

case study bulletin

CL:AIRE case study bulletins provide a source of information on the characterisation and remediation of specific sites in the UK. This case study bulletin details the conceptualisation, development and successful completion of the UK's first multiple site, multiple consultant, Cluster project.

Copyright © CL:AIRE (Contaminated Land: Applications in Real Environments).

Remediation of Four Sites in Northwest England: A Successfully Completed Multi-Site, Multi-Consultant Cluster Project

1. INTRODUCTION

The Cluster approach is designed to aid the remediation and/or development of a number of sites that are located in relative close proximity by sharing a decontamination/treatment facility located on one of the sites - the Hub. A key principle of a Cluster project is that the activity is temporary..... Excavated materials from Donor sites are sent for treatment at the Hub site as waste and upon successful treatment are returned or used at the Hub site as non-waste. The Hub site treatment activities are regulated under the Environmental Permitting regime.

The Definition of Waste: Development Industry Code of Practice, 2011, pg 30

CL:AIRE Case Study Bulletin CSB9 (CL:AIRE, 2011b) described a simple two site Cluster project and set out how the use of the Definition of Waste: Development Industry Code of Practice (DoWCoP) (CL:AIRE, 2008) could be applied to such projects. This case study details the conceptualisation, development and successful completion of the UK's very first multiple site, multiple consultant, Cluster project. This project has allowed the remediation of four sites, two of which were heavily constrained, and has delivered significant efficiency, sustainability and cost savings.

National Grid Property Holdings (NGPH) is responsible for a portfolio of occupied and surplus properties, including around 400 former gasworks sites. The company has a dedicated Commercial Property Team who manage a multi-million pound programme to restore these redundant sites to beneficial use. Over the last ten years NGPH has spent in excess of £360 million across 500 remediation projects, resulting in the reclamation of approximate 600 hectares of land. As many of the simpler and more valuable sites have now been remediated, NGPH are increasingly left with the task of remediating smaller or more complex sites and this presents a major challenge to the business.

The publication of the DoWCoP, which provides a framework for the legitimate re-use of materials on site or their movement between sites, provided an opportunity for NGPH to develop a model for a Cluster project, which, if successful, could potentially be utilised on a wide variety of sites, and this project has shown how this can be achieved.

The DoWCoP provides a framework for determination of whether material should be classified as controlled waste (or not), and thus whether it should be subject to the provisions of the Environmental Permitting Regulations. If the requirements of the DoWCoP are complied with the Environment Agency's (EA) position statement says " *If materials are dealt with in accordance with the Code of Practice we consider that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development.*"



Figure 1: Aerial view of Partington with Hub site edged in blue.

2. DECISION MAKING PROCESS AND SITE SELECTION

2.1 Pilot Trial

NGPH were involved in the development of the DoWCoP and commissioned the first full scale trial using the Cluster process in 2007/8 at a former gasworks at Neepsend in Sheffield, with the work being undertaken by VHE and WYG (UK based remediation contractor and contaminated land consultant). Contaminated material from one donor site was delivered to the Hub, treated to acceptable re-use criteria and subsequently returned to the Donor site with a clear and auditable material tracking system. This supported the development of the Materials Management Plan (MMP) in the DoWCoP and also forms the basis for the CL:AIRE Cluster Guide (CL:AIRE, 2012). This highly sustainable and innovative trial demonstrated the potential for maximising the recovery of material suitable for re-use on a single remediation project, and the subsequent diversion of waste from landfill.

During the project, stakeholder workshops and technical meetings were held to identify issues and priorities. These involved experts in waste regulation, contaminated land legislation, planning law, contract law and process, technology implementation, liability management, local authority needs, national policy, regeneration aspects, community engagement, materials logistics and technical quality.

Drawing the various strands together and the lessons learnt during the pilot trial at Neepsend, the DoWCoP was issued in September 2008 and included check-lists of waste legislation, urban planning actions, technical skills, contaminated land legislation and a set of generic principles. (Version 2 of the DoWCoP was published in March 2011 (CL:AIRE, 2011a) and significantly extended the scope of the initiative).

case study bulletin

2.2 Development of the Hub and Cluster Project

Having proved the viability of the Cluster approach on a single site basis, NGPH started looking at their portfolio to identify suitable sites where a soil treatment Hub could be established. Potential sites would need to meet a number of criteria, including good transport links, space for the construction of the treatment facilities, proximity to sites requiring remediation and low environmental sensitivity. NGPH decided that the site at Common Lane, Partington, just to the south-west of Manchester, was a likely candidate for a treatment centre due to its size (27 ha). It was also ideally located in NW England, due to the high number of former gasworks sites owned by NGPH and situated within relatively close proximity to each other; NGPH commissioned various studies to determine its suitability. NGPH, supported by WYG, then submitted a planning application for the use of the site as a temporary treatment Hub and planning approval was granted in August 2008 with a condition that the Hub be decommissioned by 14 August 2011. Securing planning permission was a major success and it achieved stakeholder acceptance for the Hub site in an area that had previously resisted similar operation by other landowners.

In June 2009, WorleyParsons were engaged by NGPH to assist with the development of a theoretical Cluster model that could be used to identify sites for inclusion within a Cluster project using Partington as the Hub site. However, it quickly became evident that there were too many variables, particularly with data quality (e.g. a lack of data in older site investigations) and that the assumptions required to construct the model had the potential to significantly skew the results. A different approach was therefore required.

Consequently it was decided to progress with a full scale Cluster project based around Partington to demonstrate the benefits and to identify any problems associated with the Cluster approach, to enable the lessons learnt to be applied to the identification of future Cluster sites. WorleyParsons assisted NGPH with selection of the Cluster sites and also with the development of an appropriate contractual approach for the project. A number of models were considered, including the separate tendering of the Hub from the remediation projects, but it was decided to progress with a single contractor approach, with both remediation works and Hub operation being encompassed into a single multi-site contract, utilising a modified version of the Institution of Civil Engineer's Conditions of Contract, 7th Edition.

After several phases of assessment, four sites were selected to form the Cluster. Partington was the Hub site where the treatment Hub was established and materials from Partington itself and three Cluster sites: Halton Road, Runcorn; Ward Street, Prescot; and another site in Manchester were to be treated. Site selection was based on the relative proximity of each site, characteristics of likely contaminants, volumes of contaminated materials, and various other factors including the constrained nature of the Prescot and Runcorn sites. Other sites were considered, but excluded on sustainability grounds. Figure 2 shows the relative positions of each of the Cluster sites to the Hub.

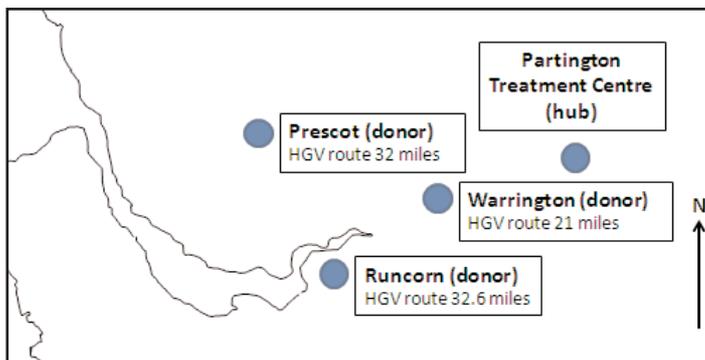


Figure 2: Plan showing relative positions of Cluster sites to Hub.

2.3 Remediation Options Appraisal/Design

As part of NGPH's preparatory work for the project, each of the Cluster sites were subject to investigation, assessment and remediation design in accordance with NGPH's own procedures, which are based on the Environment Agency's "Model Procedures for the Management of Land Contamination (CLR11)". During this process, it became apparent that the most sustainable remediation solution for the Manchester site was a combination of *in situ* and *ex situ* (on-site) soil stabilisation and it was therefore dropped from the Cluster, with a site at Winnick Street, Warrington being substituted.

During the operation of a Cluster Project additional sites may come forward, either as potential Donor sites and/or potential Receiver sites. Provided the wastes and materials can be accommodated within the timeframe agreed for the Cluster Project, and within any relevant planning conditions, it is acceptable to add these sites, with agreement from the EA and client. Consultation and agreement from the EA is required to ensure the Cluster Project is not becoming a permanent activity and that the system is not being abused.

The Definition of Waste: Development Industry Code of Practice, 2011, pg 33, Watch Point 17

This was considered to be the best commercial decision for National Grid and its portfolio as well as ensuring the viability of the Cluster. A process of continual updating as new information became available with recognition of the need to identify alternative sites early on as a contingency to ensure the most sustainable solution was reached is considered best practice. Planning applications were submitted for the works as appropriate and dialogue with the regulators began well before work commenced on-site and was maintained throughout the duration of the project. Initially the designs were based on standalone remediation, as the viability of proceeding with the Cluster had not yet been proven, with the designs being adapted to allow for off-site treatment and re-use once the works had been tendered.

3. CONTRACTUAL APPROACH

NGPH then adopted an innovative contractual approach to the multi-site project by choosing to proceed on the basis of using multiple consultants, partly to prove the concept as it was considered to reflect what would happen in the "real world" where sites were more likely to be in multiple ownership. Each of the sites within the Cluster had an incumbent consultant (Amec (formerly Entec) at Runcorn, RSK Group at Prescot and WYG at Partington and Warrington) managing the remediation strategy and design for that site. WorleyParsons worked with these consultants to develop an overall design package for the Cluster and with NGPH's cost consultant (Davis Langdon) and legal adviser (Dundas and Wilson) to derive an appropriate contract model and tender documentation. The sustainability of the differing solutions being offered by the various tender providers was considered throughout this process, and the winning bidder was selected largely on their holistic approach to the concept and their consideration of the optimal sustainable solution. The works were tendered in June 2010 and a contractor appointed in September 2010.

The successful contractor, VHE, was engaged to undertake the remediation of the four Cluster sites and the establishment of the treatment Hub site as part of a single contract, with WorleyParsons being appointed as Engineer and Project Manager for the Contract, and the various consultants each retaining responsibility for their individual sites. As part of their tender, VHE was required to consider the remediation designs and supporting data for each site and to value engineer the works while remaining true to the basic design principles as the final designs were still to be warranted by the consultants. VHE considered a number of aspects including a reassessment of the potential recovery rates of material not requiring treatment; consideration of the possibility of transfer of material between sites (via the Hub) where the reuse criteria on one site might differ from those on the site of origin; and treatment options for impacted soils. They also confirmed the value in synergy with a web of material movements. As part of the tender submission VHE was required to present treatment acceptance

case study bulletin

limits for material to be processed at the Hub and provided the material met these limits, VHE took the risk on treated material failing to achieve the reuse criteria for the respective receiver site.

As this was one of the first multi-site Cluster projects to be undertaken under the DoWCoP, there was no set procedure within the EA for dealing with Hub MMPs and after some discussion with them it was agreed that it should be submitted to the EA office responsible for the Hub site location.

Version 2 of the DoWCoP has clarified how this should be addressed, with a single MMP being required covering all component sites, and Declarations submitted for each Receiver site prior to dispatch of material from the Hub site. In the case of a Cluster project where material is being transported to the Hub site, treated and returned as part of a batch process, CL:AIRE has advised that a Declaration should be submitted for each batch of material before it is released to the Receiver site. In order to minimise the impact of this requirement on the progress of the works, it recommends that the Hub site should have a very well developed tracking plan and bulk batching arrangements, such that the Declaration covers as much material as is possible. Multiple Declarations will be required to ensure that the QP is satisfied that all the material meets the four key factors set out in the DoWCoP (Protection of Human Health & the Environment; Suitability of Use; Certainty of Use; Quantity of Material) and this cannot be determined until there is evidence of successful treatment. Version 2 also requires that a copy of all documentation associated with following the project must reside at the Hub site. Upon completion of the Cluster Project all information must be retained at the principal or registered office of the Hub site operator for a period of two years after completion of the works; this includes copies of Verification Report(s) prepared for each receiver site.

As part of the tender assessment, the results of each site investigation (trial pits, boreholes and chemical analysis) were compared to the other sites' acceptance levels. Every site had a different acceptance criteria based on site-specific risk-assessment so individual targets were set for each one. These varied according to future proposed use, proximity of receptors, treatment parameters etc.

A principal feature of the MMP is that material subject to excavation, disposal, treatment and/or reuse must be tracked throughout and evidence recorded in an auditable trail. The integrity of the system relied on the tracking system that VHE

In recognition that the best laid plans may not always work there is a need to have contingency arrangements in place in relation to the movement of wastes and materials. The contingency arrangements must be specific to the project. The contingency arrangements should cover:

- *Out of specification materials, e.g. providing for additional treatment, alternative acceptable location;*
- *Surplus materials, e.g. recovery or disposal options;*
- *Who is responsible for such materials/wastes;*
- *Project programme slippage, e.g. stockpile location and management;*
- *Extended treatment times, e.g. due to plant down time, extreme weather conditions; and*
- *Identified areas for out of specification materials.*

The Definition of Waste: Development Industry Code of Practice, 2011, pg 15, Watch Point 8

4. MATERIALS MANAGEMENT PLAN

A core component of the Cluster approach is the development of a Materials Management Plan (MMP) and the contractor's approach to this was one of the tender evaluation criteria. The DoWCoP required the preparation of a MMP for the individual donor and receiver sites, and for an MMP to be produced and followed throughout the execution of the works at the Hub site. In this case, an individual MMP and Qualified Person's (QP) Declaration was prepared for each individual remediation site and an overall Cluster MMP prepared as part of the tender documentation, with VHE taking over responsibility for the development and operation of the Cluster MMP in relation to the Hub site upon appointment. Figures 3 and 4 show a flowchart of materials management and the tender stage MMP.

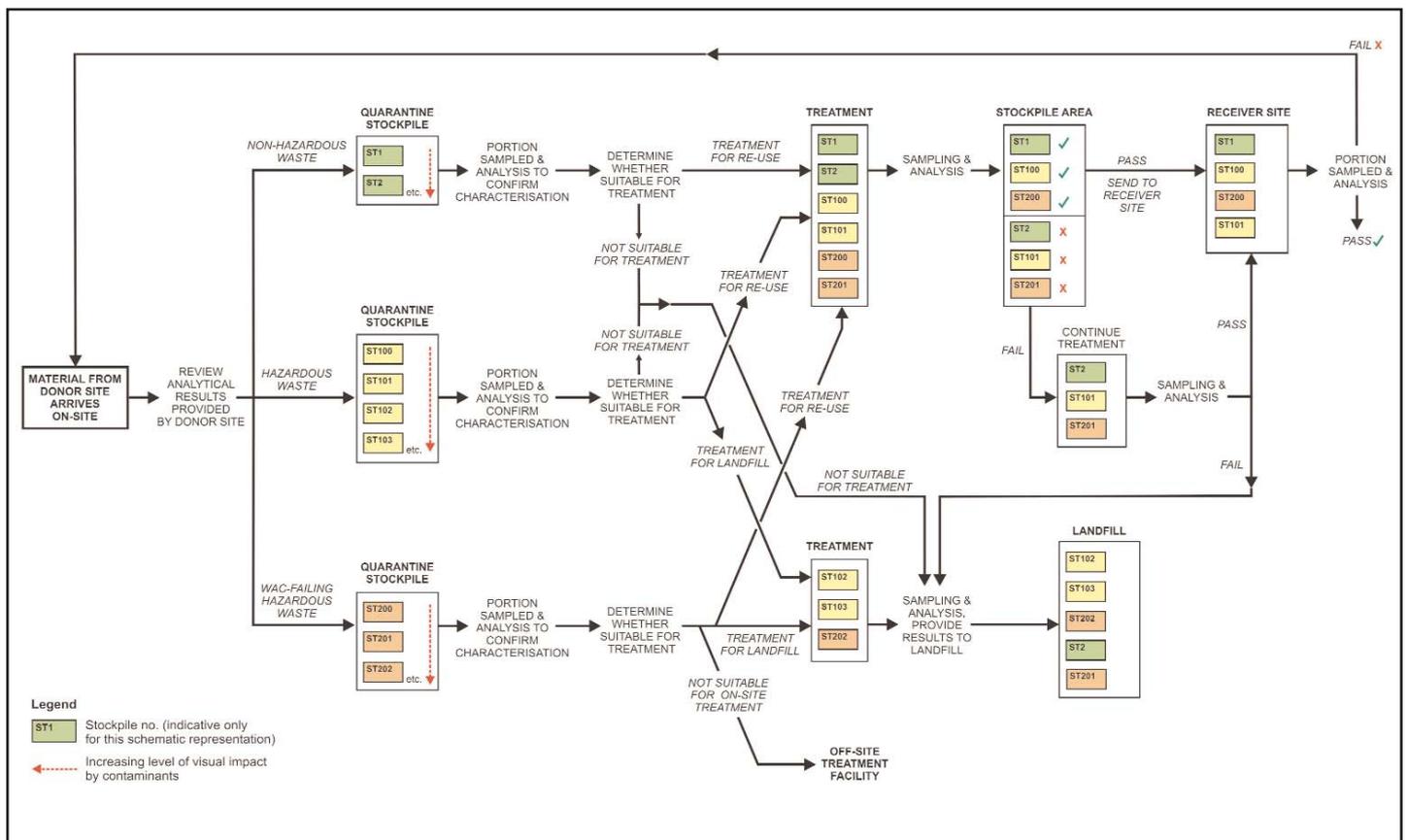


Figure 3: Schematic flowchart showing materials management.

case study bulletin

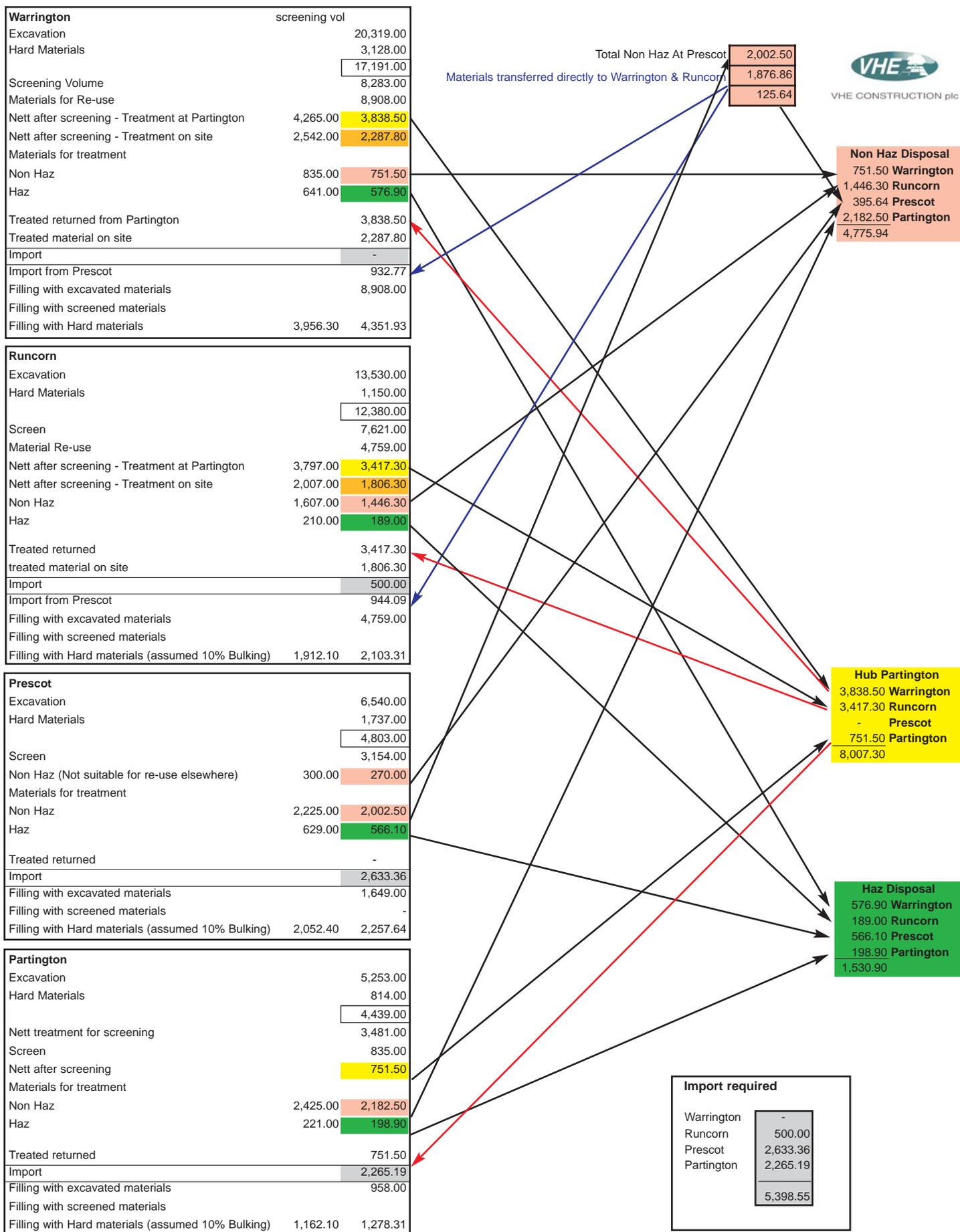


Figure 4: Tender stage Materials Management Plan (units are in m³)

case study bulletin

put in place. The tracking requirement and contingency plans allowed the MMP to deal flexibly with all material encountered across the various sites. Unforeseen ground conditions and additional treatment could be managed within the MMP without programme delays or the need for further planning permissions.

5. THE SITES

Works commenced on site at the end of October 2010 and were completed, on programme, in July 2011. All of the donor sites were former gas manufacturing plants, and excavations included former gas-holder tanks, tar tanks, pipework and hot spots. At all sites, soils were selectively excavated and screened to remove recoverable products (concrete etc.), transferred to the Hub, treated on-site, placed in site stockpiles for re-use or where untreatable (within the programme constraints) taken to landfill as part of the contingency arrangements.

The sites included technical and logistical challenges including high water table, excavations close to site boundaries, multilevel sites and sensitive adjacent receptors (residential and primary school).

The total volume of material excavated during the project was 49,500 m³, of which circa 6,500 m³ was unsuitable for on-site treatment other than volume minimisation due to the nature of the contaminants. A further 13,500 m³ was so heavily contaminated that it could not be recovered within the economic time-scales of the project.

During the 10 months of operation, the Hub site processed over 16,000 m³ of contaminated soils arising from the four sites. The treatment comprised a combination of bioremediation, stabilisation, screening and complex sorting.

Just under 30,000 m³ was reused on the sites (70% of treatable material), comprising both treated materials and material suitable for reuse without treatment.

6. BENEFITS

The Cluster approach to the remediation and reclamation of the four sites has been hugely successful on many levels, producing significant tangible and quantifiable results.

The decision to utilise a single contractor to manage both the Hub and the remediation projects across all four sites resulted in a contractor who had the incentive to provide an active, positive approach to changes and who looked to maximise the benefits of the Hub at all opportunities. The project may not have been as successful if the Hub had been operated independently as there would have been an inherent conflict between the need to "feed" the Hub and the operational requirements of the individual remediation sites.

It is also considered that the contractual approach (whereby engineering consultants who intimately knew the individual sites retained responsibility for these sites, whilst the overall contract was administered by a single Engineer) allowed a co-ordinated approach to problem solving that looked at the overall needs of the project, even if, on occasion, this was not immediately apparent in terms of the impact on an individual site. Some of the specific sustainability benefits achieved, related to the SuRF-UK framework (CL:AIRE, 2010) are set out below.

6.1 Environmental

- The environmental risks were reduced on every site, to levels acceptable to the regulators;
- Lorry movements on the project were reduced by an estimated 97,000 miles when compared to single-site remediation projects. This saved an estimated 167 tonnes of CO₂ emissions, however this must be offset by the additional resource use at the Hub site. The net saving in CO₂ emissions has been calculated at 109 tonnes;

- The project avoided 9,700 m³ of predominantly hazardous contaminated materials from being disposed of at landfill by treating for return to the Donor-cum-receiver (Cluster sites) as engineering fill, and provided a treatment route for materials on two significantly constrained sites. In addition 5,300 m³ of difficult / untreatable soils were processed, subjected to volume reduction and taken to landfill. Due to the nature of the remediation works, these materials were often discovered late in the programme, for example at the base of tanks. The ability to transport them away from the often sensitive locations of the remediation projects at short notice to the Hub site was invaluable and had social benefits by limiting odours to neighbours at those Cluster sites;
- In addition, a further 1,300 m³ of material was treated on site at Warrington and reused as there was sufficient space to allow some on-site bioremediation. This was a more sustainable option than simply taking everything to the Hub site for treatment; and,
- The varied treatment options minimised both the disposal to landfill, with a saving of 10,800 m³ and the need for first generation imports. Excavations were also required at the Partington site, as part of pre-planned environmental mitigation works, which generated materials suitable for direct reuse on the site. This, together with the soil treatment, gave a net reduction in the import requirement for the Cluster of 12,700 m³.

6.2 Social

- The team successfully managed stakeholder liaison throughout the project, despite the fact that there were multiple regulators involved with the various sites and that the Cluster concept was a novel one which was not as yet subject to testing on the scale and complexity demonstrated by this project. As part of this process a site visit to the Hub site was held for all 16 regulators involved and received very positive feedback from all attending.
- The use of the Hub site minimised the nuisance to local residents as far as practical on the Cluster, allowing treatment to be undertaken on one isolated site. No complaints were received at the treatment Hub site;
- The remediation programme allowed work at the Cluster sites to proceed faster, more efficiently - and with less disturbance than would have been possible on a stand-alone basis; and,
- The use of the treatment Hub site provided a solution for two particularly constrained sites with sensitive neighbours in close proximity, Prescott and Runcorn. Without the use of the Hub site the treatment options would have been extremely limited.

6.3 Economic

- The project was completed on time and on budget, despite discovery of a significant additional volume of liquid tars beneath a false base in a tank at Prescott.
- The treatment Hub provided flexibility in dealing with unforeseen ground conditions, such as significant pockets of highly concentrated and viscous tarry sludge with little soil content. This would otherwise have a major impact on the budget (avoided estimated 20% overrun) and programme.
- Compared to separate remediation of each of the four sites, it is estimated that a cost saving of more than 30% has been achieved from the use of the Cluster approach combined with the contractual approach adopted on this multi-million pound project.

case study bulletin

7. OUTCOMES/CONCLUSIONS

The project was considered by NGPH, regulators and all involved to have been very successful, completing on time and budget; 60% of all excavated material (70% of treatable material) was reused on the sites. This is despite being the first application of a Cluster of this complexity with the multi-site, multi-consultant contractual approach.

The innovative contractual approach adopted on the project (multiple sites and multiple engineering consultants, but a single Contractor and Engineer/Project Manager) enabled the team to manage the interfaces between the various sites and the Hub site more efficiently than would have been possible if the individual sites had simply been in a contractual relationship with the Hub. This provided a flexible and adaptable approach and demonstrated the true benefit of using the Cluster approach in responding to changes by comparison with a standalone option. For example, the tar tank false bottom that was discovered late on in the remediation of one site meant a decision could then be made for this material to be removed to the Hub site for treatment, as the Hub site was still scheduled to be operational for a further 4 months to suit the programme on other sites.

The project demonstrated that there are significant, immediate and tangible social, economic and environmental benefits from the use of the Hub and Cluster approach elsewhere. In more remote areas with smaller sites and greater distances to landfill, the potential efficiency and cost savings from a Cluster approach are likely to be even greater. The collaborative and proactive approach to learning lessons at all opportunities has allowed for the development of a model which National Grid plan to continue to use to facilitate the remediation and subsequent regeneration of previously constrained sites in its portfolio. An internal guidance document on the assembly and execution of Cluster projects was also produced on completion of the project.

The project has been added to the CL:AIRE: Register of Environmental Benefits for Cluster Projects now it has been successfully completed.

The Northwest Cluster Project is the only known project that actually satisfies all of the requirements of the DoWCoP and the current EA position statement on the use of Cluster sites, in that it gained benefit from:

- The re-use of contaminated and uncontaminated materials on the sites of production;
- The re-use of contaminated and uncontaminated materials between sites within a defined Cluster project;
- The use of a temporary Hub site shared by specified remediation sites;
- The return of treated soils from the Hub to the Cluster sites.

The project identified a number of issues with the practical application of Version 1 of the DoWCoP and these were fed back to CL:AIRE during the consultation undertaken prior to the issue of Version 2. The need to produce multiple Declarations remains an issue which has been reported to CL:AIRE; it is understood this has been highlighted for further consideration in a future revision of the DoWCoP.

In early 2011, NGPH commissioned RSK Group to undertake a retrospective sustainability assessment of the project. The assessment considered the environmental, social and economic impacts of the different remediation techniques feasible at each of the sites. This would enable NGPH to retrospectively evaluate how sustainable the project had been and to evaluate options for considering sustainability for future projects at the design stage.

The assessment outcome was a measurement that ranked the relative sustainability of the proposed remediation options for each site and gave an indication of the ranking by stakeholder. The sustainable remediation matrix revealed that the most economic, environmental and socially balanced overall

solution for this project was the Cluster approach. This solution ensured the site was remediated to a condition that did not pose an unacceptable risk to users or neighbours of the sites, while minimising the environmental, economic and social impacts as far as possible.

The retrospective sustainability appraisal developed by RSK Group and NGPH and the resultant key indicators and weighted matrix have been shared within NGPH and with the other stakeholders engaged in the Cluster project to highlight its success and to try and encourage its wider application and use on future remediation projects. The sustainability assessment process will be made public in the form of a future CL:AIRE (SuRF-UK) case study.

Acknowledgements

WorleyParsons would like to thank National Grid and VHE Construction for their assistance with the preparation of this case study, and to the various consultants, Environment Agency and local authorities, together with all other parties involved in the NW Cluster Project for their input and efforts to achieve a successful outcome.

REFERENCES

- CL:AIRE, 2008. The Definition of Waste: Development Industry Code of Practice, September 2008. ISBN: 978-1-905046-14-0.
- CL:AIRE, 2010. A framework for assessing the sustainability of soil and groundwater remediation. SuRF-UK report. March 2010.
- CL:AIRE, 2011a. The Definition of Waste: Development Industry Code of Practice, Version 2, March 2011. ISBN: 978-1-905046-23-2.
- CL:AIRE, 2011b. Case Study Bulletin CSB9: Remediation of a Former Landfill in Coventry. May 2011.
- CL:AIRE, 2012. Cluster Guide, June 2012. ISBN: 978-1-905046-17-1.
- Defra & EA, 2004. Model Procedures for the Management of Land Contamination, CLR11.

For further information, please contact the authors:

Allen Murray at WorleyParsons, 3-8 Redcliffe Parade West, Bristol, BS1 6SP, Tel: 01179 251304, Email: allen.murray@worleyparsons.com

Naomi Regan at National Grid, National Grid House, Warwick Technology Park, Gallows Hill, Warwick, CV34 6DA, Email: naomi.regan@nationalgrid.com