed areas and other surfaces required to be retained shall be protected from spillage and damage caused by site operations and they shall be handed over in an undamaged and proper state to the satisfaction of the Engineer upon completion of the works. The Earthworks Contractor shall not raise or lower the ground level beneath the spread of the branches of any tree to be retained without the approval of the Engineer.

Site Clearance

Before starting the site clearance works, the Earthworks Contractor shall verify with the Client which existing fences, gates, walls, roads, paved areas, trees, shrubs, etc., are to be removed. Any existing water features are to be made redundant and are to be filled. Water features must be cleared of all vegetation and soft/ organic deposits before filling. Any water features / watercourses (e.g., the historic pond) which have previously been filled should be re-excavated and treated likewise.

All materials removed as part of the site clearance shall be disposed of off-site at suitably licensed facilities. On-site burning of materials shall not be permitted.

The Earthworks Contractor shall demolish, break up and remove any redundant concrete slabs, structures, drains and other superficial obstructions in the way of the works or otherwise obstructing the construction of the works as instructed. Where old foundations, beds, basements, filling material,

tanks, service pipes, drains, etc., not shown on the drawings are encountered, instructions should be obtained from the Engineer before proceeding.

Tanks, if encountered, would require their liquids removed, inerted (degassed) and excavated in accordance with best practice (i.e., Guidance for Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations – chapter 15).

At the Earthworks Contractor's discretion, any demolished or cleared materials (e.g., existing brick structures and former stockpiled brick wastes) may be retained on site for use as filling material provided that they are acceptable or are treated so as to become acceptable. Materials are to comply in all respects with this specification and the relevant permit / licencing requirements for the reuse of the site won materials identified onsite.

The use of explosives shall not be permitted.

All fossils, coins, bottles, articles of value or antiquity and structures or other remains or items of geological or archaeological interest discovered on the site shall be immediately reported to the Engineer and shall be deemed to be the absolute property of the Client. All findings to be reported to the County Archaeologist.

Setting Out

The Earthworks Contractor shall be responsible for the true and proper setting-out of the Works and for the correctness of the position, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labour in connection therewith. The Earthworks Contractor shall carefully protect and preserve all benchmarks, sight rails, pegs and other articles used in setting out the Works.

Should the Earthworks Contractor find any discrepancies on the drawings he is to refer the matter to the Engineer for verification before proceeding with the works.

General Earthworks Requirements

The Specification for Highway Works (SHW) Series 600 published by HMSO shall form the base specification for all earthworks.

Acceptable engineered fill materials shall meet the requirements of Table 6/1 enclosed as Appendix A to this specification (Appendix 6/1 requirements of which are to be determined after material classification) and Tables 6/2, 6/4 and 6/5 of the SHW reproduced within Appendix A. It should be noted that the vast majority of soils located at the site fall into a 2C classification and are slightly wet of optimum.

Should the soils be wet of optimum to achieve the compaction / air void requirements and to minimise the risk associated with leachate migration, then soil moisture modification may be required.

Any soil modification should be undertaken to achieve the compaction requirements should be undertaken in accordance with the relevant licence / permitting / deployment and with prior agreement with the client

Unacceptable material shall be:

- Peat, materials from swamps, marshes and bogs.

- Logs, stumps and perishable material.
- Materials in a frozen condition.
- Clay having a liquid limit determined in accordance with BS1377: Part 2, exceeding 90% or plasticity index determined in accordance with BS1377: Part 2, exceeding 65%.
- Material susceptible to spontaneous combustion.
- Materials with a calorific value in excess of 7MJ/kg, measured in an as received condition, placed within the fill material
- Materials containing invasive plant species or roots and rhizomes of such; and
- Material having hazardous chemical or physical properties requiring special measures for its excavation, handling, storage, transportation, deposition and disposal. No hazardous materials are to be imported to the site.

Prior to works commencing the material to be excavated and replaced should be classified in accordance with the above specification.

If an authorised formation or material deposited as fill subsequently deteriorates due to inclement weather (or for any other reason) such that it would be reclassified as unacceptable and cannot be compacted in accordance with the Contract, the Earthworks Contractor shall, at his own expense, either:

- Cease work on the material until its condition is such that it can again be classified as acceptable.
- Make good by removing and disposing of the unacceptable material and replacing it with acceptable material.

The Earthworks Contractor shall provide for such measures as may be necessary to ensure that water, whether groundwater, precipitation or water from any other source does not accumulate in excavations or on subgrades.

The Earthworks Contractor shall arrange for the rapid dispersal of water shed on to the surface of earthworks or completed formation during construction or which enters the earthworks above the water table from any source.

The Earthworks Contractor shall provide where necessary temporary watercourses, ditches, drains, pumping or other means of maintaining the earthworks free from water. Such provision shall include carrying out the work of forming the earthworks in such a manner that their surfaces have at all times a sufficient minimum cross-fall and, where practicable, a sufficient longitudinal gradient to enable them to shed water and prevent ponding.

The Earthworks Contractor shall submit proposals for disposal of water to the relevant authority. Where pumping is authorised, precautions shall be taken to prevent disturbance of material in and around excavations. Adequate means of trapping silt shall be provided on temporary systems discharging into permanent drainage systems.

These surface water runoffs would require to be discharged under consent to an appropriate drainage system or alternatively tanked offsite.

Surface waters shall not be allowed to pond, and any drainage channels should be lined with low permeability clay and maintained to ensure free flow. The low permeability clay to be utilised will be clean / non-contaminated.

The Earthworks Contractor shall allow for such seasonal and other variations to the ground water levels indicated in the Site Investigation Reports as might reasonably be anticipated.

Where, in the opinion of the Engineer, earthworks have been adversely affected by the ingress of water during the earthworks contract so as to render the material unacceptable, these works shall be removed and made good at the Earthworks Contractor's expense.

The Earthworks Contractor is required to remove all topsoil and to remove any soft spots prior to filling with acceptable material. Any surplus topsoil shall be removed from site to a suitably licensed off-site tip or other approved location.

Surfaces of excavations with a gradient greater than 1:5 which are to receive filling must have horizontal benches constructed to match the depths of compacted layers of filling.

Where, during the progress of the work, the difference in level between adjacent areas of filling exceeds 600mm, the Earthworks Contractor shall cut into the edge of higher filling to form benches having a minimum width of 600mm and a height equivalent to the depth of a layer of compacted filling. The Earthworks Contractor shall spread and compact new filling to ensure maximum continuity with the previous filling.

The accuracy of and permissible deviation from required formation levels (underside of sub-base/capping) shall be as follows:

- Beneath mass concrete foundations: $\pm 25\text{mm}$
- Beneath ground bearing slabs: $\pm 15\text{mm}$
- Beneath roads and other paved areas: $\pm 20 - 30\text{mm}$
- Other areas: $\pm 50\text{mm}$

Bulk Excavation

The bulk excavation shall be carried out as necessary to remove all unsuitable soils (e.g., topsoil, vegetation, Made Ground to levels as shown on the cut and full model), all obstructions and extraneous items).

Precautions should be taken to ensure the stability of the excavation due to the potential presence of granular Made Ground deposits when encountered; the Earthworks Contractor is responsible for maintaining the stability of temporary excavations during the Works and the stability of adjoining land/property.

Should the Earthworks Contractor intend to use any special methods to assist in excavation work, such as 'soil freezing', 'chemical stabilisation', etc., then details shall be submitted to the Engineer for comment at least three weeks in advance of the work. No work shall be commenced on the portion of the excavation concerned until consent is given.

Any large obstructions or unexpected findings discovered during excavation shall be reported immediately to the Engineer.

Following completion of any excavation, particular care must be taken to avoid deterioration of the excavated surface. The Earthworks Contractor shall be responsible for protecting the excavations against damage from weather and/or construction traffic.

Where areas of ground considered unsuitable by the Engineer are identified at the base of excavations the Earthworks Contractor shall, under the direction of the Engineer, excavate to such further depth as may be required. Such extra depth shall be filled with, acceptable general fill materials or sub-base/capping materials as required by the Engineer.

Excavations shall be carried out by the Earthworks Contractor in such a way as to avoid disturbance and/or damage to the surrounding ground, existing roads, pavements, buildings and services, etc. on and/or adjoining the site.

The Earthworks Contractor shall be solely responsible for the safety of all excavations and for the sufficiency of all temporary supports thereto.

The Earthworks Contractor shall be responsible for disposing of all unacceptable or surplus materials arising from the Works at suitably licensed off-site tips as required.

Should material be encountered that appears contaminated, either by olfactory or visual evidence, the material will be brought to the attention of the Engineer who will advise as to the appropriate course of action. Hotspot removal works should be undertaken as described with the section below.

Hotspots

If during the remediation works if previously unidentified mobile hydrocarbon contaminants or obviously visually or olfactory contamination is noted, the excavation works are to cease in the area, and the LPA / EA notified of the findings. Works shall not recommence until agreement has been sought by the LPA / EA as to the most appropriate way forward, which is likely to involve hotspot removal works and validation of the sides and base of the excavation been removed. The excavated soils would be required to be stockpiled appropriately on site for classification prior to being removed off site to a suitably licensed landfill facility under appropriate duty of care documentation. The procedure for dealing with hotspots is as follows.

- Visually assess the area that is impacted and determine an initial area / depth of excavation, initially a nominal 5m x 5m in area and by the appropriate depth, increasing by 5m intervals until hotspot area is deemed fully excavated.
- Informing the relevant parties / authorities.
- Undertake confirmatory chemical testing at the base and sides of the excavation (minimum of 2 No. samples per side and base for a 5m x 5m excavation, increasing to 4 per side and base for a 10m x 10m excavation, increasing to 6 per side and base for a 15m x 15m excavation and so on (2 No. samples per liner 5m)
- Should hydrocarbon odours / visual staining be noted TPH, PAH, BTEX, MTBE, PCB, SVOCs and VOCs should be tested for.
- Should a hotspot of metal contamination be encountered a full metal suite should be tested for.
- Should asbestos debris be encountered then asbestos testing should be undertaken (identification and quantification). Hand picking will be required under appropriate asbestos management procedures and appropriately qualified asbestos removal contractors.
- Excavated hotspot soils should be tested at a rate of 1/100m³ of arisings (minimum of 3 tests).

- All tests' results to be compared against the Remediation Criteria within Appendix C. should materials fail the criteria, the hotspot area should be extended until all tests pass the remediation criteria.
- Prior to offsite disposal of contaminated soils additional WAC tests should be undertaken.
- All material should be disposed offsite to a suitably licensed landfill facility under appropriate duty of care documentation.
- The resultant excavation should be surveyed, and hotspot removal plans produced showing testing locations / hotspot extents and contaminated volumes.
- All excavated hotspot materials are to be placed into a designated / signposted area. The receiving area have a protective visqueen layer at its base and be approbatively bunded to ensure no contaminated runoff.
- Clearance certificates should be provided by the asbestos contactor following removal of asbestos

Material Classification

To provide formation levels for the proposed development, suitable material may be processed from excavated site soils.

Compliance testing of all imported and site won materials selected as earthworks materials required to achieve formation levels shall be carried out by the Earthworks Contractor at a UKAS / MCERTS accredited testing laboratory. Geotechnical earthworks testing at a frequency of 1 no. suite of tests to be undertaken per 1,000m³ of single class material type, or a minimum of 3 samples per material type (as defined in SHW) imported (See engineered Fill Specification below for details of suite).

The Earthworks Contractor should ensure the environmental and geotechnical suitability of acceptable site and imported materials. The results of the tests shall be made available to the Engineer prior to placement of material as fill.

Should materials be encountered that appear contaminated, either by olfactory or visual evidence, the material will be brought to the attention of the Engineer who will advise as to the appropriate course of action.

Filling

The performance of fill material placed at the site can be ensured by placement of the fill to an Engineered (End Product Specification) i.e., 95% of maximum dry density and less than 5% air voids.

The Earthworks Contractor shall ensure that the final platform is suitable for the placement of the embankment fill.

Areas of landscaping should receive at least 300mm of low permeability clay which will act as a barrier to potential vertical migration of rainwater and protect future site users from the soils beneath. The low permeability clay / subsoil (SHW 2A/B with a coefficient of permeability of at least $k=1 \times 10^{-9}$ m/s) should be clean / non-contaminated imported material. The thickness of the low permeability clay should be validated by post remediation inspection pit.

Engineered Fill Specification

On the basis of the results of a site investigation and earthworks trials which has been carried out, the Earthworks Contractor shall provide the Engineer with the results of the following tests for each type of fill on site.

- Natural moisture content (BS1377: Part 2:1990: Section 3).
- Liquid and plastic limits for cohesive soils (BS1377: Part 2:1990: Section 4 and 5).
- Particle density (specific gravity) to assist in evaluating compaction results.
- Particle size distribution by wet sieving method to give the distribution of particle sizes down to fine sand and the percentage of fines (BS1377: Part 2:1990).
- Proctor Soil Compaction Test using a 2.5kg hammer (moisture content versus Maximum dry density compaction curve).
- Calorific Value Tests (acceptable materials to report < 7,000 MJ/Kg)
- A separate compaction trial shall be carried out for each type of fill to be used on the site.
- The volume of geotechnical testing anticipated and provided by the Contractor within fill areas is shown below.
- Earthworks Classification Testing (as above) **every 1,000m³ of placed material**
- In-situ Density Tests (Sand Replacement Test -SRT) **every 1,000m³ of placed material**
- CBR tests at finished remediation level and **50m grid**
and at 1m height intervals as fill is placed

Furthermore, where material is predominantly cohesive in nature then the validation testing will also include a series of hand shear vanes (**every 1,000m³ of placed material**) with target shear strength of no less than 50kPa. Every layer should have at least one SRT undertaken to demonstrate that the appropriate compaction has been achieved.

The laboratory geotechnical testing undertaken on soil retrieved from the ground investigations has shown the soils to be relatively consistent and it is considered that a testing rate of **every 1,000m³** is appropriate.

General Filling Requirements

The Earthworks Contractor shall be responsible for removing from site any unacceptable material to suitably licensed tips.

Moisture content testing shall also be undertaken on each layer of material excavated and re-compacted. Initially the material placed will be observed by both the plant operators and the attendant Engineer to ensure that compaction is being achieved.

Should imported materials be at or near to its optimum moisture content and the material prove to be too wet to achieve adequate compaction, then the material will be removed, and consideration given to the addition of lime / natural drying (laying out to dry prior to compaction) to reduce the moisture content to make the material suitable for placement.

The Earthworks Contractor should ensure suitability of fill materials for lime modification if required. Such testing will also include for swell potential. Where lime modified material is incorporated in the works a record will be kept of its location, and layer thickness. As stated previously relevant licence / permit / deployment (e.g., mobile plant.) will also be required for lime / cement modified materials.

Any in-situ validation tests (if required and under instruction) will include a record of their layer number and associated X, Y and Z co-ordinates.

Environmental validation testing will be undertaken on soils placed at the site in accordance with Appendix C. Tests are to be undertaken at a rate of 1 per 1,000m³ of placed fill with base of excavation testing and finished level testing undertaken in accordance with the following drawings.

2585-301 - Base of Excavation Sampling Locations

2585-302 - Finished Remediation Level Sampling Locations

The imported subsoil / clay should be tested at a rate of 1/250m³ with a minimum of 3 No. samples tested.

The ground investigations undertaken at the site have shown that the existing soils located at the site are suitable to remain in situ and do not pose a significant impact on the environment and as such the chemical concentration limits are as shown in Appendix C which represent "industry standard" Human Health Criteria for a Commercial Enduse.

Should any soils be imported to the site (preferably naturally occurring materials) the same criteria are to be adopted and all soils to be used on site shall also be checked using HazWaste Online on the chemical results for material reuse / import to determine that the material is non-hazardous.

If recycled materials (typical demolition, recycled aggregates) are to be utilised these shall not report leachable concentrations of contaminants above the water criteria as described within Appendix C, providing an additional level of protection.

In order to develop the site a Deposit for Recovery Environmental Permit is to be obtained from the Environment Agency for reuse of site won Made Ground. Aggregates would be imported under the WRAP Protocol and imported soils under a Materials Management Plan (MMP).

Slopes

Permanent slopes should be no steeper than 1:3 (vertical: horizontal – based on previous slope stability assessments).

Permanent batters at the western edge and eastern edge of the development are expected to achieve gradients at 1:3.

Specific Requirements

Validation testing of the expected final formation level should comprise incremental plate load tests. Plate load tests should comprise a 600mm diameter plate (in accordance with BS1377 Part 9 with increments of loading at 25%, 50%, 75%, 100% 125% and 150% and 0% of 150kPa) to ensure a modulus of subgrade reaction of at least 27,500 kN/m²/m (which equates to a maximum settlement of 10mm), and to ensure that an equivalent CBR value of at least 3% is achieved to ensure suitability of the final formation levels for the proposed road / pavement construction.

Health and Safety

The Earthworks Contractor shall not commence construction works until the project health and safety plan has been prepared to the Main Contractor's satisfaction. The Earthworks Contractor shall be responsible for complying with the plan and he shall be required to:

- Ensure co-operation between other Earthworks Contractors so that they all may comply with the relevant statutory provisions as are relevant to the project themselves.

- Ensure that everyone on site complies with the health and safety plan.
- Take reasonable steps to ensure that only authorised persons are allowed on site (or part thereof as the case may be).
- Display, where they can be easily read, any notification that has been sent to the Health and Safety Executive.
- Prepare method statements for construction operations as required by the Principal Designer; and

The Earthworks Contractor shall pay particular attention to the following in the context of this Specification:

- Potentially hazardous or contaminated materials used or encountered on site.
- Deep excavations.
- Working in the vicinity of underground or overhead services.
- Working in confined spaces.
- Working in or adjacent to watercourses /water features; and
- Working on or in the vicinity of highways.
- Provision of temporary slope stability.

The Earthworks Contractor shall take all necessary safety precautions throughout the ground treatment operations and shall comply with the Health and Safety at Work Act 1974 or any subsequent re-enactment thereof.

The Earthworks Contractor shall take note of the Pre-Tender Health & Safety Plan and comply with the CDM Regulations 2015.

The Earthworks Contractor shall submit for approval all necessary method statements to the Main Contractor prior to commencing the works.

Working Hours

The Earthworks Contractor must liaise with the Client to determine the permitted working hours, which must be strictly observed throughout the duration of the operations.

Contractor's Report

The Earthworks Contractor shall on a weekly basis provide the Engineer within the following information:

- Base of excavation drawing.
- Compliance test results and the locations of sampling.
- Hotspot removal works surveys, test results (e.g., soils, asbestos, and waters)
- Low permeability clay surveys
- Water monitoring results.
- Site compaction records of layer thicknesses and compactive effort.
- Details of compaction plant used.

- Verification test results and their location.
- Material placement records (e.g., what materials were placed where):
- Photographs of the work; and
- As-Built final topographical survey.

On completion of the works a contractor's report should be provided providing all the as built information as detailed above.

6.0 POST EATHWORKS GROUNDWATER MONITORING

Whilst slightly elevated concentrations of PAH have been reported within occasional leachate samples and deep groundwater analysis with isolated boreholes. The groundwater risk assessment previously undertaken at the site has shown that the soils to not pose a significant risk to the underlying aquifers or local water courses.

To confirm that the piling works, to be undertaken on completion of the earthworks, do not have a negative impact on the underlying acquire, remediation monitoring boreholes are to be constructed as shown on the following drawing.

2585-302 - Remediation Monitoring Boreholes.

The boreholes are to be drilled to an anticipated depth of 20m bgl with response zone of the boreholes wholly within the underlying rock.

The existing monitoring boreholes which are located at the site can be utilised for this purpose however, it is anticipated that the boreholes will be required to be removed / decommissioned as part of the earthworks.

During the piling works the boreholes should be monitored on a weekly basis. Monitoring should be extended to monthly for a minimum of six months following piling. The monitoring will be required to extend to the completion of the bulk earthworks should these works still be ongoing 6 months after the piling.

Further monitoring may be required in addition to the above should it be demonstrated that the groundwater conditions have deteriorated or not improved following completion of the monitoring.

In addition, additional monitoring should also be undertaken immediately following exceptional rainfall events.

Chemical testing to be undertaken from the groundwater samples retrieved as per the same determinands detailed in Appendix C 'Remediation Screening Value'.

On completion of the monitoring period following the piling works the boreholes should be decommissioned in accordance with "Good practice for decommissioning redundant boreholes and wells, Environment Agency 2012.

- Remove all headworks and pipework.
- Backfill with bentonite.
- Finish surface as per the requirements of the development drawings.

7.0 VALIDATION

The objective of the earthworks to be undertaken at the site is to provide a suitable development platform for the anticipated retail development utilising piled foundations (Unit 1) and vibro stone columns (Unit 2), and a raft foundation for the PFS.

The works will be considered to be validated on completion of the initial earthworks that show that.

- At least 95% compaction with less than 5% air voids has been achieved (2.5kg proctor rammer) during the earthworks.
- Undrained shear strength of 50kPa reported through the placed fill during the earthworks
- Minimum of 3% CBR within main access road / car parks
- Calorific Values of less than 7MJ/Kg within placed fill
- No elevated concentrations of contaminants reported.
- Groundwater monitoring has shown no deterioration of groundwater quality and has preferability shown an improvement.
- Groundwater monitoring boreholes have been decommissioned.

On completion of the remediation works a completion verification report will be produced to confirm that the data, detailed previously within this Remediation Strategy, will be collected to demonstrate that the works set out previously are complete and have been undertaken in accordance with this document.

Any changes to the Remediation Strategy will be agreed with the Environment Agency / Sunderland City Council and the changes / contingency works undertaken will be detailed within the validation / verification report.

8.0 REFERENCES

- Site walkover survey.
- Historical and Recent Ordnance Survey maps and plans.
- Geological Survey Sheets.
- The Environment Agency.
- Groundsure Report.
- British Geological Survey.
- Coal Authority Mining Report.
- BRE Report BR211; Radon: Protective measures for new buildings.
- NRPB-W26 'Radon Atlas of England and Wales,' NRPB, 2015.
- CIRIA 132 'A guide for safe working on contaminated sites,' CIRIA, 1996.
- CIRIA C552 'Contaminated Land Risk assessment. A guide to good practice,' CIRIA, 2001.
- BS10175 'Investigation of potentially contaminated sites – code of practice,' BS, 2011.
- Environmental Protection Act 1990: Part IIA
- Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance April 2012.
- Ciria C733 Asbestos in soil and made ground: a guide to understanding and managing risks, March 2014.
- BRE Special Digest 1, 2005 (Third Edition). Concrete in aggressive ground. Construction Research Communications Ltd, Watford.
- BS 5930: 1999. Code of practice for site investigations. BSI, UK.
- BS 10175: 2011. Investigation of potentially contaminated sites – Code of Practice. BSI, UK.
- CIRIA C665: 2006. Assessing risks posed by hazardous ground gases to buildings. London UK.
- DD ENV, 1997. Eurocode 7: Geotechnical Design. Parts 1 to 3. BSI, UK.
- Environment Agency, 2008 - onwards, Science Reports SC050021 (SGVs)
- TOMLINSON, M.J., 2001 Foundation design and construction. Prentice Hall, London.
- The LQM/CIEH S4ULs for Human Health Risk Assessment (S4UL3251), November 2014
- The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations, September 2015.
- Keynetix Holebase SI (including connected data sources)
- RocScience Slide and Settle 3D Software
- Priors Hall, Corby, Preliminary Risk Assessment, for Urban & Civic Corby Ltd, January 2018, Shadbolt Group
- Priors Hall Park, Corby Zone 2 and Zone 3 (South) Ground Investigation Interpretive Report Urban & Civic (Corby) Ltd. Issue V2 November 2018, Shadbolt Group
- Earthworks and Remediation Trial Strategy, Zone 2, Priors Hall Park, Corby, Project No. 2564 Urban and Civic (Corby) Ltd. August 2018, V2, Shadbolt Group
- All relevant ecological reports pertaining to the site

APPENDIX A

REPORT CONDITIONS

REPORT CONDITIONS

PARCEL SPECIFIC EARTHWORKS STRATEGY

*This report is produced for the benefit of **For Hellens Land** in accordance with the terms of the appointment.*

This report has been prepared in accordance with the terms and conditions of the appointment and relates to the condition of the site at the time of ground investigations. No warranty is provided as to the possibility of future changes in the condition of the site.

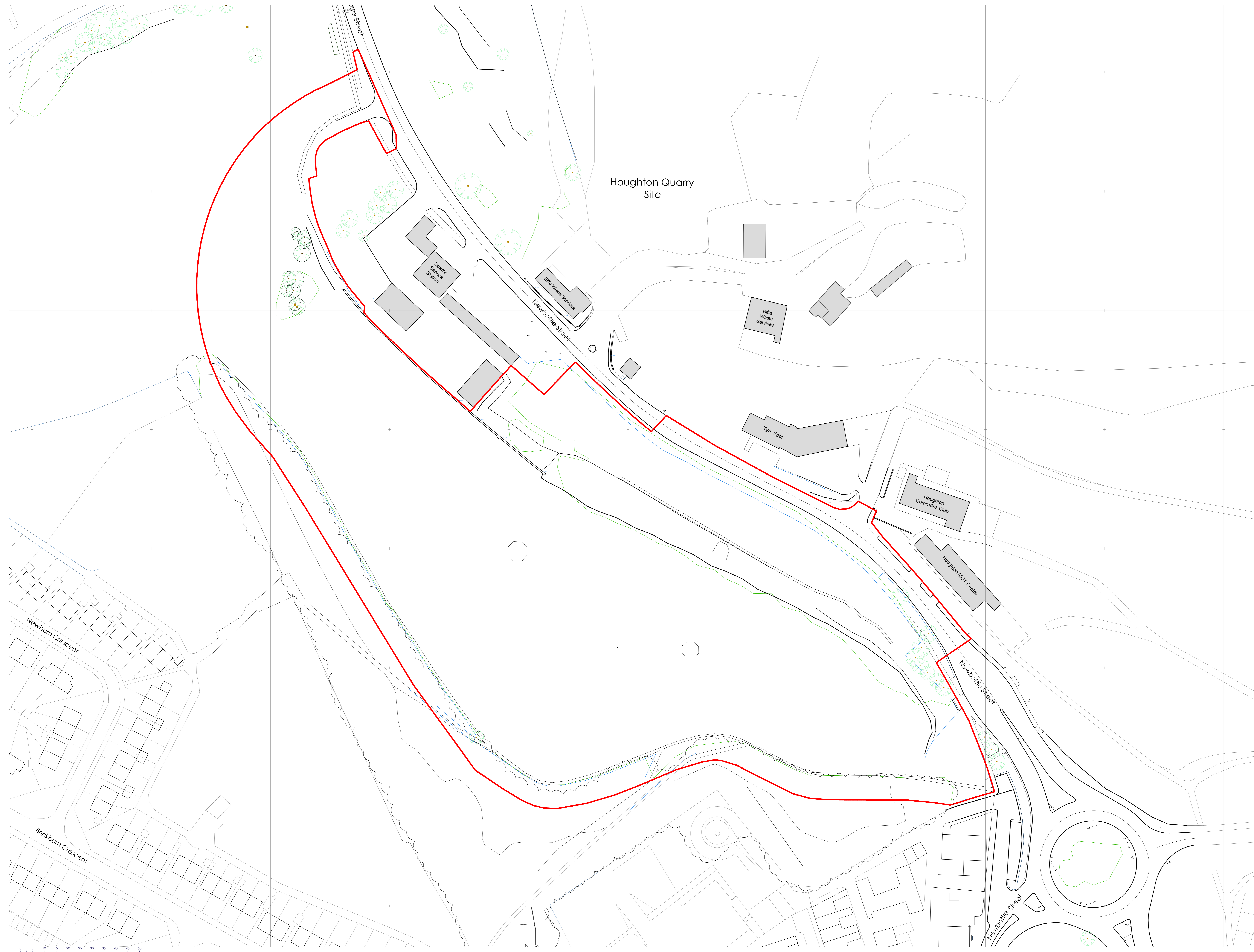
Shadbolt Environmental takes no responsibility for conditions which occur between the individual exploratory holes. Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative.

Whilst the contamination assessment detailed within this report reflects our view, because there are no exact UK definitions of these matters, being subject to risk analysis, Shadbolt Environmental are unable to give categoric assurances that they will be accepted by authorities or funds without question. This report is prepared and written for the purposed uses stated in the report and should not be used in a different context without reference to Shadbolt Environmental. In time, improved practices or amended legislation may necessitate a re-assessment.

The report is limited to the geotechnical and environmental aspects detailed within the report and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents.

APPENDIX B

DRAWINGS



Improving
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HELLENS
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FINTRY | ESTATES

IBA ARCHITECTS
Kest Row 4 | The Watermark | Colchester | NE11 9SZ
E: info@iba-architects.com | T: 0191 461 1411
www.iba-architects.com

Project: HOUGHTON COLLETRY RETAIL
Newboole Street
Houghton-le-Spring DH14

Title: Existing Site Plan

Client: Hellens Land / Fintry Estates

Drawn: Initials Scale: 1:500 B/A0
Checked: Initial & sign Date: 23.04.20

TENDER

1485 (SP)010 T1

THIS DRAWING IS COPYRIGHT



Key

- Existing Buildings
- Retail Buildings
- Ancillary Buildings
- Landscaped Areas
- Paved Areas
- Concrete Service Yards
- Tarmac
- Totem Sign
- PFS Sign
- Mineshaft
- Planning Application Boundary Line



Parking Provision

Standard Parking Spaces 4800 x 2500mm	274no
Accessible Spaces	22no
Parent & Child Spaces	17no
Electric Charging Spaces	16no
Total Spaces	329no



FINTRY | ESTATES



Keel Row 4 | The Watermark | Colnehead | NE11 9SE
E: info@iba-architects.com T: 0191 461 1411
www.iba-architects.com

Project: HOUGHTON COLLIERY RETAIL
Newboothle Street
Houghton le Spring

Title: Proposed Site Layout

Client: Hellems Land / Finty Estates

Drawn: KW Scale: 1:500 @ AD

Checked: FW Date: 04.10.21

TENDER

1485 (SP)040 T1

THIS DRAWING IS COPYRIGHT

Health and Safety Notes:
 The following key residual health and safety risks have not been eliminated by design and are identified below:
 - Refer Design Risk Assessments Ref: 2020011-DRA
 Safe methods and systems of work remain the responsibility of the contractor.



LEGEND
 ■ DENOTES AREA OF FILL
 ■ DENOTES AREA OF CUT

PLAN
 1:500

0	Preliminary Issue	MG	MG	MG	NOTISS
Rev.	Description	By	CHK	App	Date

Portland
 consulting engineers

10 Barkside, The Watermark, Gateshead, Tyne & Wear, NE11 9BY
 T: 0191 4819770 W: www.portlandconsulting.co.uk
 F: 0191 4603028 E: info@portlandconsulting.co.uk

Client: **Hellens Land / Fintry Estates**

Project: **Retail Development
 Newbottle Street
 Houghton le Spring**

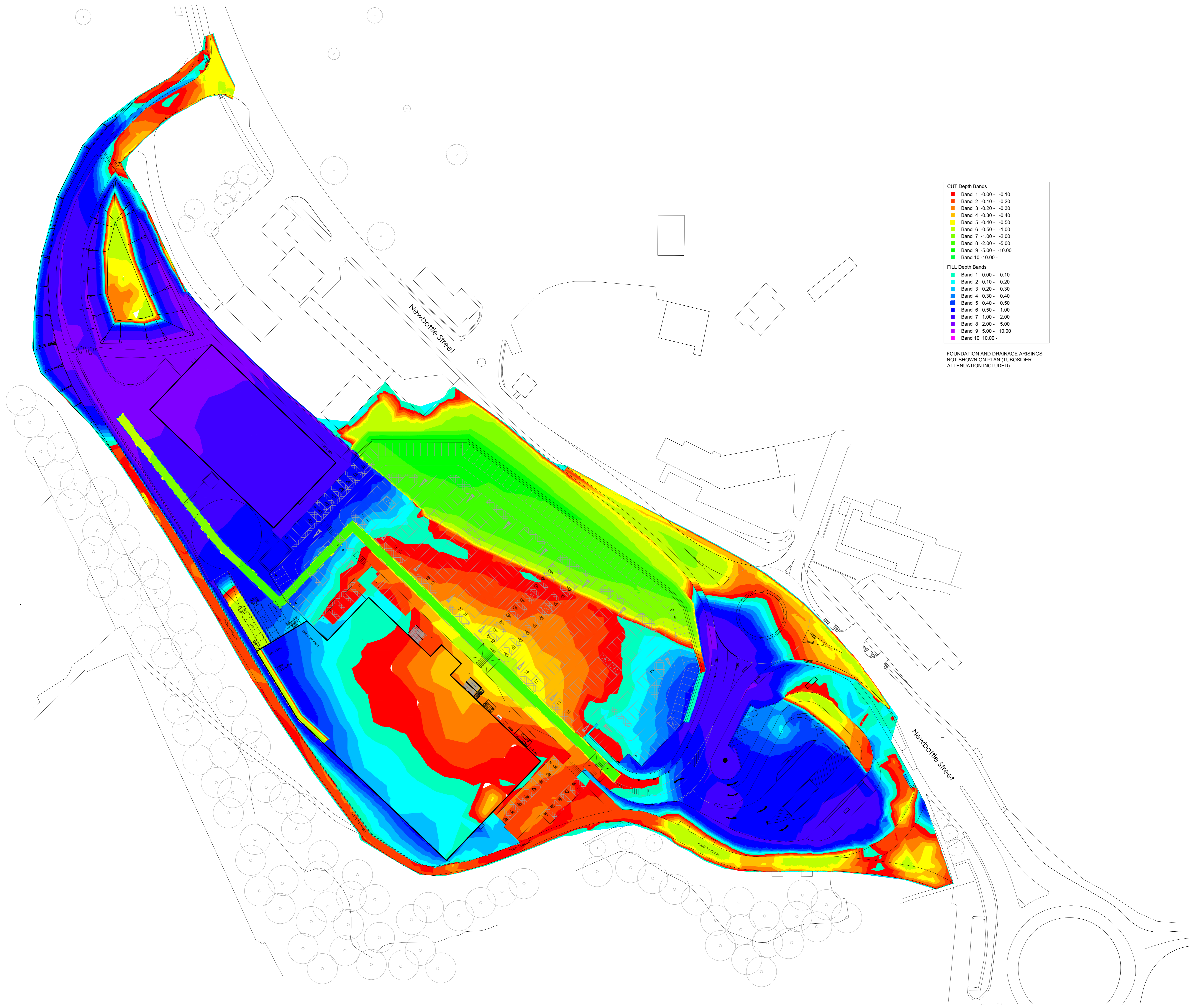
Drawing Title: **Bulk Earthworks
 Sheet 2**

Scale	As Shown	Sheet Size	A0
Drawn By	MC	Checked By	MG
Approved By	MG	Date	17/05/21
Drawing Status	Preliminary		

Project No.	2020011	Drawing No.	000-2	Revision	0
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This drawing and design is for use solely in connection with the above project. This drawing is the copyright of Portland Consulting Engineers and must not be reprinted, stored or copied without written consent. All dimensions and setting out shall be checked on site before construction. Do not scale from this drawing. This drawing is to be read in conjunction with all other information relevant to the project. Any apparent discrepancy shall be brought to the attention of Portland Consulting Engineers.

ISO 9001
 REGISTERED COMPANY



CUT Depth Bands

- Band 1 -0.00 - -0.10
- Band 2 -0.10 - -0.20
- Band 3 -0.20 - -0.30
- Band 4 -0.30 - -0.40
- Band 5 -0.40 - -0.50
- Band 6 -0.50 - -1.00
- Band 7 -1.00 - -2.00
- Band 8 -2.00 - -5.00
- Band 9 -5.00 - -10.00
- Band 10 -10.00 -

FILL Depth Bands

- Band 1 0.00 - 0.10
- Band 2 0.10 - 0.20
- Band 3 0.20 - 0.30
- Band 4 0.30 - 0.40
- Band 5 0.40 - 0.50
- Band 6 0.50 - 1.00
- Band 7 1.00 - 2.00
- Band 8 2.00 - 5.00
- Band 9 5.00 - 10.00
- Band 10 10.00 -

FOUNDATION AND DRAINAGE ARISING
 NOT SHOWN ON PLAN (TUBOSIDER
 ATTENUATION INCLUDED)

PLAN
 1:500

0	Preliminary Issue	MG	MG	MG	17/05/21
Rev.	Description	By	CHK	App	Date

Portland
 consulting engineers

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 T: 0191 4619770 W: www.portlandconsulting.co.uk
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Client: **Hellens Land / Fintry Estates**

Project:
**Retail Development
 Newbottle Street
 Houghton le Spring**

Drawing Title:
**Bulk Earthworks
 Sheet 1**

Scale	As Shown	Sheet Size	A0
Drawn By	MC	Checked By	MG
Approved By	MG	Date	17/05/21
Drawing Status	Preliminary		

Project No.	2020011	Drawing No.	000-1	Revision	0
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NOTE: EXISTING LIGHTING COLUMN TO BE RELOCATED

NOTE: FOOTPATH TO BE CONSTRUCTED TO ADOPTABLE STANDARDS. CONTRACTOR TO ALLOW FOR ALL SECTION 38 COSTS AND LHA INSPECTIONS

NOTE: EXISTING LIGHTING COLUMN TO BE RELOCATED

ENTRANCE PLAN
1:250

PLAN
1:250

LEGEND

- CONCRETE YARD
 - 175mm THICK PAV2 CONCRETE (BRUSHED FINISH) WITH A252 FABRIC REINFORCEMENT.
 - 1200g SLIP MEMBRANE
 - 150mm TYPE 1 SUBBASE
 - 300mm 6F2 SUBBASE
- CONCRETE YARD CONSTRUCTION JOINT (CJ)
- SAWN JOINT (SJ)
- EXPANSION JOINT (EJ)
- HB2 HALF BATTERED KERB 125 x 255
- HBQ HALF BATTERED KERB QUADRANT 305 x 255
- BNB BULLNOSE KERB 125 x 150 6mm UPSTAND
- CS2 SQUARE CHANNEL BLOCK 150 x 125
- EF FLAT TOP EDGING 50 x 150
- DK DROP KERB 1:12 GRADIENT
- BOL BOLLARD

NOTE: KERB RADI LESS THAN 12m SHALL BE FORMED USING PRE-FORMED RADIUS KERBS. OTHERWISE STRAIGHTS OF NOT LESS THAN 300mm LONG SHOULD BE USED WITH MITRE CUTS.

ALL KERBS SHALL BE BUTT JOINTED.

KERBS SHALL BE LAID TO THE DESIGN LEVEL +/- 6mm.

FULL LENGTHS OF KERB PIECES SHALL BE USED WHERE POSSIBLE. IF PIECING UP IS REQUIRED UNITS SHALL NOT BE OUT TO LESS THAN HALF THEIR LENGTH.

TOLERANCES

SUB-BASE TO RECEIVE BASE ROAD-BASE + 0/-30mm.

BASE (ROADBASE) TO RECEIVE BINDER COURSE +/- 15mm.

BINDER COURSE TO RECEIVE SURFACE COURSE +/- 6mm.

BINDER COURSE TO RECEIVE SURFACE COURSE ON AREAS OTHER THAN ROADS E.G. CAR PARKS +/- 10mm.

SURFACE COURSE +/- 6mm.

THE SUM OF THE DEVIATIONS IN THE LEVELS OF DIFFERENT PAVEMENTS LAYERS SHALL NOT RESULT IN A REDUCTION OF THE REQUIRED DESIGN THICKNESS BY MORE THAN 8.5% OR IN THE OVERALL SURFACE COURSE THICKNESS BY MORE THAN 5mm.

LEGEND

- TARMAC - ACCESS ROAD
 - 30mm SURFACE COURSE (STONE MASTIC ASPHALT SURF 40/60)
 - 70mm BINDER COURSE (AC20 DENSE BIN 100/150 REC. (CL 906))
 - 90mm BASE COURSE (AC32 HDM BASE 40/60 DES. LAID IN ONE PASS (CL929))
 - 300mm SUB-BASE (GRANULAR TYPE 1 TO CL803)
- TARMAC - ADOPTABLE
 - 40mm SURFACE COURSE (HRA DESIGNATION RAD14F SURF 40/60 DES. WITH 20mm PRECOATED CHIPPINGS. (CL915))
 - 60mm BINDER COURSE (AC20 DENSE BIN 100/150 REC. (CL 906))
 - 110mm BASE COURSE (AC32 HDM BASE 40/60 DES. LAID IN ONE PASS (CL929))
 - 330mm SUB-BASE (GRANULAR TYPE 1 TO CL803)
 - 275mm 6F2 SUBGRADE IMPROVEMENT
- TARMAC - PARKING
 - 30mm SURFACE COURSE (STONE MASTIC ASPHALT SURF 40/60)
 - 70mm BINDER COURSE (AC20 DENSE BIN 100/150 REC. (CL 906))
 - 225mm SUB-BASE (GRANULAR TYPE 1 TO CL803)
- TARMAC - FOOTPATH
 - 20mm SURFACE COURSE WITH 6mm NOMINAL SIZE CLOSE GRADE MACADAM (AC5 DENSE SURF. TO CL. 909)
 - 50mm BINDER COURSE WITH 20mm NOMINAL SIZE DENSE MACADAM (AC20 DENSE BIN. TO CL. 906)
 - 150mm SUB-BASE (TYPE 1 GRANULAR MATERIAL TO CL. 803)
- TACTILE PAVING/CROSSING POINT
 - PAVING TO ARCHITECT'S SPECIFICATION ON SAND BED
 - 50mm TYPE 1 SUBBASE
- PAVING
 - PAVING TO ARCHITECT'S SPECIFICATION ON SAND BED
 - 150mm TYPE 1 SUBBASE
- CONCRETE YARD
 - 175mm THICK PAV2 CONCRETE (BRUSHED FINISH) WITH A252 FABRIC REINFORCEMENT.
 - 1200g SLIP MEMBRANE
 - 150mm TYPE 1 SUBBASE
 - 300mm 6F2 SUBBASE

+79.646* EXISTING LEVEL
+79.646 PROPOSED LEVEL

Health and Safety Notes:
The following key residual health and safety risks have not been eliminated by design and are identified below:
- Refer Design Risk Assessments Ref: 2020011-DRA
Safe methods and systems of work remain the responsibility of the contractor.

This drawing shall be read in conjunction with specification ref: 2020011-SP-001 Site Preparation and Earthworks & 2020011-SP-004 External Concrete Slabs

J	Clouded revisions	MG	MG	MG	02/12/21
H	Issued for Tender	MG	MG	MG	05/11/21
G	Stage 4 Issue	MG	MG	MG	01/10/21
F	Updated to suit Architect's revised layout	MG	MG	MG	07/05/21
E	Clouded revisions	MG	MG	MG	25/08/20
D	Preliminary Issue	MG	MG	MG	12/06/20
C	Updated to suit Architect's revised site layout received 29/04/20.	MG	MG	MG	30/04/20
B	Updated to suit Architect's revised site layout received 08/04/20	MG	MG	MG	08/04/20
A	Drawing updated to suit Architect's latest input	MG	MG	MG	07/04/20
0	Preliminary Issue	MG	MG	MG	21/02/20
Rev.	Description	By	CHK	App	Date

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Client: **Hellens Land / Fintry Estates**

Project: **Retail Development
Newbottle Street
Houghton le Spring**

Drawing Title: **External Works Layout - Sheet 1**

Scale	As Shown	Sheet Size	A0
Drawn By	MG	Checked By	MG
Approved By	MG	Date	21/02/20
Tender			
Project No.	2020011	Drawing No.	002-1
Revision			J

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ISO 9001
REGISTERED FIRM



LEGEND

4 CONCRETE YARD
 • 175mm THICK PAV2 CONCRETE (BRUSHED FINISH) WITH A252 FABRIC REINFORCEMENT.
 • 1200g SLIP MEMBRANE
 • 150mm TYPE 1 SUBBASE
 • 300mm 6F2 SUBBASE
 CONCRETE YARD
 CONSTRUCTION JOINT (CJ)
 SAWN JOINT (SJ)
 EXPANSION JOINT (EJ)
 (HB2) HALF BATTERED KERB 125 x 255
 (HBQ) HALF BATTERED KERB QUADRANT 305 x 255
 (BN6) BULLNOSE KERB 125 x 150 6mm UPSTAND
 (CS2) SQUARE CHANNEL BLOCK 150 x 125
 (EF) FLAT TOP EDGING 50 x 150
 (DK) DROP KERB 1:12 GRADIENT
 BOL BOLLARD
 NOTE: KERB RADI LESS THAN 12m SHALL BE FORMED USING PRE-FORMED RADIUS KERBS. OTHERWISE STRAIGHTS OF NOT LESS THAN 300mm LONG SHOULD BE USED WITH MITRE CUTS.
 ALL KERBS SHALL BE BUTT JOINTED.
 KERBS SHALL BE LAID TO THE DESIGN LEVEL +/- 6mm.
 FULL LENGTHS OF KERB PIECES SHALL BE USED WHERE POSSIBLE. IF PIECING UP IS REQUIRED UNITS SHALL NOT BE OUT TO LESS THAN HALF THEIR LENGTH.
TOLERANCES
 SUB-BASE TO RECEIVE BASE ROAD-BASE +/- 30mm.
 BASE (ROADBASE) TO RECEIVE BINDER COURSE +/- 15mm.
 BINDER COURSE TO RECEIVE SURFACE COURSE +/- 6mm.
 BINDER COURSE TO RECEIVE SURFACE COURSE ON AREAS OTHER THAN ROADS E.G. CAR PARKS +/- 10mm.
 SURFACE COURSE +/- 6mm.
 THE SUM OF THE DEVIATIONS IN THE LEVELS OF DIFFERENT PAVEMENTS LAYERS SHALL NOT RESULT IN A REDUCTION OF THE REQUIRED DESIGN THICKNESS BY MORE THAN 8.5% OR IN THE OVERALL SURFACE COURSE THICKNESS BY MORE THAN 5mm.

LEGEND

TARMAC - ACCESS ROAD
 • 30mm SURFACE COURSE (STONE MASTIC ASPHALT SURF 40/60)
 • 70mm BINDER COURSE (AC20 DENSE BIN 100/150 REC. (CL 906))
 • 90mm BASE COURSE (AC32 HDM BASE 40/60 DES. LAID IN ONE PASS (CL929))
 • 300mm SUB-BASE (GRANULAR TYPE 1 TO CL803)
 TARMAC - ADAPTABLE
 • 40mm SURFACE COURSE (HRA DESIGNATION R40/14F SURF 40/60 DES. WITH 20mm PRECOATED CHIPPINGS (CL915))
 • 60mm BINDER COURSE (AC20 DENSE BIN 100/150 REC. (CL 906))
 • 110mm BASE COURSE (AC32 HDM BASE 40/60 DES. LAID IN ONE PASS (CL929))
 • 330mm SUB-BASE (GRANULAR TYPE 1 TO CL803)
 • 275mm 6F2 SUBGRADE IMPROVEMENT
 TARMAC - PARKING
 • 30mm SURFACE COURSE (STONE MASTIC ASPHALT SURF 40/60)
 • 70mm BINDER COURSE (AC20 DENSE BIN 100/150 REC. (CL 906))
 • 225mm SUB-BASE (GRANULAR TYPE 1 TO CL803)
 TARMAC - FOOTPATH
 • 20mm SURFACE COURSE WITH 6mm NOMINAL SIZE CLOSE GRADE MACADAM (AC3 DENSE SURF TO CL 909)
 • 50mm BINDER COURSE WITH 20mm NOMINAL SIZE DENSE MACADAM (AC20 DENSE BIN. TO CL 906)
 • 150mm SUB-BASE (TYPE 1 GRANULAR MATERIAL TO CL 803)
 TACTILE PAVING/ CROSSING POINT
 • PAVING TO ARCHITECT'S SPECIFICATION ON SAND BED
 • 50mm TYPE 1 SUBBASE
 PAVING
 • PAVING TO ARCHITECT'S SPECIFICATION ON SAND BED
 • 150mm TYPE 1 SUBBASE
 PAVING
 • PAVING TO ARCHITECT'S SPECIFICATION ON SAND BED
 • 300mm CONCRETE SLAB PAV2 SLAB ON 1200g MEMBRANE
 • 150mm TYPE 1 SUBBASE
 CONCRETE YARD
 • 175mm THICK PAV2 CONCRETE (BRUSHED FINISH) WITH A252 FABRIC REINFORCEMENT.
 • 1200g SLIP MEMBRANE
 • 150mm TYPE 1 SUBBASE
 • 300mm 6F2 SUBBASE
 +79.646* EXISTING LEVEL
 +79.646 PROPOSED LEVEL

Rev.	Description	By	CHK	App	Date
L	Clouded revisions	MG	MG	MG	02/12/21
K	Issued for Tender	MG	MG	MG	05/11/21
J	Stage 4 Issue	BO	MG	MG	01/10/21
H	Updated to suit Architect's revised layout	MG	MG	MG	27/05/21
G	Clouded revisions	BO	MG	MG	21/10/20
F	Clouded revisions	MG	MG	MG	25/08/20
E	Clouded revisions	MG	MG	MG	15/07/20
D	Preliminary Issue	BO	MG	MG	10/06/20
C	Updated to suit Architect's revised site layout received 29/04/20.	MG	MG	MG	30/04/20
B	Updated to suit Architect's revised site layout received 08/04/20	MG	MG	MG	08/04/20
A	Levels updated and drawing updated to suit Architect's latest layout	MG	MG	MG	07/04/20
0	Preliminary Issue	MG	MG	MG	21/02/20

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Client: **Hellens Land / Finny Estates**
 Project: **Retail Development
Newcastle Street
Houghton le Spring**
 Drawing Title: **External Works Layout - Sheet 2**
 Scale: **As Shown** Sheet Size: **A0**
 Drawn By: **MG** Checkered By: **MG** Approved By: **MG** Date: **21/02/20**
 Drawing Status: **Tender**
 Project No: **2020011** Drawing No: **002-2** Revision: **L**

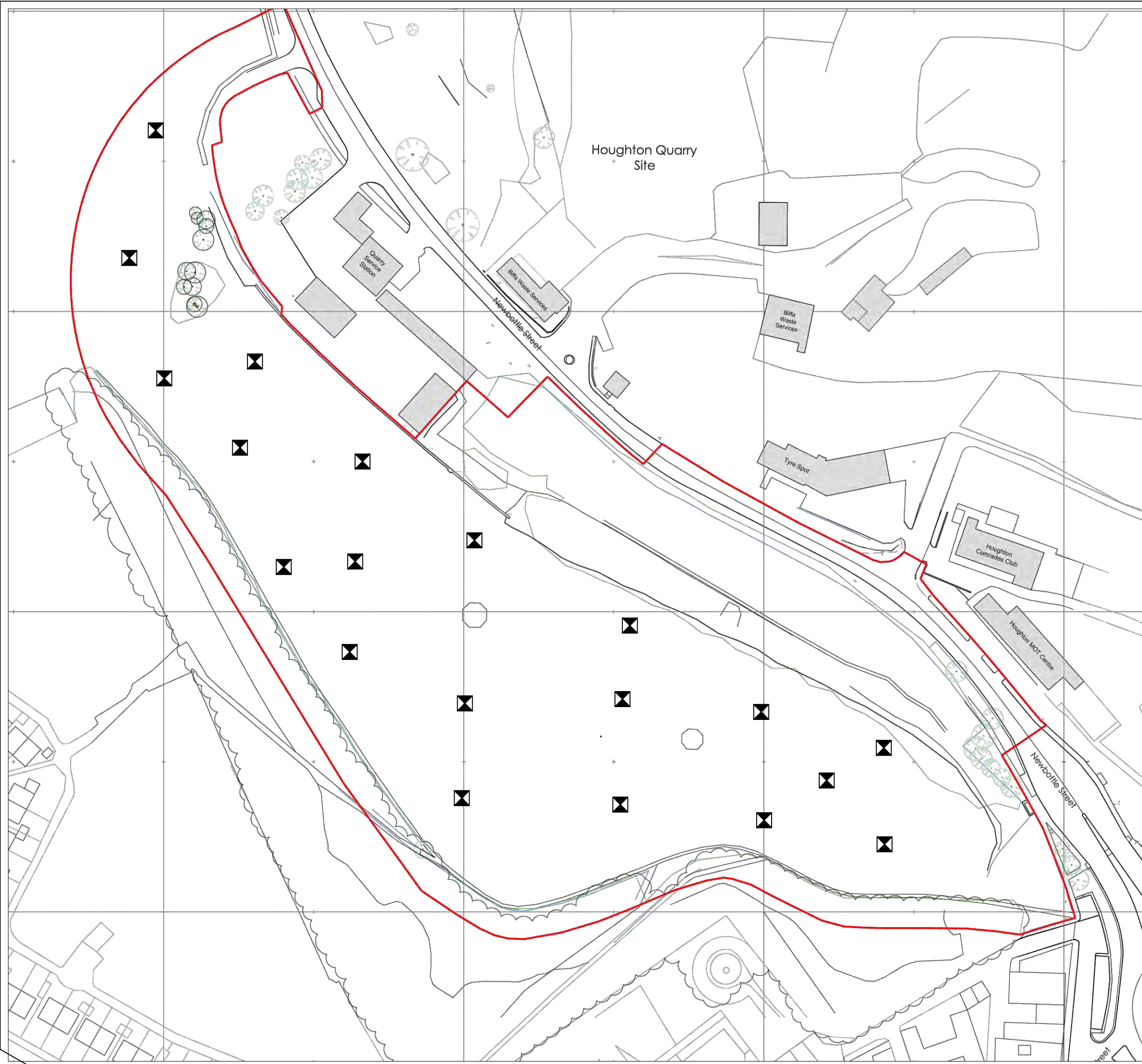
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PLAN
 1:250

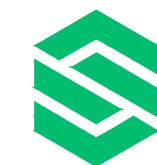
DO NOT SCALE

GENERAL NOTES

☒ Indicative Sampling Location



Rev	Description	By	Ckd	Date
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SHADBOLT
ENVIRONMENTAL

Drawing Status: **INFORMATION**

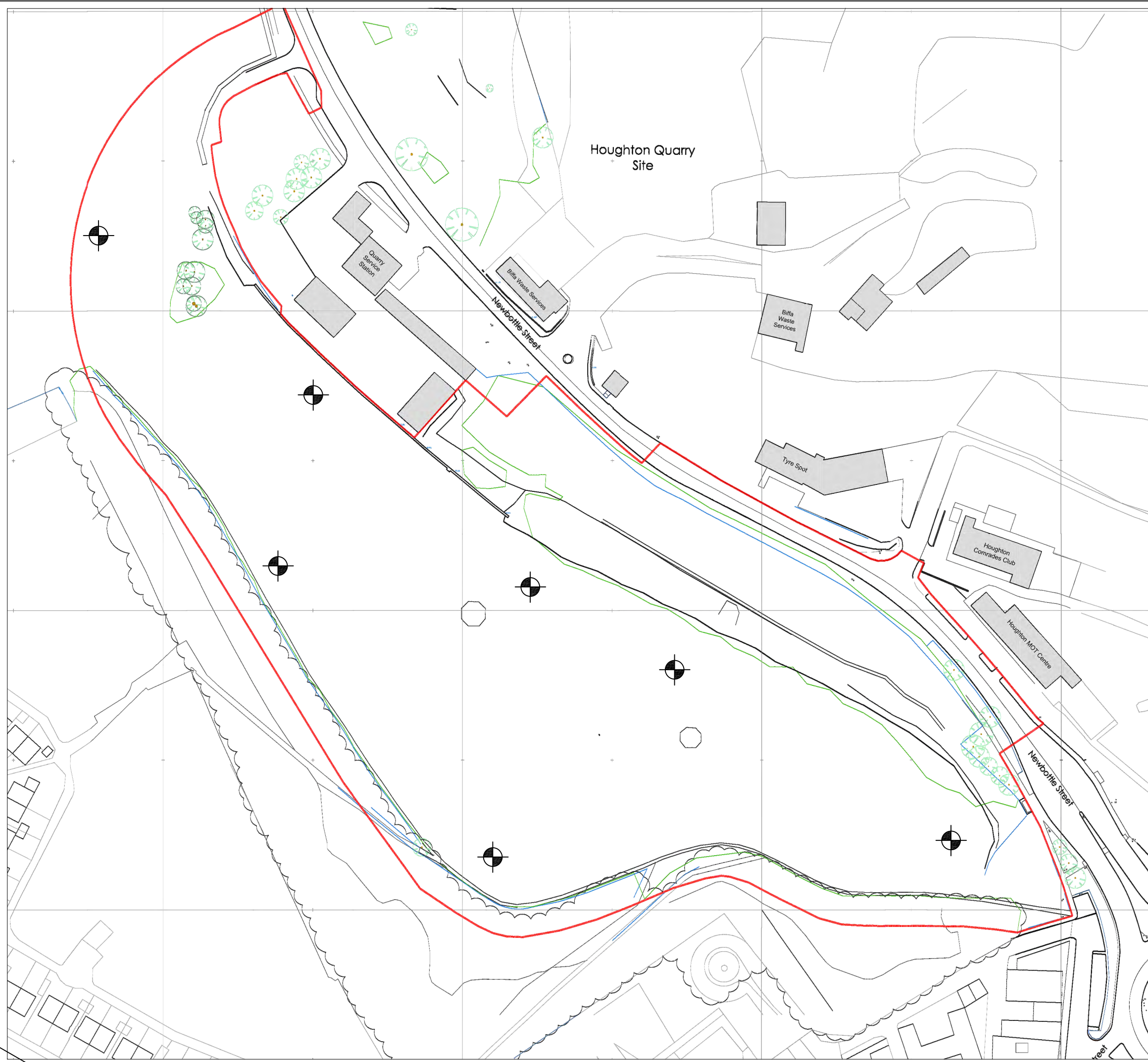
Client: **Hellens Group**

Project: **Former Houghton Colliery
Houghton le Spring**

Drawing Title: **Base of Excavation
Validation Sampling Locations**

Drawing No: **2585 - 301** Rev: **-**

Scale: **1:1250 @ A3** By: **IM** Ckd: **MJT** Date: **Jan '21**



DO NOT SCALE

GENERAL NOTES

 Remediation Monitoring Boreholes

Rev	Description	By	Ckd	Date
-----	-------------	----	-----	------



Drawing Status: **INFORMATION**

Client: **Hellens Group**

Project: **Former Houghton Colliery
Houghton le Spring**

Drawing Title: **Remediation Monitoring
Borehole Locations**

Drawing No: **2585 - 303** Rev: **-**

Scale: **1:1250 @ A3** By: **TJS** Ckd: **MJT** Date: **Sept 22**

APPENDIX C

REMEDICATION SCREENING VALUES FOR FILL MATERIALS

REMEDIATION SCREENING VALUES FOR FILL MATERIALS - HOUGHTON DEVELOPMENT SITE

Determinand	Units	Commercial	Derivation Tool
pH		<5, >9	Nuetral Conditions
Asbestos	%	No Asbestos Identified	Lab Ttesting
HEAVY METALS/METALLOIDS			
Arsenic	mg/kg	640	CLEA MODE LQM/CIEH 2015
Beryllium	mg/kg	12	CLEA MODE LQM/CIEH 2015
Boron	mg/kg	240000	CLEA MODE LQM/CIEH 2015
Cadmium	mg/kg	190	CLEA MODE LQM/CIEH 2015
Chromium (III)	mg/kg	8600	CLEA MODE LQM/CIEH 2015
Chromium (VI)	mg/kg	33	CLEA MODE LQM/CIEH 2015
Copper	mg/kg	68000	CLEA MODE LQM/CIEH 2015
Lead	mg/kg	2330	pC4SL
Mercury (Elemnetal)	mg/kg	58 ^{vap} (25.8)	CLEA MODE LQM/CIEH 2015
Mercury (Inorganic)	mg/kg	1100	CLEA MODE LQM/CIEH 2015
Mercury (Methyl)	mg/kg	320	CLEA MODE LQM/CIEH 2015
Nickel	mg/kg	980	CLEA MODE LQM/CIEH 2015
Selenium	mg/kg	12000	CLEA MODE LQM/CIEH 2015
Vanadium	mg/kg	9000	CLEA MODE LQM/CIEH 2015
Zinc	mg/kg	730000	CLEA MODE LQM/CIEH 2015
GENERAL INORGANICS			
Free Cyanide	mg/kg	373	ATRISK
US EPA PRIORITY PAHs			
Acenaphthene	mg/kg	97000 (141sol)	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Acenaphthylene	mg/kg	97000 (212sol)	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Anthracene	mg/kg	540000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Benzo(a)Anthracene	mg/kg	170	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Benzo(a)pyrene	mg/kg	35	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Benzo(b)fluoranthene	mg/kg	44	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Benzo(k)fluoranthene	mg/kg	1200	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Benzo(g,h,i)perylene	mg/kg	4000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Chrysene	mg/kg	350	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Di-benzo(a,h)anthracene	mg/kg	3.6	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Indeno(1,2,3-cd)pyrene	mg/kg	510	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Fluoranthene	mg/kg	23000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Fluorene	mg/kg	68000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Naphthalene	mg/kg	460 (183)sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Phenanthrene	mg/kg	22000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Pyrene	mg/kg	54000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Coal Tar (Bap as surrogate marker)	mg/kg	15	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH (Environment Agency 16 Fractions)			
TPH Aliphatic >C5-6	mg/kg	5900 (558) sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aliphatic >C6-8	mg/kg	17000 (332) sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aliphatic >C8-10	mg/kg	4800 (190) vap	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aliphatic >C10-12	mg/kg	23000 (118) vap	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aliphatic >C12-16	mg/kg	82000 (59) sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aliphatic >C16-35	mg/kg	1700000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aliphatic > C35-44	mg/kg	1700000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC5-7	mg/kg	46000 (2260) sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC7-8	mg/kg	110000 (1920) sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC8-10	mg/kg	8100 (1500) vap	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC10-12	mg/kg	28000 (899) sol	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC12-16	mg/kg	37000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC16-21	mg/kg	28000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC21-35	mg/kg	28000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
TPH Aromatic >EC35-44	mg/kg	28000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
Alphatic - Aromatic EC44-70	mg/kg	28000	CLEA MODEL LQM/CIEH 2015 - 2.5% SOM
BTEX			
Benzene	mg/kg	47.00	LQM/CIEH 2015 - 2.5% SOM
Toluene	mg/kg	110000 vap (1920)	LQM/CIEH 2015 - 2.5% SOM
Ethylbenzene	mg/kg	13000 vap (1220)	LQM/CIEH 2015 - 2.5% SOM
Xylenes (ortho)	mg/kg	15000 sol (1120)	LQM/CIEH 2015 - 2.5% SOM
Xylenes (meta)	mg/kg	14000 vap (1470)	LQM/CIEH 2015 - 2.5% SOM
Xylenes (para)	mg/kg	14000 sol (1350)	LQM/CIEH 2015 - 2.5% SOM
Misc'			
PCBs	MG/KG	0.184	ATRISK
MTBE	mk/kg	3140	ATRISK

Leachate / Groundwater Criteria

Inorganics ug/l						
Analyte	Guideline Value	Guidance Source		Analyte	Guideline Value	Guidance Source
Arsenic	10	UKDWS		Mercury	1	UKDWS
Boron	1,000	UKDWS		Nickel	20	UKDWS
Cadmium	5	UKDWS		Sulphate	250,000	UKDWS
Chromium	50	UKDWS		Selenium	10	UKDWS
Copper	2000	UKDWS		Zinc	3000	SWR
Cyanide	50	UKDWS		pH	6.5-9.5	UKDWS
Lead	10	UKDWS				

EQS (f) – Environmental Quality Standard for Freshwater, EA

UKDWS – UK Drinking Water Standard Guidelines taken from the “The Water Supply (Water Quality) Regulations 2016”

SWR - The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (as amended). SI 1996 / 2001

Table 1 – Inorganic Analytes

Leachate / Groundwater Criteria

Organics ug/l						
Analyte	Guideline Value	Guidance Source		Analyte	Guideline Value	Guidance Source
Benzo(a)pyrene	0.01	UKDWS		Fluoranthene	0.0063	EQS (f)
Naphthalene	2	EQS (f)		Benzene	1	UKDWS
Acenaphthylene	5.8	WRc plc (2002), R&D Technical Report		Toluene	74	EQS (f)
Sum of 4 PAH	0.1	UKDWS		Ethyl benzene	300	WHO
Benzo(b)fluoranthene						
Benzo(k)fluoranthene						
Benzo(g,h,i)perylene						
Indeno(1,2,3-cd)pyrene						
TPH (Hydrocarbons)	10	UKDWS		Xylene	30	EQS (f)
C5-C6 (Ali)	1.5x10 ⁴	WHO		C5-C6 (Aro)	1	WHO
C6-C8 (Ali)	1.5x10 ⁴	WHO		C6-C8 (Aro)	700	WHO
C8-C10 (Ali)	3x10 ²	WHO		C8-C10 (Aro)	300 (ethylbenzne) 500 (xylene)	WHO
C10-C12 (Ali)	3x10 ²	WHO		C10-C12 (Aro)	90	WHO
C12 – C16 (Ali)	3x10 ²	WHO		C12 – C16 (Aro)	90	WHO
C16-C21 (Ali)	-	WHO		C16-C21 (Aro)	90	WHO
C21-C35 (Ali)	-	WHO		C21-C35 (Aro)	90	WHO

EQS (f) – Environmental Quality Standard for Freshwater, EA

UKDWS – UK Drinking Water Standard Guidelines taken from the “The Water Supply (Water Quality) Regulations 2016”

SWR - The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (as amended). SI 1996 / 2001

WHO – World Health Organization Guidelines

Table 2 Organic Analytes

APPENDIX D
SHW EXTRACTS
SITE SPECIFIC REQUIREMENTS

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/31)				Compaction Requirements in Clause 6/12	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
						Lower	Upper			
G E N E R A L	Well graded granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i), (ii) and (iv) in next column, shall not apply to chalk). Recycled aggregate	(i) grading	BS 1377 : part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	1	A
				(ii) uniformity coefficient	See Note 5	10	-			
				(iii) mc	BS 1377 : Part 2	App 6/1	App 6/1			
				(iv) MCV	Clause 6/32	App 6/1	App 6/1			
				(v) IDD of chalk	Clause 6/34	-	App 6/1			
G R A N U L A R	Uniformly graded granular material	General Fill	Any material, or combination of materials, other than chalk. Recycled aggregate	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	1	B
				(ii) uniformity coefficient	See Note 5	-	10			
				(iii) mc	BS 1377 : Part 2	App 6/1	App 6/1			
				(iv) MCV	Clause 6/32	App 6/1	App 6/1			
F I L L	Coarse granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i) and (ii) in next column, shall not apply to chalk). Recycled aggregate	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	1	C
				(ii) uniformity coefficient	See Note 5	5	-			
				(iii) Los Angeles coefficient	Clause 6/35	-	50			

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
2 A G E N E R A L C O	Wet cohesive material	General Fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377 : part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 1 except for materials with liquid limit greater than 50, determined by BS1377 : Part 2, only deadweight tamping or vibratory tamping rollers or grid rollers shall be used.	2 A -
				(ii) plastic limit (PL)	BS 1377 : part 2	-	-		
				(iii) mc	BS 1377 : Part 2	PL-4%	App 6/1		
				(iv) MCV	Clause 632	App 6/1	App 6/1		
				(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1		
2 B H E S I V E F I L L	Dry cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	2 B -
				(ii) plastic limit (PL)	BS 1377 : Part 2	-	-		
				(iii) mc	BS 1377 : Part 2	App 6/1	PL-4%		
				(iv) MCV	Clause 632	App 6/1	App 6/1		
				(v) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1		

TABLE 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/31)				Compaction Requirements in Clause 6/12	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
						Lower	Upper			
2	Stony cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377 : part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	2	C
				(ii) plastic limit (PL)	BS 1377 : part 2	-	-			
				(iii) mc	BS 1377 : Part 2	App 6/1	App 6/1			
				(iv) MCV	Clause 632	App 6/1	-			
				(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	-			
2	Silty cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	2	D
				(ii) mc	BS 1377 : Part 2	App 6/1	App 6/1			
				(iii) MCV	Clause 632	App 6/1	App 6/1			
				(iv) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1			
2	Reclaimed pulverised fuel ash cohesive material	General Fill	Reclaimed material from lagoon or stockpile containing not more than 20% furnace bottom ash	(i) mc	BS 1377 : Part 2	To enable compaction to Clause 6/12		End product 95% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method)	2	E
				(ii) bulk density	BS 1377 : Part 9	App 6/1	App 6/1			

G E N E R A L C O H E S I V E F I L L

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
G F E I N L L C H A L K	Chalk	General Fill	Chalk and associated materials all designated as Class 3 in the Contract	(i) mc	BS 1377 : Part 2	-	App 6/1	3	-
				(ii) IDD	Clause 634	App 6/1	App 6/1		
L F A I N L D L S C A P E	Various	Fill to landscape areas	See App 6/1	(i) grading	BS 1377 : Part 2	App 6/1	App 6/1	4	-
				(ii) mc	BS 1377 : Part 2	-	App 6/1		
				(iii) MCV	Clause 632	App 6/1	App 6/1		
T O P S O I L	Topsoil, or turf, existing on site	Topsoiling	Topsoil or turf designated as Class 5A in the Contract	(i) grading	Clause 618	-	Clause 618	5	A
				-	-	-	-		
5	Imported topsoil	Topsoiling	General purpose grade complying with BS 3882	-	-	-	-	5	B

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower			Upper
6 S E L E C T E D	Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil or any combination thereof. (Properties (i) and (ii) in next column, shall not apply to chalk.) Recycled aggregate	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	No compaction	6 A
				(ii) uniformity	See Note 5	10	-		
				(iii) SMC of chalk index	Clause 634	-	20%		
				(iv) plasticity index	BS 1377 : Part 2	Non-plastic			
6 G R A N U L A R	Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. (Properties (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	6 B
				(ii) plasticity index	BS 1377 : Part 2	Non-plastic			
				(iii) Los Angeles coefficient	Clause 635	-	50		

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower			Upper
S E L E C T E D G R A N U L A R F I L L	Selected uniformly graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. (Property (iii) in next column, shall not apply to chalk.) Recycled aggregate	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2 Method 3	6	
				(ii) uniformity coefficient	See Note 5	-	10		
				(iii) plasticity index	BS 1377 : Part 2	Non-plastic			
				(iv) Los Angeles coefficient	Clause 635	-	50		
				(v) mc	BS 1377 : Part 2	App 6/1	App 6/1		
6				(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2 Method 4	6	
				(ii) uniformity coefficient	See Note 5	-	10		
				(iii) plasticity index	BS 1377 : Part 2	Non-plastic			
				(iv) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(v) MCV	Clause 632	App 6/1	App 6/1		

TABLE 6/1: (11/08) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		Compaction Requirements in Clause 612	Class
						Lower	Upper		
						Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			
S E L E C T E D G R A N U L A R F I L L	Selected granular material (Class 9A)	For stabilisation with cement to form capping	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock. (Properties (i), (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	Not applicable	6 E -
					BS EN 933-2 (Off-site)	Tab 6/5	Tab 6/5		
				(ii) mc	BS 1377 : Part 2	-	App 6/1		
				(iii) liquid limit	BS 1377 : Part 2	-	45		
				(iv) plasticity index	BS 1377 : Part 2	-	20		
				(v) organic matter	BS 1377 : Part 3	-	App 6/1		
				(vi) water soluble (WS) sulfate content	TRL Report 477, Test No. 1	-	3000 mg/l as SO ₄		
				(vii) oxidisable sulfides (OS) content	TRL Report 477, Tests No. 2 and 4	-	0.6% as SO ₄		
(viii) SMC of chalk	Clause 634		20%						

TABLE 6/1: (11/09) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Acceptable Limits Within:		Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Lower	Upper			
S E L E C T E D G R A N U L A R F I L L	Selected granular material (fine grading)	Capping	Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F
				(ii) optimum mc	BS 1377 : Part 4 (vibrating hammer method)	-	-			
				(iii) mc	BS 1377 : Part 2	Optimum mc - 2%	Optimum mc			
				(iv) Los Angeles coefficient	Clause 635	-	60			
				(v) Class Ra (asphalt) content	Clause 710	-	50%			
				(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%			
U L A R F I L L	Selected granular material (coarse grading)	Capping	Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt and tar-bitumen binders, unburnt colliery spoil and argillaceous rock. Property (i) in the next column shall not apply to chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F
				(ii) optimum mc	BS 1377 : Part 4 (vibrating hammer method)	-	-			
				(iii) mc	BS 1377 : Part 2	Optimum mc - 2%	Optimum mc			
				(iv) Los Angeles coefficient	Clause 635	-	50			
				(v) Class Ra (asphalt) content	Clause 710	-	50%			
				(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%			

TABLE 6/1: (11/09) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		Compaction Requirements in Clause 612	Class
						Lower	Upper		
S E L E C T E D G R A N U L A R	Selected granular material	Capping	Any material, or combination of materials with not less than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6 Maximum Compacted layer thickness shall be 200 mm	6
				(ii) optimum mc	Clause 613	-	-		
				(iii) mc	Clause 613	Optimum mc - 2%	Optimum mc		
				(iv) Class Ra (asphalt) content	Clause 710	50%	-		
				(v) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	10%		
F I L L	Selected granular material (fine grading) - imported on to the Site	Capping	Unbound mixture complying with BS EN 13285. Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 - 0/31.5 and G_E	Tab 6/5	Tab 6/5	Tab 6/4 Method 6	6
				(ii) Maximum fines and oversize categories	BS EN 13285 - UF_{15} and OC_{75}	Tab 6/5	Tab 6/5		
				(iii) Los Angeles coefficient	BS EN 13242 - LA_{60}	-	60		
				(iv) Volume stability of blast furnace slag	BS EN 13242 - free from dicalcium silicate and iron disintegration	-	-		

TABLE 6/1: (11/09) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6(1))	Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		Compaction Requirements in Clause 612	Class
						Lower	Upper		
						Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			
S E L E C T E D G R A N U L A R F I L L	4 (contd)			(v) Volume stability of steel (BOF) and EAF) slag	BS EN 13242 - V_5	-	-		
				(vi) Other aggregate requirements	BS EN 13242 - Category _{NR} (no requirement)	-	-		
				(vii) Laboratory dry density and optimum water content	BS EN 13285, clause 5.3 - declared values	-	-		
				(viii) Water content	BS EN 1097-5	Optimum _{WC - 2%}	Optimum _{WC}		
				(ix) Clas Ra (asphalt) content	Clause 710	-	50%		
				(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%		

TABLE 6/1: (11/09) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
					Lower	Upper		
S E L E C T E D G R A N U L A R F I L L	Selected granular material (coarse grading) - imported on to the Site	Capping	Unbound mixture complying with BS EN 13285. Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 - 0/80 and G_E	Tab 6/5	Tab 6/4 Method 6	5
				(ii) Maximum fines and oversize categories	BS EN 13285 - UF_{12} and OC_{75}	Tab 6/5	Tab 6/5	6
				(iii) Los Angeles coefficient	BS EN 13242 - LA_{50}	-	50	
				(iv) Volume stability of blast furnace slag	BS EN 13242 - free from dicalcium silicate and iron disintegration	-	-	
				(v) Volume stability of steel (BOF) and EAF) slag	BS EN 13242 - V_5	-	-	
				(vi) Other aggregate requirements	BS EN 13242 - Category _{NR} (no requirement)	-	-	
				(vii) Laboratory dry density and optimum water content	BS EN 13285, clause 5.3 - declared values	-	-	
				(viii) Water content	BS EN 1097-5	Optimum _{wc} - 2%	Optimum _{wc}	
				(ix) Clas Ra (asphalt) content	Clause 710	-	50%	
				(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%	

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
				(i) grading	BS 1377 : Part 2 (On-site)	Lower	Upper		
6	Selected granular material	Gabion filling	Natural gravel, crushed rock, crushed concrete or any combination thereof. None of these constituents shall include any argillaceous rock..	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	None	6
				(ii) Los Angeles coefficient	Clause 635	-	50		
6	Selected granular material	Drainage layer to reinforced soil and anchored earth structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (vi), (vii), (viii), (ix), (x), (xi) and (xii) in next column only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) (Properties (ii) and (v) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	6
				(ii) plasticity index	BS 1377 : Part 2	Non-plastic			
S E L E C T E D G R A N U L A R F I L L				(iii) Los Angeles coefficient	Clause 635	-	50		
				(iv) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(v) MCV	Clause 632	App 6/1	App 6/1		
				(vi) pH value	BS 1377 : Part 3	Tab 6/3	Tab 6/3		
				(vii) chloride ion content	BS EN 1744-1	-	Tab 6/3		
				(viii) water soluble (WS) sulfate content	TRL Report 447, Tests No. 1	-	Tab 6/3		
				(ix) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	Tab 6/3		
				(x) restivity	Clause 637	Tab 6/3	-		
				(xi) redox potential	Clause 638	Tab 6/3	-		
				(xii) organic content	BS 1377 : Part 3	-	Tab 6/3		
	(xiii) microbial activity index	Table 6/3	-	Tab 6/3					

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower Upper			
6	Selected well graded granular material	Fill to reinforced soil and anchored earth structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof except that chalk shall not be combined with any other constituent. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (v) in next column shall not apply to chalk.) (Properties (viii), (ix), (x), (xi), (xii), (xiii) and (xiv) only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	I	
				(ii) uniformity coefficient	See Note 5	10	-		-
				(iii) SMC of chalk	Clause 634	-	20%		-
				(iv) mc	BS 1377 : Part 2	App 6/1	App 6/1		App 6/1
				(v) MCV	Clause 632	App 6/1	App 6/1		App 6/1
				(vi) effective angle of friction (ϕ') and effective cohesion (c')	Clause 636	App 6/1	App 6/1		-
				(vii) coefficient of friction and adhesion (fill/elements)	Clause 639	App 6/1	App 6/1		-
				(viii) pH value	BS 1377 : Part 3	Tab 6/3	Tab 6/3		Tab 6/3
				(ix) chloride ion content	BS EN 1744-1	-	Tab 6/3		Tab 6/3
				(x) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	Tab 6/3		Tab 6/3
				(xi) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	Tab 6/3		Tab 6/3
				(xii) resistivity	Clause 637	Tab 6/3	Tab 6/3		-
				(xiii) redox potential	Clause 638	Tab 6/3	Tab 6/3		-
				(xiv) organic content	BS 1377 : Part 3	-	Tab 6/3		Tab 6/3
				(xv) microbial activity index	Table 6/3	-	Tab 6/3		Tab 6/3

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower			Upper
S E L E C T E D G R A N U L A R F I L L	Selected uniformly graded granular material	Fill to reinforced soil and anchored earth	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof, except that chalk shall not be combined with any other constituent. None of these constituents shall include any argillaceous rock. (Properties (viii), (ix), (x), (xi), (xii), (xiii) and (xiv) in next column only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) (Properties (i), (ii) and (v) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	6	J
				(ii) uniformity coefficient	See Note 5	5	10		
				(iii) SMC of chalk	Clause 634	-	20%		
				(iv) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(v) MCV	Clause 632	App 6/1	App 6/1		
				(vi) effective angle of friction (ϕ') and effective cohesion (c')	Clause 636	App 6/1	-		
				(vii) coefficient of friction and adhesion (fill/elements)	Clause 639	App 6/1	-		
				(viii) pH value	BS 1377 : Part 3	Tab 6/3	Tab 6/3		
				(ix) chloride ion content	BS EN 1744-1	-	Tab 6/3		
				(x) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	Tab 6/3		
				(xi) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos 2 and 4	-	Tab 6/3		
				(xii) resistivity	Clause 637	Tab 6/3	-		
				(xiii) redox potential	Clause 638	Tab 6/3	-		
				(xiv) organic content	BS 1377 : Part 3	-	Tab 6/3		
				(xv) microbial activity index	Table 6/3	-	Tab 6/3		

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
					Lower	Upper			
6 K S E L E C T E D G R A N U L A R F I L L	Selected granular material	Lower bedding for corrugated steel buried structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 90% of maximum dry density of BS 1377 : Part 4 (Vibrating hammer method)	6 K
				(ii) uniformity coefficient	See Note 5	5	-		
				(iii) plasticity index	BS 1377 : Part 2	-	6		
				(iv) optimum mc	BS 1377 : Part 4 (vibrating hammer method)	-	-		
				(v) mc	BS 1377 : Part 2	Optimum mc -2%	Optimum mc +1%		
				(vi) MCV	Clause 632	App 6/1	App 6/1		
				(vii) Los Angeles coefficient	Clause 635	-	40		
				(viii) resistivity	Clause 637	2000 ohm cm	-		
				(ix) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	300 mg/l as SO ₄		
				(x) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos 2 and 4	-	0.06% as SO ₄		
				(xi) chloride ion content	BS EN 1744-1	-	0.025%		
				(xii) pH value	BS 1377 : Part 3	6	9		
				(xiii) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	-	Rapid blackening of lead acetate paper		

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/01 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/01 and Testing in Clause 6/31)			Compaction Requirements in Clause 6/12	Class		
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
						Lower			Upper	
S F E I L L E L C T E D G R A N U L A R	Selected uniformly graded granular material	Upper bedding for corrugated steel buried structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	None	6	-
				(ii) resistivity	Clause 6/37	2000 ohm cm	Tab 6/5			
				(iii) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	300 mg/l as SO ₄			
				(iv) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	0.06% as SO ₄			
				(v) chloride ion content	BS EN 1744-1	-	0.025%			
				(vi) pH value	BS 1377 : Part 3	6	9			
				(vii) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	-	Rapid blackening of lead acetate paper			

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower			Upper
S E L E C T E D G R A N U L A R F I L L	Selected granular material	Surround to corrugated steel buried structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 90% of maximum dry density of BS 1377 : Part 4 (Vibrating hammer method) unless otherwise stated in App 6/1	6 M -
				(ii) uniformity coefficient	See Note 5	5	-		
				(iii) plasticity index	BS 1377 : Part 2	-	6		
				(iv) optimum mc	BS 1377 : Part 4 (vibrating hammer method)	-	-		
				(v) mc	BS 1377 : Part 2	Optimum mc -2%	Optimum mc +1%		
				(vi) MCV	Clause 632	App 6/1	App 6/1		
				(vii) Los Angeles coefficient	Clause 635	-	40		
				(viii) resistivity	Clause 637	2000 ohm cm	-		
				(ix) water soluble (WS) sulfate content	TRL Report 447 Test No. 1	-	300 mg/l as SO ₄		
				(x) oxidisable sulfides (OS) content	TRL Report 447 Tests Nos. 2 and 4	-	0.06% as SO ₄		
				(xi) chloride ion content	BS EN 1744-1	-	0.025%		
				(xii) pH value	BS 1377 : Part 3	6	9		
				(xiii) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	-	Rapid blackening of lead acetate paper		

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/31)				Compaction Requirements in Clause 6/12	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S F E I L L E L C T E E D G R A N U L A R	Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377 : Part 4 (vibrating hammer method)	6
				(ii) uniformity coefficient	See Note 5	10	-		
				(iii) Los Angeles coefficient	Clause 6/35	-	40		
				(iv) undrained shear parameters (c and ϕ)	Clause 6/33	App 6/1	-		
				(v) effective angle of internal friction (ϕ') and effective cohesion (c')	Clause 6/36	App 6/1	-		
				(vi) permeability	Clause 6/40	App 6/1	-		
				(vii) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(viii) MCV	Clause 6/32	App 6/1	App 6/1		
				(ix) slope stability test (where required in App 6/6)	Clause 6/10	App 6/6			
								N	
								-	

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)	Compaction Requirements in Clause 612	Class
						Lower	Upper			
S E L E C T E D G R A N U L A R F I L L	Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377 : Part 4 (vibrating hammer method)	6
				(ii) uniformity coefficient	See Note 5	5	-	-		
				(iii) IDD of chalk	Clause 634	-	App 6/1	-		
				(iv) Los Angeles coefficient	Clause 635	-	60	-		
				(v) undrained shear parameters (c and ϕ)	Clause 633	App 6/1	-	-		
				(vi) effective angle of internal friction (ϕ') and effective cohesion (c')	Clause 636	App 6/1	-	-		
				(vii) permeability	Clause 640	App 6/1	-	-		
				(viii) mc	BS 1377 : Part 2	App 6/1	App 6/1	App 6/1		
				(ix) MCV	Clause 632	App 6/1	App 6/1	App 6/1		
				(x) slope stability test (where required in App 6/6)	Clause 610	App 6/6	App 6/6	App 6/6		

TABLE 6/1: (11/08) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Acceptable Limits Within:		Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Lower	Upper			
S E L E C T E D	Well graded uniformly graded or coarse granular material	Overlying fill for corrugated steel buried structures	As Class 1A, 1B or 1C granular fill materials, but not to include argillaceous rock, slag or PFA in any proportions. Recycled aggregate except recycled asphalt	As for Class 1A, 1B or 1C with the addition of the following:					6	O
				(i) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	300 mg/l as SO ₄			
				(ii) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	0.06% as SO ₄			
				(iii) chloride ion content	BS EN 1744-1	-	0.025%			
				(iv) pH value	BS 1377 : Part 3	6	9			
G R A N U L A R	Selected granular material	For stabilisation with lime and cement to form capping (Class 9F)	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock. (Properties (i), (ii) and (iii) in text column, shall not apply to chalk.)	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/2	6	R
				(ii) mc	BS EN 933-2 (Off-site)	Tab 6/5	Tab 6/5			
				(iii) liquid limit	BS 1377 : Part 2	App 6/1	-			
				(iv) plasticity index	BS 1377 : Part 2	-	45			
				(v) organic matter	BS 1377 : Part 2	-	20			
F I L L				(vi) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	3000 mg/l as SO ₄	App 6/1	6	R
				(vii) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	0.6% as SO ₄			
				(viii) IDD of chalk	Clause 634	-	App 6/1			

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
6	Selected well graded granular material	Filter layer below subbase	Crushed rock or sand	(i) grading	BS 1377 : Part 2 (On-site)	Tab 6/2	Tab 6/2	-	S
					BS EN 933-2 (Off-site)	Tab 6/5	Tab 6/5		
				(ii) plasticity index	BS 1377 : Part 2	-	Non-plastic		

S E L E C T E D G R A N U L A R F I L L

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/31)				Compaction Requirements in Clause 6/12	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S F E I L L E L C T E D C O H E S I V E	Selected cohesive material	Fill to structures	Any material or combination of materials, other than argillaceous rock and materials designated as Class 3 in the Contract. If chalk is used it shall form 100% of constituents. (Properties (i) and (iii) shall not apply to chalk.) (Properties (vii) and (viii) may be increased to 54% and 31% respectively for Lias Clay only and subject to the requirements of Appendix 6/6)	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	End product: 100% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method) or a dry density corresponding to 5% air voids at field mc whichever is lower	7 A -
				(ii) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(iii) MCV	Clause 632	App 6/1	App 6/1		
				(iv) undrained shear parameters (c and φ)	Clause 633	App 6/1	App 6/1		
				(v) effective angle of internal friction (φ') and effective cohesion (c')	Clause 636	App 6/1	App 6/1		
				(vi) IDD of chalk	Clause 634	App 6/1	App 6/1		
				(vii) liquid limit	BS 1377 : Part 2	-	45		
				(viii) plasticity index	BS 1377 : Part 2	-	25		

TABLE 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/31)			Compaction Requirements in Clause 6/12	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
				Lower	Upper			
S F E I L L E L C T E D C O H E S I V E	Selected conditioned pulverised fuel ash cohesive material	Fill to structures and to reinforced soil	Conditioned material direct from power station dust collection system and to which a controlled quantity of water has been added	(i) mc	BS 1377 : Part 2	To enable compaction to Clause 6/12	End product: 95% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method)	7
				(ii) bulk density	BS 1377 : Part 9	App 6/1		App 6/1
				(iii) undrained shear parameters (c and ϕ)	Clause 633	App 6/1		-
				(iv) effective angle of internal friction (ϕ') and effective cohesion (c')	Clause 636	App 6/1		-
				(v) coefficient of friction and adhesion (fill/elements)	Clause 639	App 6/1		-
				(vi) permeability	Clause 640	App 6/1		-
				(vii) slope stability test (where required in App 6/6)	Clause 610	App 6/6		-
							B	

TABLE 6/1: (05/04) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/01 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/01 and Testing in Clause 6/31)				Compaction Requirements in Clause 6/12	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S E L E C T E D C O H E S I V E F I L L	Selected wet cohesive material	Fill to reinforced soil	Any material, or combination of materials, other than unburnt colliery spoil, argillaceous rock and chalk. (Properties (viii), (ix), (x), (xi) and (xii) in next column only apply when metallic reinforcing elements, facing units or fastenings are used)	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 1	7 C -
				(ii) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(iii) MCV	Clause 632	App 6/1	App 6/1		
				(iv) effective angle of internal friction (ϕ) and effective cohesion (c')	Clause 636	App 6/1	-		
				(v) coefficient of friction and adhesion (fill/elements)	Clause 639	App 6/1	-		
				(vi) liquid limit	BS 1377 : Part 2	-	45		
				(vii) plasticity index	BS 1377 : Part 2	-	25		
				(viii) pH value	BS 1377 : Part 3	Tab 6/3	Tab 6/3		
				(ix) chloride ion content	BS EN 1744-1	-	Tab 6/3		
				(x) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	Tab 6/3		
				(xi) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	Tab 6/3		
				(xii) resistivity	Clause 637	Tab 6/3	-		
				(xiii) redox potential	Clause 638	Tab 6/3	-		

TABLE 6/1: (05/04) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/31)				Compaction Requirements in Clause 6/12	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S E L E C T E D C O H E S I V E F I L L	Selected stony cohesive material	Fill to reinforced soil	Any material, or combination of materials, other than unburnt colliery spoil, argillaceous rock and chalk. (Properties (vi), (vii), (viii), (ix), (x), (xi) and (xii) in next column only apply when metallic reinforcing elements, facing units or fastenings are used)	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	7 D
				(ii) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(iii) MCV	Clause 632	App 6/1	App 6/1		
				(iv) effective angle of internal friction (ϕ) and effective cohesion (c')	Clause 636	App 6/1	-		
				(v) coefficient of friction and adhesion (fill/elements)	Clause 639	App 6/1	-		
				(vi) liquid limit	BS 1377 : Part 2	-	45		
				(vii) plasticity index	BS 1377 : Part 2	-	25		
				(viii) pH value	BS 1377 : Part 3	Tab 6/3	Tab 6/3		
				(ix) chloride ion content	BS EN 1744-1	-	Tab 6/3		
				(x) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	Tab 6/3		
				(xi) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	Tab 6/3		
				(xii) resistivity	Clause 637	Tab 6/3	-		
				(xiii) redox potential	Clause 638	Tab 6/3	-		

TABLE 6/1: (11/03) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S E L E C T E D C O H E S I V E	Selected cohesive material	For stabilisation with lime to form capping (Class 9D)	Any material, or combination of materials, other than unburnt colliery spoil	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Not applicable	7
				(ii) mc	BS 1377 : Part 2	-	App 6/1		
				(iii) MCV	Clause 632	App 6/1	-		
				(iv) plasticity index	BS 1377 : Part 2	10	-		
				(v) organic matter	BS 1377 : Part 3	-	App 6/1		
				(vi) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	App 6/1		
				(vii) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	App 6/1		
				(viii) total potential sulfate (TPS) content	TRL Report 447, Test No. 4	-	App 6/1		
F I L L	Selected silty cohesive material	For stabilisation with cement to form capping (Class 9F)	Any material, or combination of materials, other than chalk, unburnt colliery spoil and argillaceous rock	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Not applicable	7
				(ii) uniformity coefficient	See Note 5	5	-		
				(iii) mc	BS 1377 : Part 2	App 6/1	App 6/1		
				(iv) MCV	Clause 632	App 6/1	App 6/1		
				(v) liquid limit	BS 1377 : Part 2	-	45		
				(vi) plasticity index	BS 1377 : Part 2	-	20		
				(vii) organic matter	BS 1377 : Part 3	-	App 6/1		
				(viii) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	App 6/1		
(ix) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	App 6/1						
(x) total potential sulfate (TPS) content	TRL Report 447, Test No. 4	-	App 6/1						

TABLE 6/1: (11/05) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S E L E C T E D C O H E S I V E F I L L	Selected conditioned pulverised fuel ash cohesive material	For stabilisation with cement to form capping (Class 9C)	Conditioned material direct from power station dust collection system and to which a controlled quantity of water has been added	(i) mc	BS 1377 : Part 2	App 6/1	App 6/1	Not applicable	7
				(ii) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	3000 mg/l as SO ₄		
				(iii) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	0.6% as SO ₄		
				(iv) total potential sulfate (TPS) content	TRL Report 447, Test No. 4	-	1.2% as SO ₄		
7	Wet, dry, stony or silty cohesive material and chalk	Overlying fill for corrugated steel buried structures	As Class 2A, 2B, 2C, 2D general cohesive fill material or Class 3 chalk fill material, except that argillaceous rock, slag, PFA or any combination thereof shall not be used	As for Class 2A, 2B, 2C, 2D or 3 with the addition of the following				7	H
				(i) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	300 mg/l as SO ₄		
				(ii) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	0.06% as SO ₄		
				(iii) chloride ion content	BS EN 1744-1	-	0.025%		
				(iv) pH value	BS 1377 : Part 3	6	9		

TABLE 6/1: (11/03) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
S E L E C T E D C O H E S I V E F I L L	Selected cohesive material	For stabilisation with lime and cement to form capping (Class 9E)	Any material, or combination of materials, other than unburnt colliery spoil	(i) grading	BS 1377 : Part 2	Tab 6/2	Tab 6/2	Not applicable	7 I
				(ii) mc	BS 1377 : Part 2	-	App 6/1		
				(iii) MCV	Clause 632	App 6/1	-		
				(iv) plasticity index	BS 1377 : Part 2	10	-		
				(v) organic matter	BS 1377 : Part 3	-	App 6/1		
				(vi) water soluble (WS) sulfate content	TRL Report 447, Test No. 1	-	App 6/1		
				(vii) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos. 2 and 4	-	App 6/1		
				(viii) total potential sulfate (TPS) content	TRL Report 447, Test No. 4	-	App 6/1		

TABLE 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class
				Property (See exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:			
						Lower	Upper		
8	Class 1, Class 2 or Class 3 material	Lower trench fill	Any, except there shall not be any stones or lumps of clay >40 mm nominal diameter. Recycled aggregate	(i) mc	BS 1377 : Part 2	App 6/1	App 6/1	Tab 6/4	8
				(ii) MCV	Clause 632	App 6/1	App 6/1		
9	Cement stabilised well graded granular material	Capping	Class 6E with addition of cement according to Clause 614	(i) pulverisation	BS 1924 : Part 2	60%	-	Tab 6/4 Method 6	9
				(ii) bearing ratio	BS 1924 : Part 2	App 6/1	-		
				(iii) mc	BS 1924 : Part 2	App 6/1	App 6/1		
9	Cement stabilised silty cohesive material	Capping	Class 7F with addition of cement according to Clause 614	(i) pulverisation	BS 1924 : Part 2	App 6/1	-	Tab 6/4 Method 7	9
				(ii) MCV immediately before compaction	Clause 632	App 6/1	12		
				(iii) bearing ratio	BS 1924 : Part 2	App 6/1	-		
				(iv) mc	BS 1924 : Part 2	App 6/1	App 6/1		
9	Cement stabilised conditioned pulverised fuel ash cohesive material	Capping	Class 7G with addition of cement according to Clause 614	(i) pulverisation	BS 1924 : Part 2	60%	-	End product 95% of maximum dry density of BS 1924 : Part 2 (2.5 kg rammer method)	9
				(ii) bearing ratio	BS 1924 : Part 2	App 6/1	-		
				(iii) mc	BS 1924 : Part 2	To enable compaction to Clause 612			
9	Lime stabilised cohesive material	Capping	Class 7E with addition of lime according to Clause 615	(i) pulverisation	BS 1924 : Part 2	30%	-	Tab 6/4 Method 7	9
				(ii) MCV immediately before compaction	Clause 632	App 6/1	App 6/1		
				(iii) bearing ratio	BS 1924 : Part 2	App 6/1	-		
				(iv) mc	BS 1924 : Part 2	App 6/1	App 6/1		

MATERIALS

TABLE 6/1: (11/04) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 6/1 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 6/1 and Testing in Clause 6/1)				Compaction Requirements in Clause 6/12	Class	
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
						Lower	Upper			
S M T A A T B E I R L I I A S L E S	Lime and cement stabilised cohesive material	Capping	Class 7I with addition of lime and cement according to Clause 6/43	(i) pulverisation	BS 1924 : Part 2	30%	-	Tab 6/4 Method 7	9	E
				(ii) MCV immediately before completion	Clause 6/32	App 6/1	App 6/1			
				(iii) bearing ratio	BS 1924 : Part 2	App 6/1	-			
				(iv) mc	BS 1924 : Part 2	App 6/1	App 6/1			
D 9	Lime and cement stabilised well graded granular material	Capping	Class 6R with addition of lime and cement according to Clause 6/43	(i) pulverisation	BS 1924 : Part 2	60%	-	Tab 6/4 Method 6	9	F
				(ii) bearing ratio	BS 1924 : Part 2	App 6/1	-			
				(iii) mc	BS 1924 : Part 2	App 6/1	App 6/1			

Footnotes to Table 6/1

1. App = Appendix
2. Tab = Table
3. Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in Appendix 6/1 shall apply. Where Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
4. (05/04) Where BS 1377 : Part 2 is specified for mc, this shall mean BS 1377 : Part 2 or BS EN 1097-5 as appropriate.
5. Uniformity coefficient is defined as the ratio of the particle diameters D_{60} to D_{10} on the particle-size distribution curve, where:
 D_{60} = particle diameter at which 60% of the soil by weight is finer
 D_{10} = particle diameter at which 10% of the soil by weight is finer
6. (11/04) The limiting values for Class U1B material are given in Appendix 6/14 and Appendix 6/15.

TABLE 6/2: (05/04) Grading Requirements for Acceptable Earthworks Materials Other Than Classes 6F4, 6F5 and 6S

Class	Percentage by Mass Passing the Size Shown																Class				
	Size (mm)		Size (mm) BS Series												Size (microns) BS Series			Size (microns)			
	500	300	125	90	75	37.5	28	20	14	10	6.3	5	3.35	2	1.18	600	300	150	63	2	
1A		100	95-100																<15		1A
1B			100																<15		1B
1C	100		10-95													0-25			<15		1C
2A & 2B			100											80-100					15-100		2A & 2B
2C			100											15-80					15-80		2C
2D			100																80-100	0-20	2D
6A	100									0-100		0-85				0-45			0-5		6A
6B	100		0-10																		6B
6C			100			0-100					0-100		0-35	0-10		0-2					6C
6D										100		89-100		60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock			6D
6E & 6R			100	85-100						25-100						10-100			<15		6E & 6R
6F1					100	75-100				40-95		30-85				10-50			<15		6F1
6F2			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F2
6F3			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F3
6H								100				60-100			15-45	0-25		0-5			6H
6I & 6J			100						25-100					15-100		9-100			<15		6I & 6J
6K								100											0-10		6K
6L										100		89-100		60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock			6L

TABLE 6/2: (11/05) Grading Requirements for Acceptable Earthworks Materials (continued)

Class	Percentage by Mass Passing the Size Shown																	Class				
	Size (mm)		Size (mm) BS Series													Size (microns) BS Series			Size (microns)			
	500	300	125	90	75	37.5	28	20	14	10	6.3	5	3.35	2	1.18	600	300	150		63	2	
6M					100														0-10			6M
6N & 6P					100														<15			6N & 6P
6S					100										60-100	30-90		4-45	0-16			6S
7A					100														15-100			7A
7C			100		85-100				83-100						80-100	60-100			15-45	0-20		7C
7D			100		85-100			40-90							15-79	15-75			15-45	0-20		7D
7E					100		95-100												15-100			7E
7F			100																15-100			7F
7I					100		95-100												15-100			7I

TABLE 6/3: (11/05) Limits of Material Properties of Fill for Use With Metal Components in Reinforced Soil and Anchored Earth Structures for Class 6H, 6I, 6J, 7C and 7D Materials

Reinforcing Element Material	Properties of Fill								
	pH Value		Max Chloride Ion Content %	Max Organic Content %	Max Water Soluble (WS) Sulfate Content mg/l as SO ₄	Maximum Oxidisable Sulfides (OS) Content % as SO ₄	Minimum Resistivity Ohm.cm	Minimum Redox Potential volts	Microbial Activity Index
	Min	Max							
Galvanised Steel	5	10	0.02	0.2	300	0.06	5000	0.40))) Less than 5
Stainless Steel	5	10	0.025	0.2	600	0.12	3000	0.35))

NOTES:

1 A method of calculating the Microbial Activity Index may be obtained by reference to TRRL Contractor Report 54 ‘Soil Corrosivity Assessment’.

2 (11/03) The corrosion potential of frictional fill shall be assessed from resistivity, pH, chloride, water soluble sulfate and oxidisable sulfides tests. For cohesive soil it will be necessary to test additionally for organic content. Should either organic content or sulfate be in excess of the specified levels, then tests shall also be included for Redox Potential and Microbial Activity Index. Further information may be obtained by reference to TRRL Contractor Report 54.

3 (11/03) The water soluble sulfate content and oxidisable sulfides content shall be determined in accordance with the methods described in TRL Report 447, Tests Nos. 1, 2 and 4.

4 (11/03) Methods of test (except for Microbial Activity Index, water soluble sulfate content and oxidisable sulfides content) are given in BS 1377 : Part 3.

TABLE 6/4: Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6)
(This Table is to be read in conjunction with sub-Clause 612.10)

Type of Compaction Plant	Ref No.	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N#	D	N#	D	N#	D	N	D	N	N for D = 110 mm	N for D = 150 mm	N for D = 250 mm
Smoothed wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll: over 2100 kg up to 2700 kg over 2700 kg up to 5400 kg over 5400 kg	125	8	125	10	125	10*	175	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2		125	6	125	8	125	8*	200	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	3		150	4	150	8	unsuitable		300	4	unsuitable	unsuitable	16	16	unsuitable
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 5400 kg over 5400 kg up to 8000 kg over 8000 kg	150	10	unsuitable		150	10	250	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2		150	8	125	12	unsuitable		325	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	3		150	4	150	12	unsuitable		400	4	unsuitable	unsuitable	20	20	unsuitable
Deadweight tamping roller	1	Mass per metre width of roll: over 4000 kg up to 6000 kg over 6000 kg	225	4	150	12	250	4	350	4	unsuitable	unsuitable	12	20	unsuitable
	2		300	5	200	12	300	3	400	4	unsuitable	unsuitable	8	12	20
Pneumatic-tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg over 1500 kg up to 2000 kg over 2000 kg up to 2500 kg over 2500 kg up to 4000 kg over 4000 kg up to 6000 kg over 6000 kg up to 8000 kg over 8000 kg up to 12000 kg over 12000 kg	125	6	unsuitable		150	10*	240	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2		150	5	unsuitable		unsuitable		300	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	3		175	4	125	12	unsuitable		350	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	4		225	4	125	10	unsuitable		400	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	5		300	4	125	10	unsuitable		unsuitable		unsuitable	unsuitable	12	unsuitable	unsuitable
	6		350	4	150	8	unsuitable		unsuitable		unsuitable	unsuitable	12	unsuitable	unsuitable
	7		400	4	150	8	unsuitable		unsuitable		unsuitable	unsuitable	10	16	unsuitable
	8		450	4	175	6	unsuitable		unsuitable		unsuitable	unsuitable	8	12	unsuitable
Vibratory tamping roller	1	Mass per metre width of a vibrating roll: over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	100	12	100	12	150	12	100	10	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2		125	12	125	12	175	12*	175	8	unsuitable	unsuitable	12	unsuitable	unsuitable
	3		150	12	150	12	200	12*	unsuitable		unsuitable	unsuitable	8	12	unsuitable
	4		150	9	150	9	250	12*	unsuitable		400	5	6	10	unsuitable
	5		200	9	200	9	275	12*	unsuitable		500	6	6	10	unsuitable
	6		225	9	225	9	300	12*	unsuitable		600	6	4	8	unsuitable
	7		250	9	250	9	300	9*	unsuitable		700	6	3	7	unsuitable
	8		275	9	275	9	300	7*	unsuitable		800	6	3	6	12

TABLE 6/4: Method Compaction for Earthworks Materials: plant and Methods (Method 1 to Method 6)
(This Table is to be read in conjunction with sub-Clause 612.10)

Type of Compaction Plant	Ref No.	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6			
			D	N#	D	N#	D	N#	D	N	D	N for D = 110 mm	N for D = 150 mm	N for D = 250 mm		
Vibratory roller		Mass per metre width of a vibratory roll: over 270 kg up to 450 kg over 450 kg up to 700 kg over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	75	16	150	16	150	16	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	1		unsuitable													
	2		unsuitable	75	12	150	12	150	12	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	3		100	12	125	10	150	6	10	125	10	16	16	16	16	16
	4		125	8	150	8	200	10*	4	175	4	6	6	6	6	12
	5		150	4	150	4	225	12*	unsuitable	unsuitable	unsuitable	4	5	5	5	11
	6		175	4	175	4	250	10*	unsuitable	unsuitable	unsuitable	400	5	5	5	10
	7		200	4	200	4	275	8*	unsuitable	unsuitable	unsuitable	500	5	5	5	8
	8		225	4	225	4	300	8*	unsuitable	unsuitable	unsuitable	600	5	4	4	7
	9		250	4	250	4	300	6*	unsuitable	unsuitable	unsuitable	700	5	4	4	6
10	275	4	275	4	300	4*	unsuitable	unsuitable	unsuitable	800	5	3	3			
Vibrating plate compactor		Mass per m ² of base plate: over 880 kg up to 1100 kg over 1100 kg up to 1200 kg over 1200 kg up to 1400 kg over 1400 kg up to 1800 kg over 1800 kg up to 2100 kg over 2100 kg	unsuitable	unsuitable	75	6	6	6	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	1		unsuitable													
	2		unsuitable	75	10	100	6	10	10	75	10	10	10	10	10	
	3		unsuitable	75	6	150	6	8	8	150	8	8	8	8	8	
	4		100	6	125	6	150	4	4	unsuitable	unsuitable	8	8	8	8	
	5		150	6	150	5	200	4	4	unsuitable	unsuitable	5	5	5	5	
6	200	6	200	5	250	4	4	unsuitable	unsuitable	3	3	3	3			
Vibro-tamper		Mass: over 50 kg up to 65 kg over 65 kg up to 75 kg over 75 kg up to 100 kg over 100 kg	100	3	100	3	150	3	125	3	3	3	3	3	3	
	1		100	3	100	3	150	3	125	3	3	3	3	3		
	2		125	3	125	3	200	3	150	3	3	3	3	3		
	3		150	3	150	3	225	3	175	3	3	3	3	3		
4	225	3	200	3	225	3	225	3	250	3	2	2	2			
Power rammer		Mass: 100 kg up to 500 kg over 500 kg	150	4	150	6	unsuitable	unsuitable	200	4	4	4	4	4		
	1		150	4	150	6	unsuitable	unsuitable	200	4	4	4	4	4		
2	275	8	275	12	unsuitable	unsuitable	400	4	4	4	4	4	4			
Dropping-weight compactor		Mass of rammer over 500 kg weight drop: over 1 m up to 2 m over 2 m	600	4	600	8	8	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable		
	1		600	4	600	8	8	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable		
2	600	2	600	8	8	8	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable			

TABLE 6/4: Method Compaction for Earthworks Materials: Plant and Methods (Method 7)
(This Table is to be read in conjunction with sub-Clause 612.10)

Type of Compaction Plant	Ref No.	Category	Method 7	
			N for D = 150 mm	N for D = 250 mm
Smooth wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll: over 2100 kg up to 2700 kg over 2700 kg up to 5400 kg over 5400 kg	unsuitable unsuitable 12	unsuitable unsuitable unsuitable
	2			
	3			
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 5400 kg over 5400 kg up to 8000 kg over 8000 kg	unsuitable 16 8	unsuitable unsuitable unsuitable
	2			
	3			
Deadweight tamping roller	1	Mass per metre width of roll: over 4000 kg up to 6000 kg over 6000 kg	4 3	8 6
	2			
Pneumatic-tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg over 1500 kg up to 2000 kg over 2000 kg up to 2500 kg over 2500 kg up to 4000 kg over 4000 kg up to 6000 kg over 6000 kg up to 8000 kg over 8000 kg up to 12000 kg over 12000 kg	unsuitable 12 6 5 4 unsuitable unsuitable unsuitable	unsuitable unsuitable unsuitable unsuitable 16 8 4 4
	2			
	3			
	4			
	5			
	6			
	7			
	8			
Vibratory tamping roller	1	Mass per metre width of vibrating roll: over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	unsuitable unsuitable 16 12 10 8 7 6	unsuitable unsuitable unsuitable unsuitable 16 14 12
	2			
	3			
	4			
	5			
	6			
	7			
	8			
Vibratory roller	1	Mass per metre width of vibrating roll: over 270 kg up to 450 kg over 450 kg up to 700 kg over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	unsuitable unsuitable unsuitable unsuitable 12 10 10 8 8 6	unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable 12
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
Vibratory plate compactor	1	Mass per m ² of base plate: over 880 kg up to 1100 kg over 1100 kg up to 1200 kg over 1200 kg up to 1400 kg over 1400 kg up to 1800 kg over 1800 kg up to 2100 kg over 2100 kg	unsuitable unsuitable unsuitable 10 8 6	unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable
	2			
	3			
	4			
	5			
	6			
Vibro-tamper	1	Mass: over 50 kg up to 65 kg over 65 kg up to 75 kg over 75 kg up to 100 kg over 100 kg	unsuitable unsuitable unsuitable 8	unsuitable unsuitable unsuitable unsuitable
	2			
	3			
	4			
Power rammer	1	Mass: 100 kg up to 500 kg over 500 kg	8 6	unsuitable 10
	2			
Dropping weight compactor	1	Mass of rammer over 500 kg height drop: over 1 m up to 2 m over 2 m	unsuitable unsuitable	unsuitable unsuitable
	2			

TABLE 6/5: (11/05) Off-Site Grading Requirements for Class 6 Acceptable Earthworks Materials

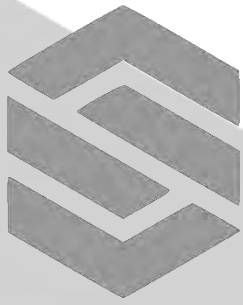
Class	Percentage by Mass Passing the Size Shown													Class								
	Size (mm)			Size (microns) BS EN 933-2 Series																		
	500	300		125	80	63	40	31.5	20	16	10	8	6.3	4	2	1	500	250	125	63	0	
6A	100										0-100		0-85				0-45			0-5		6A
6B	100			0-10																		6B
6C				100			0-100						0-100	0-35	0-10		0-2					6C
6D											100			85-100	60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock			6D
6E & 6R				100	85-100						25-100						10-100			<15		6E & 2R
6F3				100	75-99		50-90		30-75		15-60				0-35					0-12		6F3
6F4				100		100		75-99		50-90		30-75				0-35				<15		6F4
6F5				100	75-99		50-90		30-75		15-60									0-12		6F5
6H									100				60-100			15-45	0-25		0-5			6H
6I & 6J				100	85-100					25-100					15-100		9-100			<15		6I & 6J
6K									100											0-10		6K
6L											100			85-100	60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock			6L
6M					100															0-10		6M
6N & 6P					100															<15		6N & 6P
6S						100									60-100		30-90		8-45	0-16		6S

Site Specific Earthworks Specification

Appendix 6/1

The earthwork specification, (utilising Series 600 – Specification for Highways Works), was to achieve;

- At least 95% maximum dry density and less than 5% air voids,
- Undrained Shear strength - 50kPa in remoulded / re-engineered fill (where applicable).
- A CBR value of 3% at finished level prior to capping and pavement construction.
- Optimum MC% of fill to be (Average 18%). Excessively wet / dry moisture at +/-6% is likely to be unacceptable.
- 2A/B/C cohesive material to be compacted to an end product specification. Site trial required to confirm layer thickness, passes in relation to plant
-



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