



TECHNICAL NOTE 1

DATE:	02 February 2024	CONFIDENTIALITY:	Confidential
SUBJECT:	TRP Outline Remediation Approach		
PROJECT:	70098718	AUTHOR:	Rob Hares
CHECKED:	Rob Hares	APPROVED:	Rob Hares

INTRODUCTION

The purpose of this Technical Note is to provide a high-level summary of potential in ground abnormal constraints and potential outline contaminated land remedial approach for the TRP scheme.

SOURCES OF INFORMATION

The Site has an extensive history of military use. A significant volume of work has been undertaken at the Site relevant to Ground Conditions and Hydrogeology which will be used to inform the outline contaminated Land Remedial approach for the TRP scheme the information as provided within the following reports:

This Technical Note has been undertaken based on information contained in the following reports:

- WSP, 2022. Marine Contamination Investigation Interpretative Report, Lennox Point, January, 2022, Ref: LXP-WSP-XX-XX-T-G-000001.
- WSP, 2021. Generic Quantitative Risk Assessment (GQRA) Risk Assessment, JHP Site, Tipner, April 2021, Ref. 70064592-R00;
- WSP, 2018. Phase 2 Ground Contamination Investigation Interpretative Report, City Deal –Horsea Island East'. WSP, May 2018, Ref. 70015362.002.CL;
- WSP, 2018. Phase 2 Ground Contamination Investigation Interpretative Report, City Deal – Tipner West & Horsea Island East Regeneration'. WSP , March 2018, Ref. 70015362.002.CL;
- WSP|PB, 2016. 'Constraints & Opportunities Report, City Deal – Tipner West & Horsea Island East Regeneration'. WSP Parsons Brinckerhoff April 2016, ref. 5362-001;
- WSP|PB, 2016a. 'W9 Tipner Firing Range – Ground Investigation Initial Findings'. WSP Parsons Brinckerhoff, December 2016, ref 70015362;
- Contamination of beaches – trials at Tipner. Porton Report,1939 (Report No. 2067);
- Tipner/Stamshaw area desk study. Parkman Environment, 1994 (Report no. 11288/OR/1 C);
- Tipner/Stamshaw Area, Ground Investigation and Risk Assessment - Parkman Environment, 1994 (Report No. 11288/OR/2 C);
- Tipner redevelopment area, Portsmouth desk study C L Associates, 1996 (Ref. 8735);
- Waterside Special School contaminations site investigation and assessment. Clayton Environmental, 1996 (Report No. C02452);

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- HMS Excellent Horsea Island, Land Quality Assessment Phase Two: Intrusive Survey Factual Report. Scott Wilson Kirkpatrick &Co. Ltd. July 1997. (Ref. N3/006656);
- HMS Excellent Tipner Ranges Land Quality Assessment Phase Two: Intrusive Survey Factual Report. Scott Wilson Kirkpatrick &Co. Ltd. June 1997 (Ref. N3/06656);
- Tipner West – Portsmouth contaminated land desk study. Gifford 2001 (Report No. B4240/R01);
- Site investigation for contamination status assessment at the Portsmouth Harbour Cruising Club, Tipner, Portsmouth. University of Portsmouth, 2004 (Report No. UPEL 1408 P -352);
- Tipner site desk study report. IKM Consulting Ltd. 2005 (Ref. 1544);
- Tipner, Portsmouth Factual and interpretative report, Final Report. IKM Consulting Ltd. 2006 (Ref. 1544- 061025);
- Tipner, Port Solent and Horsea Island, Portsmouth City Council Desk Study Report. Atkins 2010 (Ref. 5089843);
- Harbour School Sports Hall land contamination assessment report and outline remediation strategy. Entec, 2010 (Ref. 26713-RR004i2);
- Summary of desk study site investigation information available West Tipner, Portsmouth. Lake Environmental, 2013 (Ref. 00132LE PCC TWS v-1);
- Horsea Island East, Portsmouth, Hampshire, Sitesafe UXO Deskstudy, Zetica, 2014 (ref. P4775-14-R1-A) Horsea Island East, Portsmouth, Hampshire;
- Land At Horsea Island East Portsmouth, Phase 1 Land Quality Report. ESI 2014 (ref. 62043R2);
- Land At Horsea Island: Site Investigation and Geoenvironmental Assessment. ESI, 2015 (Ref. 63343R1D2);
- Tipner Firing Range, Portsmouth: Site Investigation and Geoenvironmental Assessment. ESI, 2015 (Ref. 63341R1);
- Tipner Firing Range – Explosive Ordnance Threat Assessment in Respect of Tipner Range, Portsmouth, Bactec, March 2015 (Ref. 5939TA);
- Assessment of the Potential for Radiological Contamination within the Horsea Island East and Tipner West Redevelopment Zone. Matom, 2016 (Ref: 03/146/03.02);

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- Detailed unexploded Ordnance (UXO) Threat & Risk Assessment, City Deal Portsmouth W3 , 6 Alpha Associates, 2016, (Ref. P5380_W3);
- Detailed unexploded Ordnance (UXO) Threat & Risk Assessment, City Deal Portsmouth W4, 6 Alpha Associates, 2016 (Ref. P5380_W4);
- Detailed unexploded Ordnance (UXO) Threat & Risk Assessment, City Deal Portsmouth W5, 6 Alpha Associates, July 2016 (Ref. P5380_W5);
- Detailed unexploded Ordnance (UXO) Threat & Risk Assessment, City Deal Portsmouth W6 , 6 Alpha Associates, July 2016 (Ref. P5380_W6);
- Detailed unexploded Ordnance (UXO) Threat & Risk Assessment, City Deal Portsmouth W7 , 6 Alpha Associates, July 2016 (Ref. P5380_W7);
- Detailed unexploded Ordnance (UXO) Threat & Risk Assessment, City Deal Portsmouth W8 , 6 Alpha Associates, July 2016 (Ref. P5380_W8);
- Assessment of the Potential for Radiological Contamination within the Horsea Island East and Tipner West Redevelopment Zone. Matom, 2016 (Ref: 03/146/03.02);
- Site Investigation and Sampling Operations of MOD Firing Range (Area W9) Tipner, Portsmouth. Matom, 2016 (Ref: 03/146/03.20); and,
- Site Investigation and Sampling Operations of MoD Landfill (Area W4), Tipner Boating Club (Area W8) and Tipner Firing Range (Area W9) Tipner, Portsmouth, Matom 2017 (Ref: 03/146/03.29).

LAND CONTAMINATION CONSTRAINTS

Ground Investigations

Horsea Island East

The GI was completed on the basis of an undetermined end use and identified controlled water receptors of Tipner Lake Portsmouth Harbour, the Secondary A Aquifer in the superficial deposits and Principal Chalk Aquifer. It is understood that the site will partly comprise an intertidal ecological compensation area) The GQRA determined:-

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- Risks to Controlled Waters (Groundwater and Surface Water):** Marginal exceedances were noted for metals and inorganic analytes for assessment criteria for surface waters and aquifers in both the Secondary and Principal Aquifers. Given the saline intrusion identified in the investigation the future resource potential of these aquifers is considered to be low and therefore the risk to these aquifers is also considered to be low. The risks to Portsmouth Harbour from these marginal exceedances of the assessment criteria are also considered to be low given the potential for dilution in the aquifers and the harbour. Intervention for these marginal exceedances is not considered warranted.
- Risks to Future Site Users (Human Health Exposure):** There is a low to moderate risk to future site users from asbestos, PAHs and lead in areas of soft landscaping. There is a low risk from ground gas to future site users.

Based on the current information the findings determined that sources of contamination were limited and that potential risks to human health and controlled waters do not pose a significant constraint to the redevelopment of the site. Although it is noted that mass excavation to create intertidal zones will potentially expose Made Ground and contaminated soils that may require treatment.

Tipner West Land

The WSP, 2018. Phase 2 Ground Contamination Investigation Interpretative Report, City Deal – Tipner West, March 2018, Ref. 70015362.002.CL determined the following:

- Risks to Controlled Waters (Groundwater and Surface Water):** generally marginal exceedances were noted for metals, PAHs and inorganic contaminants for assessment criteria for surface waters and aquifers in the Secondary and Principal Aquifers monitored during the investigation. The proposed development will increase hard standing on the site which will reduce infiltration and contaminant mass flux associated with leachate, providing some betterment of water quality. Given the saline intrusion identified in the investigation the future resource potential of these aquifers is considered to be low and therefore the risk to these aquifers is also considered to be low. The risks to Portsmouth Harbour from these marginal exceedances of the assessment criteria are also considered to be low given the potential for dilution in the aquifers and the harbour the intervention

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for these marginal exceedances is not warranted. Locally the hydrocarbon product identified in W4BH307 presents a risk to controlled waters and further management is recommended.

- Risks to Current Site Users (Human Health Exposure):** Risks were assessed to be low to moderate from direct contact, ingestion, inhalation exposure to the contamination identified in the Made Ground on site. This pathway is potentially active in areas of exposed Made Ground in the current site setting including parts of the firing range.
- Risks to Future Site Users (Human Health Exposure):** There is a moderate risk to future site users from asbestos, PAHs and lead in the Made Ground in all areas of Tipner West Land . However, the proposed development includes land raising to mitigate flood risk across the majority of the site. In these areas, the pathway of direct exposure will be broken and the associated risk to future site users low. There is a low risk from ground gas to future site users.

Based on the current information this assessment has confirmed that there are moderate concentrations of widespread inorganic (metals, asbestos) and organic (PAHs) contamination in the soils in the areas assessed on Tipner West Land associated with Made Ground deposited as part of the former military and landfilling activities on site. There are potential risks to human health which will need to be managed as part of the redevelopment of the Tipner West Land. It is considered that risks to controlled waters do not pose a significant constraint to the redevelopment of the site with the exception of hydrocarbon contamination identified within the MoD Landfill and land adjacent to the east.

JHP Site

The most recent intrusive investigation works were undertaken in February 2021 by WSP and reported in the following document:

- JHP Site, Tipner, Generic Quantitative Risk Assessment – WSP, Ref 70064592-R00, April 2021.
- The investigation was restricted as there were areas across the Site, where investigation works could not take place owing to site operational activities.
- The GQRA confirmed the following findings for human health, groundwater and ground gas risk assessments:

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- Risks to Current and Future Site Users (Human Health Exposure):** Asbestos containing materials were identified in 12 Made Ground samples at nine locations on the Site, one of which recorded the presence of a piece of asbestos cement sheet. Given the heterogeneous nature of the Made Ground deposits and the former land uses identified at the Site, the presence of asbestos within Made Ground in other areas of the Site cannot be discounted and there is considered to be a Moderate risk to construction workers during the works. Future site users and potentially third-party neighbours are considered not to be at risk as the Site is to be hard surfaced or beneath the footprints of commercial building footprints. If soft landscaping is recommended that a chemically validated capping layer and geotextile membrane is utilised within the area of soft landscaping to mitigate the risks. Following mitigation, the risk in unsealed areas is considered to be Low.
- Risks to Controlled Waters (Groundwater and Surface Water):** Based on the assessment of the soil leachate and groundwater results, the overall risk to groundwater underlying the Site is considered to be Low to Moderate. Risk to the adjacent Portsmouth Harbour Waters from groundwater within the Made Ground, Tidal Flat Deposits and Lewes Nodular Chalk, Seaford Chalk and Portsdown Chalk Formation underlying the Site is considered to be Low to Moderate. This assessment is based upon the following:
 - The leachate exceedances represent a risk from contaminants within Made Ground leaching down to the groundwater within the Made Ground, Tidal Flat Deposits and Lewes Nodular Chalk, Seaford Chalk and Portsdown Chalk Formation and migrating laterally towards the tidal waters of Portsmouth Harbour. The whole of the proposed development includes hardstanding or building cover providing betterment, by restricting rainfall infiltration to the subsurface and therefore restricting the leaching of contaminants from shallow soils into the underlying groundwater;
 - Although contaminant impact has been observed within groundwater within the Made Ground and tidal flat deposits this is generally not reflected within the Lewes Nodular Chalk, Seaford Chalk and Portsdown Chalk Formation apart from concentrations of Zinc recorded above the EQS from the recent monitoring investigation works;

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- The heavy metal groundwater concentrations recorded from the recent investigation are within two magnitudes of the EQS protective of coastal waters; and,
- Groundwater level monitoring indicates that it is tidally-influenced beneath the site.

OUTLINE REMEDIATION APPRAOCH/STRATEGY

Approach

This section defines the remediation objectives and constraints and sets out the basis for selecting the most appropriate overall remediation option for the Site.

The objectives of the proposed remediation are as follows:

- Protection of human health and the environment;
- To provide a site suitable for the proposed end-use;
- Contributing to a sustainable development;
- Minimising adverse environmental impact on off-site locations; and,
- Best practical remediation measure.

The protection of human health from soil and groundwater contamination will need to address:

- Unacceptable risks to human health (future occupiers/users of the site);
- Unacceptable risks to groundwater (predominately the Principal ~Chalk aquifer);
- Unacceptable risks to surface water, namely degradation of water quality within Tipner Lake and a Portsmouth Harbour; and,
- Unacceptable risk to Ecological receptors present within the designated areas surrounding Horsea Island East and Tipner West.

A high level appraisal has been undertaken taking into consideration technical, logistical and financial aspects of the remediation technology/options and incorporates the staged approach as defined in Land Contamination Risk Management (LCRM) 2021.

The remedial options available to manage unacceptable risks will either:

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- Manage (remove, destroy, modify or immobilise) the source;
- Interrupt the pathway; or,
- Modify the receptor or the behaviour of the receptor.

The proposed options are designed to manage the source of contamination or interrupt the pathway. Modifying receptor or receptor behaviour has not been considered in this instance. Source management may involve the removal, destruction, stabilisation, or transformation of the source. Pathway interruption may involve either the blocking of the pathway or the destruction or removal of contaminants moving along a pathway.

This approach will mitigate the impacts of land contamination on the receptors identified above to an acceptable level.

Horsea Island East

Based on the current information, the potential development constraints for Horsea Island East are summarised below.

Once the development/habitat scheme is fixed, it will be prudent to undertake a revised assessment of the data and undertake a targeted development specific investigation to inform detailed design. As the extent of Made Ground and associated contamination is intermittent across the Horsea Island East the proposed capping solution may not be required in all retained habitat areas. More extensive coverage will allow a more comprehensive plan for the management and reuse of materials.

Table 1 Potential Remedial Approach – Horsea Island East

Potential Contaminants	Potential Remediation Solution
Made Ground, which is intermittently present across the site, containing lead, PAHs and trace asbestos fibres predominantly near former structures on site.	Areas of retained habitat may require selected hotspot remediation following a (targeted ground investigation) and or clean cover system
	Areas designated for potential intertidal habitat may require extensive earthworks removal predominately consisting of Made Ground. Complex sorting/separation of differing material types and any areas of identified contamination hotspots.

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Tipner West and JHP Site

The potential development constraints at Tipner West are considered to comprise the following:

- Made Ground which is present across the majority of the site, containing lead, PAHs and asbestos and organic contamination in localised areas. The exposure to this material in the future development will need to be appropriately managed to mitigate risks to future site users. Some areas of deeper Made Ground were identified containing higher concentrations of asbestos. This will present a potential constraint to management of earthworks and foundation works in these areas;
- Former MOD Landfill. This landfill contains significant quantities of asbestos containing materials as well as free fibres. The area has been surfaced by a Brexit lorry park;
- Ground gas which is predominantly assessed as low risk across the site, there were locally elevated concentrations of carbon dioxide recorded in the Made Ground across the site and chalk and elevated methane in the former landfill which indicates that gas protection measures are likely to be required in the proposed development of Tipner West;
- Design mitigation measures for the development at Tipner West are likely to include the following, subject to the design of the development;
 - Capping of Made Ground in areas of soft landscaping and installation of clean service trenches through areas of Made Ground; and,
 - Gas protection measures area likely to be required in the new buildings in accordance with conditions identified in the respective monitoring wells. Where Made Ground or chalk is present this is likely to be CIRIA Characteristic Situation 2.

The next steps of assessment will be determined by the masterplan for Tipner West. Once the development scheme is fixed, it will be prudent to undertake a revised assessment of the data and a targeted development specific investigation.

Whilst the risks to Controlled Waters are considered to be low; it is recommended that additional groundwater sampling is undertaken to form a baseline of water quality against which the impact of future development

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works can be monitored. Further gas monitoring is recommended once the scheme is fixed to assess ground gas risks in relation to the proposed end use.

The identified **free product** in monitoring well W4BH307 is an anomaly that presents a risk to the Chalk aquifer. It is recommended that this further assessed through bail down testing and steps are taken to recover the product, treat/remove any impacted soil, remediate groundwater locally if needed.

To capture the design mitigation measures across the scheme it is recommended that an outline remediation strategy is prepared which sets out a framework for management of ground contamination risks during the development of the scheme.

Table 2 Summary of Potential Remedial Approach – Tipner West and JHP

Potential Contaminants	Potential Remediation Solution
Made Ground which is present across the majority of the site, containing lead, PAHs and asbestos and organic contamination in localised areas.	It has been assumed that the site will be raised by c 1.5 m (for flood risk protection) with chemically and geotechnically suitable material and likely that dermal contact and ingestion pathways will be broken, thus protecting human health risk (with the exception of vapour risk).
MoD Landfill contains significant quantities of asbestos containing materials as well as free fibres. The area has been surfaced by a Brexit lorry park affording protection against airborne asbestos release.	It has been assumed that the area around the MoD landfill will be raised by c 1.5 m (for flood risk protection) with chemically and geotechnically suitable material and likely that dermal contact and ingestion pathways will be broken, thus protecting human health risk (with the exception of vapour risk). In ground structures (e.g. basements) should be avoid where possible to avoid the disposal of asbestos



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Potential Contaminants	Potential Remediation Solution
Diesel was identified in monitoring well W4BH307.	contaminated materials within the vicinity of the MOD Landfill. It is recommended that this further assessed through bail down testing and steps are taken to recover the product, treat/remove any impacted soil, remediate groundwater locally if needed.

Summary

Based on current Ground Investigations the risk to Human Health and Controlled Waters can be largely mitigated by the land raise required to protect the site against flood risk. The following should be noted:

- Further detailed Ground Investigations are required in areas of the site not previously investigated;
- It has been assumed that the site will be raised by c 1.5 m with chemically and geotechnically suitable material and likely that dermal contact and ingestion pathways will be broken, thus protecting human health risk (with the exception of vapour risk);
- Gas protection measures area likely to be required in the new buildings in accordance with conditions identified in the respective monitoring wells. Where Made Ground or chalk is present this is likely to be CIRIA Characteristic Situation 2;
- In ground structures (e.g. basements) should be avoid where possible to avoid the disposal of asbestos contaminated materials within the vicinity of the MOD Landfill; and,
- Free phase product recorded in the MOD Landfill will need to be characterised and remediated.