Verification Report

Client: Greene King

Emersons Green, Bristol

Report No: 938.04.01

March 2024

REMADA GEO CONSULTANTS

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Issue No	*Date*	*Prepared By*	*Technical Review*	*Authorised*
01	*12.03.2024*	*P Dickinson* [redacted]		

1. INTRODUCTION

Remada Ltd was appointed by Greene King (hereafter referred to as the 'the Client') to prepare a Verification Report for the implementation of remediation works at land off Fieldfare, Emersons Green, Bristol, BS16 7FN.

1.1 Objectives

The objective of this assessment is to verify that the remediation works were implemented in general accordance with the approved Remediation Statement to discharge Condition 13 of South Gloucestershire Council's Planning Permission ref: P19/8333/F.

1.2 Scope of Work

The scope and layout of this document has been designed in mind of the Environment Agency's Land Contamination Risk Management guidance for land contamination reports.

The scope of work implemented by the Principal Contractor, PCA, on behalf of Greene King comprised:

- pump out and dispose of standing water within the eastern area of the site.
- general site clearance.
- preparation of ground levels in advance of store construction.
- disposal of wastes.

Remada was appointed to:

- Attend site during the site enabling works.
- Produce site inspection reports for the gas membrane installations.
- Review correspondence from the contractor confirming that remedial measures were implemented as necessary prior to casting the floor slab.
- Document actions taken by the contractor in the event that unforeseen contamination is identified during the works.
- Incorporate test results supplied the contractor that demonstrate imported landscape soils are suitable for use.
- Prepare the Remediation Verification Report

1.3 Previous Reports

A summary of the available reports is tabulated below:

2019	*Phase 1 Geo-environmental and Geotechnical Report for a proposed commercial development at Emersons Green, Bristol, by GIP Ltd (ref: KCD/28099A).* *Phase II Ground Investigation Report for a Proposed Commercial Development, at Emersons Green, Bristol, by GIP Ltd (ref: KCD/28099a)*
2020	*Inspection & Testing report, by Dynamic Ground Solutions (ref: C20-248).*

2022	*Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment, by Landmark Information Group Ltd, on behalf of Remada Ltd (ref: 938.01.01).*
2023	*Supplementary Investigation Report, by Remada Ltd (ref: 938.02.01).* *Remediation Strategy, by Remada Ltd (ref: 938.04.01) issued in August 2023.*

1.4 Planning Conditions

The following pre-approval conditions set out by South Gloucestershire Council are to be addressed by the submission of Remada's previous Remediation Strategy, and the subsequent verification strategy. It should be noted that the development of the pub/restaurant referenced in Condition 13 has been amended in favour of the present development strategy comprising the construction of a Gregg's and McDonald's, both with drive-thru facilities.

Condition 13 - Remediation Strategy (in respect of the Pub/Restaurant)

A) *Remediation Strategy – The GIP Ground Investigation report dated June 2019 identified a low risk from ground gases and recommended precautionary gas protection measures equivalent to CS2. Prior to commencement of development of the Pub/Restaurant details of the proposed gas protection measures shall be confirmed and agreed in writing with the Local Planning Authority. The program of the works to be undertaken should be described in detail and the methodology that will be applied to verify the works have been satisfactorily completed.*

   The approved remediation scheme shall then be carried out before the Pub/Restaurant development (or relevant phase of development) is occupied.

B) *Verification Strategy – Prior to first occupation of the Pub/Restaurant, where works have been require to mitigate contaminants (under Part A) a report providing details of the verification demonstrating that all necessary remediation works have been completed satisfactorily shall be submitted to and agreed in writing by the Local Planning Authority.*

C) *Any contamination found during the course of construction of the Pub/Restaurant development that was not previously identified shall be reported immediately to the Local Planning Authority. Development on the part of the site affected shall be suspended and a risk assessment carried out and submitted to and approved in writing by the Local Planning Authority. Where unacceptable risks are found additional remediation and verification schemes shall be submitted to and approved in writing by the Local Planning Authority. These approved schemes shall be carried out before the Pub/Restaurant development (or relevant phase of development) is resumed or occupied whichever is the sooner.*

1.5 Limitations

The comments given in this report and the opinions expressed are based on the information reviewed and observations during site work. However, there may be conditions pertaining to the site that have not been disclosed by this assessment and therefore could not be taken into account.

2. GENERAL SITE CHARACTERISTICS

2.1 Site Description

Prior to the commencement of the construction of the McDonalds and Greggs retail units, the site comprised a level development platform to the north of the A4174. Historically, the site comprised agricultural land on the mapping of 1881 and remained until the associated farm and nursery to the south had been replaced by the new A4174 road and roundabout by 1989. The road 'Fieldfare' along the northern boundary of the site had been constructed by 2014.

The site is located in a mixed commercial and residential setting. The area to the west is occupied by a Costa 'drive-thru' unit adjacent to the western boundary, with a Travelodge beyond. Several commercial units are present to the north of the site, with the M4 motorway beyond. An office block is present to the east of the site, with Folly Brook Road beyond. The A4174 road bounds the site to the south, with residential properties beyond.

The opportunity was taken to inspect the site on 20th February 2023, with Remada's walkover being recorded in **Photos 1 – 4** below.

Photo 1: The southern and eastern site boundaries marked by wooden fencing and shrubs. The majority of the site consists of a compacted clay surface covered with a thin layer of vegetation.

Photo 2: A view towards the north-western corner of the site. Some standing water was present during the site investigation as well as softer ground.

Photo 3: *Looking south-west across the site showing the hedge forming the southern site boundary and the A4174 beyond.*

Photo 4: A view eastwards along the eastern zone of the site, the majority of this area consisted of standing water circa 0.25m deep.

2.2 Ground Investigation Findings

2.2.1 Phase 2 Report, by GIP Ltd (June 2019)

Remada was provided with GIP's Phase 2 Ground Investigation Report (ref: KCD/28099B, dated 19th June 2019), for which the pertinent sections of the Executive Summary are reproduced below. :

Scope of Investigation

Twenty-two windowless sample boreholes were advanced to depths between 2.34 and 3.41mbgl to enable geotechnical testing and environmental sampling of soils. Thirty-six trial pits were also excavated to depths ranging from 0.60 to 2.80mbgl to establish the geotechnical design characteristics of shallow soils and to obtain environmental soil samples for chemical testing. Soakaway was also carried out within nine of these trial pits.

Ground Conditions Encountered

Intrusive investigations encountered Made Ground comprising demolition material and industrial by-products to a maximum depth of 2.50mbgl on-site, and 2.80mbgl within the bund along the northern

site boundary. The Made Ground was found to overlie residual soils predominantly comprising stiff and very stiff clays with mudstone and siltstone lithorelicts which was underlain by extremely weak reddish-brown, green-grey, and light grey mudstones, siltstones, and occasionally sandstones.

Groundwater

Groundwater was not encountered during the intrusive investigation, although 0.02 to 0.04m of groundwater was noted during the monitoring period within a single 3.30m deep standpipe (WS306).

Risk to Human Health

No concentrations of the determinants tested for were found to exceed their appropriate screening values for the proposed end-use of the site. No asbestos was detected, and no olfactory evidence of contamination was noted during the ground investigation.

Concrete Classification

The conclusions of concrete classification testing recommended that an ACEC class of AC-1s be adopted for the design of buried concrete structures.

Gas Protection Measures

Six readings over four visits within two of the monitoring installations recorded carbon dioxide concentrations exceeding 5%. Considering the Made Ground encountered on-site which was found to contain industrial by-products and buried topsoil/organic horizons, a characteristic gas situation of CS-2 (low hazard potential) was recommended for the site, which precluded the inclusion of gas protection measures within the design of the proposed development.

Soakaway Design

Nine soakaway tests were carried out within which water levels were observed to fall by less than 0.11m over four hours. The negligible drop in water levels and the prevalence of cohesive soils on-site lead to the designation of the on-site soils as being practically impermeable, and it was recommended that an alternative drainage scheme be adopted.

2.2.2 Inspection & Testing Report, by Dynamic Ground Solutions (February 2020)

In February 2020, Dynamic Ground Solutions provided an Inspection & Testing Plan for the site. This document presented the requirements for earthworks and stabilisation works in order to form a site platform for a subsequent construction phase. The scope of works proposed by DGS is reproduced below:

1. *Mobilise to site and carry out a 100mm vegetation site strip and leave stockpiled for removal by others.*
2. *Carry out the earthworks cut/fill across the site based on a 300mm stabilised capping layer at FFl-300mm.*
3. *Carry out the Rolling Dynamic Compaction across the site.*
4. *The installation of a 30% CBR frost resistant stabilised sub-base replacement layer.*
5. *Supply and install 3 No. attenuation tanks totalling 242m^3 gross volume.*
6. *Push out 100mm thick Type 1 stone layer as supplied by others.*

Lightweight deflectometer (LWD) testing undertaken on the formation layer by DGS in 2020 recorded CBR values between 32% and 57%, with all passing their 30% target.

2.2.3 Supplementary Investigation Report, by Remada Ltd (April 2023)

Remada was commissioned by the Client to undertake an intrusive investigation on-site in February 2023. The objectives of this investigation were to undertake geotechnical testing within the footprints of the proposed Gregg's and McDonald's drive-thru units in the central area of the site, and to assess the chemical composition and strength of the capping layer placed on-site.

The findings were presented in Remada's Supplementary Investigation Report (ref: 938.02.01, issued in April 2023), with the Executive Summary being reproduced below:

> ***Intrusive Investigation***
>
> *The investigation comprised the drilling of four window sample boreholes and the undertaking of four falling-weight deflectometer (FWD) CBR tests. Three of the window sample boreholes were positioned within the footprint of the proposed Gregg's drive-thru unit in the western area of the site, whilst the fourth was located within the footprint of the proposed McDonald's drive-thru unit in the east. The four FWD CBR tests were located in the central area of the site, targeting proposed car parking and access roads.*
>
> ***Proposed Drive-Thru Units***
>
> *Within all four boreholes, firm to stiff, reddish-brown, locally sandy and gravelly clay was encountered to depths of between 0.40 and 0.80mbgl. This cohesive stratum was typically underlain by stiff reddish brown and brown CLAY, with mudstone lithorelicts being observed below c.1.5m in WS1 and WS2. SPT refusals (N-value >50) were encountered in all four boreholes at a depth of 2.00mbgl.*
>
> *No groundwater was encountered within any of Remada's exploratory holes, although a large area of standing water was noted occupying the majority of the proposed McDonald's drive-thru footprint.*
>
> *Preliminary calculations indicated that for a shallow traditional pad foundation (up to 1.2m wide) at a minimum of 1.2m depth, bearing within the stiff cohesive materials (with a minimum undrained shear strength of 100kN/m^2), a design bearing resistance of 200kN/m^2 would be appropriate to satisfy the ultimate and serviceable limit states in accordance with BS EN 1997-1: 2004.*
>
> *All samples of clay were reported as being of intermediate plasticity and low volume change potential.*
>
> *A Design Sulphate Class DS-1 was considered appropriate for buried concrete and an ACEC Class of AC-1s was considered appropriate for the location.*
>
> *Side slopes within the clay are likely to remain stable in the short term without support or without being battered back to a safe slope gradient. However, side slopes within the Made Ground and any encountered granular deposits are unlikely to remain stable even in the short term without support or without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during excavation and a risk assessment carried out to fully assess the support measures required.*
>
> ***Capping Layer***
>
> *The Client-supplied DGS Verification Report indicated that the compacted stabilized platform on-site should have comprised a 300mm thick capping layer with a minimum CBR value of 30%. All four of Remada's boreholes encountered a 400mm – 800mm layer of firm to stiff, reddish brown locally sandy and gravelly clay from surface levels and there was no evidence of anthropogenic material being present within this stratum. It was considered likely that this cohesive stratum is representative of the compacted stabilized platform (capping layer).*

Four FWD CBR tests undertaken on this stratum exhibited equivalent CBR values ranging between 27% and 44%.

The results of soil chemical analysis carried out on this stratum were compared to Human Health Generic Assessment Criteria for commercial land use. None of the concentrations of the determinants tested for exceeded their appropriate screening values for the proposed development end-use for the protection of end-users and construction phase workers.

The results of the assessment indicated that contaminant concentrations within the samples were generally low and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

Waste Acceptance Criteria (WAC) analysis was undertaken on a sample of the capping layer material and concluded that the sample met the requirements for disposal in an inert landfill.

2.3 Remediation Strategy Requirements

Environmental and geotechnical remediation requirements are summarised below:

Environmental Remediation Objectives

The principal environmental remediation objectives are to remove the identified environmental liabilities in order to discharge South Gloucestershire Council's planning condition by:

- Ensuring that the public and adjacent residents are not exposed to contaminants.
- Ensuring controlled waters are not exposed to chemical contaminants.
- Preventing ground gas intrusion into proposed store building using gas protection measures.
- Identifying, manage and assess unforeseen contamination.
- Constructing hard-cover surfacing beneath car park and external to stores' footprints; and
- Providing clean cover or fill to the proposed landscaped areas.

Geotechnical Remediation Objectives

The principal geotechnical remediation objectives are to:

- Remove existing hardstanding in the area of the proposed McDonald's drive-thru footprint;
- Remove existing any relic foundations beneath proposed McDonald's drive-thru footprint in their entirety;
- Crush, screen and emplace existing demolition rubble and rubble generated from the demolition of the existing hardstanding for re-use as engineered fill.

2.4 Pre-Remediation Conceptual Site Model

The pre-remediation Conceptual Site Model has been reproduced below:

Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Un-mitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
On-site Sources **Ground gases** *characteristic situation CS-2 applicable to site based on gas monitoring undertaken to-date.* ***Off-site Sources*** **Ground gases (methane and carbon dioxide)** *associated with possible Made Ground or organic-rich deposits to the north.* **Heavy metals, PAHs, and hydrocarbons** *associated with possible Made Ground including the mound forming the northern boundary.* **Asbestos** *associated with past and current structures adjacent to the site.*	Methane, carbon dioxide.	Inhalation. Direct Contact with occupants of the proposed development (commercial). Inhalation of fibres / vapours / gases by occupants of proposed development. Permeation of water supply pipework. Leachate.	Occupants of the development / building fabric Adjacent residents during construction Secondary Aquifer	Direct Soil Ingestion	• Yes	No exceedance of GAC.	Very Low	Hardstanding to cover retail site minimising direct contact.	Negligible
				• Indoor Dust ingestion	• Yes	As above	Very Low	As above	Negligible
				• Skin Contact with Soils	• Yes	As above	Very Low	As above	Negligible
				• Skin Contact with Dust	• Yes	As above	Very Low	As above	Negligible
				• Inhalation of Outdoor Dust	• Yes	As above	Very Low	As above	Negligible
				• Inhalation of Outdoor Vapours	• Yes	As above	Very Low	As above	Negligible
				• Inhalation of Indoor Vapours	• Yes	As above	Very Low	As above	Negligible
				• Ingestion via permeated water supply pipework	• Yes	As above	Very Low	As above	Negligible
				• Inhalation of ground gas	• Yes	CS2	Low	Gas protection measures	Negligible
				• Inhalation of radon gas	• Yes	Low Probability Radon Area	Very low	As above	Negligible
				• Leaching to Secondary A Aquifer in Superficial Deposits and / or Principal Aquifer in Bedrock	• Yes	No exceedance of GAC.	Very low	Hardstanding to prevent precipitation infiltration and leaching.	Negligible

Table 1: Pre-remediation Conceptual Site Model

3. REMEDIATION ACTIVITIES

3.1 Overview

The remediation and site preparation works commenced in the Winter 2023. Perched water was pumped from the eastern area of the site (**Photo 4**) into the drainage system in November 2023. The Principal Contractor, PCA, have confirmed in writing that a sediment filter was employed; this correspondence being presented in **Appendix A**, as well as a receipt for the filter.

A summary of the remediation activities is presented on **Figure 1.**

During Remada's first visit to site during the construction phase on 9th & 10th January 2024, general site clearance and preparation of ground levels had already taken place, as shown in **Photos 5 – 8.**

Photo 5: *View south-westwards towards Greggs retail unit on 10th January 2024.*

Photo 6: *View eastwards across the site, with the site entrance shown on the immediate left on 10th January 2024.*

Photo 7: *View southwards across the site on 10th January 2024.*

Photo 8: *View from the northern boundary of the site across the footprint of the proposed McDonalds retail unit on 10th January 2024.*

.

During Remada's subsequent visit to site during the construction phase on 16th February 2024, general site clearance and preparation of ground levels had already taken place, as shown in **Photos 9 – 12.**

Photo 9: *Construction of roadway around Greggs unit on 16th February 2024*

Photo 10: *Access road around McDonalds unit in the process of receiving concrete on 16th February 2024.*

Photo 11: *Similar view to Photo 10.*

Photo 12: *View westwards towards the Greggs unit.*

3.2 Re-use of Site Won Concrete

Relic Floor Slabs

The site had previously been formed as a compacted stabilised platform, prior to PCA commencing their preparatory works on-site. No relic floor slabs were encountered by PCA, including beneath the ponded water in the eastern area of the site.

Relic Basements

None encountered.

3.3 Groundwater in Excavations and Basements

No groundwater encountered during the redevelopment of the site.

3.4 Soft Landscaping Topsoil

In the absence of any suitable soft landscaping soils available on-site, PCA have imported BS3882:2015 compliant 'Multipurpose Grade' topsoil. PCA's provided laboratory testing certificate for this is presented as **Appendix B.**

3.5 Unforeseen Contamination

There were no visible or olfactory indicators of unforeseen contamination during the works. This has been confirmed by PCA within the correspondence presented in **Appendix A**.

3.6 Gas Membrane

The Remediation Strategy set out requirements for the installation of ground gas protection measures for occupants of the proposed store building to meet the requirements of Characteristic Situation 2.

A Visqueen Gas Barrier membrane was installed beneath the reinforced concrete floor slabs and inspected by Remada on 10th January 2024 and 16th February 2024. In summary the inspections were undertaken when the membrane had been laid on the sub-base layer as per the foundation schematics drawing in Remada's Remediation Strategy and prior to the fixing of steel and pouring of the concrete slab.

Checks comprised those listed within the Remediation Strategy as recorded on the attached inspection records at **Appendix C.** Where repairs or additional works were required, Remada requested evidence from the Principal Contractor which was duly provided.

4. RISK ASSESSMENT

The upper limits for general fill produced from the excavation and processing of associated Made Ground were limited to the LQM/CIEH S4ULs for Commercial Land Use as presented in the Remediation Strategy.

4.1 Made Ground

The Phase 2 Ground Investigation, Remediation Strategy and Pre-Remediation Conceptual Model did not identify a need to remediate made ground.

4.2 Site Won Crushed Concrete

No relic foundations or buried concrete encountered.

4.3 imported Topsoil

PCA have imported BS3882:2015 compliant 'Multipurpose Grade' topsoil, as detailed in **Appendix B**.

4.4 Ground Gas

Intrusive investigations on-site in 2019 concluded the site should be classified as gas Characteristic Situation 2 (CS2), with basic gas protection measures being required within the two retail units on-site. A Visqueen Gas Barrier membrane was installed beneath the reinforced concrete floor slabs and inspected by Remada on 10th January 2024 and 16th February 2024

5. WASTE DISPOSAL RECORDS

The following wastes were removed from site:

Excavated Concrete

None encountered.

Soils

Thirty five (35 No.) loads of surplus soils were removed as non-hazardous waste (17.05.04) by Bristol & Avon Transport & Recycling Ltd to Holloway Road, BS34 4BR between 23rd and 30th January 2024. Example muckaway tickets are presented in **Appendix D**.

Scrap Metals

None encountered.

Full waste disposal records are held by PCA and are available upon request.

REFERENCES & GUIDANCE

AGS, Guidance on the Waste Classification for Soils – A Practitioners' Guide 2019.

Barnes, G. 2010, Soil Mechanics Principles and Practice. 3rd Edition.

BRE, Special Digest 1:2005 (3rd Edition), Concrete in Aggressive Ground. 2005.

BRE465 Cover Systems for Land Regeneration 2004

BS 10175:2011+A1:2013, Investigation of potentially contaminated sites: Code of practice.

BS 1377:1999. Methods of test for soils for civil engineering purposes.

BS 5930:2015+A1:2020, Code of practice for site investigations.

BS 8485:2015+A1:2019, Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

BS 8576:2013, Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

BS EN ISO 22476-3:2005, Geotechnical investigation and testing: Field testing - Standard penetration test.

CIRIA, C665, Assessing risks posed by hazardous ground gases to buildings, 2007.

CIRIA, C682, The VOCs Handbook: Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination, 2009.

CIRIA, C716, Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination, 2012.

CIRIA C733, Asbestos in Soil and Made Ground: A Guide to Understanding & Managing Risks.

CL:AIRE/EIC/AGS, The Soil Generic Assessment Criteria for Human Health Risk Assessment, 2009.

CL:AIRE, SP1010, Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination -Final Project Report. 2013.

CL:AIRE, The Definition of Waste: Development Industry Code of Practice Version 2

DEFRA, Circular 01/2006, Contaminated Land Environmental Protection Act 1990, Part 2A. 2006.

DEFRA, SP1010, Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. March 2014.

Environment Agency, Verification of Remediation of Land Contamination Science Report – NC/00/38/SR

Environment Agency, Waste Classification, Guidance on the classification and assessment of waste (1st Edition V1.2GB) Technical Guidance WM3. October 2021.

Health & Safety Executive, HSG 66, Protection of Workers and the General Public During Redevelopment of Contaminated Land. 1991.

Highways Agency, IAN 73/06 Rev 1, Design of Pavement Foundations, 2009.

Land Contamination Risk Management www.gov.uk 08.10.2020.

LCM/CIEH, The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, S4UL3146, 2015.

NHBC Standards, 2024.

Tomlinson, M.J., 2001, Foundation Design and Construction, 7th Edition.

The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

The Definition of Waste: Development Industry Code of Practice, CL:AIRE 2011.

UKWIR, Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. 2011

STUDY LIMITATIONS

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Remada, Ltd with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with (the 'Client'). Remada does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.

3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Remada is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have published, more stringent objectives. Further work may be required by these parties.

4. All work carried out in preparing this report has used, and is based on, Remada' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice pending changes in legislation, of which Remada is aware, have been considered. Following delivery of the report Remada has no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are to the best of Remada' belief, Remada cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have received

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

9. The content of this report represents the professional opinion of experienced environmental consultants. Remada does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.

12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13. Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have NOT been analysed or assessed for waste classification purposes.

FIGURE 1
Remediation Activities

Concrete Aggressivity

The pH and concentrations of water soluble sulphate place the site into a Design Sulphate Class DS-1 for buried concrete and an ACEC Class of AC-1s.

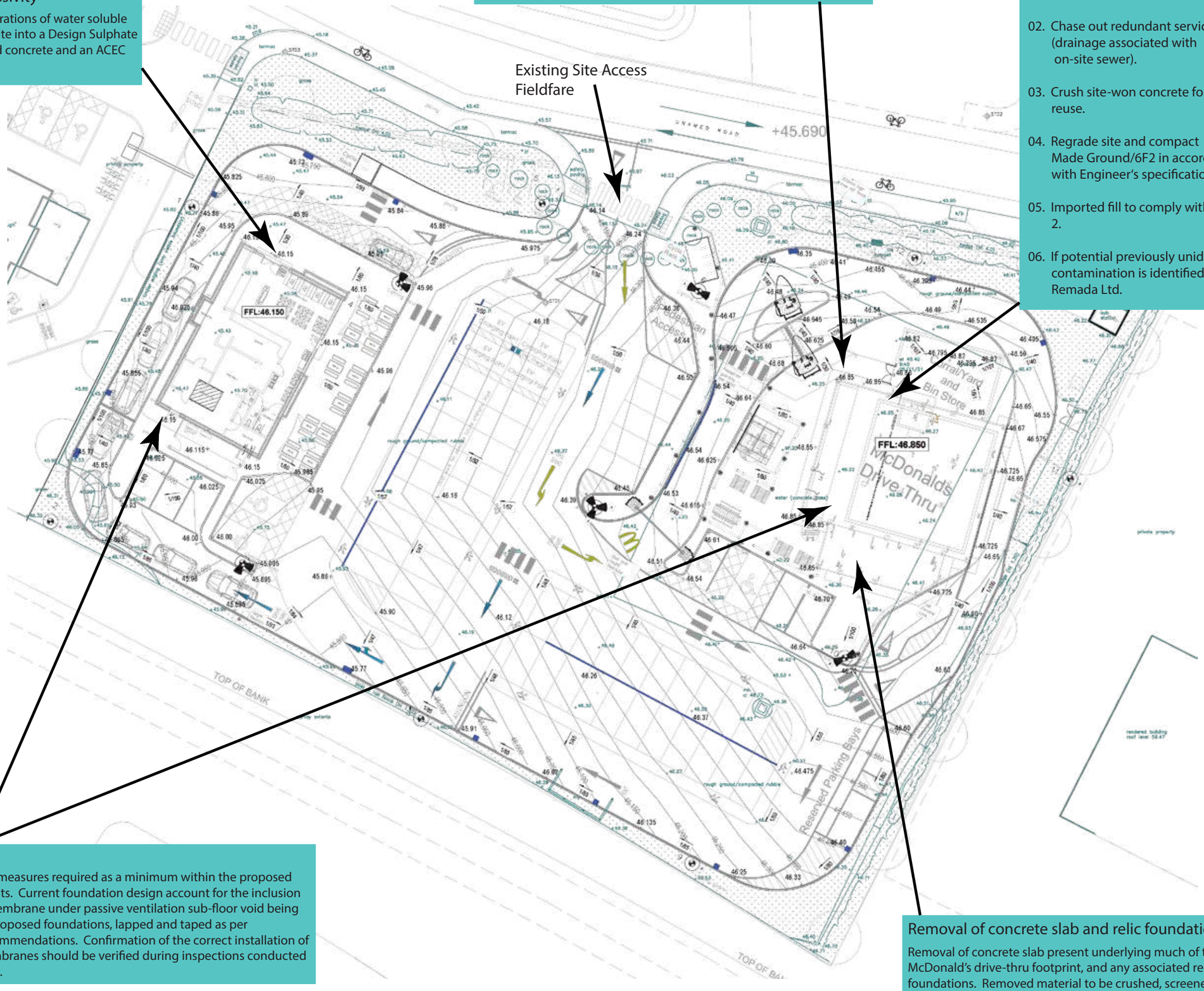
Additional Investigation

Confirmation of the suitability of placed engineered fill will be required to ensure suitability of bearing capacity for the proposed foundations.

General Requirements

01. Break out concrete slab and any associated foundations.
02. Chase out redundant services (drainage associated with on-site sewer).
03. Crush site-won concrete for reuse.
04. Regrade site and compact Made Ground/6F2 in accordance with Engineer's specification.
05. Imported fill to comply with Table 2.
06. If potential previously unidentified contamination is identified, consult Remada Ltd.

Existing Site Access
Fieldfare



Ground Gas

CS2 gas protection measures required as a minimum within the proposed drive-thru restaurants. Current foundation design account for the inclusion of a gas resistant membrane under passive ventilation sub-floor void being installed over the proposed foundations, lapped and taped as per manufacturers' recommendations. Confirmation of the correct installation of gas protection membranes should be verified during inspections conducted during construction.

Removal of concrete slab and relic foundations

Removal of concrete slab present underlying much of the McDonald's drive-thru footprint, and any associated relic foundations. Removed material to be crushed, screened, and processed into 6F2 engineered fill designated for reuse on-site.

Legend

Notes

Project Title
Emersons Green, Bristol

Drawing Title
Figure 1: Remediation Strategy Activities

Client
Greene King

Scale	Drawn	Size
as shown	ST	A4
Date	Job No.	Drawing /Rev No.
23.08.23	938.04	01

REMADA GEO & CONSULTANTS

APPENDIX A
Email Correspondence from Principal Contractor (PCA)

Thursday, March 7, 2024 at 08:01:52 Greenwich Mean Time

Subject:	RE: Remada Order - FW: Emerson's Green, Bristol
Date:	Wednesday, 6 March 2024 at 17:58:14 Greenwich Mean Time
From:	johann@pcabuild.co.uk
To:	Peter Dickinson, qs@pcabuild.co.uk, operations@pcabuild.co.uk
CC:	patrick@pcabuild.co.uk, sitemanager1@pcabuild.co.uk, Greg Jones, Shane Mcnulty, Paul Curlett
Attachments:	image003.jpg, image004.png, image005.png, image002.png, image008.png, Topsoil certs.zip, Muck away tickets.zip, 2206307.pdf

Hello Peter,

Please take this email as confirmation that no unforeseen contamination was identified during the construction works on site at Emerson Green, Bristol, BS16 7FE .
Throughout the duration of the construction activities, I can confirm that no unexpected or previously unknown contamination was encountered on the site.
Any potential risks or concerns related to contamination were diligently monitored and managed, and I am pleased to confirm that no such issues arose during the construction works.

Please find attached lab test results for imported landscape soils and muck away tickets as requested.

As discussed, we pumped the standing rainwater into the drainage system and employed a sediment filter. Regrettably, I am unable to locate images of the sediment filter in operation. However, please refer to the attached invoice for the purchase of the sediment filters. We did utilize them, and I will search for the corresponding pictures.

Kind regards

Johann Barnard
[M] 07568 391923

From: Peter Dickinson <peter.dickinson@remada.co.uk>
Sent: 06 March 2024 15:11
To: qs@pcabuild.co.uk; operations@pcabuild.co.uk
Cc: johann@pcabuild.co.uk; patrick@pcabuild.co.uk; sitemanager1@pcabuild.co.uk; Greg Jones <greg.jones@remada.co.uk>
Subject: Re: Remada Order - FW: Emerson's Green, Bristol

Hi All,

Further to my message a week ago (included in the email chain below dated 27/02/2024), I've yet to receive a response.

Can the requested information be forwarded over please?

Regards,

Peter Dickinson
Principal Consultant
Remada Ltd

T: 0333 123 5222
E: peter.dickinson@remada.co.uk
A: Forward House, 17 High Street, Henley in Arden, Warwickshire B95 5AA
M: 07885 300691

www.remada.co.uk

My usual working hours are Monday – Friday, 8am – 4pm.
I'm sending this email now, but do not expect you to read, respond or action things outside of the hours that work for you.

From: Peter Dickinson <peter.dickinson@remada.co.uk>
Date: Tuesday, 27 February 2024 at 13:10
To: qs@pcabuild.co.uk <qs@pcabuild.co.uk>, operations@pcabuild.co.uk <operations@pcabuild.co.uk>
Cc: johann@pcabuild.co.uk <johann@pcabuild.co.uk>, patrick@pcabuild.co.uk <patrick@pcabuild.co.uk>, sitemanager1@pcabuild.co.uk <Sitemanager1@pcabuild.co.uk>, Greg Jones <greg.jones@remada.co.uk>
Subject: Re: Remada Order - FW: Emerson's Green, Bristol

Hi All,

As part of Remada's appointment by Greene King to undertake the Verification Reporting for the site at Emersons Green, we will require the following information from yourselves:

- Written confirmation that unforeseen contamination was not identified during the construction works. If it was encountered, please detail what actions were taken by PCA.
- Lab test results for any imported landscape soils.
- Waste disposal / transfer notes for any waters and surplus soils that have been removed from site.

Any issues with supplying the above, please contact me directly: 07885 300 69. Many thanks in advance.

Regards,

Peter Dickinson
Principal Consultant
Remada Ltd

T: 0333 123 5222
E: peter.dickinson@remada.co.uk
A: Forward House, 17 High Street, Henley in Arden, Warwickshire B95 5AA
M: 07885 300691

www.remada.co.uk

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johann@pcabuild.co.uk
www.pcabuild.co.uk

Construction | Civil Engineering | Maintenance

APPENDIX B
Topsoil Laboratory Testing Certificate

Certificate of Analysis

Client: (R600)
ANALYSIS SERVICES DIRECT
NRM LABORATORIES
COOPERS BRIDGE
BRAZIERS LANE
BRACKNELL
BERKS

Originator:
AMANDINE LENFANT
PLOT 2
WARNE RD
WESTON SUPER MARE
SOIL

Lab ID: 22469 - 567445
Sample ID: TOWENS OF WESTON
Sample Weight: 871g

Date Received: 22/06/2022
Date Reported: 05/07/2022

BS 3882 : 2015 SPECIFICATION FOR TOPSOIL
Multipurpose Grade

		Unit	Result		Compliant with range (Y/N) Multi-P	Acid	Calc	Low-F	Low-F Acid	Low-F Calc
Texture:	Clay	% w/w	29							
	Silt	% w/w	36			*See area of permitted soil textural*				
	Sand	% w/w	35			*classes in Fig. 1.*				
	Textural Class		Clay Loam		Y	Y	Y	Y	Y	Y
Organic Matter:		% w/w	7.5		Y	Y	Y	Y	Y	Y
Coarse	>2 mm	% w/w	0.4		Y	Y	Y	Y	Y	Y
Fragment	>20 mm	% w/w	0.0		Y	Y	Y	Y	Y	Y
Content:	>50 mm	% w/w	0.0		Y	Y	Y	Y	Y	Y
Soil pH:			6.8		Y	N	N	Y	N	N
Carbonate:		% w/w	1.2				Y			Y
Available	Nitrogen	% w/w	0.430		Y	Y	Y			
Plant	Phosphorus	mg/l	26.2	(3)*	Y	Y	Y	N	N	N
Nutrients:	Potassium	mg/l	149.1	(2-)*	Y	Y	Y			
	Magnesium	mg/l	165.8	(3)*	Y	Y	Y			
Carbon:Nitrogen Ratio:		:1	10.1		Y	Y	Y	Y	Y	Y
Exchangeable Sodium Percentage:		%	1.0							
Phytotoxic	Total Zinc	mg/kg	94.2		Y	Y	Y	Y	Y	Y
Contaminants:	Total Copper	mg/kg	21.2		Y	Y	Y	Y	Y	Y
	Total Nickel	mg/kg	22.8		Y	Y	Y	Y	Y	Y
Visible	> 2mm	% w/w	0.00		Y	Y	Y	Y	Y	Y
Contaminants:	Plastics	% w/w	0.00		Y	Y	Y	Y	Y	Y
	Number of Sharps		0		Y	Y	Y	Y	Y	Y
Additional	Available Sodium	mg/l	27.5							
Analysis:	Available Calcium	mg/l	2140.0							
	Conductivity	uS/cm	2151		Y					
Compliancy:					**Y**	**N**	**N**	**N**	**N**	**N**

Results are expressed on a dry matter basis.
* Soil indices from RB209

Released by: *Myles Nicholson* **Date: 05/07/2022**

DECLARATION: I certify that this sample has been analysed by NRM in accordance with BS 3882 Specification for Topsoil (2015).

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
Tel: +44 (0) 1344 886338 **Fax:** +44 (0) 1344 890972 **Email:** enquiries@nrm.uk.com **www**.nrm.uk.com

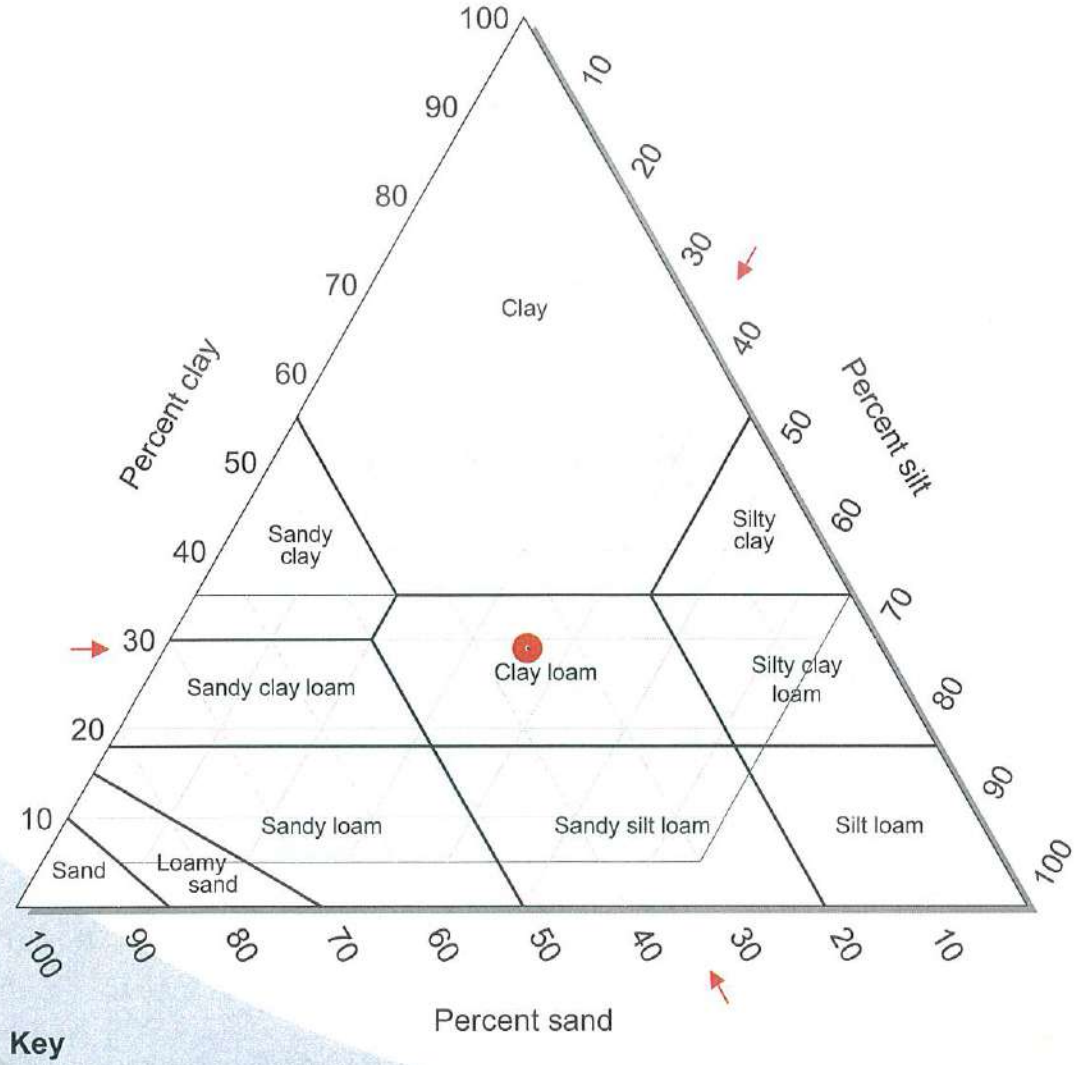
Analytical Report

Client:	ANALYSIS SERVICES DIRECT	**Originator:**	AMANDINE LENFANT
(R600)	NRM LABORATORIES		PLOT 2
	COOPERS BRIDGE		WARNE RD
	BRAZIERS LANE		WESTON SUPER MARE
	BRACKNELL		SOIL
	BERKS		

Lab ID: 22469 - 567445
Sample ID: TOWENS OF WESTON
Sample Weight: 871g

Date Received: 22/06/2022
Date Reported: 05/07/2022

Fig. 1. Textural Class: Clay Loam (compliant)



Key

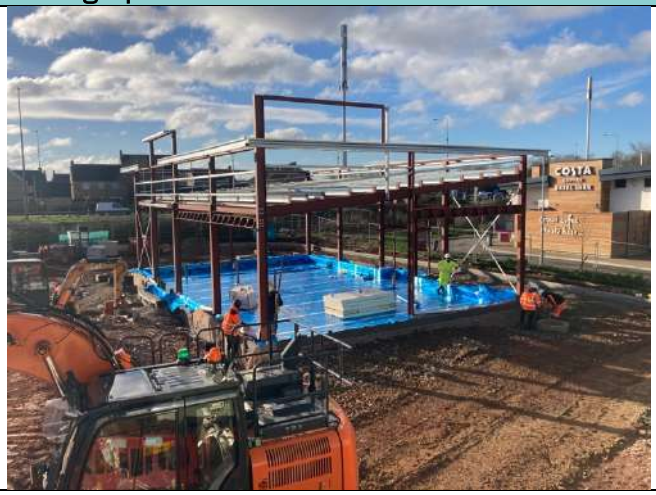
Area within which texture of topsoil is required to fall.

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
Tel: +44 (0) 1344 886338 **Fax:** +44 (0) 1344 890972 **Email:** enquiries@nrm.uk.com **www**.nrm.uk.com

APPENDIX C
Gas Membrane Inspection Records

Site Name:	New Greggs Store, Emersons Green, Bristol BS16 7FE	**Gas Characteristic Situation (CS)**	CS 2
Remada Job No:	938.05	**Type of Development & Building / Block Checked:**	Ground Bearing Floor Slab
Dates:	10th January 2024	**Building Description:**	New Build Construction
Inspection By:	Peter Dickinson	**Gas Protection Type:**	Passive

No.	Item	Comments
1 Gas Membrane		
1.1	**Condition of subgrade and underside of gas membrane**	150mm Type 1 subgrade material installed, with membrane laid on top.
1.2	**Gas membrane type**	Visqueen Gas Barrier
1.3	**Gas membrane condition**	No visible tears or damage where visible.
1.4	**Joint tape product**	Double sided joint tape
1.5	**Lapping design**	Overlap recorded on-site between 100 – 200mm, resulting in a 200 – 400mm overlap.
1.6	**Laps, welds and joints seals**	At the time of the inspection, some service entries and joints through floor slab still required sealing. Photos subsequently provided by PCA.
1.7	**Service entries seals**	Top hats installed and sealed.
2 Passive Venting		
2.1	**Sub-floor void**	N/A
2.2	**External wall airbricks**	N/A
2.3	**Internal sleeper wall**	N/A
2.4	**External vent trenches / duct**	N/A
3 Active Venting		
3.1	**System details**	N/A

No	Photograph	Description
1		The Gregg's unit under construction at the time of Remada's inspection on 10.01.2024.

2		Visqueen membrane installed within footprint of Gregg's unit.
3		Visqueen membrane installed within footprint of Gregg's unit, with majority of joints taped.
4		Overlap measured between individual sheets, with double-taping visible.

5		Top hat covers around service entry, sealed with tape and metal clip present.
6		Top hat cover around service entry, sealed with tape.
7		Top hat covers around service entry, sealed with tape and metal clip present.

8		190mm overlap noted along joints.

At the time of writing, some service entries and one joint still required sealing. PCA have provided Remada with photographic evidence to show that this work was completed on the 10th January 2024. A selection of these photographs is presented below:

Photos 9 and 10 – PCA supplied photo showing all joints to have been sealed.

Photos 11 and 12 – PCA supplied photo showing all joints to have been sealed, and top hat covers installed.

The gas protection measures inspected	a. Acceptable and comply with the specification. ~~b. Are acceptable but attention is drawn to issues related to item Nos 1 - 8 (after completion of installation)~~ ~~c. Are not acceptable due to use of a DPM only~~

Checked by:	**Peter Dickinson**	**Signature:**	P. Dickinson	**Date:**	11.01.2024

Site Name:	New McDonalds, Emersons Green, Bristol BS16 7FE	**Gas Characteristic Situation (CS)**	CS 2
Remada Job No:	938.05	**Type of Development & Building / Block Checked:**	Ground Bearing Floor Slab
Dates:	16th February 2024	**Building Description:**	New Build Construction
Inspection By:	Peter Dickinson	**Gas Protection Type:**	Passive

No.	Item	Comments
1 Gas Membrane		
1.1	**Condition of subgrade and underside of gas membrane**	150mm Type 1 subgrade material installed, with membrane laid on top.
1.2	**Gas membrane type**	Visqueen Gas Barrier
1.3	**Gas membrane condition**	No visible tears or damage where visible.
1.4	**Joint tape product**	Double sided joint tape
1.5	**Lapping design**	Overlap recorded on-site between 100 – 200mm, resulting in a 200 – 400mm overlap.
1.6	**Laps, welds and joints seals**	At the time of the inspection, some service entries and joints through floor slab still required sealing.
1.7	**Service entries seals**	Top hats installed and sealed.
2 Passive Venting		
2.1	**Sub-floor void**	N/A
2.2	**External wall airbricks**	N/A
2.3	**Internal sleeper wall**	N/A
2.4	**External vent trenches / duct**	N/A
3 Active Venting		
3.1	**System details**	N/A

No	Photograph	Description
1		The McDonalds's unit under construction at the time of Remada's inspection on 16.02.2024.

2		Visqueen membrane installed within footprint of McDonald's unit. Top hat covers still in the process of being installed.
3		Visqueen membrane installed within footprint of Gregg's unit, with majority of joints taped.
4		Overlap measured between individual sheets, with double-taping visible.

5		Product details of double-sided tape
6		Top hat cover around service entry, sealed with tape.

7		Top hat cover around service entries, sealed with tape.
8		Service entries still requiring top hat covers at the time of Remada's visit.

At the time of Remada's inspection, some service entries and some joints still required sealing. PCA have provided Remada with photographic evidence to show that this work was completed on the 16h February 2024.

A selection of these photographs is presented as **Photos 9 & 10** overleaf.

Photos 9 & 10 – PCA supplied photos showing all joints and service entries have been sealed.

The gas protection measures inspected:	a. Are acceptable and comply with the specification. ~~b. Are acceptable but attention is drawn to issues related to item Nos 1 - 8 (after completion of installation)~~ ~~c. Are not acceptable due to the issues related to item(s)~~

Checked by:	**Peter Dickinson**	**Signature:**	P. Dickinson	**Date:**	22.02.2024

APPENDIX D
Example Muckaway Tickets

Material Ticket

Bristol & Avon Transport & Recycling Ltd
Severn Road, Hallen, Bristol, BS10 7SE
Tel : 01179 829 561

Ticket No: 152058 **Date:** 23/01/2024 **Customer Order No:** 01.EMERSON.MB129

Account Address:
TR-BALCARDE
Balcar Developments Ltd
6 BRACKEN PARK
DERRY
NORTHERN IRELAND, BT48 8AZ

Address:
PCA BUILD (BALCAR) - FOLLY BROOK RD EMERSONS GREEN
HARLEQUIN BUSINESS PARK
FOLLY BROOK ROAD
EMERSONS GREEN
BS16 7FE

Vehicle: GTI - GT17MUK **Haulier:** GTI TRANSPORT **Waste Carriers Licence:** CBDU432877

Time On Site 16:05:20 **Time Off Site** 16:15:00

Outlet:	Westgate Phase 2 - Incoming, Land off Holloway Road, South Glos, BS34 4BR Site Licence EPR/HB3107UD

Product:	**Vehicle Type**	**EWC**	**Unit:**	**Qty:**	
SUBSOIL	8 Wheeled Tipper	17 05 04	LOAD	1.00	

I confirm that I have fulfilled my duty to apply the waste hierarchy as required by regulations 12 of the waste (England and Wales) regulations 2011

Terms and conditions

- Placing vehicles on block paving, slabbed driveways, soft and unlevel ground is done so at the customers risk.
- Bristol and Avon take no responsibility for damage to the customers premises if the ground or site is unsuitable for a HGV. Bristol and Avon will not accept damage caused to a manhole that are not capable for carrying the weight of a HGV.
- No electrical items including fridges/freezers, tyres, asbestos, gas bottles.
- Please see our website for the full list of terms and conditions.

Carrier		**Customer**		**End Destination**	
Driver Name	Jason m	**Print Name**	Martin	**WB OP Name**	Jason m
Signature		**Signature**		**Signature**	

Bristol & Avon Transport & Recycling Ltd VAT Registration No: 666 3029 29 Waste Carriers/Brokers Registration: CBDU81599 Issued by the Environmental Agency

Material Ticket

Bristol & Avon Transport & Recycling Ltd
Severn Road, Hallen, Bristol, BS10 7SE
Tel : 01179 829 561

Ticket No: 152059 **Date:** 23/01/2024 **Customer Order No:** 01.EMERSON.MB129

Account Address:
TR-BALCARDE
Balcar Developments Ltd
6 BRACKEN PARK
DERRY
NORTHERN IRELAND, BT48 8AZ

Address:
PCA BUILD (BALCAR) - FOLLY BROOK RD EMERSONS GREEN
HARLEQUIN BUSINESS PARK
FOLLY BROOK ROAD
EMERSONS GREEN
BS16 7FE

Vehicle: GTI - WU69AHA **Haulier:** GTI TRANSPORT **Waste Carriers Licence:** CBDU432877

Time On Site 16:03:04 **Time Off Site** 16:38:00

Outlet:	Westgate Phase 2 - Incoming, Land off Holloway Road, South Glos, BS34 4BR Site Licence EPR/HB3107UD

Product:	**Vehicle Type**	**EWC**	**Unit:**	**Qty:**	
SUBSOIL	8 Wheeled Tipper	17 05 04	LOAD	1.00	

I confirm that I have fulfilled my duty to apply the waste hierarchy as required by regulations 12 of the waste (England and Wales) regulations 2011

Terms and conditions

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- No electrical items including fridges/freezers, tyres, asbestos, gas bottles.
- Please see our website for the full list of terms and conditions.

Carrier	**Customer**	**End Destination**
Driver Name paddy	**Print Name** madalin	**WB OP Name** paddy
Signature 	**Signature** 	**Signature** 

FENCEUK
PCA
SITE SAFETY
Safety helmets must be worn
Protective footwear must be worn
High visibility jackets must be worn beyond this point

Material Ticket

Bristol & Avon Transport & Recycling Ltd
Severn Road, Hallen, Bristol, BS10 7SE
Tel : 01179 829 561

Ticket No: 153127 **Date:** 26/01/2024 **Customer Order No:** 01.EMERSON.MB129

Account Address:
TR-BALCARDE
Balcar Developments Ltd
6 BRACKEN PARK
DERRY
NORTHERN IRELAND, BT48 8AZ

Address:
PCA BUILD (BALCAR) - FOLLY BROOK RD EMERSONS GREEN
HARLEQUIN BUSINESS PARK
FOLLY BROOK ROAD
EMERSONS GREEN
BS16 7FE

Vehicle: CE19FSD **Haulier:** BRISTOL & AVON TRANSPORT **Waste Carriers Licence:** CBDU81599

Time On Site 10:53:49 **Time Off Site** 10:59:00

Outlet:	Westgate Phase 2 - Incoming, Land off Holloway Road, South Glos, BS34 4BR Site Licence EPR/HB3107UD

Product:	**Vehicle Type**	**EWC**	**Unit:**	**Qty:**	
SUBSOIL	8 Wheeled Tipper	17 05 04	LOAD	1.00	

I confirm that I have fulfilled my duty to apply the waste hierarchy as required by regulations 12 of the waste (England and Wales) regulations 2011

Terms and conditions

- Placing vehicles on block paving, slabbed driveways, soft and unlevel ground is done so at the customers risk.
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- No electrical items including fridges/freezers, tyres, asbestos, gas bottles.
- Please see our website for the full list of terms and conditions.

Carrier		**Customer**		**End Destination**	
Driver Name	Mark Hill	**Print Name**	Madalin	**WB OP Name**	Mark Hill
Signature		**Signature**		**Signature**