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# Clean Capping Requirements for Brownfield Land Remediation

In association with British Sugar TOPSOIL



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# Programme

- British Sugar TOPSOIL – Andy Spetch, National TOPSOIL Manager
- Sources of Topsoil, Soil Assessment and Soil Compaction – Tim O’Hare, Tim O’Hare Associates
- NHBC Requirements for Soil Capping Systems – Matt Lennard, NHBC
- Local Authority Requirements – Fabia Pollard, King’s Lynn & West Norfolk Borough Council
- National Contaminated Land Officers Group Update – Chris Culley St Helens Council

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# NHBC Requirements for Soil Capping Systems

Matthew Lennard – Senior GeoEnvironmental Engineer



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# Requirements for Soil Capping Systems

## What will be covered

- NHBC and land quality
- Soil capping / clean cover theory
- NHBC requirements for clean cover systems
- Verification
- Common Issues
- Other Considerations

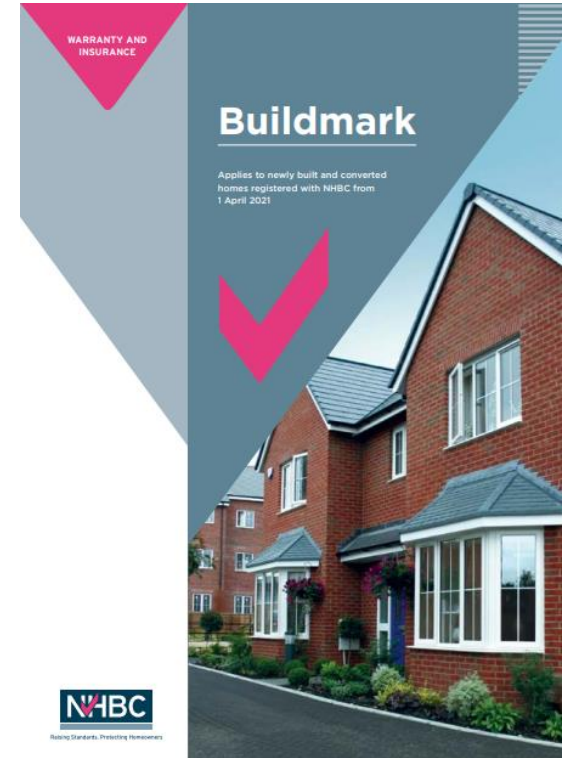
# NHBC and Land Quality

- The National House Building Council (NHBC) are:
  - Leading Warranty and Building Control Provider
  - Providing consumer protection for new homebuyers
  - Raising standards in the new house building industry
- Contaminated Land is covered in our warranty
- We manage Land Quality Risks via our Standards and by setting conditions



# Buildmark Warranty

- Contaminated Land Cover is included in Section 3.4 of the Buildmark Warranty
- What is Covered
  - *'Work required to improve the condition of your land if you receive a statutory notice for your land or a statutory notice could be issued because of the condition of your land'*
- Financial Limit for the warranty is typically the sales price of the home up to £1,000,000.



# NHBC Standards – Chapter 4.1

- Chapter 4.1 Land Quality – Managing Ground Conditions
- Provides a framework for managing geotechnical and contamination risks
- Key objectives for contaminate sites are to ensure:
  - all sites are properly assessed and investigated for potential contamination hazards;
  - all sites are properly remediated where necessary or appropriate, and design precautions are taken;
  - Appropriate documentation and verification is provided to NHBC



# NHBC Standards – Chapter 10.2

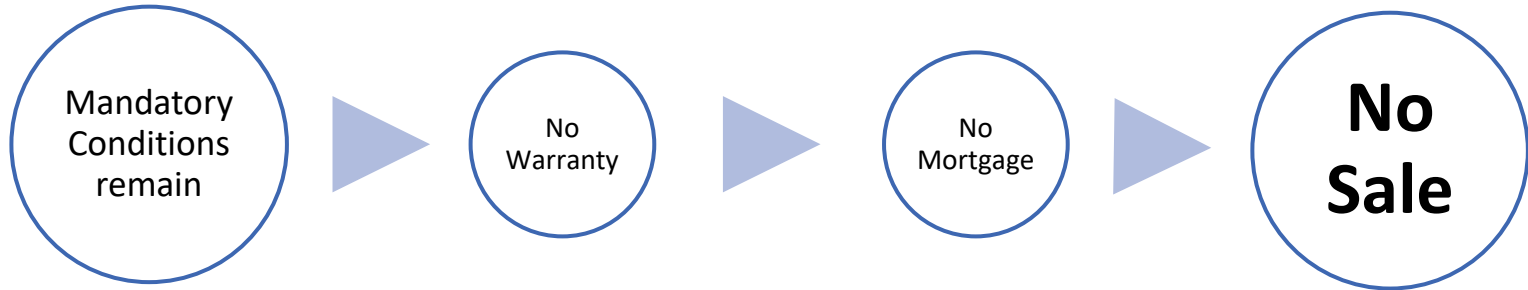
- Chapter 10.2 – Drives, paths and Landscaping
- Key points for garden areas:
  - 10.2.1 – All works should be completed in accordance with the ground remediation statement (where applicable)
  - 10.2.7 & 10.2.9 – Topsoil and subsoil should be of a quality that will not present a hazard to users of the garden area;
  - 10.2.9 – Old foundations, concrete, bases and similar obstructions should be removed from within 450mm of the finished ground surface;
  - 10.2.9 – Appropriate action should be undertaken to restore physical condition (e.g. soil structure) and drainage characteristics of topsoil and subsoil that has been compacted during construction
  - 10.2.9 - A minimum thickness of 100mm topsoil is required





# NHBC Land Quality Conditions

- We undertake a land quality review for ALL sites that are registered with us.
- We set MANDATORY conditions to ensure the requirements set out in the NHBC standards are met
- A warranty will NOT be provided until all mandatory conditions have been cleared.
- This includes the verification of clean cover



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# Soil Capping / Clean Cover System Theory

- A cover system is the provision of clean material over contaminated ground
- The aim of the cover system is either:
  - Complete Separation of Receptor from a Hazard; or
  - A reduction in Exposure to acceptable levels.



# Types of Clean Cover Systems

- **Simple Cover System** (as defined in BRE465) – comprises topsoil and subsoil only - will **reduce exposure** to underlying soils
- **Engineered Cover System** (see CIRIA SP124) – designed to provide complete separation
- Focus of this presentation is on simple cover or capping systems only
  - However use of geotextile/membranes will be discussed later.

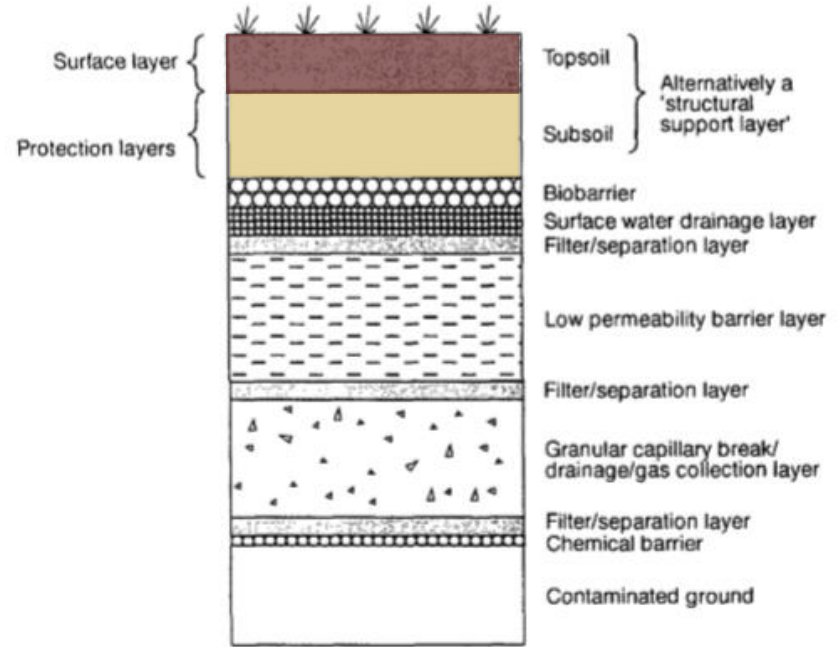
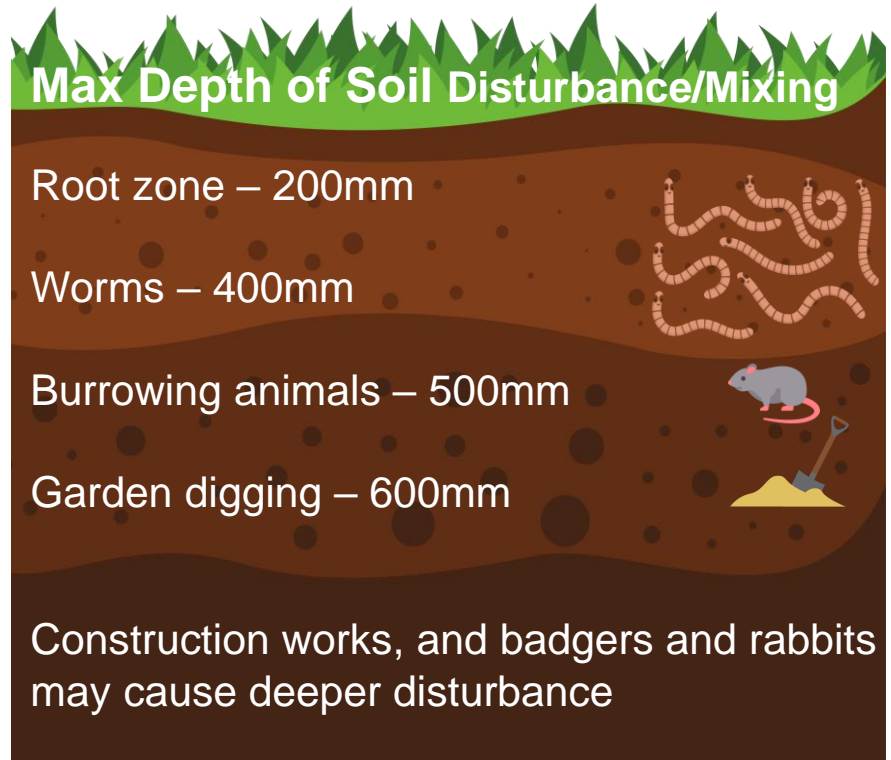


Figure 3.15 from CIRIA SP124 – possible components in an engineered cover system

# Simple Cover Systems - Theory

- Some mixing will occur between the placed clean cover and the underlying contaminated soil
- Disturbance/ mixing of soils is unlikely to exceed **600mm** in a typical garden (BRE 465)
- Soil mixing depth may be less in communal landscaping / public open space
- Geotextile/separator layers will reduce mixing



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# NHBC Requirements for Clean Cover Systems

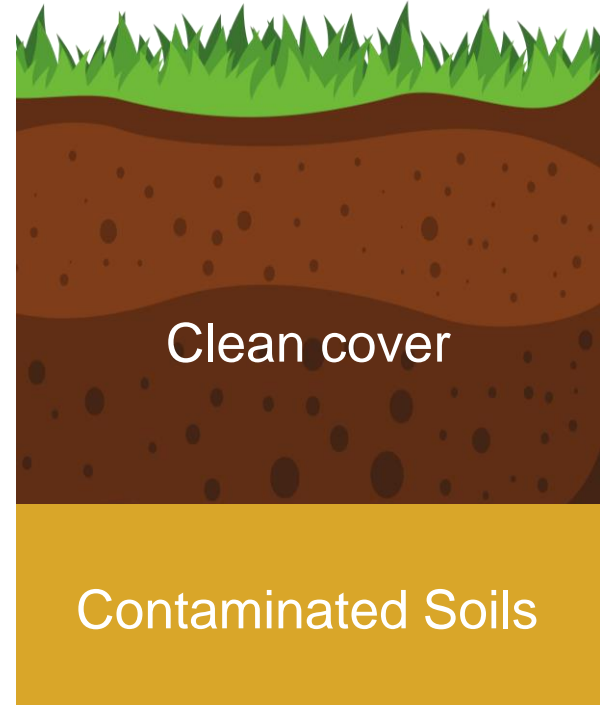
- Design it
- Install it
- Verify it
- *(Keep us (and the Local Authority) in the loop)*

# Simple Cover Systems – Suitable for Use?

- Used to mitigate risks to human health from **low to moderate** levels of contamination
- Widely used (and accepted)

**BUT....**

- Not suitable for volatile/gaseous contaminants;
- Not suitable everywhere (e.g. sites with shallow water table, sloping sites)
- May not be suitable for areas with active rabbit and badger populations
- **Even simple cover systems need appropriate design, installation and verification**

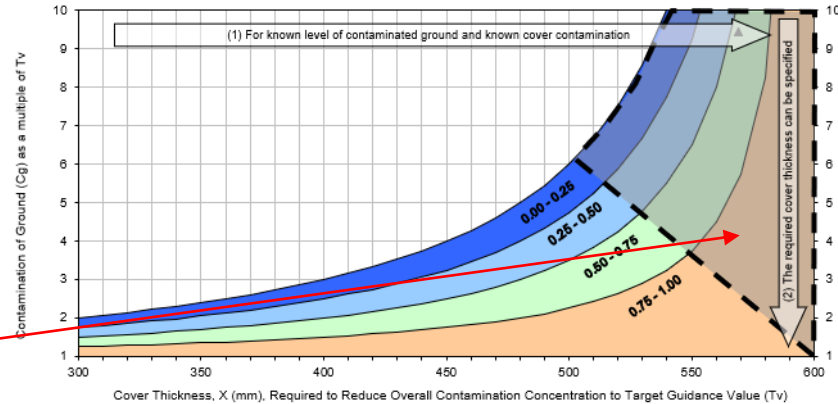


# Before you start your design... Sense Check.....

- Final Land Use
  - Private Gardens, communal areas/landscaping, Public Open Space
  - Use appropriate screening criteria for clean cover
- Final Site layout
  - How much soft and hard landscaping will there be and where?
  - Podiums?
- What are the Final Site Levels?
  - Cut & fill or site strip? Will the contaminant source still be present?
  - Is there space for the capping?
  - If site levels are being raised, is the placed fill material protective of human health?

# Clean Cover System – Design It

- It's not just 600mm...
- BRE 465 Design Chart/Spreadsheet?
  - Simple spreadsheet model that assumes complete intermixing between clean cover and underlying soils to calculate required thickness in simple cover systems
  - Accepted for use by NHBC on appropriate low risk sites but all assumptions need to be **JUSTIFIED**
  - Pick sensible contaminant concentrations for clean cover
  - Don't forget the shaded zone
  - **Minimum thickness of clean cover is 300mm**
- Is a separation or marker layer required?
- Clean cover should comprise topsoil and subsoil – need appropriate source(s)





# Clean Cover System – Install it (the easy bit?)

- Do what you said you'd do (or what was agreed)
  - If plans/designs change, let us (and the LA) know in advance
- Look out for unsuitable materials, odours, colours etc....  
(would you want it in your garden?)
- Look after your source of clean cover
  - If clean soil is stockpiled on site, keep it segregated, avoid cross contamination
- Look after your records / filing
  - When importing soils to site, keep records of sources, import tickets and analysis etc.
- **Remember, we'll be asking questions if we're not happy – make sure those doing the work do it right**



# Clean Cover System – Verify It

- A verification report is required to confirm that the clean cover system has been placed in accordance with the initial design and is suitable for use
- The report should confirm:
  - Soil Quality (topsoil and subsoil) including details of soil sources, chain of custody etc;
  - Soil Thickness; and
  - Presence of geotextile separator / marker layer or a hard to dig layer (if required).
- Frequency of verification testing / sampling is dependent on factors including the number of plots and the source of the clean cover material.
- Verification approach (testing frequency, analysis requirements etc) should be agreed with NHBC (and other regulators) in advance

# Topsoil and Subsoil for use as a growth medium

- If topsoil and/or subsoil is only being placed as a growth medium (e.g. a clean cover system is not part of the remediation strategy), NHBC will not usually require full verification of placement
- However, any materials being used **must** be suitable for use in accordance with **Chapter 10.2 of NHBC Standards**

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# Verification Requirements

- Soil Quality Testing Requirements
- Clean Cover Thickness
- **Reporting**

# Verification – Soil Quality Testing Requirements

- Need to ensure the placed materials are suitable for use
- NHBC chemical testing requirements will depend on the source of the capping materials. Site won or imported?
- Sources :

## Greenfield

- Greenfield
- Agricultural land
- Forestry land

## Manufactured

- Manufactured soils from green waste/  
re-processed soil

## Unknown /Brownfield site

- Brownfield
- Unknown source?
- (Not agreed in advance)

# Verification – Soil Quality Testing Requirements

- Greenfield Source (Direct Transfer From Donor Site)
  - A minimum of a desk study and a site walkover (by a suitably qualified person), and/or previous site investigation report is required to confirm no historical or visible evidence of contamination.
  - If no potential sources of contamination is identified then no additional testing above BS:3882:2015 and BS8601:2013 is required.
  - For site-won soils, sufficient evidence of soil suitability including SI data, and on site soil management would be required
- Manufactured soil where **GOOD** levels of quality control are in place:
  - Copy of suppliers chemical test certificate and confirmation of is required.
  - Certificate should be current and representative of the material actually being used on site.
  - If the above information is available, additional testing may not be required
- Delivery Tickets are required to confirm the soil source but beyond this NHBC would not normally require further chemical analysis for these sources

# Verification – Delivery Notes/ Chain of Custody

- Chain of Custody is important if imported materials (from non contaminated sources) are assessed in advance based on off-site information
- Haulage delivery notes may be acceptable - the more info the better
  - On sites with large import volumes, a selection of delivery notes would be ok
- Can you confirm the certificate relates to the material imported to site?
- A visual inspection of soil on delivery essential (does soil visually compare with that described on suppliers test report?)

# Verification – Soil Quality Testing Frequency

- For a source with unknown / insufficient background information or testing, sufficient testing should be undertaken to confirm the soils are suitable for use
- NHBC consider the suggested testing frequencies below as good practice (for each separate soil source used)

No of Plots	Nominal sampling frequency	Suggested min No of tests per site of each capping material
1-5	1 test per plot	3
5-10	1 test per 2 plots	5
10-20	1 test per 2 plots	5
20-30	1 test per 3 plots	7
30-40	1 test per 4 plots	10
Over 40 plots	1 test per 4 plots	10

- **Skip Waste is not normally acceptable as a capping material without extensive testing**



# Verification – Soil Quality Chemical Analysis

- Chemical analysis should include be for contaminant concentrations as well as the criteria set out in BS3882:2015
- No simple answer to testing requirements – it depends on the source, the contaminants of concern and the available documentation;
- Should be agreed in advance / included in the Verification Plan
- Don't forget to allow enough time for laboratory analysis to be completed!

	%	0.1	NONE	< 0.1	34
Stone Content	%	0.1	NONE	< 0.1	34
Moisture Content	%	0.01	NONE	19	19
Total mass of sample received	kg	0.001	NONE	1.0	1.0

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SFS	SFS

General Inorganics					
pH - Automated	pH Units	N/A	HCERTS	8.1	8.5
Total Cyanide	mg/kg	1	HCERTS	< 1.0	< 1.0
Water Soluble Sulphate as SO4 10hr extraction (2:1 Equivalent)	mg/kg	2.5	HCERTS	110	130
Water Soluble DCM 10hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	HCERTS	0.057	0.065
Water Soluble DCM 10hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	HCERTS	56.5	64.6
Organic Matter (automated)	%	0.1	HCERTS	3.2	0.9

Total Phenols					
Total Phenols (monohydric)	mg/kg	1	HCERTS	< 1.0	< 1.0

Speciated PAHs					
Naphthalene	mg/kg	0.05	HCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	HCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	HCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	HCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	HCERTS	0.22	< 0.05
Anthracene	mg/kg	0.05	HCERTS	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	HCERTS	0.45	< 0.05
Pyrene	mg/kg	0.05	HCERTS	0.42	< 0.05
Benzo(a)anthracene	mg/kg	0.05	HCERTS	0.31	< 0.05
Chrysene	mg/kg	0.05	HCERTS	0.24	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	HCERTS	0.31	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	HCERTS	0.16	< 0.05
Benzo(a)pyrene	mg/kg	0.05	HCERTS	0.31	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	HCERTS	0.22	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	HCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	HCERTS	0.28	< 0.05

Total PAH					
Speciated Total EPA-16 PAHs	mg/kg	0.8	HCERTS	2.92	< 0.80

Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	HCERTS	5.8	2.5
Boron (water soluble)	mg/kg	0.2	HCERTS	2.1	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	HCERTS	0.3	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	HCERTS	6.8	1.0
Copper (aqua regia extractable)	mg/kg	1	HCERTS	21	8.4
Lead (aqua regia extractable)	mg/kg	1	HCERTS	41	9.4
Mercury (aqua regia extractable)	mg/kg	0.3	HCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	HCERTS	6.3	3.1
Selenium (aqua regia extractable)	mg/kg	1	HCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	HCERTS	43	17

# Verification – Clean Cover Thickness

- The inspection frequency for capping thickness will depend on the final land-use and number of plots being built.
- For low-rise housing with private gardens

No of Plots	Inspection Frequency
< 5	Each plot
5 to 20	1 in 2
20-30	1 in 3
>30	1 in 4

- Typically, verification of cover system thickness is via trial pit and use of photographs and/or logging of encountered soils.
  - Photographs should include a tape or staff clearly showing the hole depth
- **If included in the clean cover design, don't forget to confirm the presence of geotextile/membrane/break layer**

# Verification – Reporting

- The verification report should ideally include:
  - Plot numbers – which plots/block are being verified?
  - A site plan confirming sample and depth check locations
  - Confirmation of clean cover depth including photos
  - Confirmation of source suitability and chain of custody (if materials are verified off-site)
  - Chemical analysis results
  
- Watch Points
  - Keep the report clear, concise and easy to review
  - Does the verification report correspond to the clean cover design?
  - Allow enough time for chemical analysis to be completed to meet the site deadline/CML
  - Get the report to us as soon as possible



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# Common Verification Issues

- Design and Installation
- Chemical Analysis
- Depth Check and Photos
- Timescales

# Common Issues – Design and Installation

- Has all land quality information been submitted for review?
- Has the final version clean capping design and validation plan been reviewed and accepted by NHBC?
- Has the required depth of capping been achieved?
- Where is the membrane?
- Change in soil source is not documented?

# Common Issues – Chemical Analysis

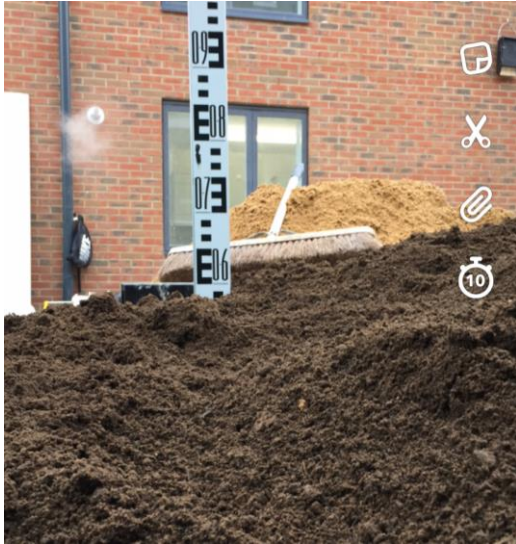
- Testing Frequency
- Incorrect chemical analysis results provided such as:
  - Waste Acceptance Criteria (WAC)
  - BS3882 nutrient analysis without appropriate contaminant analysis
  - Missing determinands
  - Does the testing suite match the contaminants of concern?
- Chemical analysis is out of date – it must be representative/applicable to the imported soil material;
- Chemical analysis exceeds the agreed screening/import criteria

# Common Issues – Depth Check and Photos

- Frequency of Depth Check
- Poor quality photos
  - We need to see the depth of the cover including base of the pit
  - If in doubt, two photos are better than one
  - Measurements on tape/staff need to be legible
  - Check photo resolution in electronic reports

# Common Issues – Depth Check and Photos

These are genuine photos received for verification – not acceptable!





# Common Issues – Depth Check and Photos

Good examples – clear depth measurements, base of hole (and membrane) visible!



# Common Issues – Timescales

- The most common issue for verification reports is **TIME** (or lack of it)!
- Allow enough time for verification sampling, chemical analysis and reporting to be completed
- We need time to review the report
- If last minute submission is unavoidable please let us know in advance and keep us informed/updated on progress

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## Other Considerations

- Landfill tax
- Quality of Garden Areas

# Other Considerations – Landfill Tax

- Changes were made to the Landfill Tax regulations in April 2018 so that activities such as excavation and re-use of soil on site or import of soil material from other development sites could be determined as ‘an illegal deposit’ and potentially be liable to Landfill Tax.
- As a result, developers will need to ensure materials on site and those being imported are being managed appropriately with the necessary permits and exemptions in place (such as the CL:AIRE Definition of Waste Development Industry Code of Practice)

# Other Considerations – Garden Areas

- It might not be contaminated but.....
- Poor quality of gardens can be an issue and especially:
  - Waterlogging
  - Over compacted Soils; and
  - Poor growing medium
- Clauses 10.2.8 and 10.2.9 of NHBC standards include actions to reduce the risk of waterlogging such as rotavating to restore physical condition and drainage characteristics of soil which has been compacted



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## Finally....

- Design, installation and verification of clean cover is not rocket science
- However, it does need some thought and planning, and it's not suitable in every situation
- Keep the verification report clear and concise; and
- Please keep us in the loop and avoid (if you can) submitting information at the last minute

# Further Information

- NHBC Standards – [www.nhbc-standards.co.uk](http://www.nhbc-standards.co.uk)
- NHBC Technical Extra 8
  - <https://www.nhbc.co.uk/builders/products-and-services/techzone/nhbc-standards/technical-extra>
- BS 3882: 2015 – Specification for Topsoil
- BS8601: 2013 – Specification for Subsoil
- Or call us on 0344 633 1000 and ask for Technical Services

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**Thank you**

