MEMO

ARCADIS Design & Consultancy for natural and built assets

SUBJECT
Technical Note: Materials Re Use and Timber Picking Pond Backfilling v03 in support of EIA

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DEPARTMENT
GeoEnvironment

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1. Background and Scope

Arcadis has been instructed by Port of Milford Haven to prepare a technical note in support of its planning application to create an enhanced facility at Pembroke Dock. The project is required to support the development of marine renewable energy technologies.

As part of the scheme, material will need to be excavated and removed from or near to the marine environment to form the enhanced width and depth slipway required. Infilling of the historical Timber Pickling Pond and Graving Dock voids onshore within the Dockyard is required to enable construction of new structures and laydown areas.

The vision is for the majority of materials that arise to be re-used as engineering fill within the former Timber Pickling Pond and Graving Dock. The re-use will be of only “suitable” materials, and hence in summary, the strategy is 1. beneficial reuse on site or 2. disposal of unsuitable materials if not possible or uneconomical/impractical to recover.

The preparation of this technical note followed a preliminary meeting with National Resources Wales (‘NRW’). Clarification in relation to the following aspects was requested.

- Consider treatment and infill methods for timber pond including dewatering.
- Set out options for treatment and whether materials used to surcharge the Timber Pond Infill could then be used later in the project, for the graving dock infill.
- Consider whether abstraction is relevant (see link below just provided by NRW).
- Consider whether waste regulation is applicable (awaiting Waste Regulation contact from NRW), noting that the Port considers this project to be capital dredging with a directly associated beneficial use within the project on the same site.

The main documents used to support this review are:

- RHDHV Slipway Excavation Volumes; Drawing PB8556-RHD-ZZ-XX-DR-C-0018 Rev P01.
- RHDHV SLIPWAY EXCAVATION VOLUMES DREDGE MATERIAL BELOW M.L.W.S. Drawing PB8556-RHD-ZZ-XX-DR-C-0019.
- RHDHV Technical Note, Dredging Strategy: Milford Haven Port Authority Slipway. Dated 17 September 2020, ref: PB8556-RHD-ZZ-XX-NT-Z-0001 P01.02.

Brief reference is also made to draft Factual Report on Ground Investigation, Causeway Geotech, report dated 7th September, Ref 19-1693. Interpretation and assessment (of the considerable volumes of data contained in this report) is currently being undertaken by others.

2. Treatment and Infill Methods

2.1 Constraints and Requirements

Infilling of the Timber Pickling Pond is required to allow for the construction of a new fabrication building. The volume of imported fill required to achieve this (excluding any surcharge layer) is estimated as approximately 40,000m^3 - volume taken from Arcadis report 10027704-ARC-XX-XX-RP-Q-5002-P1 Pembroke Infill Cost Estimate.

The Timber Pickling Pond is a Grade II listed structure and the proposals for infilling it have been discussed with Pembrokeshire County Council and Cadw as part of the ongoing planning process, led by RPS. The overriding philosophy is that the heritage fabric of the Pond should remain largely intact and should be protected such that in the future the infilling could be reversed if desired.

The infill will need to be suitable for use, geotechnically and chemically. Materials re-use is proposed to be appropriate under CL:AIRE Definition of Waste Code of Practice (DoWCoP) or similar agreed process (see section 5). Re-use of materials should not require additional regulation, other than regulation consistent with planning. For example, chemical and associated leaching criteria, to define "suitably protective of sensitive receptors", would be agreed with regulators based on the findings of a site-specific risk assessment. This would be appropriate to the risk based regulatory structure, i.e. planning regime, that is applied to management of land quality. Hence leachate criteria should be risk based and may not need to align with other regulatory prescribed "hazard based" criteria, such as "*landfill leaching guidelines*".

An approach that would require a "*contamination containment measure*", such as material encapsulation, would likely be regulated as a deposit of waste. This would not be compatible with a development project, and is not proposed.

2.2 Timber Pickling Pond Preparation

Prior to backfilling, the pond will need to be free of standing water.

A certain reduction in level can be achieved via opening the tidal sluice on a falling tide, and then preventing rising tide inflow. Final reduction will need to be by pumping out of the residual sea water. Depending on pond wall integrity, and adjoining groundwater levels, periodic pumping may be required to maintain a reasonably dry condition, during the in-fill working environment.

The requirement (or not) for abstraction/discharge permit is considered in Section 4.

Assuming at least part of the infill will be permeable, permanent drainage will be required as part of the infill detailed design.

To preserve the historic fabric of the horizontal structures, the first element of infill needs to act as both a competent starter layer, and a protection layer. It has been envisaged that this layer would be a medium grained granular material, such as a "medium sand", and that a separator layer would be used, to support the protection role and the reversibility requirement. Suitable materials for this protection layer may arise from the dredging works or other excavation works. Screening, to remove over-size coarse gravel or cobbles, may be required. A geo-textile, such as Terram, would provide separation, and remain permeable. This is a potentially important function to enable excess pore water pressures (that may arise during compaction and/or during surcharge) to dissipate and allow related small settlements to occur in a reasonably short time frame.

Ground Investigation of the Timber pond basal structure has not yet been undertaken. Findings of the recent ground investigation of the adjacent areas should be used, combined with evidence of local rock outcrops, to make reasonable assessment of the strata sequence levels, and hence materials likely to be present beneath. If there is uncertainty, then investigation to prove the pond's lower formation type and competency may be required.

For this note, the reasonable assumption is made that the pond's base is founded on the competent natural geology.

It can be anticipated that the timber would have a thin layer of sediment, over the base, where historic records indicate the base to be a layer of puddle clay. The thickness, type, and chemical quality of the likely thin uppermost layer is uncertain. This information will need to be obtained. If the thin sediments are suitably "clean", leaving a thin layer in-situ beneath the placed protection layer might be accommodated, unless it was too soft to support that operation. If too soft, or too thick, or chemically impaired, it might need to be excavated out. If so these materials could be subject to the remedial approach of Stabilisation/Solidification (see section 3.2), as developed for the soft sediment dredge materials, or alternatively, disposed off-site to a suitably permitted facility.

The puddle clay layer is likely of natural and uncontaminated material. Whether this clay layer would need to be removed, to facilitate filling and achieve good compaction, or could be left in-situ, will be considered during detail design. Puddle clay is also recorded to extend up and under the slope of the limestone pitching. To preserve the historic structure, that layer, together with the limestone pitching will need to be retained.

2.3 Material Types and Volumes

Assessment of the findings of recent ground investigation is currently being undertaken. This work includes volumes assessment of material types that will arise, plus assessment of chemical data to help define the boundary between impacted and essentially "clean" materials.

With reference to RHDHV Dredging Note 17th September 2020 and associated section drawing PB8556-RHD-ZZ-XX_DR-C-0019 these materials types will become available to the infill work.

- Hardstanding, (anticipated to be mainly concrete surfacing, to be crushed/screened).
- Made Ground within the Middle Pier (mixed cohesive and granular).
- Soft intertidal Silts (soft cohesive).
- Coarse Sandy Sediment (granular).
- Gravel and Gravel/Clay Bound Mudstone [*base of sediments/ highly weathered rockhead*] (mix of granular and Stoney cohesive).
- Limestone/Mudstone Bedrock [*appears generally competent within a core-run i.e.1 to 1.5m*] (rock, likely to require crushing).

The volume of soft silts is estimated to be 3,551 m^3. The total volume of materials predicted to arise from the entire slipway works is approximately 66,240 m^3.

As part of design development, an understanding of the materials types and volumes that will arise, will be required to help inform the CL:AIRE assessment and associated Materials Management Plan (MMP), see section 5.

Materials, other than the soft silts, that arise from above groundwater level and above high water level, are likely to be reasonably dry and suitable for use without pre-treatment, other than perhaps moisture content adjustment, i.e. some drying or damping down. Contaminated materials, if present, would require some treatment or would need to be taken off-site to a suitably permitted disposal facility.

Materials that are excavated from below groundwater or tidal level, may need to be stockpiled and left to drain, to achieve moisture contents low enough to enable adequate compaction.

A materials processing area will be required, including containment and management of produced water.

Material types will need to kept separate, as different compaction requirements will apply, to achieve adequate compaction, depending on the material type and specification class.

Based on the results of geotechnical testing undertaken, each material type should be classified in accordance with a suitable specification. An appropriate form for this project would be "Specification for Highway Works (SHW) series 600 Earthworks". By following the specification, using defined compaction plant, layer thickness, and number of passes, a good standard of compaction, normally set to meet >95% of maximum dry density, can be achieved.

Placement and compaction to this standard will help ensure self-weight settlements are controlled and minimal, and adequate bearing capacity is available to the proposed redevelopment. It should also help ensure that piling can be installed, to adequately support future structures, by removal of larger fractions (boulders etc).

SHW is usually applied as a "Method Specification". Fill will be placed/spread in layers (typically of 200-300mm thickness) and compacted.

Material types (cohesive, granular and stoney cohesive) will arise, reasonably predictably, from the sequential excavation horizons, and locations. Hence the sequence of re-use should be planned on this basis, to help minimise double handling and storage of large volumes of materials.

3. Options for Treatment and/or Surcharge

3.1 Assumptions

In advance of detailed interpretation and risk assessment of chemical data recorded during the ground investigation, the following assumptions have been made.

1. Most of the soft silts will be contaminated to a degree such that some form of treatment is required. The treatment will reduce leaching risk and improve the shear strength and related engineering properties of these materials.
2. The remaining natural soils and rock that will arise should be free of contamination of concern.
3. The majority of made ground arising from excavation of the middle pier should be mostly free of contamination of concern, with only limited and occasional impact from hydrocarbons and blacktop surfacing materials, as noted by the Causeway Geotec factual report.

3.2 Stabilisation / Solidification of Soft Silts

Stabilisation / Solidification trials will be required on representative "ultra-bulk" samples (order of half tonne) of the contaminated soft silts. These trials are to test and optimise mix design and have two key objectives.

1. demonstration of the required contaminant immobilisation, capable of achieving risk-based leachate objectives,
2. achieve a desirable range of shear strength and load bearing capacity, i.e. Strength sufficient to support development platform loadings, but not prohibitive of subsequent piling for foundations.

The risk assessment will be informed by leach testing. The form of test should reflect the use of the materials as a bulk compacted solid fill material and hence a Monolithic BS EN form of "Tank Leach Test", or variation thereof, should be agreed with NRW. This is a sequential form of leach test, and in standard form runs for 64 days. It best simulates the potential for release of substances to the environment, when used as engineered fill.

3.3 Re Use of Uncontaminated Materials

Re use of excavated soils (cohesive and granular) can be managed by application of normal civil engineering best practice, and application of SHW.

These "hard" blocky materials would typically be processed (crushed and screened) to produce a 6F2 "capping" class of granular material, in accordance with SHW. This has an upper size limit of 125mm, but otherwise allows a wide particle size range, down to a small fraction of clay and silt (small fraction

of fines).

This 6F2 is a more versatile material type, unlikely to degrade under handling or multiple compactions, and hence would be suitable to be used as a Surcharge, if that additional control on back-fill performance was required.

Subject to discussions with a piling contractor, and perhaps with tighter limits set on fraction of fines, 6F2 would also be more likely to provide a suitable piling platform material, and more generally a weather resilient development formation.

As noted in section 5, the requirement to crush concrete and probably the excavated rock, to create a suitable in-fill material, will likely require an additional regulatory step and agreement to be reached.

4. Abstraction of Water from Timber Pickling Pond

Reference has been made to NRW website regarding when a project might require an abstraction permit and/or impoundment license.

https://naturalresources.wales/permits-and-permissions/water-abstraction-and-impoundment/find-out-if-you-need-a-water-abstraction-or-impoundment-licence/?lang=en

The guidance says:

You **do not need** an abstraction licence for:

- abstractions of 20 cubic metres a day or less
- abstraction by a vessel for use on that or another vessel
- abstraction for fire-fighting purposes, or for training/practice or testing of apparatus used in fire- fighting
- some navigation, harbour or conservancy authority abstractions
- abstractions within managed wetland systems
- draining water (dewatering) to prevent interference with building or engineering works, where the abstraction lasts for less than 6 consecutive months, subject to restrictions
- third-party operated dry docks transferring water to and from a navigation authority's water system
- port, harbour or conservancy authority emergency abstractions

Based on this guidance, the proposed dewatering, to enable backfilling, should meet the requirements of bullet 6, and possibly bullet 7.

A second aspect, also stated in the guidance, is that projects "**will need** an impoundment licence if you construct, alter, repair or remove an impoundment structure". Backfilling of the pickling pond could be considered to equate to the removal of an impoundment structure.

The guidance says:

"You do not need an impoundment licence for the following exempt activities:

- works constructed without a licence before 1 April 2006, except where we serve a notice requiring you to apply for a licence
- where a navigation, harbour or conservancy authority constructs or alters an impoundment, or obstructs or impedes flow while carrying out its duties
- where a drought order or drought permit authorises it
- where the persons doing the work are Crown exempt

- where structures and works are authorised by legislation (for example an act of Parliament)
- where we serve a notice requiring impoundment only for the purpose of screening or passage for eels
- works constructed by us or our behalf while carrying out our responsibilities within internal drainage districts
- works needed in an emergency

You will not normally need an impoundment licence for low risk activities where there is little or no impact on flow or levels of water".

Based on this guidance, bullet 1 should apply. In addition, given the tidal nature of the pickling pond, then backfilling should be accepted as a low risk activity, where there is little or no impact on flow or levels of water.

Thus, neither an abstraction license nor impoundment license should be required by NRW. However, it would be prudent, in liaison with NRW to confirm that the backfilling is covered by these exemptions.

5. Appropriate Regulation

The Stabilisation / Solidification will require a Mobile Treatment Permit (MTP). The remediation contractor, typically, would hold a MTP for the Stabilisation / Solidification process, and would deploy it on the project, through submission of site-specific details to NRW and payment of the appropriate fees.

Concrete and excavated rock are likely to require crushing to achieve a suitable grading for re-use. Concrete may require re-bar to be screened. This work would typically be regulated by the Local Authority permitting regime. Contractors who operate the crushing and screening plant normally hold the permit (T5 Permit is common in England). This is to ensure adequate control of noise and dust.

The two forms of "treatment", set out above, will normally mean that materials post treatment are considered (and may be regulated) by NRW as "Waste" until "fully recovered" status is achieved. Clearly these materials are needed for the project, and there is no intention to "discard". Materials that are unable to meet suitable for use criteria would become waste and would be removed off site to an appropriately permitted site.

Thus, a process to secure "Full Recovery" and bespoke agreement for validation and sign-off, via Planning, should be agreed with NRW. A best practice mechanism to achieve this would be the use CL:AIRE and the DoWCoP related Materials Management Plan (MMP) and Qualified Person (QP) declaration.

The route to appropriate regulation should be via the Planning system, whereby NRW Groundwater Protection and the Local Authority Contaminated Land officer should be statutory consultees to that planning process.

6. Next Steps

6.1 Stabilisation / Solidification Trial and NRW Liaison

Establishing an appropriate treatment method and mix design to facilitate re-use of the contaminated soft silts is an important aspect, and the trial should be built into the works programme.

From the initial bulk sampling, through mix development, cube testing (28 days) and Monolithic Tank testing (64 days) plus reporting, a period of 18 to 20 weeks should be allowed.

In terms of sequence of materials re-use, there may be no "absolutes", however, the soft silts will likely arise earlier in the Works. Thus, in terms of sequence of materials arising, being able to re-use the treated silts earlier in the backfill, would seem logical.

Interlayered materials (e.g. made ground, clayey and granular materials arising from the middle pier and natural soils profile over the weathered rock) will typically arise next.

Use of higher quality site won granular fills, e.g. crushed rock and crushed concrete, may be beneficial within the upper zone, and possibly as a surcharge, if that need was identified.

6.2 Understanding Contaminant profile and type(s)

Chemical testing has been undertaken on samples arising from land-based and marine based materials.

A risk assessment will be undertaken, with report of the findings in relation to risks to human health and the Controlled Waters environment, taking into account both soils total analysis and eluate leach test results.

Based upon those outputs, the physical location, by area, depth, material type and contaminative status should be clearly recorded, together with the re-use constraints such findings may imply. This information will inform materials re-use design, the location for representative bulk-sampling to obtain sufficient representative material for the stabilisation / solidification trials and to inform the Materials Management Plan.

6.3 Volume Estimates and Planned Re-Use

To support the CL:AIRE DoWCoP declaration, the project will need to produce clear plans of volumes estimates of each material type that will arise, and the location and volumes of proposed re-use.

Four lines of evidence underpin the CL:AIRE process and the work undertaken will be required to demonstrate these have been met in full. Failure to do so could mean NRW would seek to apply additional waste regulation to the scheme.

Factor 1: **Protection of human health and protection of the environment.**
Factor 2: **Suitability for use. Both chemical and geotechnical properties.**
Factor 3: **Certainty of use. Not just a probability.**
Factor 4**: Quantity of Material. Necessary for that use, and no more.**

6.4 Material Management Area

The works will require a material management area (MMA) to allow the separation of material types, which may require different dewatering and treatment processes. Ideally this would be a level area, close to the reception area. Water will require collection and provision for disposal or discharge.

The size of the area should be determined in conjunction with the dredging/remediation contractor as it is linked to the production and treatment rates.

Critical to the delivery of an efficient dredging and beneficial reuse contract is balancing production, dewatering and treatment rates of materials. This will require co-ordination between dredging and infill contractors and would be best managed by a single contract entity to prevent a contractual conflict.

6.5 Qualified Person Role

CL:AIRE DoWCoP process sets out good practice, and has three basic steps:
1. Ensuring that an adequate Materials Management Plan (MMP) is in place, covering the use of materials on a specific site;
2. Ensuring that the MMP is based on an appropriate risk assessment, that underpins the Remediation Strategy or Design Statement, concluding that the objectives of preventing harm to human health and pollution of the environment will be met if materials are used in the proposed manner; and
3. Ensuring that materials are treated and used as set out in the MMP and that this is subsequently demonstrated in a Verification Report.

To confirm that steps 1 and 2 have been taken, a “Qualified Person” (QP) would need to be appointed The QP role is to review the relevant project documents and provides a Declaration to NRW prior to the

use or dispatch of materials. Arcadis have staff who are Qualified Person status, and who would be able to support this project.

The Principal Contractor would normally be responsible for production of the Verification Report.

6.6 Unsuitable Materials

The design of the Works will need to include provision for disposal of materials that are either unsuitable for treatment, or otherwise fail to meet the regulatory agreed suitable for use criteria.

An examination of Wales Waste Regulations and associated landfill tax rates and qualifying terms is beyond the scope of this technical note. However, a brief referral to Landfill Disposals Tax (Wales) Act 2017, https://www.legislation.gov.uk/anaw/2017/3/contents/enacted makes reference in Schedule 1 to "Qualifying Materials". Rocks and Soil are listed as materials in Group 1. Silts and Dredgings are both included as rocks and soils. Qualifying Materials attract the lower rate of landfill tax. The condition of "naturally occurring" is set. Whether other qualifications, e.g. limits on chemical substances, or whether a waste classification of "inert" would also apply, would need further research and consultation with waste regulation and/or waste contractors.

End of Technical Note.
Enc.