Cornwall Development Company Ltd.

Land Adjacent Dudnance Lane, Camborne

Delivery Plan Volume 1

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Plan Design Enable

Cornwall Development Company Ltd.

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Delivery Plan for the Phase 1 Site and the Phase 1A Site

May 2012

Notice

Document History

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Executive Summary

The Site covers approximately 4 ha consisting of two parcels of land divided by the entrance to South Crofty Mine into the Phase 1 Site (2 ha) to the south and Phase 1A Site (1.9 ha) to the north (Maynes Site). These Sites form a key part of the Dudnance Lane South Crofty Framework Plan to deliver regeneration of the area and in particular to provide employment opportunities and housing for a nationally acknowledged deprived area. It is proposed to seek European Regional Development Fund (ERDF) funding to help remove the barriers to redevelopment as a consequence of the Sites' former mining heritage.

The Phase 1 Site consists of the former council depot site and a mixture of dilapidated buildings with existing users that have found alternative accommodation and open scrub land that is currently used for skip storage. It is proposed to re-use this area for a new Household Waste Recycling Centre and a new Energy Centre.

Up until recently the Phase 1A Site was mainly used as an open storage area, with the lower part of this Site being dense vegetation and untouched for a significant period. The lower area is proposed for 60 housing units and the upper area for 5,000 m^2 of office accommodation.

The purpose of this current study was to build on the work of a former study by Ove Arups that covered the larger site, with a specific brief to physically investigate the mining features and contamination to enable greater cost certainty of the proposed development works.

The mining features were investigated by a series of open trenches and pits designed to confirm known or suspected mining features. Part of the Phase 1 Site was not investigated as a separate investigation was undertaken by Bailey Partnership and hence this information was used in the compilation of this Delivery Plan. Similarly for the contamination issues.

The results of the investigation determined that existing known mining risks in the Phase 1 Site had already been remediated to take HGV loadings at ground level. Additional loadings would need to be checked against the existing calculations. No other mining risks were encountered. There was some limited contamination in the Phase 1 Site in the form of disused fuel stores and general waste disposal. The buildings were also found to contain asbestos, mainly as asbestos sheet roofing.

The investigation delineated numerous mining features in the Phase 1A Site. The investigation failed to find any shallow linear mining features, but did confirm the presence of a former quarry and area of mine spoil of varying consistency and consolidation.

Both sites were found to have high levels of arsenic.

Enquires of the statutory undertakers and a CCTV Survey of the site drainage revealed the largest constraint to development was a large surface water and foul water sewer that dog-legged across the Phase 1A Site and would need to be diverted or the proposed housing density for the lower site significantly reduced.

The Sites are in a critical drainage area and no soakaways are permitted due to the mine below, so significant attenuation of flows will be required using open or buried storage. A strategic system was due to be constructed as part of the East West Link Road, however the proposed capacity of this system is not sufficient to serve the proposed development. Investigations into providing a strategic system off-site have been undertaken, although without further topographical investigations the scope would appear to be limited due to the topography and the floodplain adjacent to the Red River.

The Sites have a high level of historic and ecological interest and part of the Phase 1A Site is in the Mining World Heritage Site's boundary. Cornwall Council have advised that planning will be required to undertake the proposed enabling works but that an Environmental Statement is not required. Ecological surveys will be required and due to the time constraints certain surveys should be started as soon as possible.

It is proposed to prepare the Phase 1 Site for redevelopment by removing the buried fuel tanks and existing buildings and re-grade the area to provide a secure, cleaned and relatively level platform. Due to the onerous drainage constraints, it is also proposed to provide on-site below ground attenuation tanks which are a significant cost item. Mining risks would be managed although no remedial works are currently envisaged.

Due to access constraints and general topography the Phase 1A Site will be terraced to provide two relatively level platforms divided by a small earth retaining wall. The existing mine spoil would be removed from the upper platform and processed to provide suitable fill and a stone covering for re-use. Mining features would be capped by excavating down to bedrock and sealed with a concrete plug. Some unsuitable material will require removal from the upper surface of an historic quarry. No other removal of material due to elevated levels of determinants of concern is envisaged at this stage.

It is proposed to divert the two large sewers that cross the Site and provide a series of onsite below ground attenuation tanks which would discharge to the diverted sewers. A new transformer and gas governor and associated connections to the services in Dudnance Lane would be provided.

Both sites will be either stoned or hydroseeded with grass seeded mulch to avoid the risk of windblown arsenic laden dust becoming a health hazard.

The time scale of the Dudnance Lane improvements is unknown and there may be a significant gap between the start of the proposed works and the improvement works, which would create an area of land detracting from the purposes of the proposed works of attracting development and leave the Dudnance Lane improvement site unsecured following the demolition and a potential dust and health hazard. It is proposed to clear the land, fence it and hydroseed with a grass seeded mulch.

The cost of the proposed works including all fees and a project risk allowance is as follows:

Phase 1	£2.2m (includes highway works)
Highway Areas (Works Cost Element Only)	£0.05m
Phase 1A	£2.6m (includes highway works)
Highway Areas (Works Cost Element Only)	£0.05m

The proposed works should deliver sites free of abnormal development costs and risks and support the intended aims of attracting investment for jobs and homes in this area and the construction works achieve a CEEQUAL ‘Excellent’ rating.

1. Introduction

Aims and Objectives

1.1 Atkins Ltd. (Atkins) was commissioned by CPR Regeneration Ltd, (CPRR) which is now part of the Cornwall Development Company, to carry out a mining and environmental site investigation of areas of land, designated the Phase 1 Site and Phase 1A Site, adjacent to the south of Dudnance Lane, Camborne.

1.2 The commission was to build on the work undertaken in the Dudnance Lane South Crofty Framework Plan, and a technical assessment completed by ARUP in 2010, and an Infrastructure and Remediation the Restoration Strategy prepared by ARUP in 2011, by taking forward the necessary site investigations to define the site works required in sufficient detail that would enable specialist contractors to be appointed to undertake the remediation work. The schedule of work and this resulting Delivery Plan to address the land conditions at the site are to help secure funding from the European Regional Development Funds (ERDF) to offset the costs of restoring the land for future development. After the review and site investigations during the drafting of the Delivery Plan it was agreed that the Dudnance Lane Road Alignment land should be included in the Delivery Plan as that land has a direct impact on the security and value of the Phase 1 and Phase 1A Sites.

1.3 Significant work had already been undertaken which required review and updating with the objectives of the commission being to produce a comprehensive costed site restoration plan, consistent with current design standards and guidance covering the following elements:

- **Masterplanning** – a master plan incorporating any further development that may be deemed appropriate so as to inform future investigation and remediation work.
- **Topographical Survey** – an updated survey to inform the intrusive investigatory work and subsequent on site demolition and remediation works.
- **Contamination** – a review of existing ground investigation to identify 'hot spots' and costs for their removal or on-site treatment as required.
- **Ground Remediation/Stabilisation** – a review of existing mining hazards to provide a costed implementation plan that will allow the master plan to be implemented.
- **Services** – report on the nature and cost of existing utilities to service the master plan proposals.
- **Delivery Plan** – develop a costed implementation plan based on the technical reports.

1.4 A separate study, Dudnance Lane Depot Phase 1 Feasibility Report, April 2012, prepared by the Bailey Partnership, relating to demolition buildings and possible future use of a portion land at the Phase 1 Site was also commissioned by Cornwall Council, and information obtained by that study has been utilised in the preparation of this Delivery Plan. A copy of that study is provided in Volume 2 of this Delivery Plan.

Background

1.5 The South Crofty / Dudnance Lane (SCDL) area is a key strategic development opportunity in the heart of the regeneration area at Pool, Cornwall. It comprises some 20 hectares of largely derelict land dominated by the South Crofty Mine. Plans have been progressed to transform the area into a vibrant economic, community and housing hub to complement several major investments having been made on adjacent sites over the past three years, with many other initiatives at an advanced stage of planning. SCDL is one of several Framework Areas to be planned in Pool as part of a comprehensive and integrated planning of the area.

1.6 The Dudnance Lane / South Crofty Framework Plan prepared by Poynton-Bradbury-Wynter Cole Architects Ltd. and provided in Appendix A.1, sets out the agreed development principles for the area and has now been adopted by Cornwall Council (CC) as planning policy to guide future planning applications.

1.7 That Framework Plan is part of an integrated business, leisure and community for Camborne, Pool and Redruth. The project products are:

- A relocated surface mining operation (circa 11,000m2) to the south, connected by a new underground tramway to a Visitor Centre adjacent to the South Crofty Headframe.
- A new road link across the Red River Valley as part of the East West Link Road connecting Camborne and Redruth.
- Provision for the widening of Dudnance Lane to dual carriageway standard.
- The retention and restoration of heritage assets at Chaples Shaft/Whim and the South Crofty Headframe.
- The creation of a green corridor connecting Heartlands Park to the east with the World Heritage site to the west.
- The provision of quality housing (circa 150 units) to the north with high profile commercial uses along Dudnance Lane, together with mixed commercial uses potentially extending to circa 35,000m2.
- A potential energy centre providing power to local businesses, together with high pressure steam via a dedicated duct.
- The replacement and upgrading of the existing Household Waste Recycling Centre (HWRC) to a site allocated in Forth Kegyn.

1.8 The restoration plan for the Phase 1 and Phase 1A Sites will facilitate the following aspects of that wider agenda:

- Phase 1 Site – Sustainable Energy Centre & Household Waste Recycling Centre.
- Phase 1A Site – 5000m^2 of office accommodation and 60 housing units.

1.9 Atkins has prepared a more detailed Framework Plan, which is also provided in Appendix A.2, for the Phase 1 and Phase 1A Sites, so that the interaction between the development potential of the site's and their constraints in relation to the restoration could be explored. This Delivery Plan is based on that Framework.

1.10 CPR Regeneration was established to deliver a regeneration strategy set out in the Urban Framework Plan of 2001 which saw a significant planned growth in the Camborne, Pool, Redruth area of 6,000 new homes and up to 8,000 jobs in the period to 2026. The Urban Regeneration Company (URC's) core objectives with its partners are for sustainable, high quality growth,

including strategic land acquisitions and master planning. Within the wider strategy, Pool is identified as the principal area of opportunity and crucial to the delivery of both regional and the URC's objectives in order to make the site suitable for development.

1.11 Much of the land has had historical mining activity associated with the South Crofty Mine and other mines, consequently there is a potential for buried mining and historical features and Made Ground with potentially hazardous substances to exist at the site. The area may also have protected or rare species of wildlife or plants such as Bryophytes, or invasive species such as Japanese Knotweed. Those issues have to be addressed in order that the sites are suitable for future development in line with the aspirations of the local development framework in terms of employment and housing.

1.12 On the 31st March 2012 CPR Regeneration Ltd. ceased and the Phase 1A Site, also known as the Maynes Site, and responsibility for the redevelopment of the area was passed to Cornwall Council and the Homes and Communities Agency (HCA).

1.13 The landowners, principally Cornwall Council and Western United Mines Ltd (WUM), have consented to enter into agreements that will relocate the current surface mining operations to the south; thereby releasing land that will allow the construction of a local relief road, the East West Link Road, which has recently secured approval of funding from the Department for Transport. Planning permission for the relocation of the surface mining operations is now in place, while the planning application has been made for the East West Link Road (EWLR) and though the scheme has funding secured, that application is conditional on the outcome of a public inquiry.

1.14 The commercial arrangements arising from those plans necessitate certain site works to be undertaken to bring development forward.

1.15 Once the mine has been relocated and the East West Link Road constructed, over 10 hectares of land will remain available. Development of that land will require the demolition of most of the surface buildings, a programme of restoration of the heritage assets, the decontamination of certain areas, and addressing old mine shafts and shallow mine workings. A Knotweed treatment programme has already been instigated on the site.

1.16 There is also a scheme for north-south dual carriageway works on Dudnance Lane, and that scheme has conditional planning approval but does not currently have funding in place. Hence it is now envisaged a non dual scheme with the land safeguarded for later dualling may be pursued. However as that land is adjacent the Phase 1 and Phase 1A Sites, the restoration envisaged by this Delivery Plan also includes limited proposals primarily to maintain the value and security of the adjoining land in Phase 1 and Phase 1A Sites.

1.17 The Camborne Pool Redruth Regeneration Company (CPRR) previously commissioned an overall strategy for the restoration works which was prepared by ARUP in 2011, together with a technical assessment in 2010. For pragmatic reasons it is proposed to advance that restoration in two phases, and this commission deals with first phase, the extent of which is shown on the plan provided in Appendix B.1 which shows the Phase 1 and the Phase 1A Sites.

1.18 The Phase 1 and Phase 1A Sites are substantially if not entirely in public ownership and therefore are available for early restoration as the first phase. The remaining area covers land that is primarily owned by WUM and will only become available once the relocation of the South Crofty Mine surface operations has taken place and the EWLR implemented. CPRR identified both phases as potential projects for support through the 2007-2013 ERDF Convergence Programme (CP) and, indeed funding has been identified in the 2012-2013 Delivery Plan. Given delays affecting the relocation of the mine the expected programme for bringing forward the second phase of development has slipped.

1.19 The site of the proposed development although not in the floodplain is in a critical drainage area identified as catchment name CPIR Camborne Pool, Illogan and Redruth for which a Surface Water Management Plan (SWMP) has been developed in response to the amount of proposed growth in this area and current drainage constraints. The need for a SWMP in this area was highlighted by the Catchment Flood Management Plan (CFMP) and the SWMP was developed in partnership between the Environment Agency, Cornwall Council and other partners and has been adopted by Cornwall Council as policy. The aim of the SWMP is reduced risk of flooding and pollution, with enhanced opportunities for wildlife through the creation of cleaner watercourses. The SWMP outlines the drainage standards which are expected to be achieved within the Critical Drainage Area and adopts a principle of an allowable discharge from proposed development sites of 3x the existing rate of run-off. That level would benefit developers through reduced on site attenuation, though the discharge would still need to be to a strategic system controlling the overall discharge released from development sites to no greater than 1x the existing run-off. However no funding is available for a strategic system, so for each of the Phase 1 and Phase 1A sites development needs to be attenuated back to 1x the existing run-off.

Site Description

1.20 The Phase 1 Site comprises areas of hard standing and industrial structures with open currently undeveloped land in the west. The land is relatively flat though with the ground elevation generally rising to the south.

1.21 The Phase 1A Site has three main types of landcover. In its north the land generally slopes slightly to the west to an earth bund which delineates much of that area. There is little vegetation cover other than some grass and scrub. The site has two small buildings which cover or are related to Maynes Shaft, and other studies have referred to the area as the Maynes Site.

1.22 To the west of the bund the land is at a notably lower level by several metres and had dense vegetation cover with heather and bramble, though some vegetation clearance was carried out to enable the ground investigations. The northern face of the bund displayed evidence of Japanese Knotweed (Falonica japonica, a non-native invasive species classed as a notifiable weed), though it is understood it has been subject to control by herbicide application and evidence of active growth was not observed during the environmental ground investigation period.

1.23 The south of the Phase 1A Site comprises areas of road surface, concrete and tarmac hard standing, and gravel hardcore. The land either side of the main access to the South Crofty Mine site off Dudnance Lane, is surrounded by bunds on three sides, those being remnants of bunds around former water storage lagoons associated with the historical mining activity.

1.24 At present the land is owned by Cornwall Council, with the Phase 1A Site currently unused, whereas the Phase 1 Site is utilised by the Council as a depot, Coastline Housing Ltd. a property and grounds maintenance company, and SITA (UK) Ltd. who operate a recycling and waste transfer station under lease and also utilise the western portion of the site for skip storage.

1.25 A topographic survey of the Phase 1 and Phase 1A Sites is included in the Volume 2 of this Delivery Plan.

2. General Constraints to Development

Demolition

2.1 Most of the Phase 1 Site is occupied by existing buildings and those will need to be demolished as they are either not economically viable to be retained, or are required to be demolished as part of the future safeguarding of the route for the proposed Dudnance Lane dualling when funds become available. The Phase 1A Site has few if any buildings, most demolition having been carried out previously, although there are some remnants of concrete-lined settlement lagoons and hardstanding that needs to be removed to allow redevelopment.

2.2 The area has a rich industrial heritage including of local significance the former Bartle's Foundry, which was founded by F. Bartle in the late 19th century and which had a foundry that not only supplied castings to the local mines, but also produced a range of road furniture, small domestic goods and other products. Hence a watching brief by an archaeologist (ref. Dudnance Lane Depot Phase 1 Feasibility Report, April 2012) will be required during demolition works and the general site clearance and earthworks. Parts of the former Bartle's Foundry will need to be moved to store in order to preserve key examples of archaeological significance.

Contamination

2.3 The ground surface at the sites has been disturbed due to the previous mining related activity and Made Ground predominantly comprising mining derived materials is present over the majority of the surface of the sites. Much of the South Crofty Mine site, which included the west of the Phase 1 Site and some of the Phase 1A Site was landscaped in the 1970s during modernisation that was carried out at the South Crofty Mine site, with ground levels altered by the placement of waste rock. The Made Ground is variable rock derived from the Killas, granite, process operations, and locally also includes other man made waste materials e.g. plastic, wood, metal.

2.4 Comparison of the chemical data to guideline values indicated the main concern to be elevated concentrations of arsenic throughout the Made Ground materials when compared to the UK Soil Guideline Values. The following main issues of potential concern have been identified:

- Made Ground, invariably comprising un-compacted mine spoil materials is widely distributed across the sites, in particular the Phase 1A Site.
- Widespread elevated arsenic concentrations in the Made Ground and natural ground, with a potential for variable concentrations of other metals and metalloids.
- Potential for petroleum hydrocarbon contamination at above ground and underground fuel storage tanks within the Phase 1 Site.
- Potential for hazardous substances associated with a former tramway and railway and storage tank (substance stored unknown) – Phase 1A Site.
- A former backfilled Elvan quarry – Phase 1A Site.

2.5 Further ground investigation, e.g. of the backfilled quarry, or ground inspection e.g. of the underground fuel storage tank when removed, will be required in localised areas. However after development as envisaged by the Framework there will be minimal potential for a pollutant linkage to cause significant harm or more than slight pollution of a controlled water, because the new buildings, hardstanding and landscaped areas will prevent a pathway to a potential receptor.

2.6 But during construction works appropriate environmental management and health and safety planning will need to be implemented to mitigate the potential human health, environmental and geotechnical risks. The mitigation measures identified should primarily consist of the use of appropriate PPE, the use of mechanical plant and controlled access to specific areas, with dust and surface water run-off control measures, and monitoring for potentially unusual or unexpected occurrences. Due to the generally elevated levels of arsenic, care will need to be taken during earthworks and the final interim surfaces will need to be covered with clean stone or seeded to reduce the risk of wind blown dust.

Mine Workings

2.7 The only area of the Phase 1 Site to have known mine workings is the south-eastern part. However it is understood from WUM that those have been extensively remediated, though the remediation was for a different scheme and was mainly to enable to the safe trafficking of the land by heavy goods vehicles.

2.8 There is one mineshaft in the south-west of the Phase 1 Site which is known to have been capped, but previous studies also indicate the presence of another suspected mineshaft towards the centre of the site.

2.9 The Phase 1A Site has several known or suspected mineshafts, some have been made safe whereas others are untouched or remediated to a low standard only, and there is also a potential for shallow mine workings. Therefore in addition to the mining investigation carried out for this commission it will be necessary to investigate critical development areas further, such as building foundation locations, by the use of open probe hole drilling and to have a mining engineer on site during the removal of spoil and the excavation of foundations in order to inspect the ground for evidence of possible mineworkings.

Land Stability

2.10 The Phase 1 Site contains some areas of Made Ground, but the review of previous investigations indicates that it is generally relatively limited thickness. The east of the Phase 1 Site has also had previous extensive development; hence ground at the Phase 1 Site should be suitable to support the envisaged development at the locations shown, subject to local confirmatory geotechnical ground investigation at foundation locations.

2.11 The centre of the Phase 1A Site contains an extensive area of Made Ground up to 3-4metres thick, whereas around that area the Made Ground is generally of relatively limited thickness. In the central area the Made Ground varies from uncompacted mine spoil and tailings, to compacted sub-base material, but overall is unsuitable for the proposed development without ground stabilisation works. These stabilisation works would normally take the form of excavation with screening and processing of excavated materials to form a material which can be placed compacted as an engineered fill. However none of the envisaged development buildings will be located in the central area of the site, for buildings located around that area traditional strip or pad foundations are likely to be possible.

Services

Foul and Surface Water Drainage

2.12 Both sites have large surface and foul water sewers crossing the site with capacity to serve the envisaged development, but which would restrict the location of above ground development.

Electricity

2.13 The Phase 1 Site is not affected by electrical cables traversing the area.

2.14 The Phase 1A Site has an electrical supply cable to the existing adjacent South Crofty Mine and that cable will need a temporary diversion until the mine relocates.

Gas

2.15 A small gas main crosses just beyond the Phase 1 Site and serves the 'Miners Dry' building on the adjoining South Crofty Mine site. That gas main can be accommodated in the proposed works, but will require protection for the duration of the works.

Telecommunications

2.16 The main telecommunication feed to the South Crofty Mine crosses the Phase 1A Site and will require a temporary diversion until the mine relocates. There are no other telecommunication crossings.

Surface Water Run-off

2.17 The sites are in a safeguarded area where soakaways should not be installed because the water would simply soak into underlying mine workings, and ultimately discharge from a mine drainage adit at a reduced quality compared to the run-off, most likely via the Dolcoath Adit to the Red River. Or in future it may require pumping out of the underlying mine workings, dependent on the future mining operations of Western United Mines.

2.18 However for the Camborne, Pool, Illogan and Redruth (CPIR) areas a Surface Water Management Plan (SWMP) has been developed in response to the amount of proposed growth in this area and current drainage constraints.

2.19 The site lies within a Critical Drainage Area of that SWMP due to flooding concerns along the Red River. In January 2012 Cornwall Council provided a position statement to the SWMP and its latest allowable discharge rate calculations, which were an update to the rates in the CPR Regeneration & SWRDA Camborne, Pool, Redruth Drainage Implementation Strategy, November 2008.

2.20 The SWMP outlines the drainage standards which are expected to be achieved within the Critical Drainage Area and adopts a principle of an allowable discharge from proposed development sites of 3x the existing rate of run-off. But that discharge needs to be to a strategic system controlling the overall discharge released from development sites to no greater than 1x the existing run-off. The SWMP also requires the attenuation to be for storm event return periods up to the 1 in 100 year event, plus an allowance of 30% for potential climate change. By comparison of the site area to the relevant drainage area within the Cornwall Council SWMP allowable discharge rate calculations, the 1x discharge rate for a 1 in 30 year event and 1 in 100 year event is 10 l/s/ha and 12.6 l/s/ha respectively, and the 3x discharge rate for a 1 in 30 year event and a 1 in 100 year event are 30 l/s/ha and 37.9 l/s/ha respectively.

2.21 But there is no strategic flood infrastructure to which the Phase 1 Site or the Phase 1A Site could discharge, and Atkins is not aware of proposals for the provision of a suitable strategic flood infrastructure to which discharge at the 3x existing run-off rate may be made.

2.22 Atkins' liaison with South West Water (SWW) has indicated that surface water from the site can be drained into its system provided the run-off rate is restricted to the greenfield run-off rate for up to a 1 in 30 year storm event. But Atkins understanding is that it is accepted practice is to design sewers for a 1 in 30 year rainfall return period, but flow to sewers still occurs for storm events with a less frequent return period, and that flow is potentially unrestricted. By comparison of the site area to the relevant drainage area within the Cornwall Council SWMP allowable discharge rate calculations, that implies a discharge rate of 6 l/s per hectare compared to the SWMP 1x existing discharge rate of 10 l/s/ha for a 1 in 30 year storm event and 12.6 l/s/ ha for a 1 in 100 year event. Hence design to the meet the SWW criteria could potentially be less onerous than the SWMP for storm events with return periods higher than 1 in 30 year, and hence could be objected to by the Environment Agency.

2.23 Therefore to estimate for attenuation storage for up to a 1 in 100 year event plus a 30% allowance for climate change it should be appropriate to assume discharge restricted to the SWMP 1x existing discharge rate for a 1 in 30 year event, as it is accepted practice is to design sewers for a 1 in 30 year rainfall return period as set out in Sewers for Adoption 6 (SfA6). Or as the existing development at the Phase 1 Site currently discharges without attenuation that situation could continue, with attenuation storage only provided at the Phase 1 Site for development of areas which have no existing development. However there is a risk that SWW may require the discharge to be restricted to the lower rate as well as having to cope with the 1:100 year event.

Environmental and Planning

2.24 The Planning Authority, Cornwall Council, has advised that site restoration entailing demolition, clearance and regrading of the site levels will require planning permission, but not an Environmental Statement. However for land to the south of the Phase 1A Site the Council previously provide a Scoping Opinion for a proposed Residential Development, for which an application for outline planning permission has recently been submitted. Therefore it has been assumed a similar range of supporting studies will be required for to support the required planning application for restoration of the Phase 1 and Phase 1A Sites.

2.25 Based on the above and review of the supporting documents for the planning applications for the nearby EWLR and the relocation of the South Crofty Mine surface infrastructure, it is envisaged that the following supporting studies will be required for planning application at the Phase 1 and Phase 1A Sites:

- Ecological Assessment.
- Archaeological / Historic Environment Assessment.
- Geo-Environmental Assessment including a mining investigation.
- Visual Impact Assessment.
- Noise and Dust Assessment.
- Construction Management Plan.
- Flood Risk Assessment including a drainage strategy.

2.26 Part of the northern section of the Phase 1A Site is within the Cornwall and West Devon Mining Landscape World Heritage Site (WHS) which will need to be addressed by a supporting statement detailing why the development is necessary and the implications for the WHS, and a visual impact assessment completed regarding the effect of the proposed restoration works on the setting of the WHS.

2.27 The Phase 1 and Phase 1A Sites are also in the Camborne Pool Redruth Air Quality Management Area (CPR AQMA) and therefore an air quality assessment will be required, which for the Sites' restoration will need to cover vehicle and fugitive emissions during the construction period.

2.28 Bryophytes were detected in the west of the Phase 1 Site in 2008, an area now utilised for skip storage. Although the bryophytes may no longer be present it is likely that some of their original habitat may remain. That habitat could require relocation to an area to agreed with Natural England to support the remaining colonies of bryophytes, because that is the form of mitigation that has been agreed for the land to the north for the proposed Residential Development on the South Crofty Mine site. Western United Mines has an XRF analyser which has previously successfully been used to analyse and sort suitable substrate for bryophytes, and hence it is envisaged a similar technique could be useful during survey at the Phase 1 Site. However full surveys for bryophytes can only be done between November and March and hence for the planning permission for the site restoration it is likely that only an XRF survey will be possible.

2.29 Potential reptile habitat has previously been identified on the Phase 1A Site and it is likely that habitat and reptiles are still be present and will require translocation. Therefore a possible pond has been identified on the Indicative Framework Plan in Appendix A.2, and the adjacent land can be a nature area, but its value for reptiles with the close proximity of the proposed housing is expected to be limited.

3. Phase 1 Site

Existing Situation

3.1 The Phase 1 Site consists mainly of a cluster of historic buildings with various occupiers including a Council Depot, Coastline Housing Ltd. and a Household Waste Recycling Centre and Transfer Station operated by SITA (UK) Ltd. SITA also utilise open scrub land to the west for skip storage. The site is currently owned by Cornwall Council.

3.2 The site has a mixture of building types from the more recent Household Waste Transfer Station to semi-derelict and demolished buildings. The majority of buildings, many of which are in use for low grade storage, would need substantial investment to bring them up to current standards, particularly in terms of mechanical and electrical services. The ad hoc nature of the buildings is such that they do not make efficient use of space.

3.3 The Dudnance Lane Depot Phase 1 Feasibility Report, April 2012, prepared by the Bailey Partnership, regarding the Phase 1 Site area used by the Council Depot and Coastline Housing Ltd. was commissioned by Cornwall Council to look at the short term use of the existing buildings and existing liabilities. A copy of that report is provided in Volume 2. No buildings were considered suitable for short term use other than the Main Office Block and Block 12 Store, with Block 4 a component of the former Bartle's Foundry suitable for conservation, and consequently the study recommended that the remainder should be demolished. The Main Office Block and Block Store 12 were considered suitable for limited refurbishment to provide a short term solution only.

Details of Current Investigation

3.4 To build upon the existing studies, Atkins carried out a review of the existing information supplemented with Atkins' local knowledge and contacts with Western United Mines, SITA (UK) Ltd. and the Council.

3.5 Documents reviewed for the purpose of this study included but were not limited to the following:

- Supporting documents to planning application PA12/04644made 15th May 2012 for a Proposed residential development comprising 107 dwelling units and a Care Home at the South Crofty Mine Site. Including:
  - Ecological Assessment of land in the north of the South Crofty Mine surface site, Pool, Redruth, Cornwall, April 2012, prepared by Leppitt Associates for Crofty Developments.
  - Dudnance Lane Depot Phase 1 Feasibility Report, Revision No.0 04/04/2012, April 2012, prepared by the Bailey Partnership.
  - CPR Regeneration South Crofty/Dudnance Lane Framework Area, Infrastructure and Remediation Strategy, REP/057/11, March 2011, prepared by Ove Arup.

- Supporting documents to planning application W2/PA09/01295/F made 2nd October 2009 for the construction of a new highway between Dolcoath Avenue and Dudnance Lane and to undertake highway works (and highway modification and improvement works) on Dudnance Lane, Chapel Road, Dolcoath Road, Dolcoath Avenue and adjacent side road. Including:
  - CPR Regeneration Highway Infrastructure Project Phase 2 Dolcoath Avenue to Dudnance Lane Environmental Statement Volume Three – Technical Appendix Annex F1: Ground Investigation August 2009, prepared by Mouchel for Cornwall Council.
  - CPR Regeneration Highway Infrastructure Project Phase 2 Dolcoath Avenue to Dudnance Lane Environmental Statement Volume Three – Technical Appendix Annex F2: Mining Stability Report, 2009, prepared by Mouchel for Cornwall Council.
  - Basset (Bartle's) Foundry, Dudnance Lane, Pool, Cornwall, Archaeological Assessment, May 2008, prepared by the Historic Environment Service, Environment and Heritage, Cornwall County Council for the Mouchel Group on behalf of Cornwall County Council Highways.
  - Archive Structural Mining Report, Land surrounding 'Maynes Shaft' Dudnance Lane, Pool, Redruth, Cornwall, ref. IC.SC.PR.4359.asmr, 30/11/07 prepared by Cornwall Mining Services Ltd. for pdp Green Consulting Ltd.
  - South West of England Regional Development Agency Camborne Pool Redruth: Compulsory Purchase and Building for Business, Site Investigations, Phase 1 Geotechnical Desk Study Report: Sites 5 & 6 - South Crofty, March 2005, prepared by Arup. Excluded Appendix A Mining Report.
  - An intrusive Environmental Ground Investigation, April 2004, of the South Crofty Mine site carried out by Atkins for Baseresult Holdings Ltd.
  - A non intrusive Environmental Land Condition Study, March 2003, prepared by Atkins for Baseresult Holdings Ltd., the study covering the South Crofty Mine site and also the Taylors Shaft site and the Roskear Shaft site.
  - Archaeological Report, February 2003, prepared by Baseresult Holdings Ltd. during the South Crofty Mine's review of its old mineral permission.
  - Mining Activity Report, February 2003, prepared by Baseresult Holdings Ltd. during the South Crofty Mine's review of its old mineral permission.
  - Mining Activity Site Investigation: Trenching, Land at Dudnance Lane, Pool, Redruth, Cornwall, 21/2/02, prepared by Cornwall Consultants for EN1 Ltd.
  - Dudnance Lane Site Investigation draft Land Quality Assessment of land at the South Crofty Mine adjacent SKW Transfer Station (now operated by SITA UK Ltd.) at Dudnance Lane, January 2002. This investigation was of land in the south and west of the Phase 1 site currently used by SITA for skip storage, but draft report does not include a drawing showing exploratory hole locations.

3.6 In addition to the review of existing information Atkins commissioned Cornwall Consultants to undertake a desk study comprising a mining search and document review to enable a subsequent mining investigation, also carried out by Cornwall Consultants, of the site to confirm or discount suspected mining features that could affect development. A copy of those studies are provided in Volume 2. Following the desk study the mining investigation of the Phase 1 Site was limited to the undeveloped land in the west currently used for skip storage, because the south of the site with the highest risk of previous mining activity along the North Tincroft Lode has been investigated and some remedial work implemented at that time (refer to Mining Activity Report, February 2003, prepared by Baseresult Holdings Ltd.).

3.7 Therefore the mining investigation work in the Phase 1 Site consisted of two linear trenches north to south to investigate for a suspected shaft in the centre of the site identified by other studies,

although the desk study carried out as part of this commission could find no record of that shaft in historical mining records, and trenches had been previously dug in that vicinity.

3.8 In addition to the mining investigation, samples were taken at the trench locations and at two other trial pits in order to supplement the existing chemical data for the Phase 1 Site available from a previous investigations (refer to Dudnance Lane Site Investigation draft Land Quality Assessment of land at the South Crofty Mine adjacent SKW Transfer Station at Dudnance Lane, January 2002, and Mining Activity Site Investigation: Trenching, Land at Dudnance Lane, Pool, Redruth, Cornwall, 21/2/02)

3.9 New utility maps for the entire site were obtained via Atkins' in-house service, as well as a topographic survey by Douglas Geomatics, and those documents are also provided in Volume 2.

3.10 A CCTV Survey of the site drainage was carried out by a subcontractor Clear-flow Ltd. and the report and videos from that survey are provided in Volume 2. The area of the current household waste recycling centre and the waste transfer station could not be accessed due to the operational constraints on the site. However for that area survey drawings of the known drainage on the site were obtained from the operator SITA (UK) Ltd., and the drainage was also visually traced upstream of that area into the south of the Forth Kegyn Industrial Estate.

Investigation Findings

Tenancies

3.11 There are several occupiers existing on the Phase 1 Site, some of which have the benefit of existing leases and hence Cornwall Council does not have unencumbered ownership of the whole site. Atkins has been informed that Coastline Housing Ltd. has been offered and accepted an alternative site nearby and hence the duration of the tenancy held by Coastline Housing is not an issue. Further details regarding that issue can be found in the Dudnance Lane Depot Phase 1 Feasibility Report, April 2012 prepared by the Bailey Partnership and provided in Volume 2 appendix H of this report.

Demolition

3.12 Apart from the waste transfer station building, which is a small simple portal frame metal clad building, none of the existing facilities on the site have a long-term commercial use due to the amount of refurbishment required and the layout of the buildings.

3.13 Furthermore under the Dudnance Lane Depot Phase 1 Feasibility Report, 2012, study an asbestos report of the buildings has been prepared and evidence of asbestos confirmed in the buildings. The asbestos survey was compliant with the HSE publication HSG264 Asbestos: The Survey Guide, and various sources of asbestos were found, but a further survey is likely to be required to inform a specialist asbestos removal contractor and a pre-demolition asbestos strip will be required.

3.14 Due to the high historic value of parts of the site, in particular the Bartle's Foundry building, it is likely a watching brief from an archaeologist during demolition and earthworks will be a condition of the planning permission for the site restoration. The Bartle's Foundry building also contains some unique historic features and Cornwall Archaeological Services has advised that key features should be preserved by removal to a safe store and a full archaeological record survey of the key buildings be undertaken before demolition.

3.15 Stockpiles of earth, building rubble (blocks, bricks, concrete and sand), tyres and windows/doors were recorded across the derelict area of the site and in buildings generally. There was also evidence of uncontrolled tipping, though not extensive.

Decontamination

3.16 In summary for the Phase 1 Site, the north and east of the site was occupied by an iron foundry (Bartle's) from prior to the first available historical plans, with earthworks in the west of the site associated with the nearby mining activity. Additional buildings were added and removed since, including in the north west of the site large 'Holman Sheds' used by the Holman Brothers when they owned the foundry, which were later used by South Crofty Mine for storage. The east of the site is recorded as a council depot since the 1960's and there is reported anecdotal evidence that an area of the site was previously used for concrete production. There is also a fuel storage area with above and below ground tanks. OS maps from the 1800s to early 1900s identify the west of the site as New Cook's Kitchen Mine with a couple of buildings shown on the 1880 map though the engine house was to the north and the buildings are not shown on the 1908 map. In the 1960s there was a leat running north into the south of the site to a tank, the water being used by the South Crofty Mine Mill.

3.17 During the recent ground investigations Made Ground was locally encountered down to a maximum depth of 1.6 m bgl, with ash and clinker present in the footprint of the former foundry, but outside that area and the fuel storage area, no visible indicators of ground contamination were observed. Ground conditions encountered in the centre of the site consisted of compacted hardcore surface followed by approximately 1.0 m of heterogeneous fill, comprising of demolition rubble and variable quantities of mine and ash wastes. That was underlain by weathered greenstone rock. In the west of the site similar ground conditions were encountered although the Made Ground was more variable though of a similar nature i.e. ash and mine spoil, but more mixed. This area is shown on historic plans as a depression, and the evidence suggests backfilling of that area. In the south of the site Made Ground material is either not present or is a relatively thin layer (0.2m) pockets below compacted aggregate, underlain by the natural subsoil and weathered bedrock.

3.18 The ground investigation carried out as part of the Dudnance Lane Depot Phase 1 Feasibility Report, 2012, studies encountered a thin layer of Made Ground comprising concrete and furnace waste in the northern eastern part of the site currently used for parking and for storage of materials. Deeper Made Ground comprising reworked natural material was recorded in one trial pit in the derelict area to the west (east of the skip storage area). Furnace waste and anthropological inclusions such as concrete, brick, metal and plastic were encountered in two trial pits. Weathered bedrock was recorded to underlie the Made Ground and comprised silty, gravelly clay (weathered Mylor Slate). That material became rapidly more competent with depth other than in the eastern side of the site where natural material arose more predominantly as gravelly sand.

3.19 The majority of the chemical analysis indicated potentially hazardous substances were generally not present at concentrations above relevant screening guideline values with regard to risk to human health for a commercial land use, the exception being arsenic concentrations which invariably exceeded the Soil Guideline Value for a commercial land use. However given future development is likely to entail new final surfaces over the majority of the site, either as new buildings, roads and pavements or parking areas, and newly landscaped areas, the potential pollutant linkage of a future site user to arsenic in the existing ground will be mitigated.

3.20 Visual inspection during the site investigation carried out by Cornwall Council Engineering Services Laboratory in March 2012 revealed oil contamination in a flooded vehicle service pit, with petroleum hydrocarbon contamination also suspected during investigations in the vicinity of both

the above ground and buried fuel tanks, though that was not represented by the chemical analysis results. Nevertheless the fuel and oil storage facilities currently on site are in a poor condition and are surrounded by inadequate protection, for example inadequate bunds around the above ground tanks, and it will be prudent to plan for further investigation of that area or chemical analysis of the ground locally near to those tanks during their removal.

Mine Workings

3.21 Key mining features in the Phase 1 Site are summarised in the following table, with full details provided in the Desk Study Mining Search and Document Review, and Mining Investigation reports provided in Volume 2.

Table 3.1 – Phase 1 Known Mining Features

Key Mining Feature(s) and mining desk study and investigation reference ()	Findings of mining studies	Dimensions	Status	Remediation Required
Unnamed Shaft (S10)	Unconfirmed – believed non-existent.	N/A	N/A	Construction risk item.
Adit Shaft (S11)	Reported capped.	N/A	Reported capped. Low risk.	Suitability of cap may need to be assessed dependent on final development plans.
North Tincroft Lode (L13 and L14)	Confirmed	N/A	Very high risk though underground support provided to hanging wall such that ground is suitable for trafficking by heavy goods vehicles.	The underground support (design calculations) may need to be checked dependent on the final development plans for that area if additional loading is proposed on or near to that ground.

3.22 The unnamed shaft (S10) identified within other studies was searched for but not located, either by the desk study or the mining investigation, and in the view of Cornwall Consultants that shaft does not exist at this location, and nor do Western United Mines believe a shaft exists in that area. No other unexpected mining features were found in the investigation of that area.

3.23 Known mining subsidence risk is restricted to the south west end of the Phase 1 Site, associated with workings on North Tincroft Lode. That area was investigated previously (Land at Dudnance Lane Pool, Cornwall Consultants, 2002) and the workings were treated in 2002 by Western United Mines to support HGV traffic, although Cornwall Consultants highlight a residual risk from hanging wall failure above the shallowest dipping lode which could possibly affect a larger area of the site (unspecified).

3.24 The mining desk study and mining investigation did not indicate the presence of other shafts or other deleterious mining related features in the area. It is thought likely that the only outstanding mining features that existed previously to the south east of the site nearest Forth Kegyn have

already been treated or do not exist, and that conclusion also accords with the thoughts of Western United Mines.

3.25 Therefore no ground stabilisation works are envisaged for the restoration works for the Phase 1 Site.

Services

Foul and Surface Water Drainage

3.26 The Phase 1 Site is served by a 300mm diameter surface water sewer and a 225mm diameter foul sewer both in Dudnance Lane. Access to the surface water sewer is restricted due to cover levels at the northern end of the Phase 1 Site but a connection is still possible along the entire length of the Phase 1 Site.

3.27 There are numerous surface and foul water pipes that can be abandoned in the area, but although not shown on South West Water plans there are critical surface and foul water pipes that serve properties in the Forth Kegyn industrial Estate to the south of the Phase 1 Site. Those will need to be maintained, though it would appear that can be accommodated in the outline Framework Plan without diversions.

Electricity

3.28 The Phase 1 Site is not affected by electrical cable crossings serving other sites, and has a recently modern connection to the new transfer station. The service provider has not suggested that a new sub-station will be required for this area which already has current users.

Gas

3.29 There are no gas services on the site and a new service to the Forth Kegyn access road is will be required to serve future development.

Telecommunications

3.30 There are no telecommunication services crossing the site serving other sites. The new proposed developments can be served off the existing infrastructure in Dudnance Lane.

Drainage, Surface Water Run-off and Attenuation

Site Drainage

3.31 The majority of the site is positively drained to the existing surface water sewers, though without the benefit of oil interceptors or attenuation storage. Only the west of the site currently used for skip storage is not positively drained.

3.32 As indicated in Section 2, soakaways cannot be utilised and attenuation storage will be required for a restricted rate of surface water discharge from the site.

Methodology to Estimate Attenuation Storage

3.33 Estimation of the required attenuation storage has been carried out for a 1 in 100 year design rainfall calculated from the FEH rainfall Depth-Duration-Frequency (DDF) model, with parameters obtained from the FEH CD-ROM for the Red River catchment upstream of the national grid reference SW 66000 41050. For possible climate change 30% has been added to the design rainfall as required by the SWMP. Due to the small size of the site in comparison to the Red River catchment and its location and development proposals, it has been treated as urban for the purposes of defining design rainfall, i.e. the rainfall return period is equal to the design flood return period. The calculations have also assumed a uniform rainfall intensity (in line with the Rational Method's assumption), though in reality the intensity of rainfall will vary during a storm event. For

simplicity it was assumed that attenuation storage would begin to fill at the start of the storm event, with discharge commencing after 0.25 hours.

3.34 The percentage run-off has been calculated using the fixed Wallingford Procedure UK run-off model released in 1983 (a statistically based regression equation that was calibrated against a large number of events recorded in the UK), based on assumptions regarding the potential future impermeable area of the site.

3.35 The calculations, which are provided in Appendix F.1, determine the minimum storage volume required based on the applied discharge rate which is assumed to be constant, that assumption not being critical to providing an indicative storage estimate, because even for the shortest storm there is a requirement for storage.

Estimated Attenuation Storage

3.36 For the Phase 1 Site the attenuation storage estimates was determined by the following approach:

- Volume A – calculating the total volume of run-off from only the existing developed portion of the Phase 1 Site for a 1 in 30 year event for storm durations from 5 minutes to 7 days with no restriction to the discharge and no allowance for climate change. The existing developed portion of the Phase 1 Site is wholly impermeable with percentage run-offs derived of 78.8% for summer and 81.2% for winter.
- Volume B – calculating the total volume of run-off from the Phase 1 Site based on the Framework Plan provided in Appendix A, for a 1 in 100 year event for storm durations from 5 minutes to 7 days with an allowance for climate change of 30% added to the rainfall and the discharge restricted to 10 l/s/ha i.e. the SWMP 1x existing discharge rate for a 1 in 30 year rate. The discharge has been restricted to that return period because discharge will be to a SWW sewer and it is accepted practice is to design sewers for a 1 in 30 year rainfall return period as set out in Sewers for Adoption 6 (SfA6). From the Framework Plan provided in Appendix A an impermeable proportion of 88% for the 2ha area was determined, giving percentage run-off values of 66.9% for summer and 69.3% for winter.
- The required attenuation storage was estimated as the maximum value of Volume B minus Volume A, a value of 408m^3, as that will provide attenuation storage for development of areas which have no existing development.

3.37 For the Phase 1 Site stormwater storage crates with 95% void are the first option to provide the storage, so the required stormwater storage crate volume is 430m^3 (from attenuation storage volume divided by 0.95). The surface water drainage is shallow in this area and hence storage crates are proposed consisting of 36 x 15 x0.8m (see Appendix B.4 – Drawing 05). Those will need to be encased in an impermeable membrane to avoid water infiltrating into the ground and enable the discharge from that storage to be accepted by South West Water.

3.38 Options analysis of the attenuation storage requirements has indicated the following:

- Increased attenuation storage to 496m^3 for up to a 1 in 100 year event plus 30% climate change allowance with discharge from the whole site made to a strategic system at the SWMP x3 existing rate for a 1 in100 year event i.e. 37.9 l/s/ha.
- Increased attenuation storage to 688m^3 storage if discharge from the whole site had to be restricted to 6 l/s/ha i.e. the greenfield run-off rate for a 1 in 30 year event, for up to a 1 in 30 year event plus 30% allowance for climate change.
- Increased attenuation storage to 813m^3 for up to a 1 in 100 year event plus 30% climate change allowance if discharge from whole site had to be restricted to the SWMP x1 existing for a 1 in 30 year event i.e. 10 l/s/ha.

3.39 The attenuation storage volumes determined by the options analysis are greater than the volume proposed for the Delivery Plan and will therefore need to be accounted for as a risk for development.

Proposed Solutions

3.40 The buildings on the Phase 1 Site are not economically viable to be retained and would restrict the overall employment opportunities for the site. The main occupiers of the Phase 1 Site are Cornwall Council, SITA (UK) Ltd. and Coastline Housing Ltd. SITA is already programmed to move from the site, and Coastline housing also have alternative arrangements to move if required.

3.41 Several of the buildings contain asbestos and a pre-demolition asbestos strip is proposed prior to demolition commences. An asbestos survey is available which provides an initial basis for the location of asbestos containing materials, but a supplementary survey is required prior to demolition (refer to Asbestos Refurbishment Survey within the Dudnance Lane Depot Phase 1 Feasibility Report, April 2012, prepared by the Bailey Partnership).

3.42 Some buildings form part of the boundary of the site, which will require boundary negotiations with the adjoining landowners. But it is proposed that for the restoration a simple security fencing will be adequate to satisfy the adjoining land owners because they will ultimately be redeveloping their site also.

3.43 The fuel and oil storage installations in the Council depot area (see Appendix B.2 – Drawing 01 should be decommissioned and removed. The existing below ground and above ground tanks and flooded vehicle pits would be made safe by emptying and disposal offsite and by degassing the underground fuel storage tanks prior to their excavation and disposal. It would be possible to leave the tanks in situ and fill with foamed concrete, but that could leave the surrounding ground contaminated and would restrict future development due to the obstructions in the ground.

3.44 Suspected 'hot spots' associated with the former oil storage uses would be inspected during earthworks and suspect ground subject to further investigation and chemical analysis. The chemical analysis of the limited number of samples from that area did not show elevated levels of petroleum hydrocarbons, but that may not be wholly representative given the limited sampling. Material unsuitable for reuse would be transferred off site to a licensed waste facility, though the aim would be for the inspection and further investigation to delineate and thereby minimise the quantity contaminated soils requiring excavation and off site disposal.

3.45 The topographic survey shows several mounds and level changes on the site and after demolition it is proposed to level the site to provide a clear stable platform for future development. There is some general localised waste materials at the site associated with previous and ongoing activity at the site, and that waste will be removed off site to a suitable licensed facility prior to general re-grading of the site. Levelling the site will also demonstrate that historic depositing of waste and the risk of unknown mining features has been effectively minimised.

3.46 However although there have been previous works to cap the only known shaft and mitigate the possibility of hanging wall failure on North Tincroft Lode, the appraisal for the latter only considered up to loadings due to Heavy Goods Vehicles. Therefore should additional new buildings or higher loadings be required in this area then the calculations would need to be revisited or the development proposals revised.

3.47 It is assessed a low risk that further untreated mine features could be found on this site, but nevertheless it is proposed there be a watching brief for an experienced mining engineer to be present or on call during site clearance and re-grading of the site to inspect the ground and manage the risk of mining features, if encountered. The future development may require further mining investigations for specific structures in order to verify the absence or risk of shallow

surface workings given the previous mining history of the site. Further investigation may also be required if adverse ground conditions are encountered during construction.

3.48 The site will need to be protected from unauthorised access and use, so a post and wire fence is proposed with a 1.5m high security bund also installed on adjacent land to the east.

3.49 The levelled site could create a dust hazard and it is proposed to temporarily cap the central portion of the site with crushed and sorted demolition material from site, with the north and south west portions of the site hydroseeded.

3.50 Discharge of foul water will be to SWW foul sewer and no foul diversions are required for the Phase 1 Site, though some existing sewers will need to be removed or sealed. However the main sewer serving the Forth Kegyn Industrial Estate to the south (see Appendix B.2 – Drawing 01) will need to be safeguarded.

3.51 Provision will be made for attenuation of flows to SWW surface water sewer (see Appendix B.4 – Drawing 05). A small bund will be formed at the downslope boundary of the site to intercept run-off onto the adjacent land owned by Western United Mines.

Alternative Options

3.52 The reuse of the buildings was also considered but the sizing and general extent of refurbishment required is not considered economically viable. The Household Waste Transfer Station is relatively new but is small in size and surplus to requirements, however it is a small simple low cost portal frame building and could be easily removed for reuse elsewhere.

3.53 As there is considered to be only be very limited potential for reuse of the existing buildings at the site without hindering the framework aspirations, alternative options for the Phase 1 Site are mainly limited to the restoration surface finishes.

3.54 Options considered for the Phase 1 Site included:

- Further investigation by geophysics and probe hole to explore for possible shallow mining features, but given the main mining features are well known and there is relatively low risk of mining features elsewhere, it is considered more effective to use a mining engineer with a watching brief for the restoration earthworks.
- Placement of a geotextile separator beneath proposed surface finishes of aggregate. However as that was not considered a necessity because the natural ground is not expected to be soft, and as in some areas the aggregate may need to be moved as the lack of a geotextile separator will make that activity easier and without disposal cost of the geotextile.
- Increased thickness of aggregate surface finishes, either arising from processed materials from demolition at the Phase 1 Site or the adjacent South Crofty Mine site, or imported recycled aggregate.
- Importation of subsoil and topsoil rather than simply hydroseeding areas of the levelled site, but that option was discounted because of likely cost and it may not be required in future because there is only a limited area shown by the Framework Plan to require future landscaping.
- Installation of greater or alternative attenuation storage provision either underground or in open surface storage, though the latter would need to be lined. Within the Framework Plan there is limited room in Phase 1 Site at the low point which is also the focal point of the larger area being close to the South Crofty Mine head frame. Water could be conveyed to the Phase 1A Site but that connection is restricted by the proposed East

West Link Road and access to the South Crofty Mine site, and hence achieving correct levels for drainage would be difficult, if not impossible.

- Installation of strategic surface water attenuation storage provision either underground or in open surface storage. However due to the topography of the adjacent land and along the Red River, it would appear not to be feasible due to the sloping nature of the ground and the need to avoid the flood plain.
- The provision of a new substation was considered due to the possibility heavy demands at the HWRC, but the service provider did not see the need for that, so the option was not taken further.

Risk Register

3.55 See the risk register provided in Appendix C.1 which feed in to the project risk allowance accounted for in the following section regarding costs. Note that where possible potential costs have been moved to the risk register as opposed to allowing for it in outline cost estimate as a provisional item. For example, it is considered that the need to remove contaminated material is low and hence only where it is definite that this needs to be removed has it been placed as an item in the cost schedule.

Costs

3.56 The key items of costs are detailed in the following table and appended in full in the cost plan provided in Appendix C.2. Please note that the cost of the provision of the heating and steam main are not included.

Table 3.2 – Key Cost Items for Restoration of the Phase 1 Site

Key Items	Approx Cost £k	Comment
Stage 1		
Site prep	225	Includes road area
Demolition	450	
Other items	80	
Stage 2		
Earthworks	55	
Attenuation Tanks	350	
Hydro Seeding	25	
Other Items	0	
Contractors OHP (5.5%)	65	
Project Preliminaries (20%)	235	
Project Risk Allowance	285	See risk register
Inflation	15	
Total Works Cost	1,800	

Key Items	Approx Cost £k	Comment
Fees		
Planning Application	35	Includes studies
Planning Mitigation Works	95	
Professional Fees	190	
Total Project Costs	2,200	

3.57 Various options are available that could be considered and the implied cost without prelims, risk etc. are contained in the following table.

Table 3.3 – Cost Implications of Options for the Phase 1 Site

Option	Approx Cost £k	Comment
Geotextile separator over stoned areas E/O	7	Stoned area only
Importing topsoil instead of hydro seed and mulch	85	Where not stoned
Importing subsoil instead of hydro seed and mulch	151	Where not stoned
Importing Topsoil instead of hydro seed and mulch	40	Highway Land Only
Importing subsoil instead of hydro seed and mulch	70	Highway Land only
Placement of 200mm of stone E/O	7	Stoned area only
New Electric Substation	30	In Risk Register

Baseline Costs

3.58 Standard base line costs for derelict and contaminated land exclude new services and drainage. As the minimum of work is being undertaken to the highway land this should also be excluded. The revised site area would 2 ha and the work costs excluding as stated above would be £0.9m.

3.59 Comparing this with English Partnership Best Practice Note 27 Contamination and Dereliction remediation costs for the following scenarios, based on 2007 prices:

- Derelict Site employment small complex - £225k – £400k / ha + 275 to 400K .
- For the Phase 1 Site the cost would be £675k - £1.2m

3.60 From the above the price is in the correct range as actual construction inflation over this period has been neutral if not negative.

Annexes

3.61 The technical annexes used to compile this Delivery Plan are included in Volume 2 and consist of:

- Services Returns – Atkins
- Topographic Survey – Douglass Geomatics
- CCTV Survey – Clear-flow
- Mining Desk Study – Cornwall Consultants
- Mining Investigations and Risk Assessment – Cornwall Consultants
- Environmental Ground Investigation – Atkins
- Infrastructure and Remediation Strategy – Ove Arups
- Phase 1 Feasibility Report – Bailey Partnership

4. Phase 1A Site

Existing Situation

4.1 The Phase 1A Site has three main types of landcover. In its north the land generally slopes slightly to the west to an earth bund which delineates much of that area. There is little vegetation cover other than some grass and scrub. The site has two small buildings which cover or are related to the Maynes Shaft, and other studies have referred to the area as the Maynes site.

4.2 To the west of the bund the land is at a notably lower level by several metres and had dense vegetation cover with heather and bramble, though some vegetation clearance was carried out to enable the ground investigations. The northern face of the bund displayed evidence of Japanese Knotweed (Falonica japonica, a non-native invasive species classed as a notifiable weed), though it is understood it has been subject to control by herbicide application and evidence of active growth was not observed during the environmental ground investigation period.

4.3 The south of the Phase 1A Site comprises areas of road surface, concrete and tarmac hardstanding, and gravel hardcore. The land either side of the main access to the South Crofty Mine site off Dudnance Lane, is surrounded by bunds on three sides, those being remnants of bunds around former water storage lagoons associated with the historical mining activity.

4.4 At present the land is owned by HCA, with the Phase 1A Site currently unused.

Details of Current Investigation

4.5 To build upon the existing studies, Atkins carried out a review of the existing information supplemented with Atkins' local knowledge and contacts with Western United Mines, SITA (UK) Ltd. and the Council.

4.6 Documents reviewed for the purpose of this study included but were not limited to the following:

- Supporting documents to planning application PA12/04644made 15th May 2012 for a Proposed residential development comprising 107 dwelling units and a Care Home at the South Crofty Mine Site. Including:
  - Ecological Assessment of land in the north of the South Crofty Mine surface site, Pool, Redruth, Cornwall, April 2012, prepared by Leppitt Associates for Crofty Developments.
  - Dudnance Lane Depot Phase 1 Feasibility Report, Revision No.0 04/04/2012, April 2012, prepared by the Bailey Partnership.
  - CPR Regeneration South Crofty/Dudnance Lane Framework Area, Infrastructure and Remediation Strategy, REP/057/11, March 2011, prepared by Ove Arup.
- Supporting documents to planning application W2/PA09/01295/F made 2nd October 2009 for the construction of a new highway between Dolcoath Avenue and Dudnance Lane and to undertake highway works (and highway modification and improvement works) on Dudnance Lane, Chapel Road , Dolcoath Road, Dolcoath Avenue and adjacent side road. Including:
  - CPR Regeneration Highway Infrastructure Project Phase 2 Dolcoath Avenue to Dudnance Lane Environmental Statement Volume Three – Technical Appendix Annex F1: Ground Investigation August 2009, prepared by Mouchel for Cornwall Council.
  - CPR Regeneration Highway Infrastructure Project Phase 2 Dolcoath Avenue to Dudnance Lane Environmental Statement Volume Three – Technical Appendix Annex F2: Mining Stability Report, 2009, prepared by Mouchel for Cornwall Council.

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- South West of England Regional Development Agency Camborne Pool Redruth: Compulsory Purchase and Building for Business, Site Investigations, Phase 1 Geotechnical Desk Study Report: Sites 5 & 6 - South Crofty, March 2005, prepared by Arup. Excluded Appendix A Mining Report.
- An intrusive Environmental Ground Investigation, April 2004, of the South Crofty Mine site carried out by Atkins for Baseresult Holdings Ltd.
- A non intrusive Environmental Land Condition Study, March 2003, prepared by Atkins for Baseresult Holdings Ltd., the study covering the South Crofty Mine site and also the Taylors Shaft site and the Roskear Shaft site.
- Archaeological Report, February 2003, prepared by Baseresult Holdings Ltd. during the South Crofty Mine's review of its old mineral permission.
- Mining Activity Report, February 2003, prepared by Baseresult Holdings Ltd. during the South Crofty Mine's review of its old mineral permission.

4.7 In addition to the review of existing information Atkins commissioned Cornwall Consultants to undertake a desk study comprising a mining search and document review to enable a subsequent mining investigation, also carried out by Cornwall Consultants, of the site to confirm or discount suspected mining features that could affect development. A copy of those studies are provided in Volume 2. Following the desk study the mining investigation of the Phase 1A Site entailed excavation of four trenches to suspected lode outcrops and six trial pits, extended as necessary, to investigate suspected and known shafts locations. The suspected lode outcrops could not be investigated where close to the SWW sewers. A further ten trial pits were excavated to investigate the general ground conditions or areas of concern such as an old quarry and bunds, but were also inspected for mining features.

4.8 New utility maps for the entire site were obtained via Atkins' in-house service, as well as a topographic survey Douglas Geomatics, and those documents are also provided in Volume 2.

4.9 A CCTV Survey of the site drainage was carried out by a subcontractor Clear-flow Ltd. and the report and videos from that survey are provided in Volume 2.

Investigation Findings

Demolition

4.10 Most of the former buildings have been demolished, such that there is no substantial structure requiring specialist demolition plant. Four minor buildings remain and there are some localised general waste deposits on site.

Decontamination

4.11 In summary for the Phase 1A Site, the early plans show Long Close Mine with the Hayle Railway line crossing north to south. Later plans identify that as G.W.R. North Crofty Branch which was constructed in 1837, with a tramway joining from the east, and residential buildings (East Hill House and probably a station in the north, with earthworks either side of the railway, and an engine house and other mine structures in the south or south west of the site.

4.12 The more recent plans since the 1960s, show changes to the buildings and earthworks, mine shafts identified as Mayne's Shaft and 'Sump' Shaft, and ponds in the south of the site for storage of water from the South Crofty Mine for use by its mill south of the site. Earthworks and spoil are

shown as covering the central portion of the site from the earliest maps onwards, with later maps also showing earthworks around the shafts and a tank adjacent Mayne's Shaft on maps from the 1960s to the 1980s. Maps pre the 1900s show an area of disturbed ground, identified in the mining reports as a quarry for Elvan rock, in the north west corner of the site, though it is not shown by later maps. Indeed the historical maps indicate little prior usage of the land in the west of the site other than that quarry and small buildings at its perimeter, though there is anecdotal evidence that area has been used for grazing, and also keeping pigs in its south western corner.

4.13 During the recent ground investigations it was confirmed that much of the Phase 1A Site has a covering of Made Ground comprising mainly mine spoil materials, poorly graded and placed uncompacted, the main area of Made Ground being delineated by the obvious bund around the centre of the site.

4.14 The majority of the chemical analysis indicated potentially hazardous substances were generally not present at concentrations above relevant screening guideline values for risk to human health, the exception being arsenic concentrations which invariably exceeded the respective Soil Guideline Values for commercial land and residential land uses.

4.15 Other than surface staining locally in one area, evidence of petroleum hydrocarbons and polyaromatic hydrocarbons within the Made Ground was not apparent during the ground investigation, though the chemical analysis indicates the presence of those substances. In the east of the Phase 1A Site previous pollutant sources include the former North Crofty Branch Line and a storage tank shown on historical plans near Maynes Shaft, though the presence of the petroleum hydrocarbons and polyaromatic hydrocarbons may reflect a combination of historical and more recent activities at the site. The detected concentrations are unlikely to represent a risk to human health, though further more detailed analysis will be necessary if evidence of widespread suspected contamination is encountered during future earthworks. Elevated concentrations were also detected in the west of the site at a suspected mine shaft encountered and subsequently designated S13 by the mining investigation, though that localised occurrence is also unlikely to represent a risk to human health.

4.16 That suspected shaft and other shafts and the Made Ground at the site will be excavated during redevelopment, hence a possible concern is if off site disposal of excess materials is required. Based on the likely main source of the Made Ground as mining spoil material, arisings from excavations could be classified under European Waste Code 01 'Wastes Resulting from Exploration, Mining, Quarry, and Physical and Chemical Treatment of Minerals', but in addition the Waste Acceptance Criteria for inert landfill were occasionally exceeded for some substances.

4.17 A trial pit, TP7, excavated in the old quarry shown in the northern west corner of the Phase 1A Site on pre 1900s historical maps encountered the suspected southern boundary of the former quarry and mainly quarry or mine spoil materials as backfill, though with more mixed materials nearer the existing ground surface.

Mine Workings

4.18 Key mining features in the Phase 1A Site are summarised in the following table, with full details provided in the Desk Study Mining Search and Document Review, and Mining Investigation reports provided in Volume 2. Those features are in addition to Mayne's Shaft.

Table 4.1 – Phase 1A Mining Features

Key Mining Feature(s) and mining desk study and investigation reference ()	Findings of mining studies	Dimensions	Status	Remediation Required
Unnamed shaft (S2)	Confirmed	3.0 x 1.5 m. Collar at 4.0 m bgl.	No cap or plug. Backfill of loose mine waste held in place by friction. Very high risk.	Capping at level of bedrock with mass or reinforced concrete.
Rutter's Shaft (S3)	Confirmed	Unknown. Excavation to collar not practical.	Unknown. Believed capped with metal grid and possibly in part by an existing concrete platform. High to moderate risk.	Removal of present cap. Capping at level of bedrock with mass or reinforced concrete.
Adit Shaft (S4)	Confirmed	4.0 x 5.0 m. Collar at 4.5 m bgl.	Steel grid and vent placed at bedrock level. Voided beneath grill. High to moderate risk.	Removal of present cap. Capping at level of bedrock with mass or reinforced concrete.
S8	Confirmed	~1.5 x 2.0 m. Collar not inspected due to health and safety considerations although recorded at approximately 2.5 m bgl.	No cap or plug. Open shaft surrounded by herras fencing. Very high risk.	Capping at level of bedrock with mass or reinforced concrete.
Reynold's Shaft (S9)	Confirmed	2.8 x 1.5 m. Collar at 2.0 m from base of bund.	No cap or plug. Backfill of loose mine waste held in place by friction. Very high risk.	Shaft collar considered small for depth of lode. May be the case that this is an access way to the main shaft which has to date not been found. Capping at level of bedrock with mass or reinforced concrete.
Longclose Main Lode (L4)	Confirmed shallow workings or shaft	1.0 x 0.5 m. Collar at 2.0 m bgl	No cap or plug. Backfill of loose blocky mine waste and soil. Moderate to high risk.	Capping at level of bedrock with mass or reinforced concrete.
Longclose Caunter Lode (L3a) (S12)	Confirmed shallow workings/ shaft	1.0 x 1.5 m. Collar at 3.2 m bgl.	No cap or plug. Backfill of loose blocky mine waste. Moderate to high risk.	Capping at level of bedrock with mass or reinforced concrete.
Elvan Quarry	Confirmed southern edge of former quarry	Unconfirmed at present. 1880 historical map indicates approximately 5-600m2.	Backfilled.	Dependent upon further investigation and development plans.

4.19 Further mining investigation will be required because it was not possible due fully investigate some suspected mining hazards due to the proximity of the SWW sewers. However much of the central area of the Phase 1A Site where there is Made Ground delineated by the distinctive bund around the centre of the site, will need to be excavated to natural ground and the materials sorted and replaced in compacted layers as engineered fill. That excavation combined with that to secure the mine shafts will also provide an opportunity to inspect the natural ground surface for possible mine workings.

Services

Foul and Surface Water Drainage

4.20 The Phase 1A Site has a large surface water sewer (570–800mm diameter) crossing east to west in a dog leg, which serves properties off Dudnance Lane to the south, including the Forth Kegyn Industrial Estate, and which will also be able to serve future development at the site. Parallel to that is a foul water sewer (225–375mm diameter) which will also be able to receive foul water from future development at the site. However both will require diversion to economically enable the development envisaged by the Framework Plan.

4.21 A smaller foul sewer (150mm diameter) crosses the northern part of the Phase 1A Site and that which will also require diversion. Diversion of the section which crosses the north east corner of the site will be feasible, but due to the connections at the rear of properties along East Hill, diversion of that section at the enabling works stage will not be possible.

Electricity

4.22 The eastern part of the site contains an electrical supply to the mine that will need a temporary diversion until the mine relocates. Apart from the private mine feed there are no other known electrical connections to the site and a new supply and substation will be required. Original service provider plans used the proposed EWLR as a service corridor, but this will not be available in time to meet the programme but the alternative route will not entail significant additional costs.

Gas

4.23 There are no gas services on the site and a new service and governor will be required.

Telecommunications

4.24 The main telecommunication feed to the underground mine and surface facility crosses the site in the east and will also require a temporary diversion from Dudnance Lane until the mine is relocated. There are no other telecommunication crossings that require diversion.

Drainage, Surface Water Run-off and Attenuation

Site Drainage

4.25 The site is not positively drained and it is thought that most surface water run-off ponds on the current surfaces and evaporates, or is taken up by vegetation or infiltrates into the underlying strata. However previous properties in the north of the site probably drained to the foul sewer.

4.26 Currently there is no evidence of surface run-off issues.

Methodology to Estimate Attenuation Storage

4.27 The methodology for deriving attenuation storage requirements is described in detail in Section 3 and the calculations are provided in Appendix F.2.

Estimated Attenuation Storage

4.28 For the Phase 1A Site approximately 758m^2 of the southernmost portion has been anticipated to have surface water drainage via the planned East West Link Road.

4.29 The remainder of the Phase 1A Site excluding the western portion which the framework envisages will be utilised for housing is 1.155ha with an estimated impermeable proportion of 94.9% for the 1.89ha area, and a percentage run-off of 73.6% for summer and 76.0% for winter. That leads to a requirement for 540m^3 of attenuation storage for a 1 in 100 year event for storm durations from 5 minutes to 7 days with an allowance for climate change of 30% added to the rainfall and the discharge restricted to 10 l/s/ha i.e. the SWMP 1x existing discharge rate for a 1 in 30 year rate.

4.30 The portion of the Phase 1A Site anticipated to be utilised for housing including its main access road, is 0.736ha with an impermeable proportion of 73.2% and a percentage run-off of 51.0% for summer and 53.4% for winter. That leads to a requirement for 205m^3 of attenuation storage for the storm and discharge criteria detailed in the previous paragraph.

4.31 That is a total attenuation storage requirement of 745m^3 and for Phase 1A Site due to the envisaged differing areas of development and change in site levels, two storm water attenuation tanks are required (see Appendix B.4 – Drawing 06). For the eastern portion with a commercial use, the attenuation storage can be provided via a buried concrete tank structure 25m x 11m x 2m = 550m^3. For the land to the west to be used for housing, attenuation storage can be provided via storage crates of size 25 x 6 x 0.8m = 120m^3 and 20 x 6 x 0.8 = 96m^3 assuming 95% void.

4.32 However options analysis of the attenuation storage requirements has indicated the following:

- It may be feasible for some of the attenuation storage to be implemented via open storage, although the opportunities are restricted on the site. The creation of a large open water feature above the proposed housing site may reduce the value of the housing site due to developers taking into account that prospective house buyers will still perceive a higher flood risk.
- Reduced attenuation storage to 458m^3 storage for up to a 1 in 100 year event plus 30% climate change allowance with discharge from the whole site made to a strategic system at the SWMP x3 existing rate i.e. 37.9 l/s/ha for a 1 in 100 year event.
- Reduced attenuation storage to 627m^3 storage if discharge from the whole site had to be restricted to 6 l/s/ha i.e. the greenfield run-off rate for a 1 in 30 year event, for up to a 1 in 30 year event plus 30% allowance for climate change.

Proposed Solutions

4.33 Confirmed shafts will require securing through the use of mass or reinforced concrete at bedrock level in line with relevant building or local authority requirements. Some suspected lode outcrops which could not be easily investigated due to existing buried services will require further investigation in order to check for historical mine workings.

4.34 However the central portion of the Phase 1A Site which has up to approximately 3.5m of variable uncompacted and poorly graded Made Ground, will need excavation and a mining engineer with a watching brief should carry out inspection of the natural ground for signs of previous mining activity. The materials excavated can be sorted, screened and replaced in compacted layers as engineering fill.

4.35 The excavation of Made Ground materials will also provide an opportunity to for further inspection for evidence of potentially hazardous substances. However given future development envisaged by the Framework Plan is likely to entail new final surfaces over the majority of the site, either as new buildings, roads and pavements or parking areas, and newly landscaped areas such as

gardens, the potential pollutant linkage of a future site user to hazardous substances in the existing ground will be mitigated by the development. The screening of excavated materials on site will also minimise that which may require off site disposal to landfill, which in any case could not be implemented without some pre-treatment.

4.36 Additional Investigation will be required to further define the ground conditions at the former quarry in the north west of the site, and a small portion of land in the south west most corner of the site which could not be readily accessed. The area of the former quarry may require methane gas protection measures if biodegradable materials are identified.

4.37 The aim of excavation and processing of the Made Ground materials is to provide a regraded site, with the eastern portion finished with at least 100mm of site won stone. However areas which will be mainly vegetated under the Framework Plan will be treated with a hydroseeded grass mulch including the earthwork slopes (see Appendix B.4 - Drawing 06). That also includes the envisaged housing area in the west of the site as that area could be subject to considerable disturbance during construction works and hence the import of an engineered cap for garden areas was considered best left with the developer. The aggregate and hydroseed finish will also mitigate the potential for a dust hazard.

4.38 Discharge of foul water will be to SWW foul sewer, with diversions implemented for Phase 1A as indicated on Appendix B.3 - Drawing 04. The diversion differs from that suggested by SWW due to the fact that the CCTV survey has indicated the assumed depths in SWW quote are incorrect, and hence the SWW proposed diversion would not be feasible.

4.39 Discharge of surface water will be to SWW surface water sewer, with diversions implemented as indicated on Appendix B.3 - Drawing 04. That sewer is a substantial sewer and hence its diversion is likely to have notable cost implications.

4.40 In order to provide developable platforms some terracing will be required to divide the two site areas and provide access to the lower site. As the ground requires excavation and reworking the optimum solution is considered to be a reinforced earth retaining wall to the higher eastern portion site, and for the lower site a temporary regraded 1V:2H slope to support the access track. When the houses are constructed they can form part of the retaining wall for that area so that the 1V:2H slope can be removed and the optimum density of housing accommodated.

Alternative Options

4.41 Alternative options for the Phase 1A Site are also mainly limited to the restoration surface finishes. Options considered for the Phase 1A Site included:

- Further investigation by geophysics and probe hole to explore for possible shallow mining features, but given the extensive Made Ground, it is considered more effective to use a mining engineer with a watching brief for the restoration earthworks, though probe hole drilling will be required at future structure locations.
- Placement of a geotextile separator beneath proposed surface finishes of aggregate. However that was not considered a necessity because the natural ground is not expected to be soft, and as in some areas the aggregate may need to be moved the lack of a geotextile separator will make that activity easier and without disposal cost of the geotextile.
- Increased thickness of aggregate surface finishes, either arising from processed Made Ground materials of from demolition at the Phase 1 Site or the adjacent South Crofty Mine site, or imported recycled aggregate.
- Importation of topsoil rather than simply hydroseeding areas of the levelled site, in particular the envisaged residential in the west of the site. But that valuable material

would have to be stockpiled to allow construction and hence is considered best left for the developer to import the material at the correct time. Topsoil and seeding slopes at that site was considered on the basis that most of those would become permanent, but that option was again rejected due to the cost and potential for disturbance during future construction, whereas it could be relatively cost effectively installed after construction.

- It may be feasible for some of the attenuation storage to be implemented via open storage, although the opportunities are restricted on the site. The creation of a large open water feature above the proposed housing site may reduce the value of the housing site due to developers taking into account possible heightened sense of flood risk.

Risks

4.42 See the risk register provided in Appendix D.1 which feed in to the project risk allowance accounted for in the following section regarding costs. Note that where possible potential costs have been moved to the risk register as opposed to allowing for it in outline cost estimate as a provisional item. For example, it is considered that the need to remove contaminated material is low and hence only where it is definite that this needs to be removed has it been placed as an item in the cost schedule.

Costs

4.43 The key items of costs are detailed in the following table and appended in full in the cost plan provided in Appendix D.2.

Table 4.2 – Key Cost Items for Restoration of the Phase 1A Site

Key Items	Approx Cost £k	Comment
Stage 1		
Site prep	250	Includes road area
Service Diversions	225	
Other items	5	
Stage 2		
Mine Stabilisation	105	
Earthworks	550	
Attenuation Tanks	285	
Hydro Seeding	40	
Other Items	85	
Contractors OHP (5.5%)	85	
Project Preliminaries (20%)	310	
Project Risk Allowance	225	See risk register
Inflation	20	
Total Works Cost	2,185	

Key Items	Approx Cost £k	Comment
Fees		
Planning Application	55	Includes studies
Planning Mitigation Works	165	
Professional Fees	250	
Total Project Costs	2,655	

4.44 Various options are available that could be considered and the implied cost without prelims, risk etc. are contained in the following table below.

Table 4.3 – Cost Implications of Options for the Phase 1A Site

Option	Approx Cost £k	Comment
Geotextile separator over stoned areas E/O	15	Stoned area only
Importing topsoil instead of hydro seed and mulch	75	Where not stoned or used for housing
Importing subsoil instead of hydro seed and mulch	135	Where not stoned or used for housing
Importing topsoil instead of hydro seed and mulch	55	Highway Land Only
Importing subsoil instead of hydro seed and mulch	100	Highway Land Only
Placement of 200mm of stone E/O	15	Stoned area only

Baseline Costs

4.45 Standard base line costs for derelict and contaminated land exclude new services and drainage. As the minimum of work is being undertaken to the highway land this should also be excluded. The revised site area would 1.9 ha and the work costs excluding as stated above would be £1.2m.

4.46 Comparing this with English Partnership Best Practice Note 27 Contamination and Dereliction remediation costs for the following scenarios, based on 2007 prices:

- Derelict Site employment small complex - £225k – £400k / ha + 275 to 400K .
- For the Phase 1A Site the cost would be £675k - £1.2m

4.47 From the above the price is at the top end of the range.

Annexes

4.48 The technical annexes used to compile this Delivery Plan are included in Volume 2 and consist of:

- Services Returns – Atkins
- Topographic Survey – Douglass Geomatics
- CCTV Survey – Clear-flow
- Mining Desk Study – Cornwall Consultants
- Mining Investigations and Risk Assessment – Cornwall Consultants
- Environmental Ground Investigation – Atkins
- Infrastructure and Remediation Strategy – Ove Arups
- Phase 1 Feasibility Report – Bailey Partnership

5. Dudnance Lane Road Alignment

5.1 Although not part of the study it was evident that there may be a significant time gap between the construction of the proposed enabling works for the Phase 1 and Phase 1A Sites and the envisaged dualling works to Dudnance Lane. The appearance of the land would detract from the development prospects of the Phase 1 and Phase 1A Sites.

5.2 The removal of the buildings on the Phase 1 Site would also leave the eastern boundary to the Phase 1 Site unsecured and the general site clearance would leave a no man's land between the Phase 1 and 1A Sites and Dudnance Lane, which preferably should be kept safe and secure.

5.3 It is proposed to clear and hydroseed the area to reduce the risk of dust and avoiding the land detracting from the area.

5.4 It is proposed to secure the area east of the Phase 1 Site with a small security bund and fence where the buildings have been demolished and the verge is currently used by unauthorised parties.

5.5 The cost of the works are included in Phase 1 and Phase 1A.

Table 5.1 – Key Cost Items for Highway Land

Key Items	Approx Cost £k	Comment
Stage 1		
Site prep – Phase 1	25	
Site prep – Phase 1A	55	
Stage 2		
Hydro Seeding – Phase 1	10	
Hydro Seeding – Phase 1A	10	
Total excl prelims etc	100	

6. Delivery of the Restoration/ Management Strategy

Policy Context

6.1 The National Planning Policy Framework, March 2012, has superseded PPS and PPG. There is a technical appendix, but this only covers mineral planning and flooding.

6.2 The proposed scheme needs to have regard to relevant EU, Government and Council policies, including town planning and environmental regulations. The current scheme has been designed with regard to the general policies at the time. Although superseded by the NPPF the most relevant guidance can be found in the former MPS 7. Of note is that MPS 7 states that even if an environmental statement is not required applicants will need to follow the general methodology of an ES.

Planning Application Requirements

6.3 The Planning Authority, Cornwall Council, has advised that the site clearance and remodelling of the site levels will require planning permission, but not an environmental statement.

6.4 Part of the northern section of the site is within the Cornwall and West Devon Mining landscape World Heritage Site (WHS) which will need to be addressed with a supporting statement as to why the development is necessary and a visual impact assessment of the proposed demolition works on the setting of the WHS.

6.5 The site is also in an Air Quality Management Area (AQMA) and an air qualty assessment will be required particularly for fumes and dust during the construction period.

6.6 The site drains to the Red River and the area has been designated as a critical drainage area due to the incidence of flooding and a full flood risk assessment will be required. Liaison has been commenced with Cornwall Council and its drainage designers, Parsons Brinkerhoff, for the East West Link Route, although the plans for provision of strategic attenuation ponds have not been provided or likely to be provided by the EWLR.

6.7 In addition to the technical details for the restoration, additional ecological surveys will be required to support a planning application for the scheme.

6.8 Protected species have been recorded on the sites in the forms of reptiles and bryophytes, both of which will require relocation to suitable habitats.

6.9 The Reptile Mitigation Guidelines briefly published by Natural England (September 2011) have been withdrawn and are subject to further to additional consultations. Revised guidance is anticipated but in the meantime, previous guidance and survey standards continue to apply, and a substantial cost is anticipated for reptile relocation due to the number of site visits required.

6.10 Given the proximity from of the site to local ecological receptors 'West Cornwall Bryophytes' Site of Special Scientific Interest (approximately 0.7km to the south west from the centre of site) and the Red River Valley Local Nature Reserve (approximately 1km to the north west from the centre of site) new surveys will be required to gather up-to-date baseline data on present site conditions. It is recommended that these surveys are carried out within both the Phase 1 and Phase 1A Sites and for most species groups also within a radius of 500m from those sites. However ecological

surveys are seasonal and as a result should be carried out promptly and thoroughly in order to reduce the risk of delays in the project or the need to stop work should a protected species be found during construction works.

6.11 To date a number of legally (or potentially legally) protected species have been highlighted alongside recommended surveys for the Framework Plan development area. This variety of species range from European protection such as the EU Conservation of Habitats Regulations 2010 to requiring 'regard' in the planning process (Circular 06/05 Biodiversity and Geological Conservation) in the case of biodiversity action plan (BAP) habitats and species. In the case of species afforded full protection under Schedules 1 and 5 of the Wildlife and Countryside Act 1981 (as amended by the CRoW Act 2000) including all species of bat, and the great crested newt, committing an offence can entail a six month prison term or £5000 fine reinforcing the need for thorough surveys. These species, it must be noted, are also protected from 'disturbance' and their habitats from interference without appropriate authority or licence.

Required Ecological Surveys and Envisaged Mitigation

6.12 The surveys currently identified as needing updating and mitigation measures carried out are outlined and explored in more detail below.

Reptiles

6.13 Assuming neither sand lizard (*Lacerta agilis*), or smooth snake (*Coronella austriaca*) are found on site, survey requirements would include 6 - 15 separate site visits (April to September) in order to carry out direct observation and artificial refuge surveys.

6.14 Reptiles such as common lizards have previously been recorded on the Phase 1A housing site (see Appendix B.2 - Drawing 02) and those will need relocating well away from the planned housing, most likely to the Red River valley.

Bryophytes

6.15 A bryophyte survey will need to be carried out because they have been previously detected in the Phase 1 Site (see Appendix B.2 - Drawing 01). That will require a specialist surveyor, although an initial inspection of former known habitats can be made using an XRF meter to identify and thereafter safeguard mineral rich habitat. That habitat could either be relocated to the proposed new mine processing area reserved sites, as previously agreed with English Nature, or to the area set aside for the East West Link Road if that was available and more advantageous.

Required Surveys No Mitigation Envisaged

6.16 The following surveys will need be carried out but no mitigation measures are envisaged because no concerns have been raised by previous studies of the area:

Birds

6.17 Bird surveys can be divided into a number of sub surveys as outlined below.

- Breeding birds – two surveys (April and June), each requiring three site visits.
- Winter Birds – two surveys (November and February), each requiring three site visits
- Migrant birds – two surveys (April and September), each requiring three site visits.
- Schedule 1 protected birds (if necessary) – two surveys (timing species dependant).

Bats

6.18 All bat species in the UK are afforded European protection and in the case of roost surveys will require a licensed surveyor. Surveys can be divided into four categories, there being three types

of roost survey as well as an activity survey. An initial survey for potential roosts (all year round) will determine what further surveys may be necessary and will be scheduled as follows:

- Hibernation roosts (November to March).
- Summer roosts (May to September).
- Activity survey (May to September).

6.19 The Activity survey requires three visits in order to record bats emerging or swarming at roost sites as well as their foraging habits.

Great Crested Newts

6.20 Like bats Great Crested Newts (*Triturus cristatus*) are given a high level of protection and require a licensed surveyor. Surveys entail four separate visits (March to June) to carry out bottle trapping, torch counting, egg searching or netting, with two additional visits in order to obtain population size estimates if found.

Other Surveys

6.21 Further surveys that may be necessary following habitat mapping may include Invertebrates because some species of beetle, butterfly and moth are afforded protection under schedule 5 WCA 1981), and also badgers (*Meles meles*).

Potential Planning Conditions

6.22 Due to the high historic value of parts of the area it is possible that a watching brief from an archaeologist during the earthworks will be a condition of the planning permission for the restoration earthworks. The old Bartle's Foundry building also contains some unique historic features and Cornwall Archaeological Services has advised that key features should be preserved by removal to a safe store and a full archaeological survey of the key buildings be undertaken before demolition. Hence that is also likely to be a condition of the planning permission.

6.23 Parts of the site contain existing mine shafts and despite the current investigations it is probable that a watching brief by a mining engineer during the excavations will be conditioned, and also possible that additional probe hole drilling at proposed structure footprints or anomalies identified during the works will be included in a condition.

6.24 The site is within a Critical Drainage Area and surface water runoff will be strictly controlled by planning conditions.

Contractual Arrangements for the Restoration

6.25 It is proposed that where possible a Cornwall Council framework contract would be used to minimise tender costs and enable a shorter tender period for the restoration. However where possible the service diversions should be carried out by the relevant utility company because the diversions could then be constructed before the main contract was let.

6.26 The nature and potential for delay to the works indicates that a two stage construction programme is required with two separate contracts to run consecutively. The first would concentrate on site clearance and investigation with the service diversions, and the second on the main restoration and infrastructure works i.e. installation of attenuation storage, site levelling and surface finishes.

CEEQUAL

6.27 CEEQUAL (the Civil Engineering Environmental Quality Assessment and Awards Scheme) is a framework designed to promote and record improvements in environmental performance and sustainability in civil engineering projects. The scheme assesses the actions of the client, design and contractor teams across all aspects of the project, from project inception through to end of construction. A CEEQUAL Award is made to the project on completion of the assessment, with a score of ≥75% categorised as CEEQUAL 'Excellent'.

6.28 The outline design strategy of the Dudnance Lane project, and the intended works to follow on from this (including the various environmental surveys to be undertaken), have been reviewed against the CEEQUAL criteria. The review has been undertaken by an experienced CEEQUAL Verifier. The conclusion from the review is that the project has the potential to achieve a CEEQUAL 'Excellent' rating.

6.29 The strategy taken by the project in understanding its potential impacts to the environment, and in identifying the opportunities both to minimise those impacts and provide environmental and social amenity enhancements to the project, are in line with the objectives of the CEEQUAL scheme. No gaps have been identified in the project that would result in a significant reduction in the CEEQUAL score the project could achieve, and therefore in its potential to attain an 'Excellent' rated score.

Programme

6.30 Provided in Appendix E is a detailed programme derived to achieve implementation of the restoration for the Phase 1 and Phase 1A Sites. Key factors affecting that programme are consider in the following sections.

ERDF Funding

6.31 Restoration of the Phase 1 Site and restoration of the Phase 1A Site has been identified as potential projects for support through the 2007-2013 European Regional Development Fund (ERDF) Convergence Programme (CP) and, indeed funding has been identified in the 2012-2013 ERDF CP Delivery Plan. In order to qualify under that funding round the following key dates have to be met:

- Planning Consent – Dec 2012
- Submit ERDF funding application – Jan 2013
- All tenders and commissions awarded – Dec 2013
- Final payments made - May 2015

Ecology

6.32 There are several ecological constraints for the surveys required which are as follows:

- Phase 1 habitat survey – April 2012 – September 2012.
- Reptile surveys and relocations– April 2012 – Sept 2012.
- Bryophyte Surveys – November 2012– March 2013
- Initial Survey Bird survey – April 2012, June 2012, September 2012, November 2012 and February 2013.
- Initial Bat survey – All year round.

6.33 Some of the ecological studies are critical to the programme and need to be initiated as soon as possible for the programme to be achieved.

Risk Management

6.34 Factors which may affect delivery of the restoration of the Phase 1 and Phase 1A Sites are evaluated in the risk registers for each site, with key factors discussed in the following sections.

Planning

6.35 A period of three months has been allowed for the planning application process, however that process is sometimes prolonged and could take twice that period or become protracted, dependent on the consultation responses or opposition if raised.

6.36 For example the proposed demolition of the old Bartle's Foundry building could provoke local opposition because it is of local historic significance.

Ecological

6.37 Without detail surveys there is no guarantee that protected species are not present at the sites, and if found during the restoration works that temporarily halt the works and require modification of the restoration and Framework Plans.

East West Link Road

6.38 There is to be a Public Inquiry for the East West Link Road. Hence should the timing of that project and the restoration of the Phase 1 and Phase 1A Sites coincide, there could be a clash between the two projects which could affect the programme and the form of some of the diversions.

Japanese Knotweed

6.39 The spraying programme is well advanced, but before the main earthworks commence a check survey will be required and a specialist contractor, such as that carrying out the existing spraying programme, may need to enter site to complete the treatment programme.

Appendix A – Dudnance Lane / South Crofty Framework

A.1 Dudnance Lane / South Crofty Framework Plan - PBWC Architects Ltd

A.2 Detailed Framework Plan - Atkins Ltd

Appendix B – Drawings

B.1 Site Plan – Phase 1 Site and Phase 1A Site

B.2 Existing Site and Constraints – Drawings 01 and 02

B.3 Infrastructure and Service Diversions – Drawings 03 and 04

B.4 Final Levels and Surface Finishes – Drawings 05 and 06

Appendix C – Phase 1 Risk Register and Costs

C.1 Phase 1 Site – Risk Register

C.2 Phase 1 Site – Cost Plan

Appendix D – Phase 1A Risk Register and Costs

D.1 Phase 1A Site – Risk Register

D.2 Phase 1A Site – Cost Plan

Appendix E – Programme

Appendix F – Surface Water Run-off Attenuation Storage Estimates

F.1 Surface Water Run-off Attenuation Storage Estimates - Phase 1 Site

F.2 Surface Water Run-off Attenuation Storage Estimates - Phase 1A Site

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