ST. CATHERINE'S WOOD
PHASE 2 VICTORIA NORTH

REMEDIATION STRATEGY

Job Number: LKC 22 1587
Date: June 2024
Client: BAM Nuttall Ltd



INCREASING LAND VALUE

LK GROUP

LK Consult Document Verification			
Site Address	St. Catherine's Wood, Phase 2 Victoria, off Red Bank, Cheetham Hill, Manchester, M8 8TS		
Report Title	Remediation Strategy		
Job Number	LKC 22 1587	**Document Ref.**	LKC 22 1587-RS-Ph2-Vict North
Date Issued	10th May 2024	**Report Version**	R0 Draft for Comment
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Revision Record			
Revision No.	**Date**	**Nature of Revision**	**Approved By**
R1	23/05/24	Updated following comments from Arup and BAM	CB
R2	03/06/24	Updated following comments from Arup	CB

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APPENDICES

Appendix A: Imported Material Screening Values

1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by BAM Nuttall Ltd (BAM) to produce a Remediation Strategy for the Phase 2 area of Victoria North, named as St Catherine's Wood.

The report is required to support a planning application to develop St Catherine's Wood as formal public open space (POS).

LKC previously produced a Remediation Strategy for the adjacent Phase 1 area of Victoria North (Red Bank Terrace and Red Bank Plateau).

The Remediation Strategy has been developed using the risk assessment and recommendations in the DQRA Addendum Report produced by Arup[1].

The Remediation Strategy provides details of the remediation and validation works required to ensure the site is suitable for its proposed use (public open space).

1.2 Site Details

St. Catherine's Wood comprises woodland between the River Irk and Phase 1 Victoria North. The site boundaries and named areas are shown on Plate 1-1.

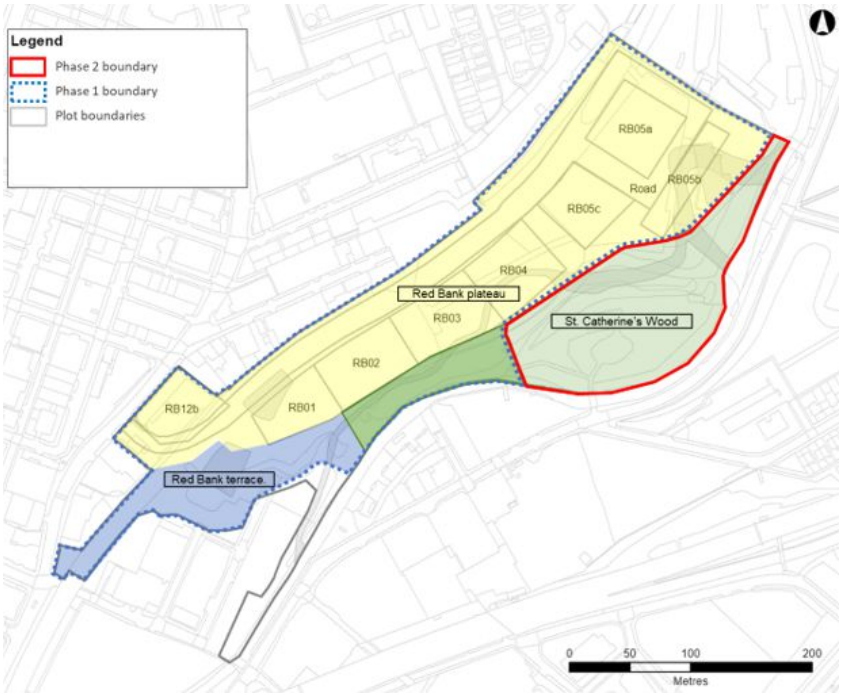


Plate 1-1: Site boundary for Phase 1 and 2 areas of Victoria North.

[1] Victoria North: Phase 2 – St Catherine's Wood – DQRA Addendum Report (Arup, ref: VNIF-ARP-ZZ-RP-CG-0021, P03, date 31st May 2024)

1.3 Proposed Development

The Phase 2 development will include the regrading of existing slopes, creation of accessible footpaths, planting of vegetation and the provision of a transport route onto Red Bank Plateau.

Earthworks will be limited to the areas where footpaths are to be created. Beyond these areas, there will be minimal groundworks and vegetation is to be preserved where possible.

The proposed development scheme is provided in Plate 1-2.

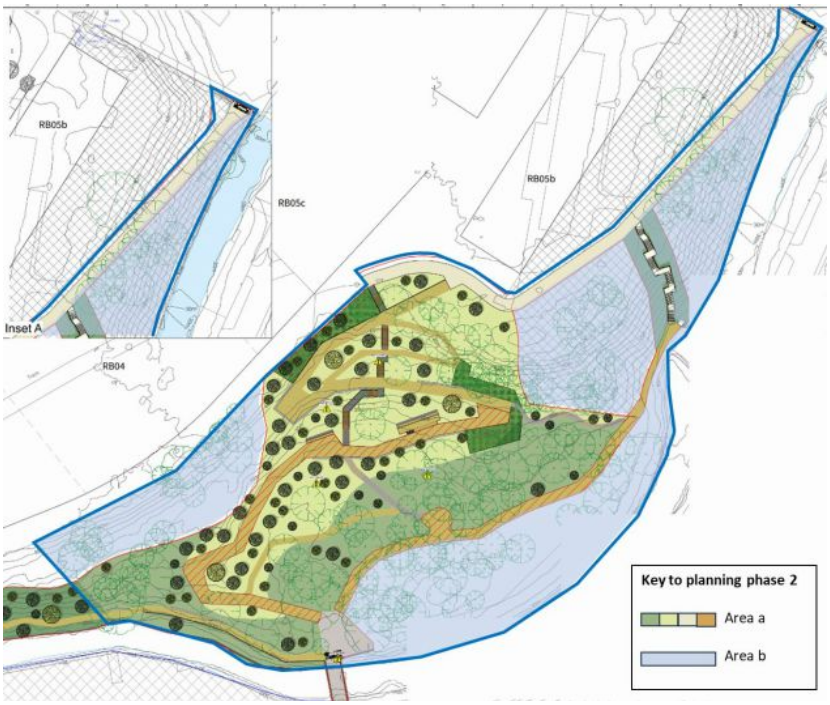


Plate 1-2: Summary proposed development scheme for Phase 2 Victoria North – St Catherine's Wood.

The site has been split into 2 areas, based on the proposed development plans.

- Area A – area of regrading / cut and fill with creating landscaping and footpaths.
- Area B – minimal landscaping proposed.

It is envisaged that some re-use of site-won material will be required within the Phase 2 area of St Catherine's Wood as part of localised regrading work.

Material will also be imported for use as bulk fill, subsoil and topsoil. Material will not be used from the Phase 1 area.

1.4 Summary of Investigation Work and Contamination Risks

Investigation work has previously been undertaken in Phases 1 and 2 and risk assessed as one area. The Arup DQRA Addendum Report has been developed to assess the risk of the Phase 2 St. Catherine's Wood area, using the original investigation data.

1.4.1 Site History

Historical site uses within St Catherine's Wood include a meander bend of the River Irk, former mill race, corn mill, church, terraced housing and school.

1.4.2 Geology

Made ground was recorded as predominantly granular.

Localised alluvium was recorded comprising slightly gravelly sand / soft sandy clay / clayey sand.

Below the made ground and alluvium is glacial till comprising soft to stiff slightly sandy, gravelly clay with granular bands.

Bedrock comprised Collyhurst Sandstone and Manchester Marls.

1.4.3 Controlled Waters Risk Assessment

Based on the DQRA Addendum Report produced by Arup[2], the soils within St Catherine's Wood are not considered to pose a significant risk to the River Irk.

Soil will either be re-used within St Catherine's Wood or imported to site. It is not considered necessary to assess soils to be re-used within St. Catherine's Wood. However, soils to be imported should be tested and screened to ensure they are suitable for use (see Section 2.2-2.3 and Appendix B).

1.4.4 Human Health Risk Assessment

Based on the DQRA Addendum Report produced by Arup, the soils within St. Catherine's Wood are not considered to pose a significant risk to current and future site uses.

Soils to be imported to site should be tested and screened to ensure they are suitable for use (See Section 2.2-2.3 and Appendix B).

[2] Victoria North: Phase 2 – St Catherine's Wood – DQRA Addendum Report (Arup, ref: VNIF-ARP-ZZ-RP-CG-0021, P03, date 31st May 2024)

2 Phase 2 Remediation Strategy

2.1 Introduction

The recommendations provided below are considered appropriate for the site based on the site investigation work and risk assessment undertaken. LKC consider that adequate information has been presented and do not deem further investigation works necessary.

LKC should stress that no remediation, enabling works or designing works should take place until regulatory approval of this Remediation Strategy has been obtained.

The risk assessment undertaken has not identified any significant human health or controlled waters pollutant linkages. Therefore, no specific / targeted remediation is required with respect to the pollutant linkages.

However, there are additional requirements during groundworks to ensure the site is suitable for its proposed end use. The following work has been identified:

- Borehole Decommissioning.
- Site Clearance Work.
- Removal of Inground Structures.
- Re-Use of Site Material.
- Importing of Material.
- Stockpile Management.
- Disposal.
- Discovery Strategy (Watching Brief / Unexpected Contamination).
- Health and Safety Measures.

The strategy has been designed to maximise sustainability through the re-use of existing site-won materials during ground works and development. The strategy ensures that the design meets with current environmental and waste legislation with the use of appropriate environmental controls during the remediation and development programme.

The strategy will ensure the site is suitable for its proposed end use once all remediation and validation has been completed.

2.2 Validation Testing Schedules

2.2.1 Site Won

There will be some cut and fill work undertaken within Phase 2 area as part of the regrading and formation of footpaths (Area A). As no significant contamination has been identified within the existing soils, there is not considered to be a requirement for the testing of site-won soil.

2.2.2 Imported Material

Imported soils will be required in the Phase 2 area. This may include general bulk fill if additional material is required for the regrading work. Subsoil and topsoil will also be required to be imported as part of the landscaping work.

No soil will be used from the Phase 1 development.

Validation testing of imported soils should be undertaken at the rates detailed in Table 2-1.

Material Type / Source	Sample / Analysis Frequency
General Bulk Fill (below topsoil and subsoil)	1 per 500m^3. Minimum of 3.
Topsoil / Subsoil – greenfield / first generation material	1 per 500m^3. Minimum of 3.
Topsoil / Subsoil – brownfield / recycled / unknown	1 per 100m^3. Minimum of 3.

Table 2-1: Summary of validation sampling frequency.

Validation testing requirements are detailed in Table 2-2 and in Appendix B.

Material Type	Testing Requirements
General Bulk Fill Topsoil Subsoil	Asbestos screen. Metals (antimony, arsenic, beryllium, cadmium, total chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc). Other Inorganics: cyanide (free and total), boron, monohydric phenol, pH. Speciated PAHs. Petroleum hydrocarbons (TPHCWG).

Table 2-2: Summary of validation testing requirements.

Any soils with visual / olfactory evidence of contamination should be rejected.

Details of the material source should be provided from the supplier. Any material from potentially contaminative source should be rejected. Any recycled aggregate should follow WRAP protocol.

Topsoil and subsoil should also be tested to confirm it meets the BS3882[3] criteria for topsoil and the BS8601[4] criteria for subsoil.

Should soils fail the RTM-calculated acceptable criteria (Appendix B), leachability testing should be carried out to allow further risk assessment to determine the suitability for use on site.

2.2.3 Waste Disposal

Should material be required to be removed from site, this should be carried out in line with the EA Technical Guidance for waste characterisation. This is summarised in Table 2-3.

[3] BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.
[4] BS (2013). "Specification for Subsoil and Requirements for Use". BS8601:2013.

Population (tonnes)	Number of Samples (homogeneous waste)	Number of Samples (new/heterogeneous waste)
< 100	2	5
< 500	3	8
< 1,000	5	14
10,000	11	22
+ per additional 10,000	+5 (pro rata)	+10 (pro rata)

Table 2-3: Number of Samples Required for Waste Characterisation (from Environment Agency guidance Waste Sampling and Testing for Disposal to Landfill).

Testing should include the contaminants listed in Table 2-2 and Appendix B.

WAC testing will also be required if the soil is classified as hazardous waste.

WAC testing may also be beneficial for non-hazardous waste to allow further classification and determine if the material can be classified as inert.

2.3 Screening Values

To ensure no detrimental impact to the River Irk, results of validation testing of imported soils will be screened against criteria derived by Arup (as detailed in the Remediation Implementation and Verification Plan[6]).

These derived criteria address both human health and controlled waters risks.

Criteria for the general bulk fill, subsoil and topsoil is provided in Appendix B.

2.4 Borehole Decommissioning

Decommission all existing groundwater sampling, ground gas monitoring and groundwater level monitoring wells by grouting will be undertaken to ensure no contamination of aquifers. In addition, decommissioning of any historic water wells that are encountered during works will be undertaken.

All borehole, borehole installation and well decommissioning is to be undertaken in accordance with current EA guidelines[7].

This work should be undertaken prior to cut and fill operations.

Records from contractors should be provided including photographs of decommissioning work. This should be documented in the Site Completion Report.

2.5 Site Clearance Work

Vegetation clearance will be required prior to earthworks.

Any invasive species need to be appropriately managed in line with Invasive Species Management Plan. Any soils impacted with Japanese Knotweed will need to be appropriately disposed and will not be suitable for use within the soils selected for re-use onsite.

[6] Victoria North: Phase 2 – St Catherine's Wood – Remediation Implementation and Verification Plan (Arup, ref: VNIF-ARP-ZZ-YYY-RP-CG-0020, P03, date 31st May 2024)
[7] Environment Agency (1996). "Decommissioning Redundant Boreholes and Wells". National Groundwater and Contaminated Land Centre.

Fly tipping will need to be removed from site. Testing of the waste material may be required to confirm the most appropriate disposal route (subject to the type of material and waste facility testing requirements). A watching brief for asbestos containing material (ACM) pieces should be maintained during this process. Any ACM should be hand-picked by a suitably qualified and experienced person, suitable stored and segregated for suitable off-site disposal, in line with the Asbestos Management Plan[8].

Records from the contractors should be provided including photographs of clearance work undertaken. This should be documented in the Site Completion Report. An Invasive Species Site Completion Report should also be provided.

2.6 Removal of Inground Structures

Inground structures may be present, particularly in the area of the former school, corn mill and church. Where encountered, inground structures should be removed and stockpiled to determine the most appropriate re-use or disposal route.

Material disturbed will need to be recompacted and tested in accordance with the Earthworks Specifications.

Dewatering of excavations may be required if perched water is being retained within relic structures.

Records from the contractors should be provided including photographs of work undertaken. This should be documented in the Site Completion Report.

2.7 Re-Use of Site Won Material

The proposed earthworks involves cut and fill and slope regrading. The scheme has been developed to re-use and retain materials onsite to ensure a sustainable development.

To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to a Materials Management Plan produced under the CL:AIRE DoW CoP.

Material excavated on site should be stockpiled, processed and categorised to determine if the soil is suitable for re-use on site in line with the Enabling Work Specification[9] produced for the Phase 1 and 2 development. Additional testing may be required to determine the engineering properties, but is outside the remit of this report.

The material to be re-used with the Phase 2 area does not require validation testing. However, the material should be inspected by a geo-environmental consultant for evidence of visual and olfactory contamination. Any contamination should be treated in accordance with the contractor's discovery strategy or removed from site (See Section 2.11).

Records of locally redistributed material re-used within St. Catherine's Wood is to be presented in the Completion Validation Report.

[8] LKC 22 1587-02 Asbestos Management Plan Feb 2023, produced by LKC.
[9] Arup (2023) Victoria North HIF Infrastructure & Enabling Works Specification for Highway Works - Civil Infrastructure VNIF-ARP-ZZ-YYY-SP-C-00, 20 November 2023

2.8 Importing of Material

Imported soils will be required are part of the Phase 2 development.

This will include general bulk fill if additional material is required for the regrading / cut and fill work in Area A. Testing of the bulk fill will be required at a rate of 1 per 500m3 (minimum 3 samples) and tested for contaminants identified in Table 2-2. Screening values to confirm the material is suitable for use are detailed in Appendix B. Additional testing may be required to determine the engineering properties, but is outside the remit of this report.

Subsoil and topsoil will also be required in Phase 2 development (Area A) to finish the landscaping area and to provide a suitable growing medium. The depth of subsoil and topsoil will be subject to the planting proposed and the landscaping specification.

Testing of the subsoil and the topsoil is subject to the source. For greenfield / first generation material, the rate should be 1 per 500m^3 (minimum 3 samples). For brownfield / recycled / unknown source, the rate should be 1 per 100m^3 (minimum 3 samples). Tested requirements are detailed in Table 2-2. Screening values to confirm the material is suitable for use are detailed in Appendix B.

Topsoil and subsoil should also meet the requirements of BS3882[10] and BS8601[11].

Imported materials should be accompanied by a certificate of analysis and source details.

Imported soils can be tested once imported to site. However, if the soils do not pass the screening values, it may need to be rejected and returned to the source supplier. It may be advisable to inspect and sample the material at source prior to import, with additional confirmatory sampling undertaken once imported to site.

Where possible, placement of the soils should only be carried out once the soil results have been reviewed to confirm suitability.

Should soils fail the controlled water screening values, leachability testing can be carried out and compared against the leachable screening values to determine the risk and suitability for use.

All source documentation, confirmation of volumes and validation testing certificates should be documented within the Site Completion Report.

2.9 Stockpile Management

Stockpiled material should be suitably managed. Considering parts of the site are close to a main river, stockpiles should be located a suitable distance from the river and any existing drainage runs. Consideration also needs to be given to the size and topography of the Phase 2 area. It is likely that there will be insufficient space within this area to accommodate extensive stockpiles and they may need to be positioned in the Phase 1 area.

The source of each stockpile should be recorded and appropriate validation testing for the potential offsite disposal should be undertaken as required. Depending on the

[10] BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.
[11] BS (2013). "Specification for Subsoil and Requirements for Use". BS8601:2013.

nature of the material the potential for dust generation will be mitigated by dampening down and covering as required.

Material should be segregated by type and source. For example, construction / demolition arisings, site won subsoil, etc.

A quarantine area for suspected contaminated soils should established on site. This should comprise an impermeable lined area with a small bund to prevent run off and to minimise the risk of contaminating other areas of the site. The material should also be covered to minimise the generation of vapours, fibres, dust and possible nuisance to adjacent receptors, and to prevent rainwater ingress which may mobilise soluble contaminants as required. The quarantine area should be positioned away from the River Irk to ensure there is no detrimental impact.

Waste records such as disposal tickets and waste carrier licences should be provided within the Site Completion Report.

2.10 Disposal

Material required to be removed from site should be carried out under an appropriate duty of care and the results of chemical analysis and waste classification should be provided to the relevant waste facility.

Waste records such as disposal tickets and waste carrier licences should be provided in the Site Completion Report. Photographic evidence of removal and waste removal tickets should be retained and included in the Site Completion Report.

2.11 Discovery Strategy (Watching Brief / Unexpected Contamination)

It is recommended that a geo-environmental engineer is present on site during the earthworks to assess any unexpected contamination or ground conditions.

This could include visual / olfactory evidence of hydrocarbons, other unusual odours or colours within the soil, suspected asbestos material, voids etc.

Should any unexpected contamination or ground conditions be identified, work should cease until an assessment of the ground is undertaken to determine the risk and possible remedial requirements.

Impacted material will be excavated and stockpiled in a quarantine area as detailed in Section 2.9.

Testing will be carried out to confirm if the material should be removed offsite to a licensed treatment facility or an assessment made of its potential for treatment and / or retention on site.

Delineation works will be undertaken to confirm the lateral and vertical extent.

Validation samples of the remaining in-situ ground should be undertaken to confirm the impacted soils have been removed. This should be undertaken at the base and sides of the excavation. The number of samples should be appropriate to the size of the excavation at c. 10m spacing. The validation testing requirements will be dependent on the type of contamination present and the outcome of the risk assessment.

The excavation should be reinstated with suitable engineered fill placed and compacted in accordance with the Enabling Work Specification[12] .

Should groundwater be encountered in an area where contamination is identified, dewatering may be required. Any impacted water should be removed from site to an appropriate facility.

If asbestos is encountered during groundworks, this should be managed in accordance with the Asbestos Management Plan[13] produced for the Phase 1 and 2 areas.

Any unexpected contamination, additional investigation, risk assessment, remediation and validation should be documented in the Site Completion Report.

2.12 Health and Safety Measures

A Construction Environmental Management Plan (CEMP) and Method Statement should be produced which details appropriate Health and Safety measures to be employed during the site works.

Risks to site workers and adjacent receptors from contamination present in the site soils can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance) should be adopted by all workers involved with site enabling and construction works.

[12] Arup (2023) Victoria North HIF Infrastructure & Enabling Works Specification for Highway Works - Civil Infrastructure VNIF-ARP-ZZ-YYY-SP-C-00, 20 November 2023
[13] LKC 22 1587-02 Asbestos Management Plan Feb 2023, produced by LKC.

3 Conclusions

Based on information available in reports provided to LKC, a detailed Remediation Strategy has been produced for the development work at Phase 2 St Catherine's Wood, Victoria North.

LKC should stress that no works should take place until Regulatory approval of the Remediation Strategy has been obtained and the declaration made in relation to the MMP.

All remediation and validation work undertaken should be documented in a Site Completion Report once all development works have been undertaken.

Appendix A

Imported Material Screening Values

Contaminant	Generic acceptability criteria (mg/kg)	RTM-calculated acceptability criteria (mg/kg)	RTM-calculated leachable acceptability criteria (mg/l)[5]
Antimony	500	-	-
Arsenic	40	-	-
Beryllium	1.7	-	-
Cadmium	85	-	-
Total chromium (including trivalent and hexavalent chromium)	6[4]	-	-
Copper	200	-	-
Lead	310	-	-
Mercury	10	-	-
Nickel	-	26.5[5]	0.05
Selenium	430	-	-
Vanadium	500	-	-
Zinc	-	191[5]	0.4
Cyanide	24	-	-
Cyanide (free)	24	-	-
Boron	500	-	-
Phenol (Monohydric)	50	-	-
Asbestos	No visible asbestos <0.01%	-	-
TPH C8-C35	-	1000[1,2]	-
TPH – Aromatic C8-C10	-	153[5]	1.64
TPH – Aromatic C10-C12	-	76[5]	0.53
TPH – Aromatic C12-C16	-	208[5]	0.72
TPH – Aromatic C16-C21	-	323[5]	0.35
Acenaphthene	50	-	-
Dibenz-a-h-anthracene	0.32	-	-
Fluoranthene	-	0.04[5]	0.00003
Fluorene	50	-	-
Indeno(1,2,3-cd)pyrene	46	-	-
Phenanthrene	50	-	-
Pyrene	50	-	-
Naphthalene	13	-	-
Acenaphthylene	50	-	-
Anthracene	-	0.15[5]	0.0005

Contaminant	Generic acceptability criteria (mg/kg)	RTM-calculated acceptability criteria (mg/kg)	RTM-calculated leachable acceptability criteria (mg/l)[5]
Benzo(a)anthracene	15	-	-
Benzo (g,h,i) perylene	50	-	-
Benzo(a)pyrene	-	0.4[5]	0.00006
Benzo(b)fluoranthene	4.1	-	-
Benzo(k)fluoranthene	50	-	-
Chrysene	32	-	-

Notes

1. RTM-calculated remediation criteria for several of the TPH fractions are far in exceedance of any soil concentrations. Any soils exceeding these criteria would be visibly grossly contaminated. Therefore, it was considered appropriate to set a soil remediation target for TPH C8-C35.

2. If exceedance is noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.

3. Not Used.

4. If total chromium exceeds 6mg/kg, the results will be assessed further to identify the nature and hazard associated with the presence of chromium in the relevant samples.

5. Routine leachability testing is not required. Leachability testing will be undertaken only if solid analysis concentrations exceed the RTM calculated acceptability criteria. The results of leachability testing will be compared with the RTM-calculated leachable acceptability criteria specified.

6. Visibly contaminated or odorous material must not be imported to site.

Sourced from Victoria North: Phase 2 – St Catherine's Wood – Remediation Implementation and Verification Plan (Arup, ref: VNIF-ARP-ZZ-YYY-RP-CG-0020, P03, date 31st May 2024). Rationale for the values is detailed in the Remediation Implementation and Verification Plan.