AECOM

Dane Valley Viability Study

1 March 2019

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DRAFT SEAFORD DANE VALLEY FEASIBILITY ASSESSMENT, 1 MARCH 2019

EXECUTIVE SUMMARY

Introduction

This note provides a summary of headlines from the suite of reports submitted to Lewes District Council on 1 March 2019 that comprise the Seaford Dane Valley Feasibility Study.

The note covers, in turn:

- Surface water flood attenuation (Appendix 2)
- Land contamination (Appendix 1)
- Viability

Surface flood water attenuation

There is a serious risk of flooding from surface water. The risk comes from the overland flow, which derives mainly from the east and partially from the north. When the water reaches the site it spreads and flows over the ground surface.

Any solution, therefore, needs to create a route for the flow of water through the site, but passing pluvial flood water through the site without any attenuation is not an option as this would exacerbate the issues at the Brooklyn Road pumping station. So flood storage is required.

We recommend that one layer of standard duty attenuation tank is assumed to be necessary, with an approximate volume of 1,400m^3.

Using a rate of £30,000/100m^3, the purchase and delivery of the storage tank is estimated at £462,000. Plus 50% for installation (labour, plant etc) and 20% for contractors prelims, overhead and profit, we estimate the total cost to be **£785,400**.

In addition, we have assumed a cost for excavating and disposing the soil for the tank. Including contractors prelims, overheads, profit and contingency, and assuming no landfill tax, the cost is estimated at **£446,600**.

Therefore, our viability appraisal includes a cost of **£1.23M** for flood attenuation.

Ground remediation

The ground investigations that have recently been commissioned by SGN, which owns the largest plot, suggest that the worst case contaminants are not present.

We have estimated remediation costs using Homes England's methodology, assuming high levels of contamination on plots 1, 2 and 3 (south west of the Twitten) and low levels on plots 5, 7, 9 and 10 (north east of the Twitten), and that all works are undertaken at the same time.

We are assuming a cost of **£800,000** for these works.

Viability

A number of scenarios have been tested, with different approaches to housing numbers, levels and types of affordable housing, values and developer's profit.

The viability assessment suggests that the Dane Valley sites **can be allocated for development** with some degree of confidence in deliverability, although some flexibility may be required as it is unlikely to generate 40% affordable housing across the whole site under a traditional development model. The modelling results indicate that an **affordable housing level of around 25%** could yield a viable scheme.

If alternative sites are greenfield or in locations sensitive for other reasons, the policy decision to lower the amount of affordable housing required may be the most appropriate course of action. Such an approach on a brownfield site would be in accordance with the National Planning Policy Framework (paragraphs 63 and 118).

In conclusion, the Dane Valley site, whilst challenging, could play a role in delivering much needed local housing and can help to facilitate development through economic cycles expected over the course of the plan period. In cooperation with LDC, the landowners should now discuss the most appropriate way to take the site forward. The allocation of the land within the Neighbourhood Plan would help to de-risk the site and provide certainty.

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The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken in the period November 2018 to January 2019 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

Professional judgements are made for the purposes of supporting the client with their plan making only. The content of this report does not represent valuation or real estate advice. The advice has been provided in accordance with the Planning Practice Guidance and other non-statutory best practice guidance.

Glossary

Affordable housing: Housing for sale or rent, for those whose needs are not met by the market (including housing that provides a subsidised route to home ownership and/or is for essential local workers); and which complies with one or more of the following definitions:
a) Affordable housing for rent: meets all of the following conditions: (a) the rent is set in accordance with the Government's rent policy for Social Rent or Affordable Rent, or is at least 20% below local market rents (including service charges where applicable); (b) the landlord is a registered provider, except where it is included as part of a Build to Rent scheme (in which case the landlord need not be a registered provider); and (c) it includes provisions to remain at an affordable price for future eligible households, or for the subsidy to be recycled for alternative affordable housing provision. For Build to Rent schemes affordable housing for rent is expected to be the normal form of affordable housing provision (and, in this context, is known as Affordable Private Rent).
b) Starter homes: is as specified in Sections 2 and 3 of the Housing and Planning Act 2016 and any secondary legislation made under these sections. The definition of a starter home should reflect the meaning set out in statute and any such secondary legislation at the time of plan-preparation or decision-making. Where secondary legislation has the effect of limiting a household's eligibility to purchase a starter home to those with a particular maximum level of household income, those restrictions should be used.
c) Discounted market sales housing: is that sold at a discount of at least 20% below local market value. Eligibility is determined with regard to local incomes and local house prices. Provisions should be in place to ensure housing remains at a discount for future eligible households.
d) Other affordable routes to home ownership: is housing provided for sale that provides a route to ownership for those who could not achieve home ownership through the market. It includes shared ownership, relevant equity loans, other low cost homes for sale (at a price equivalent to at least 20% below local market value) and rent to buy (which includes a period of intermediate rent). Where public grant funding is provided, there should be provisions for the homes to remain at an affordable price for future eligible households, or for any receipts to be recycled for alternative affordable housing provision, or refunded to Government or the relevant authority specified in the funding agreement.

Alternative use value (AUV): Where an alternative use can be readily identified as generating a higher value for a site, the value for that alternative use would take the existing use value (determined by the market) and apply an assumption that has regard to current development plan policies and all other material planning considerations and disregards that which is contrary to the development plan.

Benchmark: A comparator for the outputs or inputs into the appraisal, i.e. site value or developer's return, etc.

Building Cost Information Service (BCIS): A subscriber service set up in 1962 under the aegis of RICS to facilitate the exchange of detailed building construction costs. The service is available from an independent body to those of any discipline who are willing and able to contribute and receive data on a reciprocal basis.

Building costs indices: A series of indices published by BCIS relating to the cost of building work. They are based on cost models of 'average building', which measure the changes in costs of labour, materials and plant which collectively cover the basic cost to a contractor.

Build to Rent: Purpose built housing that is typically 100% rented out. It can form part of a wider multi-tenure development comprising either flats or houses, but should be on the same site and/or contiguous with the main development. Schemes will usually offer longer tenancy agreements of three years or more, and will typically be professionally managed stock in single ownership and management control.

Cash flow: The movement of money by way of income, expenditure and capital receipts and payments during the course of the development. The impact of cash flow assumptions on viability assessments is an important consideration. While most viability appraisals include an interest rate on capital employed, such costs are frequently applied solely to building costs pending sale. Cash flow considerations should also take into account the costs of capital employed in relation to infrastructure costs, Section 106 and CIL requirements and land purchase costs, and should incorporate realistic assumptions on build and sales rates based upon local market conditions.

Comparable evidence: A property used in the valuation process as evidence to support the valuation of another property. It may be necessary to analyse and adjust in order to put it in a suitable form to be used as evidence for comparison purposes.

Contingency: Contingencies are allowances that may sometimes be put within a development appraisal to cater for unexpected costs where it is considered likely that the site poses risks which cannot easily be quantified. For example, poor ground conditions may affect the foundations, the discovery of archaeological remains and/or contamination may only be confirmed once digging commences. Normally a contingency will be expressed as an estimated percentage of costs. They should only be used to reflect those aspects of a scheme where costs cannot be accurately estimated in advance of work starting on site. They are dependent upon the nature of the development, the procurement method and the perceived accuracy of the information obtained. A contingency should not to be used to cover the possibility of contract price increases which can be quantified at the time that the appraisal is carried out. Similarly, they should not be used to cover errors made in the construction phase – the latter is accounted for in the developer's margin that reflects risk.

Current use value Market value for the continuing existing use of the site or property assuming all hope value is excluded, including value arising from any planning permission or alternative use. This also differs from the existing use value. It is hypothetical in a market context as property generally does not transact on a CUV basis.

Deliverable: To be considered deliverable, sites for housing should be available now, offer a suitable location for development now, and be achievable with a realistic prospect that housing will be delivered on the site within five years. Sites that are not major development, and sites with detailed planning permission, should be considered deliverable until permission expires, unless there is clear evidence that homes will not be delivered within five years (e.g. they are no longer viable, there is no longer a demand for the type of units or sites have long term phasing plans). Sites with outline planning permission, permission in principle, allocated in the development plan or identified on a brownfield register should only be considered deliverable where there is clear evidence that housing completions will begin on site within five years.

Developable: To be considered developable, sites should be in a suitable location for housing development with a reasonable prospect that they will be available and could be viably developed at the point envisaged.

Development appraisal: A financial appraisal of a development to calculate either:

- the residual site value (deducting all development costs, including an allowance for the developer's profit/return from the scheme's total capital value); or
- the residual development profit/return (deducting all development costs, including the site value/cost from the scheme's total capital value).

Developer's return: The developer's reasonable expectation of profit reflecting development risk, having regard to the margin requirements of any investors (where relevant). It will be determined by each developer in accordance with their own business model typically in relation to either profit on value (Gross Development Value) or profit on cost (total development costs). Whilst in practice it is assessed in a variety of ways, for development viability assessment calculations, it is normally taken in relation to a percentage of GDV.

Development risk: The risk associated with the implementation and completion of a development including post-construction letting and sales.

Entry-level exception site: A site that provides entry-level homes suitable for first time buyers (or equivalent, for those looking to rent), in line with paragraph 71 of this Framework.

Existing use value: The estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's-length transaction after properly marketing and where the parties had each acted knowledgeably, prudently and without compulsion, assuming that the buyer is granted vacant possession of all parts of the property required by the business and disregarding potential alternative uses and any other characteristics of the property that would cause market value to differ from that needed to replace the remaining service potential at least cost. It is an accounting definition of value for business use and as such, hypothetical in a market context, as property generally does not transact on an EUV basis.

Existing use value 'plus' a premium (EUV+): The benchmark land value for the purposes of assessing the viability of development for planning purposes. The value above the EUV at which a typical willing landowner is likely to release land for development. EUV+ should be informed by comparable evidence of transactions where possible. Where transacted prices are significantly above the market norm for transactions that fully reflect planning policy conditions and constraints, they should be regarded as outliers and not used as part of EUV+. This is likely to be highest in high value urban settings but low in rural low value areas. EUV+ is not price paid and must disregard Hope Value.

Gross development value (GDV): The aggregate market value of the proposed development, assessed on the special assumption that the development is complete as at the date of valuation in the market conditions prevailing at that date. The total of likely sales proceeds from a completed development scheme, gross of any costs of sale but taken at today's values and not inflated by the prospect of changes in market prices.

Gross development cost (GDC): The cost of undertaking a development, which normally includes the following:

- land acquisition costs
- site-specific related costs
- build costs
- fees and expenses
- interest or financing costs; and
- holding costs during the development period.

Gross external area (GEA): The aggregate superficial area of a building, taking each floor into account. As per the RICS Code of Measuring Practice this includes: external walls and projections, columns, piers, chimney breasts, stairwells and lift wells, tank and plant rooms, fuel stores whether or not above main roof level (except for Scotland, where for rating purposes these are excluded), and open-side covered areas and enclosed car parking areas, but excludes: open balconies; open fire escapes, open covered ways or minor canopies; open vehicle parking areas, terraces, etc.; domestic outside WCs and coalhouses. In calculating GEA, party walls are measured to their centre line, while areas with a headroom of less than 1.5m are excluded and quoted separately.

Gross internal area (GIA): Measurement of a building on the same basis as gross external area, but excluding external wall thicknesses.

Hope value:According to the RICS (The Valuation of Development Land 1st Edition p17 (2008)) '*Hope Value is the popular term for the element of the difference between the value of the land with the benefit of the current planning consent and the value with an enhanced, assumed, consent that is reflected in the Market Value of the land'*. It is entirely speculative and, whilst recognised in the market, is not part of the EUV+ approach or Benchmark Land Value and should not be used to define land value or the return to the landowner.

Interest rate: The rate of finance applied in a development appraisal. As most appraisals assume 100 per cent financing, it is usual for the interest rate to reflect the total cost of finance and funding of a project, i.e. the combination of both equity and debt in applying a single rate.

Land Value: Central to the consideration of viability is the assessment of land or site value. Land or site value will be an important input into the assessment. The most appropriate way to assess land or site value will vary from case to case but it is recommended that the starting point is an understanding of the Current Use Value (CUV) and Existing Use Value (EUV) of the land or site. The Landowner's return should normally utilise Existing Use Value 'Plus' (EUV+) in a planning context.

Landowner's Return: In all cases the landowner's return should reflect extant and emerging policy requirements and planning obligations and, where applicable, any Community Infrastructure Levy charge and any other planning conditions for extant planning consents. Practitioners should normally utilise Existing Use Value Plus (EUV+) as an approach for determining the landowners' return in the planning context.

Market risk adjusted return: The discount rate as varied so as to reflect the perceived risk of the development in the market.

Market value (MV): The estimated amount for which an asset should exchange on the date of valuation between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion.

Net developable area versus gross site area: Many viability studies that model housing schemes assume a housing and plotting density per unit area. Such an analysis is a legitimate starting point and, provided the assumptions in relation to sales revenue and build cost are correct, produces a fully serviced land value per net developable area. However, the assumption is then made that the net developable area (i.e. income generating land) equates to the area of land that is to be acquired following the grant of planning permission. In all but the smallest redevelopment schemes, the net developable area is significantly smaller than the gross area that is required to support the development, given the need to provide open space, play areas, community facility sites, public realm, land for sustainable urban drainage schemes etc. The net area can account for less than 50%, and sometimes as little as 30% on larger sites, of the site to be acquired. Failure to take account of this difference can result in flawed assumptions and inaccurate viability studies. The HCA Development Appraisal Tool used for this study produces a residual value for the gross site area.

Net/gross ratio: Refers to the percentage of usable space or land. A typical net/gross ratio on an office is 85%, whereas on a large greenfield site it is around 60% as not all land can be developed (i.e. some is used as open space, for distributor roads, community uses, infrastructure etc.)

Net internal area (NIA): The usable space within a building measured to the internal finish of structural, external or party walls, but excluding toilets, lift and plant rooms, stairs and lift wells, common entrance halls, lobbies and corridors, internal structural walls and columns and car parking areas.

Non-strategic policies: Policies contained in a neighbourhood plan, or those policies in a local plan that are not strategic policies.

Previously developed land: Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or was last occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill, where provision for restoration has been made through development management procedures; land in built-up areas such as residential gardens, parks, recreation grounds and allotments; and land that was previously developed but where the remains of the permanent structure or fixed surface structure have blended into the landscape.

Planning obligation: Provided for under section 106 of the Town and Country Planning Act 1990, usually in connection with the grant of planning permission for a private development project. A benefit to the community, either generally or in a particular locality, to offset the impact of development, e.g. the provision of open space, a transport improvement or affordable housing. The term is usually applied when a developer agrees to incur some expenditure, surrender some right or grant some concession which could not be embodied in a valid planning condition.

Policy Compliant: Development that meets the full requirements of all national and local planning policies. Those policy requirements should be tested at the plan-making stage to ensure that the total cumulative cost of meeting them does not render development in the area unviable.

Price Paid: The amount paid for land by a developer. It should not be used as an element to assess viability in the planning process. Price paid should reflect the cost of being policy compliant, but this is often not the case. Price paid may include overpayment due to considerations of Hope Value or expectation of market increases to Gross Development Value or the assumed possibility of negotiating down developer contributions. For the purposes of viability assessment, the amount paid for any parcel of land by the developer is therefore irrelevant.

Red Book: The RICS Valuation – Professional Standards 2012 (Formerly RICS Valuation Standards). The 'Red Book' contains mandatory rules, best practice guidance and related commentary for all RICS members undertaking asset valuations.

Residual Site Value or residual land value: The amount remaining once the GDC of a scheme is deducted from its GDV and an appropriate return has been deducted.

Residual valuation: A valuation/appraisal of land using a development appraisal.

Return (on capital): The ratio of annual net income to capital derived from analysis of a transaction and expressed as a percentage.

Rural exception sites: Small sites used for affordable housing in perpetuity where sites would not normally be used for housing. Rural exception sites seek to address the needs of the local community by accommodating households who are either current residents or have an existing family or employment connection. A proportion of market homes may be allowed on the site at the local planning authority's discretion, for example where essential to enable the delivery of affordable units without grant funding.

Sales rates: The rate at which residential units are sold (either by month, quarter or year).

Self-build and custom-build housing: Housing built by an individual, a group of individuals, or persons working with or for them, to be occupied by that individual. Such housing can be either market or affordable housing. A legal definition, for the purpose of applying the Self-build and Custom Housebuilding Act 2015 (as amended), is contained in section 1(A1) and (A2) of that Act.

Serviced land: Land where the necessary infrastructure is in place. No off-site works are required and the developer simply has to connect the development with existing infrastructure

Site Value (for financial viability assessments for scheme specific planning applications): Market value subject to the following assumption: that the value has regard to development plan policies and all other material planning considerations and disregards that which is contrary to the development plan.

Site Value (for area wide financial viability assessments): Site Value (as defined above) may need to be further adjusted to reflect the emerging policy/ CIL charging level. The level of the adjustment assumes that site delivery would not be prejudiced. Where an adjustment is made, the practitioner should set out their professional opinion underlying the assumptions adopted.
These include, as a minimum, comments on the state of the market and delivery targets as at the date of assessment.

Strategic infrastructure and utility costs: Many models use construction cost information provided by BCIS or other sources. While this is regarded as a legitimate starting point, care is needed in understanding what is both included and excluded from such cost indices. Cost indices rarely provide data on the costs associated with providing serviced housing parcels, i.e. Strategic infrastructure costs.

Strategic policies: Policies and site allocations which address strategic priorities in line with the requirements of Section 19 (1B-E) of the Planning and Compulsory Purchase Act 2004.

Threshold land value: A term developed by the Homes and Communities Agency (HCA) being essentially a land value at or above that which it is assumed a landowner would be prepared to sell. Used by some practitioners for establishing site value. The basis is as with EUV but then adds a premium (usually 10% to 40%) as an incentive for the landowner to sell.

Viability assessments/financial viability: A report including a financial appraisal to establish the profit or loss arising from a proposed development. It will usually provide an analysis of both the figures inputted and output results, together with other matters of relevance. An assessment will normally provide a judgment as to the profitability (or loss) of a development.

Yield: As applied to different commercial elements of a scheme, i.e. office, retail, etc. Yield is usually calculated as a year's rental income as a percentage of the value of the property. The "yield" is the rent as a proportion of the purchase price. In determining development value, there is an inverse relationship i.e. as the yield goes up, the value goes down. To calculate development value multiply the rent by 1 divided by the yield e.g. £100,000 x 1/10% (i.e. 0.1) = £1m gross value.

Sources: MHCLG, AECOM, RICS (Financial viability in planning), LHDG (Viability testing Local Plans)

1 Introduction

1.1 Context

1.1.1 AECOM has been commissioned by Lewes District Council ('LDC') and landowners to provide viability advice in respect of the Dane Valley site. Seaford Town Council ('STC') is bringing forward a Neighbourhood Development Plan ('NDP') with the site proposed as a draft allocation. The support is also intended to inform this process and provide financial viability evidence in relation to the site allocation, and also to advise the landowners, Councils and other stakeholders about deliverability. The viability support builds upon AECOM's previous Masterplanning and Design Guide support to STC (November 2017).

1.1.2 Seaford is approximately 4 miles to the east of the port and town of Newhaven (which benefits from an Enterprise Zone), 13 miles to the east of the coastal City of Brighton & Hove and 10 miles to the west of the coastal town of Eastbourne. Lewes, the administrative centre of the Lewes District and the County Town of East Sussex, is located approximately 11 miles to north, further along the Ouse Valley.

1.1.3 The Seaford Neighbourhood Plan area is outlined on the map below.

Figure 1: Seaford Neighbourhood Plan Area (Source: Oxford Consultants for Social Inclusion/Action with Communities in Rural England)

1.1.4 The Dane Valley site is a mix of active industrial uses and brownfield land. It is located within the urban area close to the town centre services and transport links. Part of the site is allocated for residential use (saved LDLP 2003 policy SF5: Land at Blatchington Road, taken forward by Core Strategy 2016). The landowners have promoted various parcels of land via the Lewes Housing and Economic Land Availability Assessment (HELAA 2018)[1] and the STC NDP site assessment process. For the purposes of this report the study area is made up of the following plots[2] – SC1, SC2, SC3, SC5, SC7 and SC9.

Figure 2: Dane Valley Study Area

1.1.5 There is a need to remediate contaminants associated with previous Gasworks use and part of site is within flood zone 3. The site is also within an Archaeological Notification Area (medieval settlement). No other substantial constraints are identified in the HELAA (2018). The development would constitute infill development with no landscape issues raised by LDC. The site has existing access points on to Blatchington Road and Chichester Road.

1.1.6 LDC advised the Steering Group that submission of the Neighbourhood Plan should be delayed until further work on the Dane Valley Project Area was completed in order to fully demonstrate the deliverability of residential development across the Dane Valley Project Area, which is the biggest housing allocation in the draft Plan (131 of the 185 dwellings the STC NDP needs to provide). Members of the Steering Group consider that the Dane Valley Project Area is available and deliverable, but were advised by LDC that further deliverability evidence was required to ensure the Neighbourhood Plan was capable of demonstrating that it has met the basic conditions[3].

1.1.7 This report seeks to establish a realistic estimate of the Dane Valley site's potential Gross Development Value, costs and residual land value (based upon the AECOM option 1 masterplan, November 2017). This forms part of a wider commission by LDC Regeneration, AECOM are preparing a capacity report on the whole Dane Valley site to confirm the feasibility of the project (including land contamination, flood/drainage and viability).

[1] HELAA (2018) references – 04SF, 21SF and 24SF
[2] STC Site Assessment. Accessed at: https://www.seafordtowncouncil.gov.uk/Seaford-NDP-Second-Regulation-14-Consultation.aspx
[3] Local Plan Part 2 Background Paper Neighbourhood Plans (Lewes District Council, November 2018) Accessed at: https://www.lewes-eastbourne.gov.uk/_resources/assets/inline/full/0/275548.pdf

1.2 Approach

1.2.1 To inform this process, an analysis of prices paid (via the Land Registry records) for new build developments, supplemented by a market survey of all new build residential property being marketed at the time of the project using estate agent websites. Data for affordable housing is drawn from The Regulator for Social Housing's Statistical Data Return statistical releases; Valuation Office Agency Local Housing Allowance rates; and assumptions drawn from second hand market rental levels (**Chapter 3**).

1.2.2 As part of the previous AECOM support, a draft masterplan was prepared to test the potential site capacity for development. The masterplan options envisaged retention of some employment onsite. As such AECOM has utilised the CoStar real estate software suite to collect local data on commercial sales values, rents and yields. Commercial data drawn from CoStar is supplemented by published research on the local property market and a market survey of comparable commercial property being marketed at the time of the study (using freely available websites such as EGi Property Link).

1.2.3 The scheme(s) modelled in this report are policy compliant and reflect relevant guidance, such as the LDC Affordable Housing Supplementary Planning Document ('SPD') (July 2018).

1.2.4 Indicative construction costs are drawn from a number of sources: the RICS Building Cost Information System (BCIS) service; Spon's Price Books 2018; and inputs supplied by AECOM's cost consultants and technical specialists. This shall build upon the work related to flood attenuation and decontamination prepared in 2017 for STC alongside the AECOM masterplan and design code. Other key assumptions, such a developer's return and benchmark land values shall be informed by the work conducted by DSP in 2014; discussions with Lewes District Council officers

1.2.5 Other key inputs and assumptions including Benchmark Land Values and developers return have been crosschecked with appropriate available national and local evidence, including local viability studies prepared by LDC, the South Downs National Park Authority ('SDNP') and Eastbourne Borough Council ('EBC'). In addition to the professional judgements of the AECOM team.

1.2.6 The residual valuation method has been utilised to conduct the viability appraisal. For this project the Homes England Development Appraisal Tool has been used, with the output being the residual land value (the theoretical maximum that could be paid to the landowner). The results are presented in the context of the National Planning Policy Framework ('NPPF') – see overleaf. The Existing Use Value 'Plus' approach shall be used to determine whether the residual land value represents a sufficient incentive to the landowner(s) to release their land for redevelopment (see **Chapter 2**). This viability study does not constitute valuation advice and is not an RICS 'Red Book' valuation of the site's market value (see **Glossary**).

1.4 National Planning Policy Framework

1.4.1 This report has been published following publication of the NPPF (2018)[4] and the updated Planning Practice Guidance ('PPG') section on viability[5] (24th July 2018). The NPPF has transposed a number of Written Ministerial Statements relevant to neighbourhood planning and deliverability into the new Framework. For example, the Neighbourhood Planning: Written statement - HCWS346[6] has now been transposed into paragraph 14. The aim of paragraph 14 is to protect Neighbourhood Development Plans ('NDP') in circumstances where the adverse impacts of allowing development conflicts with an up to date NDP and are likely to significantly and demonstrably outweigh the benefits:

> *'14. In situations where the presumption (at paragraph 11d) applies to applications involving the provision of housing, the adverse impact of allowing development that conflicts with the neighbourhood plan is likely to significantly and demonstrably outweigh the benefits, provided all of the following apply:*
>
> *a) the neighbourhood plan became part of the development plan two years or less before the date on which the decision is made;*
>
> *b) the neighbourhood plan contains policies and allocations to meet its identified housing requirement;*
>
> *c) the local planning authority has at least a three year supply of deliverable housing sites (against its five year housing supply requirement, including the appropriate buffer as set out in paragraph 73); and*
>
> *d) the local planning authority's housing delivery was at least 45% of that required9 over the previous three years.'*

1.4.2 NPPF paragraph 65 is also of relevance as it sets out that developments of 10 or more units should provide 10% of units as 'affordable home ownership' products (the LDC Affordable Housing SPD was updated on this basis):

> *'Where major housing development is proposed, planning policies and decisions should expect at least 10% of the homes to be available for affordable home ownership [As part of the overall affordable housing contribution from the site], unless this would exceed the level of affordable housing required in the area, or significantly prejudice the ability to meet the identified affordable housing needs of specific groups. Exemptions should also be made where the site or proposed development:*
>
> *i. provides solely for Build to Rent homes;*
>
> *ii. provides specialist accommodation for a group of people with specific needs (such as purpose-built accommodation for the elderly or students);*
>
> *iii. is proposed to be developed by people who wish to build or commission their own homes; or*
>
> iv. *is exclusively for affordable housing, an entry level exception site or a rural exception site.'*

1.4.3 The NPPF also includes a revised definition for affordable housing (see **Glossary**). The NPPF also emphasises the importance of viability testing at the plan making stage and provides additional guidance within the PPG which this report reflects. See the key extract below with regards to viability/deliverability:

NPPF reference	Extract (our *emphasis*)
2. Achieving sustainable development. The presumption in favour of sustainable development	14. In situations where the presumption (at paragraph 11d) applies to applications involving the provision of housing, the adverse impact of allowing development that conflicts with the neighbourhood plan is likely to significantly and demonstrably outweigh the benefits, provided all of the following apply8: a) the neighbourhood plan became part of the development plan two years or less before the date on which the decision is made; b) the neighbourhood plan contains policies and allocations to meet its identified housing requirement; c) the local planning authority has at least a three year supply of ***deliverable*** housing sites (against its five year housing supply requirement, including the appropriate buffer as set out in paragraph 73); and d) the local planning authority's housing delivery was at least 45% of that required9 over the previous three years.

[4] Accessed at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[5] Accessed at: https://www.gov.uk/guidance/viability
[6] Accessed at: https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2016-12-12/HCWS346/

3. Plan-making	16. Plans should: a) be prepared with the objective of contributing to the achievement of sustainable development10; b) be prepared positively, in a way that is aspirational but ***deliverable***…
3. Plan-making Non-strategic policies	29. Neighbourhood planning gives communities the power to develop a shared vision for their area. Neighbourhood plans can shape, direct and help to deliver sustainable development, by influencing local planning decisions as part of the statutory development plan. Neighbourhood plans should not promote less development than set out in the strategic policies for the area, or undermine those strategic policies.
3. Plan-making Preparing and reviewing plans	31. The preparation and review of all policies should be underpinned by relevant and up-to-date evidence. This should be adequate and proportionate, focused tightly on supporting and justifying the policies concerned, and ***take into account relevant market signals***.
3. Plan-making Development contributions	34. Plans should set out the contributions expected from development. This should include setting out the levels and types of affordable housing provision required, along with other infrastructure (such as that needed for education, health, transport, flood and water management, green and digital infrastructure). Such policies should not undermine the ***deliverability*** of the plan.
3. Plan-making Examining plans	35. Local plans and spatial development strategies are examined to assess whether they have been prepared in accordance with legal and procedural requirements, and whether they are sound. Plans are 'sound' if they are: a) **Positively prepared** – providing a strategy which, as a minimum, seeks to meet the area's objectively assessed needs19; and is informed by agreements with other authorities, so that unmet need from neighbouring areas is accommodated where it is practical to do so and is consistent with achieving sustainable development; b) **Justified** – an appropriate strategy, taking into account the reasonable alternatives, and based on proportionate evidence; c) **Effective** – ***deliverable*** over the plan period, and based on effective joint working on cross-boundary strategic matters that have been dealt with rather than deferred, as evidenced by the statement of common ground; and d) **Consistent with national policy** – enabling the delivery of sustainable development in accordance with the policies in this Framework.
3. Plan-making Examining plans	36. These tests of soundness will be applied to non-strategic policies in a proportionate way, taking into account the extent to which they are consistent with relevant strategic policies for the area.
3. Plan-making Examining plans	37. Neighbourhood plans must meet certain 'basic conditions' and other legal requirements before they can come into force. These are tested through an independent examination before the neighbourhood plan may proceed to referendum.
4. Decision-making Planning conditions and obligations	57. Where up-to-date policies have set out the contributions expected from development, planning applications that comply with them should be assumed to be ***viable.*** It is up to the applicant to demonstrate whether particular circumstances justify the need for a ***viability*** assessment at the application stage. The weight to be given to a ***viability*** assessment is a matter for the decision maker, having regard to all the circumstances in the case, including whether the plan and the ***viability*** evidence underpinning it is up to date, and any change in site circumstances since the plan was brought into force. All ***viability*** assessments, including any undertaken at the plan-making stage, should reflect the recommended approach in national planning guidance, including standardised inputs, and should be made publicly available.
5. Delivering a sufficient supply of homes	63. Provision of affordable housing should not be sought for residential developments that are not major developments, other than in designated rural areas (where policies may set out a lower threshold of 5 units or fewer). To support the re-use of brownfield land, where vacant buildings are being reused or redeveloped, any affordable housing contribution due should be reduced by a proportionate amount.
5. Delivering a sufficient supply of homes	64. Where major development involving the provision of housing is proposed, planning policies and decisions should expect at least 10% of the homes to be available for affordable home ownership [As part of the overall affordable housing contribution from the site], unless this would exceed the level of affordable housing required in the area, or significantly prejudice the ability to meet the identified affordable housing needs of specific groups. Exemptions to this 10% requirement should also be made where the site or proposed development: a) provides solely for Build to Rent homes; b) provides specialist accommodation for a group of people with specific needs (such as purpose-built accommodation for the elderly or students); c) is proposed to be developed by people who wish to build or commission their own homes; or d) is exclusively for affordable housing, an entry-level exception site or a rural exception site.
5. Delivering a sufficient supply of homes	67. Strategic policy-making authorities should have a clear understanding of the land available in their area through the preparation of a strategic housing land availability assessment. From this, planning policies should identify a sufficient supply and mix of sites, taking into account their availability, suitability and likely economic ***viability***. Planning policies should identify a supply of:

Identifying land for homes	a) specific, ***deliverable*** sites for years one to five of the plan period; and b) specific, developable sites or broad locations for growth, for years 6-10 and, where possible, for years 11-15 of the plan.
5. Delivering a sufficient supply of homes - Footnote 32	[32] With an appropriate buffer, as set out in paragraph 73. See glossary for definitions of ***deliverable*** and ***developable***.
5. Delivering a sufficient supply of homes Identifying land for homes	72. The supply of large numbers of new homes can often be best achieved through planning for larger scale development, such as new settlements or significant extensions to existing villages and towns, provided they are well located and designed, and supported by the necessary infrastructure and facilities. Working with the support of their communities, and with other authorities if appropriate, strategic policy-making authorities should identify suitable locations for such development where this can help to meet identified needs in a sustainable way. In doing so, they should: a) consider the opportunities presented by existing or planned investment in infrastructure, the area's economic potential and the scope for net environmental gains; b) ensure that their size and location will support a sustainable community, with sufficient access to services and employment opportunities within the development itself (without expecting an unrealistic level of self-containment), or in larger towns to which there is good access; c) set clear expectations for the quality of the development and how this can be maintained (such as by following Garden City principles), and ensure that a variety of homes to meet the needs of different groups in the community will be provided; d) make a realistic assessment of likely rates of delivery, given the lead-in times for large scale sites, and identify opportunities for supporting rapid implementation (such as through joint ventures or locally-led development corporations)35; and e) consider whether it is appropriate to establish Green Belt around or adjoining new developments of significant size.
5. Delivering a sufficient supply of homes - Footnote 35	[35] The delivery of large scale developments may need to extend beyond an individual plan period, and the associated infrastructure requirements may not be capable of being identified fully at the outset. Anticipated rates of delivery and infrastructure requirements should, therefore, be kept under review and reflected as policies are updated.
5. Delivering a sufficient supply of homes Maintaining supply and delivery	73. Strategic policies should include a trajectory illustrating the expected rate of housing delivery over the plan period, and all plans should consider whether it is appropriate to set out the anticipated rate of development for specific sites. Local planning authorities should identify and update annually a supply of specific ***deliverable*** sites sufficient to provide a minimum of five years' worth of housing against their housing requirement set out in adopted strategic policies36, or against their local housing need where the strategic policies are more than five years old37. The supply of specific ***deliverable*** sites should in addition include a buffer (moved forward from later in the plan period) of: a) 5% to ensure choice and competition in the market for land; or b) 10% where the local planning authority wishes to demonstrate a five year supply of ***deliverable*** sites through an annual position statement or recently adopted plan38, to account for any fluctuations in the market during that year; or c) 20% where there has been significant under delivery of housing over the previous three years, to improve the prospect of achieving the planned supply39.
5. Delivering a sufficient supply of homes Maintaining supply and delivery	76. To help ensure that proposals for housing development are implemented in a timely manner, local planning authorities should consider imposing a planning condition providing that development must begin within a timescale shorter than the relevant default period, where this would expedite the development without threatening its ***deliverability*** or ***viability***. For major development involving the provision of housing, local planning authorities should also assess why any earlier grant of planning permission for a similar development on the same site did not start.
5. Delivering a sufficient supply of homes Rural housing	79. Planning policies and decisions should avoid the development of isolated homes in the countryside unless one or more of the following circumstances apply: a) there is an essential need for a rural worker, including those taking majority control of a farm business, to live permanently at or near their place of work in the countryside; b) the development would represent the optimal ***viable*** use of a heritage asset or would be appropriate enabling development to secure the future of heritage assets; c) the development would re-use redundant or disused buildings and enhance its immediate setting; d) the development would involve the subdivision of an existing residential dwelling; or e) the design is of exceptional quality, in that it: - is truly outstanding or innovative, reflecting the highest standards in architecture, and would help to raise standards of design more generally in rural areas; and - would significantly enhance its immediate setting, and be sensitive to the defining characteristics of the local area.
11. Making effective use of land	117. Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating

	objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.
11. Making effective use of land	118. Planning policies and decisions should: c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land; d) promote and support the development of under-utilised land and buildings, especially if this would help to meet identified needs for housing where land supply is constrained and available sites could be used more effectively (for example converting space above shops, and building on or above service yards, car parks, lock-ups and railway infrastructure);
11. Making effective use of land	120. Planning policies and decisions need to reflect changes in the demand for land. They should be informed by regular reviews of both the land allocated for development in plans, and of land availability. Where the local planning authority considers there to be no reasonable prospect of an application coming forward for the use allocated in a plan: a) they should, as part of plan updates, reallocate the land for a more ***deliverable*** use that can help to address identified needs (or, if appropriate, deallocate a site which is undeveloped); and b) in the interim, prior to updating the plan, applications for alternative uses on the land should be supported, where the proposed use would contribute to meeting an unmet need for development in the area.
11. Making effective use of land	121. Local planning authorities should also take a positive approach to applications for alternative uses of land which is currently developed but not allocated for a specific purpose in plans, where this would help to meet identified development needs. In particular, they should support proposals to: a) use retail and employment land for homes in areas of high housing demand, provided this would not undermine key economic sectors or sites or the vitality and ***viability*** of town centres, and would be compatible with other policies in this Framework; and b) make more effective use of sites that provide community services such as schools and hospitals, provided this maintains or improves the quality of service provision and access to open space.
11. Making effective use of land Achieving appropriate densities	122. Planning policies and decisions should support development that makes efficient use of land, taking into account: a) the identified need for different types of housing and other forms of development, and the availability of land suitable for accommodating it; b) local market conditions and ***viability***; c) the availability and capacity of infrastructure and services – both existing and proposed – as well as their potential for further improvement and the scope to promote sustainable travel modes that limit future car use; d) the desirability of maintaining an area's prevailing character and setting (including residential gardens), or of promoting regeneration and change; and e) the importance of securing well-designed, attractive and healthy places.
11. Making effective use of land Achieving appropriate densities	153. In determining planning applications, local planning authorities should expect new development to: a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or ***viable***; and b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

1.4.4 Section 7 (Ensuring the vitality of town centres) and section 16 (Conserving and enhancing the historic environment) of the Framework reference deliverability and viability factors, but specifically in the context of guiding retail and heritage planning policies in the NPPF. The above mentioned paragraphs are not of particular reference for the Dane Valley Site, albeit the employment space proposed could include small ancillary retail elements and is a heritage asset for Seaford more generally (though not nationally or locally listed).

Paragraph 63 of the NPPF is also noteworthy for Seaford, it states (our ***emphasis***): "*…To support the re-use of brownfield land, where vacant buildings are being reused or redeveloped,* ***any affordable housing contribution due should be reduced by a proportionate amount***[28]."

1.4.5 Footnote 28 clarifies that this is: *'Equivalent to the existing gross floorspace of the existing buildings. This does not apply to vacant buildings which have been abandoned.'* It is therefore necessary for STC and LDC to explore different options to enable brownfield land elements to come back into use. This will involve looking at the density, tenures and level of affordable housing to viable schemes. The Government were clear in the Housing White Paper (February 2017) and the revised NPPF (2018) that plan makers should use their powers to accelerate housing delivery and reuse brownfield sites in order to tackle the housing crisis.

1.6 Objective

1.6.1 Only a NDP that meets each of the basic conditions[7] can progress to a referendum. LDC will be responsible for determining whether the emerging Dane Valley allocation meets these tests. Plans should have regard to national policies and guidance; and be in general conformity with the strategic policies contained in the development plan of local planning authorities. The NPPF and PPG require plan makers to consider viability and deliverability. Neighbourhood plans also need to be in general conformity with the strategic policies in the corresponding Local Plan, such as affordable housing targets (unless the NDP evidence and strategy points to a different approach). Neighbourhood groups introducing new policy requirements (that may carry costs to development over and above national and local requirements); allocating sites in an NDP; and/or bringing forward Neighbourhood Development Orders ('NDO') should consider viability. The Qualifying Body should: consider whether sites are deliverable or developable[8] during the plan period (or the timeframe stipulated for the NDO); be satisfied that their approach does not put implementation of the Development Plan at risk; and helps to facilitate development during the plan period.

1.6.2 The PPG is clear that viability must be considered when preparing statutory plans:

> *The role for viability assessment is primarily at the plan making stage. Viability assessment should not compromise sustainable development but should be used to ensure that policies are realistic, and that the total cumulative cost of all relevant policies will not undermine deliverability of the plan.*
>
> *It is the responsibility of plan makers in collaboration with the local community, developers and other stakeholders, to create realistic, deliverable policies. Drafting of plan policies should be iterative and informed by engagement with developers, landowners, and infrastructure and affordable housing providers.*
>
> *Policy requirements, particularly for affordable housing, should be set at a level that takes account of affordable housing and infrastructure needs and allows for the planned types of sites and development to be deliverable, without the need for further viability assessment at the decision making stage.*
>
> *It is the responsibility of site promoters to engage in plan making, take into account any costs including their own profit expectations and risks, and ensure that proposals for development are policy compliant. The price paid for land is not a relevant justification for failing to accord with relevant policies in the plan.*[9]

1.6.3 This report is concerned with development viability for the Dane Valley site and is only one element of the NDP's wider evidence base. This document sets out the methodology used; the key assumptions made; and a high-level assessment of the proposed sites. The NPPF (paragraphs 35 and 36) emphasise that a proportionate evidence base should inform plans. In addition, the PPG emphasises that viability evidence should be based on a 'proportionate assessment of viability'.

1.6.4 As such the assumptions in this study have drawn upon existing available viability evidence, policy and guidance produced by LDC, EBC and SDNP:

- LDC and SNDP Affordable Housing and CIL Viability Study (HDH Planning and Development, December 2011);
- EBC Community Infrastructure Levy Viability Assessment (NCS, October 2013);
- SDNP Viability Assessment: Community Infrastructure Levy & Affordable Housing – Final Report (DSP, January 2014);
- LDC Community Infrastructure Levy Regulation 123 List (November 2015);
- LDC Local Plan May 2016 Part 1 Joint Core Strategy (May 2016);
- EBC Eastbourne Viability Report (Cushman & Wakefield, June 2016);
- EBC Letter to Local Plan Inspector Re: The Viability of Office Development in the Town Centre (June 2016);

[7] The basic conditions are set out in paragraph 8(2) of Schedule 4B to the Town and Country Planning Act 1990 as applied to neighbourhood plans by section 38A of the Planning and Compulsory Purchase Act 2004.
[8] See Glossary for NPPF definitions
[9] How should plan makers and site promoters ensure that policy requirements for contributions from development are deliverable? Paragraph: 002 Reference ID: 10-002-20180724 Revision date: 24 07 2018Accessed at: https://www.gov.uk/guidance/viability

- SDNP Local Plan and Affordable Housing Viability Assessment (BNP Paribas, August 2017);
- LDC Affordable Housing Supplementary Planning Document (July 2018);
- SDNP Affordable Housing Background Paper (September 2017, updated April 2018);
- LDC Local Plan Part 2 Site Allocations and Development Management Policies Submission Document (December 2018); and
- LDC Neighbourhood Plans Background Paper (December 2018).

1.6.1 Viability testing is an assessment of the financial viability of development. The study is purely concerned with whether or not the proposals for a site (and any relevant policy requirements within an emerging NDP) would render development unviable. Viability assessment outputs can be used (if necessary) to amend proposals or policies to help facilitate development and to ensure the cumulative impact of proposals and policies do not threaten the delivery of the NDP and Local Plan's vision, objectives and strategic policies.

1.6.2 The NPPF includes requirements to assess the viability and the impact on development of policies contained within plans – '*Such policies should not undermine the deliverability of the plan'* (paragraph 34). It is not a requirement of the NPPF that every site should be able to bear all of the Local Plan and neighbourhood plan requirements. However it is necessary for a site to bear the NDP policy considerations if it has been appraised, and policy drafted, to reflect site specific requirements

1.6.3 There are some types of development where viability will not be at the forefront of the developer's mind and they will proceed even if a development is 'unviable' in a conventional real estate sense. For example, an end user of an industrial or logistics building may build a new factory or depot that will help it to grow its business or improve its operational efficiency. Similarly some development sites will simply not be viable even without any additional requirements imposed upon them due to the prevailing market conditions and/or site constraints. The typical site should be able to bear whatever target or requirement is set and plan makers should be able to show, with a reasonable degree of confidence, that the plan is deliverable and facilitates development. Only sites with good prospects for development should be subject to viability testing (i.e. potentially deliverable or developable[10] sites usually identified through an earlier site assessment process).

1.7 Metric or imperial

The property industry uses both imperial and metric data - often working out costings in metric (£/m2) and values in imperial (£/acre and £/sqft). This is confusing so, on the whole, we have used metric measurements throughout this report. The following conversion rates may assist readers. A useful broad rule of thumb to convert m2 to sqft is simply to add a final zero.

Conversion rates	
1 m	3.28 ft (3' and 3.37")
1 ft	0.30 m
1 m^2	10.76 ft^2
1 ft^2	0.093 m^2

1.8 Site concept plans

1.8.1 **PLEASE NOTE:** All site plans accompanying this report are for illustrative purposes only and are informed by previous AECOM masterplanning analysis. They do not necessarily represent schemes that would either be endorsed by the Town Council or promoted by local landowners or developers. Their primary purpose for this study is to help inform realistic assumptions for the viability modelling exercise. Future planning applications will have to accord to with the draft NDP policies and extant LDC strategic policies, as such future schemes shall be informed by more detailed site investigations and a detailed design stage (including community engagement).

[10] See Glossary

2 Viability Testing

2.1.1 For plan making, the assessment of viability is a largely high-level quantitative process based on professional judgements and development appraisals at a snapshot in time. It is not the same level of detail used for viability appraisals accompanying a planning application, nor does it constitute a market valuation of a site on the basis of the rules and practice guidance set out in the RICS 'Red Book' (see Glossary).

2.1.2 Whilst viability testing in the plan making context has limitations, it can help to de-risk the planning and development process by providing an indication on whether a plan (including its policies and/or site allocations) is deliverable. 'Viability Testing in Local Plans – Advice for planning practitioners' (2012)[11] prepared by the Local Housing Delivery Group[12] (sometimes referred to as the 'Harman Guidance') defines viability as follows (p6):

> ***"An individual development can be said to be viable if, after taking account of all costs, including central and local government policy and regulatory costs and the cost and availability of development finance, the scheme provides a competitive return to the developer to ensure that development takes place and generates a land value sufficient to persuade the land owner to sell the land for the development proposed. If these conditions are not met, a scheme will not be delivered."***

2.1.3 Put simply, the process of the appraisal involves adding up all the potential income from a scheme (total sales and/or capitalised rental income from housing and/or commercial developments – including subsidy) and then subtracting all the costs associated with the creation of the product (i.e. building the houses and/or commercial property plus any associated infrastructure and external works, fees, finance costs etc.) The Residual Valuation Method (see Glossary) employed for this also incorporates a cash flow to account for the movement of money by way of income, expenditure and capital receipts and payments during the course of the development. The residual valuation method is the typical valuation method widely used by developers and is the recommended for use when testing viability at the plan making stage due to its relative simplicity (see illustration below).

Residual Valuation Method

Gross Development Value
(The combined value of the complete development)

LESS

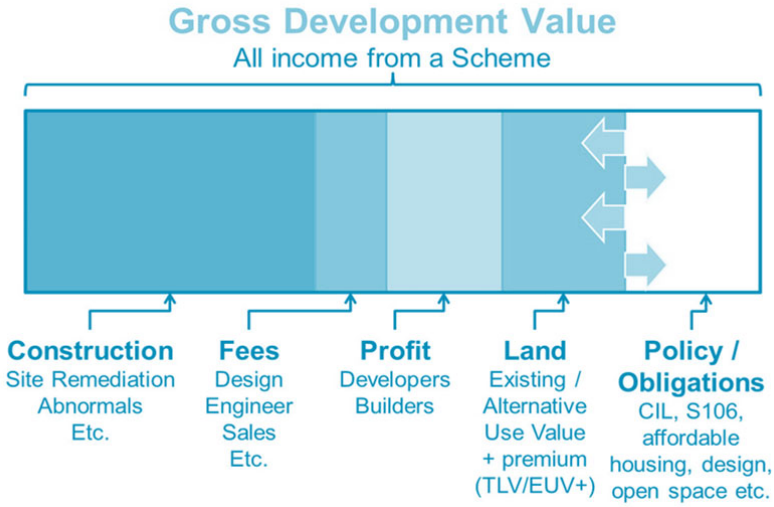
Cost of creating the asset, including a profit margin for the developer
(Construction + fees + finance charges etc.)
=
RESIDUAL VALUE

The Residual Value is compared to the Existing Use Value ('EUV') of the land to determine if the premium (uplift) above the EUV would induce the landowner to sell. This is known as the Threshold Land Value ('TLV') or Benchmark Land Value

[11] Accessed at: http://www.nhbc.co.uk/NewsandComment/Documents/filedownload,47339,en.pdf
[12] Viability Testing in Local Plans has been endorsed by the Local Government Association and forms the basis of advice given by the, MHCLG funded, Planning Advisory Service (PAS).

2.1.4 The Residual Value is the output and the theoretical top limit of what a developer could offer to pay a landowner for their site and still make a satisfactory profit margin (where the developer's return is included as a cost in the calculation). The availability and cost of land are matters at the core of viability for any development. The Residual Valuation requires the inputting of many variables and is often regarded as subjective. However, it does attempt to represent a realistic 'market' perspective (based on today's costs and values) and takes no account of the individual circumstances of any particular developer. Whilst a developer may have regard to a Residual Valuation, when assessing an offer price, they will typically undertake a more complex and detailed Development Appraisal using a Discounted Cash Flow (DCF) / Internal Rate of Return (IRR) model, either bespoke to them or an industry model (e.g. Argus).

Figure 2-1 The residual valuation method ***(source: HDH)***



2.1.5 The bar (**Figure 2-1**) above represents all the income from a scheme – the Gross Development Value ('**GDV**'). This is set by the market (rather than by the developer or local authority) and so is, largely, fixed. The developer has relatively little control over the costs of development (construction costs, fees etc.) and whilst there is scope to build to different standards and with different levels of efficiency, the costs are largely out of the developer's direct control – they are what they are, depending on the development proposed (costs of labour and materials). The developers profit is included as a cost as developers need to be rewarded for taking on the risk of development. The level of profit is typically between 15-25% of GDV or of total costs (in all cases it should reflect the risk of the development). The more policy requirements and planning obligations loaded onto a scheme, the higher the likelihood that the land value of the site will be suppressed (as shown by the arrows below).

2.1.6 Therefore, the essential balance in viability testing is whether the land value is sufficient to induce a landowner to release their land for development. The more policy requirements and planning obligations the plan asks for the less the developer can afford to pay for the land. Similarly site specific abnormal costs may impact the viability of development. The landowner will only agree to sell their land to the developer if they receive a return sufficient to release their land.

2.1.7 The return for the landowner and developer are controversial matters, and it is clear that different landowners and developers will have different views depending on their personal and corporate priorities. The Residual Value generated by the development appraisals must be compared to the Existing Use Value ('**EUV**') or an Alternative Use Value ('**AUV**') of the site. The size of the uplift or premium above the EUV/AUV must be enough to incentivise a landowner to sell. The amount of the uplift/premium over and above the EUV is central to the assessment of viability. It must be at a level to a sufficient return to the landowner so that land comes forward. This concept is known as the Existing Use Value 'Plus' a premium ('**EUV+**'), also referred to as the Threshold Land Value ('**TLV**'). Other terms to describe the landowner's return include: Benchmark Land Value ('**BLV**') or Viability Threshold. The EUV+ approach is accepted by PINS and propounded in the PPG[13].

2.1.8 The EUV+, or TLV, is the point at which a 'reasonable' landowner will be induced to sell their land. This concept is difficult since a landowner is unlikely to be entirely frank about the price that would be acceptable to them. This is one of the areas where an informed assumption has to be made. If a landowner owns a field in agricultural use they will expect a large premium above the EUV to release it for residential development as agricultural land is typically worth tens of thousands of pounds per hectare whereas as residential land it is worth hundreds of thousands of pounds per hectare.

2.1.9 The PPG makes it clear that when considering land value it should be in the context of current and emerging policies and based on today's costs and values, disregarding any hope value or the price paid for the land. In other words, land value should be reduced to reflect policy requirements. Historical transactions recorded under a different policy framework or less favourable market conditions (such as a recessionary period) will be less useful as comparable market data for informing assumptions for the EUV+/landowners return.

2.1.10 The value of land relates closely to the use to which it can be put and will range considerably from site to site; however, high level studies will typically look at three main uses, being: agricultural/greenfield, residential and industrial/commercial uses. Consideration of what constitutes the EUV+ locally incorporates, wherever available, a review of pre-existing Local Authority research. If the Residual Value does not exceed the EUV, then the development is not viable. If it exceeds the EUV but does not exceed the EUV+, then it is still not viable as it would not induce the landowner to sell. However, it may be closer to being a viable scheme with amendments to policy, or the development scheme itself if it is producing a large positive Residual Value. Only a Residual Value equal to or in excess of the EUV+ would represent a viable scheme (see illustration below).

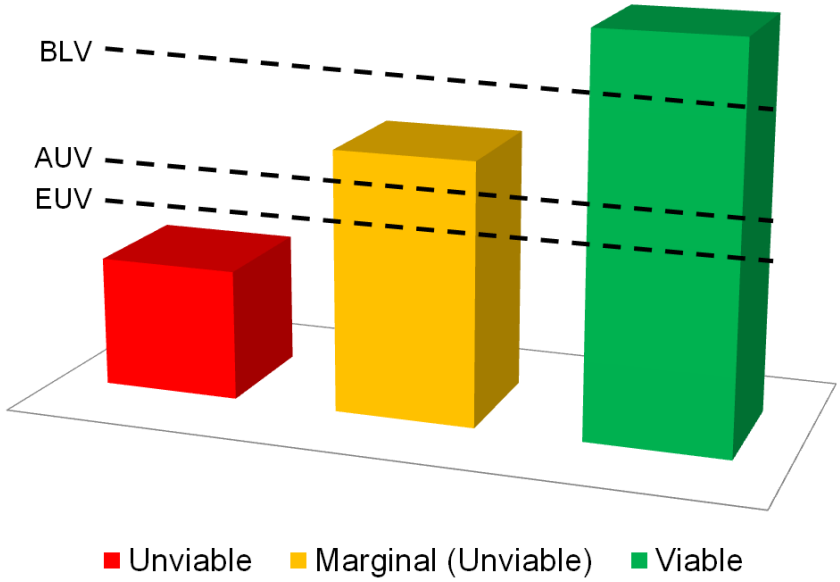
Benchmark Land Value (BLV) = Existing Use Value Plus (EUV+)	*The Benchmark Land Value for the purposes of assessing the viability of development for planning purposes. The value above the EUV at which a reasonable and willing landowner is likely to release land for development (the 'landowner's return').*
Existing Use Value (EUV) / Alternative Use Value (AUV)	*The value of the land in its existing use together with the right to carry out any development for which there are extant planning consents, including realistic deemed consents, but without regard to other possible uses that require planning consent, technical consent or unrealistic permitted development.*
Current Use Value (CUV)	*The value of land in the use to which it is currently being put. It excludes any consented use including deemed consents and any element of Hope Value.*

[13] Paragraphs 7 To 9 of Report On The Examination of the Draft Mayoral Community Infrastructure Levy Charging Schedule By Keith Holland Ba (Hons) DIPTP MRTPI ARICS The Examiner Appointed By The Mayor Date: 27th January 2012

2.1.11 In practice, a wide range of considerations could influence the precise EUV and EUV+ that should apply in each case, and at the end of extensive analysis the outcome might still be contentious. One type of approach is outlined below:

- For sites previously in agricultural use, then agricultural land represents the existing use value.
- For paddock and garden land on the edge of or in a smaller settlement you should adopt a 'paddock' value.
- Where the development is on brownfield land you assume an industrial value.
- Where the site is currently in residential use you assume a residential value.

Figure 3 Viable or unviable: does the Residual Value exceed the Benchmark Land Value?



2.1.12 For greenfield sites it is incredibly difficult to get agreement from the development industry on what the premium or uplift (EUV+) above greenfield values should be. Whatever the EUV+, it will always be a simplification of the market; however in a high level study of this type general assumptions need to be made. Landowners selling a greenfield site in the event of the grant of planning consent, usually receive over between 10-20 times the value compared with before consent was granted.

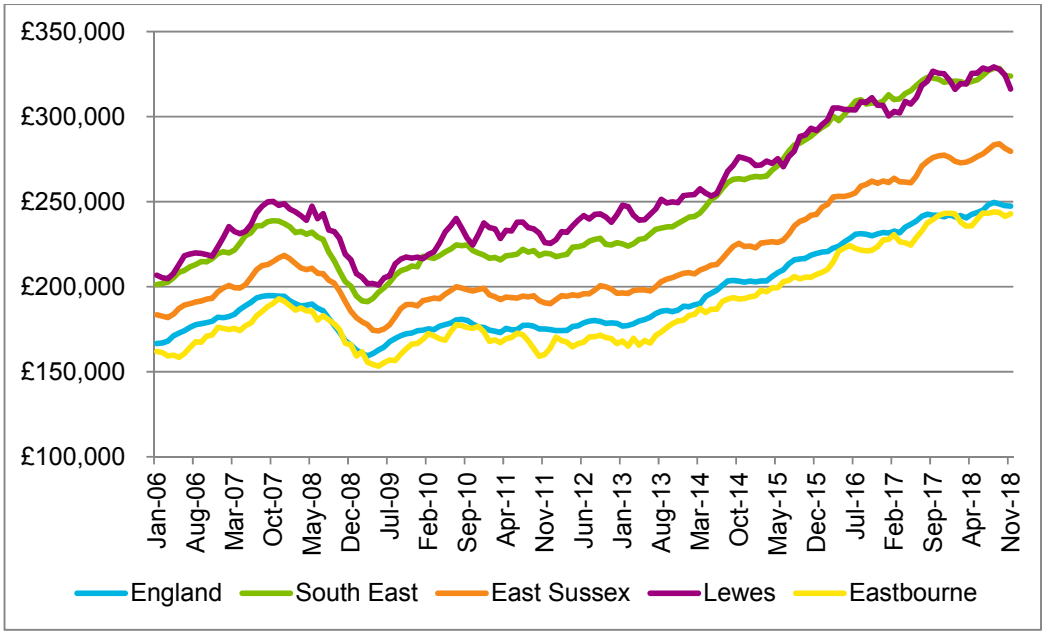
2.1.13 The high level and broad brush viability testing that is appropriate to be used to assess Local Plans and Neighbourhood Plans has limitations. It should be noted that this study is about the economics of development. Viability brings in a wider range than just financial factors.

2.1.14 The PPG and Harman Guidance both emphasise the importance of the non-financial factors. Viability is an important factor in the plan making process, but it is one of many planning considerations set down in national policy that needs to be considered as part of plan making. It is not viability at any cost.

3 Market Research

3.1.1 This study is concerned with the viability of new build residential property. Key inputs for the appraisals are the price assumptions for new development. We have reviewed new build market housing prices paid from the Land Registry from 2013 to 2018 and have conducted a survey of property being marketed in January 2019 (to highlight properties where prices paid are not yet recorded with the Land Registry). It has also been necessary to investigate the second hand market locally to triangulate the data to form judgements for the modelling.

3.1.2 Although development schemes have similarities, every scheme is unique, even schemes on neighbouring sites. Market conditions broadly reflect a combination of national economic circumstances and local supply and demand factors, although even within a town like Seaford there will be particular localities, and ultimately site specific factors, that generate different values and costs. For the purposes of this study, we have used up-to-date market evidence to inform the price assumptions.



3.1.3 The RICS December 2018 UK Residential Market Survey[14] reported that enquiries, agreed sales and new instructions all soften again over the month, sales expectations point to a further decline in near term activity, and headline price net balance slips slightly deeper into negative territory. The survey further reports that:

"…In terms of prices, the headline indicator slipped slightly deeper into negative territory during December, falling to -19% from a net balance of -11% last time. This marks the fourth consecutive negative reading and is also the weakest since August 2012. Nevertheless, the UK wide measure is still masking significant variation at the regional level. Indeed, prices continue to soften in London and the South East…Looking ahead, while downward momentum in prices at the national level is expected to persist over the near term, the twelve month outlook remains broadly flat. Furthermore, with the exception of London and the South East, prices are anticipated to either rise or hold steady, right across the board.."

[14] Accessed at: https://www.rics.org/globalassets/rics-website/media/knowledge/research/market-surveys/uk-residential-market-survey-december-2018-rics.pdf

3.3 New Build Prices Paid

3.3.1 The Land Registry publishes data of all homes sold. There were 68 homes sold recorded between 2013 and December 2018 in the vicinity of Seaford (using postcode areas to narrow the search area). These transactions are summarised as follows (and included in full in Appendix A). Of most relevance are the figures for flatted developments.

Table 1 New build prices paid

New build Sales 2013-18 £					
	Detached	Semi-detached	Terraced	**Flats**	All
Count	4	2	8	**54**	68
Max	597,500	368,725	369,950	**429,950**	597,500
Min	405,000	364,950	200,600	**140,000**	140,000
Mean ^	504,750	366,838	322,119	**243,781**	268,354
Median *	508,250	366,838	349,225	**214,950**	239,950

^ The mean is the total of the numbers divided by how many numbers there are

** The median is the middle value of a set of numbers (e.g. 1 2 3 4 5)*

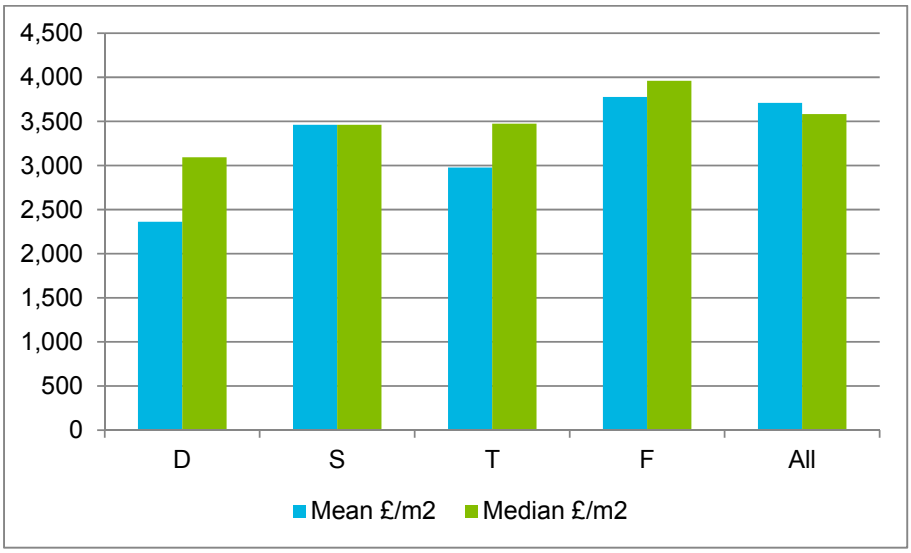
3.3.2 We have calculated the values on a pounds per square metre basis (£/m2) for each property by comparing prices paid with the total unit size (Gross Internal Area) of each unit sold, acquired from the Government's Domestic Energy Performance Certificate Register. The mean and median £/m2 prices for each broad house type are summarised below and overleaf (Table 2 Prices paid (median and mean) by type and Figure 4 Prices Paid (median and mean) Comparison).

Table 2 Prices paid (median and mean) by type

New build Sales 2013-18 £/m2		
	Mean £/m2	**Median £/m2**
Detached	2,363	3,092
Semi-detached	3,461	3,461
Terraced	2,978	3,475
Flats	**3,778**	**3,961**
All	£3,710	£3,582

Source: Land Registry (2014-2016)

Figure 4 Prices Paid (median and mean) Comparison



3.4 New build properties for sale

3.4.1 In addition to collecting price paid data we have collected information on 59 new build properties that were being marketed in January 2019. Schemes within a 10 mile (16km) radius of the neighbourhood area were included to gather a larger sample. Where available floor plans were analysed to provide accurate total floor areas, where this information was not readily available average size assumptions were used.

3.4.2 Asking prices varied very considerably across the wider housing market area; ranging from £190,000 for a 1 bed flat in Poole to £675,000 for a 2 bed retirement flat in Poole. Values ranged from ~£1,500/m^2 to ~£8,000/m^2, with a median value of £5,148/m^2 and average value of £5,272/m^2. It should be noted that a large number of specialist premium retirement housing has resulted in the high values reported. This data is set out in full in Appendix B.

Table 3 New Build For Sale Prices (January 2019)

New build For Sale 2019 £					
	D	S	T	**F**	All
Count	18	13	16	**12**	59
Max	440,000	389,995	374,995	**599,950**	599,950
Min	321,950	277,950	237,950	**72,625**	72,625
Mean	365,077	324,048	288,393	**265,144**	314,916
Median	359,950	321,950	291,950	**249,950**	321,950

Table 4 For Sale Prices (median and mean) by type

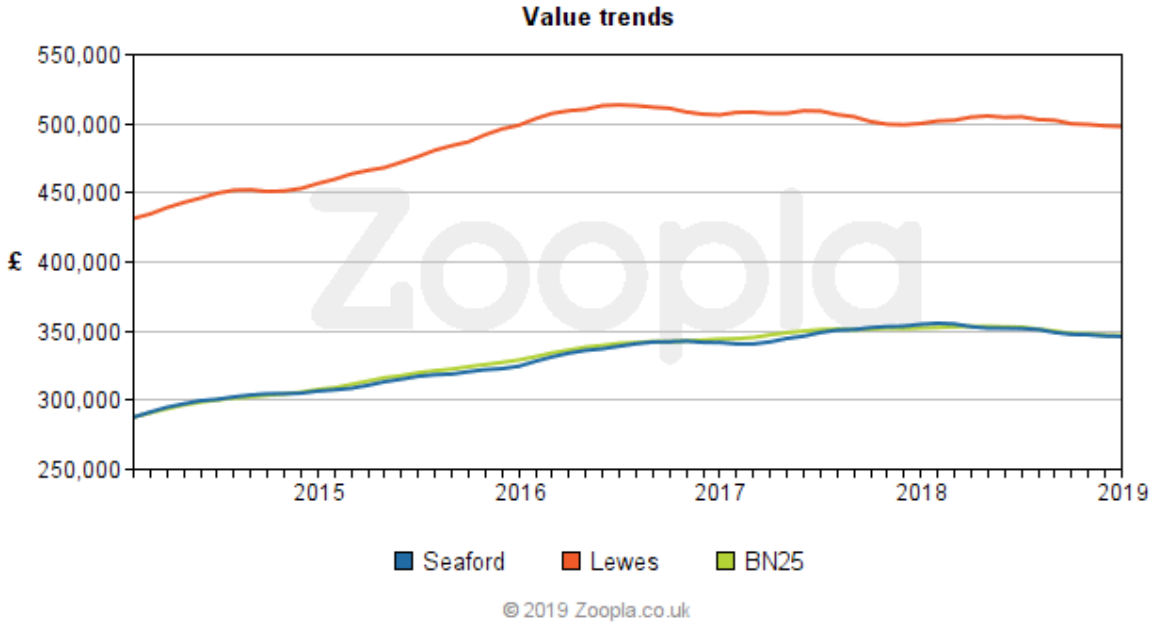
New build For Sales 2019 £/m2		
	Mean £/m2	Median £/m2
Detached	4,150	4,153
Semi-detached	3,566	3,632
Terraced	3,858	3,781
Flats	**3,863**	**4,016**
All	£3,884	£3,775

3.5 Second hand market

3.5.1 In addition to Land Registry price paid data and a survey of for sale prices, we have reviewed the second hand market using websites such as Zoopla and Rightmove (January 2019). This provides a useful benchmark and enables the collection of local marketing/sold data for Seaford, to help inform the price assumptions. Over the past 5 years the average price paid for property in Seaford has been £302,664 (source: Zoopla house prices tool) with an average value change of +£82,703 (+31.46%) over that 5 year period (based upon a sample of 2,347 sales). The current average value for property in Seaford is estimated to be £345,544. Since January 2018 Zoopla reports a -1.45% price change decrease across all property types.

3.5.2 **Figure 5** shows value trends for the past 5 years for Seaford, Lewes and post code BN25 (a search area covering most of the Seaford NDP area).

Figure 5 Values trends Seaford, Lewes and BN25 (January 2019)



3.5.3 Properties for sale on the open market within Seaford in January 2019 are summarised below (Table 5 Seaford second hand market current asking prices 2019). In Seaford, 139 homes were advertised for sale. Property prices for flats using this snapshot ranged from £465,000 3 bed flat on Bramber Close, to a 1 bed flat in The Esplanade building for £94,950. There was little information available for flatted development.

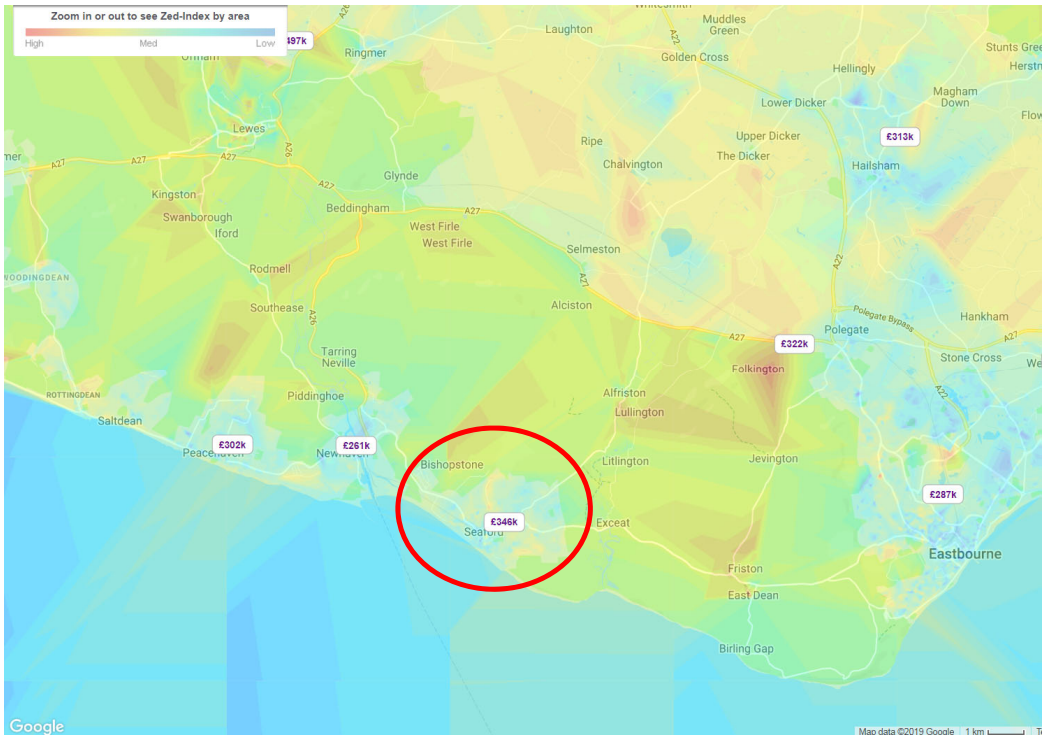
Table 5 Seaford second hand market current asking prices January 2019

2nd hand market	Property type	1 bed	2 beds	3 beds	4 beds	5 beds
Seaford	Houses	£210,000	£317,740	£361,202	£473,125	£711,359
	No.	1	20	45	18	11
	Flat	**£145,279**	**£244,758**	**£382,500**	**-**	**-**
	No.	24	18	2	-	-

Source: Zoopla (2019)

3.5.4 The Zoopla heat mapping tool[15] shows that Seaford's house values are slightly above nearby coastal towns but lower than some of the higher value rural areas in Lewes.

Figure 6 Zoopla Seaford Values Heat Map (March 2018)



[15] Zoopla use their current value estimates to generate a colour gradient overlay. Higher value areas tend towards red, and lower value areas tend towards blue. The value scale is dynamic and relative: Red in one locality may not have the same value as red in another locality, but on any given map, red is always higher value than blue.

4 Modelling Assumptions

4.1.1 This chapter considers the main assumptions required to produce financial appraisals for the site. The PPG states that viability evidence must be based upon the best available evidence, including the benchmark land values from other viability assessments. Any data used should reasonably identify any adjustments necessary to reflect the cost of policy compliance (including for affordable housing), or differences in the quality of land, site scale, market performance of different building use types and reasonable expectations of local landowners. There are a number of past studies containing viability information held locally. The key assumptions and inputs are summarised below to help inform the assumptions in this report:

	LDC/SDNP Viability Study (HDH 2011)	EBC Viability Study (NCS 2013)	SDNP Viability Study (DSP 2014)	EBC Viability Study (C&W 2016)	SDNP Viability Study (BNP 2017)
Residential Benchmark Land Values	-	£1,230,000/Ha (Low) – £1,600,000/Ha (High)	£1,500,000 - £2,000,000/Ha	£1,230,000/Ha	-
Non-Residential Benchmark Land Values	£900,000/Ha (AUV) £1,080,000/Ha (BLV)	£450,000/Ha	£850,000 - £1,500,000/Ha	£450,000/Ha	£850,000 per gross hectare
Market Housing Prices (Flats)	£2,750/m^2	£2,500-2,700/m^2	£3,000 – 5,000/m^2	£3,229/m^2	£4,141/m^2
Affordable Rent Prices (Flats)	£1,100/m^2	£1,000-1,100/m^2	80% of market rents/LHA	-	£1,475/m^2
Intermediate Prices (Flats)	£1,600/m^2	£1,200-1,320/m^2	32-75% of OMV	-	70% of market value
Affordable Housing Yield	5.25%	-	-	-	5%
B1 Rents	£54-97/m^2/year	£48-70/m^2/year	£60-100/m^2/year	£117-161/m^2/year	£139.93/m^2/year
B1 Yield	7%	8%	7.5%	7.5%	5.75%
B1 Prices	£780-1,900/m^2	£1,345/m^2	-	£1,560 – 2,146/m^2	£2,301/m^2
Residential Costs	£977/m^2	£1,114-£1,705/m^2	£1,170/m^2	£1,369/m^2	£1,745/m^2
Non-Residential Costs	£550-1,100/m^2	£1,230/m^2	£906-1,679	£1,700/m^2	£1139/m^2
S106	£3,500/unit	£1,000/unit £5/m^2 (B1)	£3,000/unit	£1,000/unit	£3,000/unit
Infrastructure/ Opening up costs	15% on costs	-	£4,500/unit	210,526/Ha	*Accounted for in BCIS uplift*
Externals	10% of costs	-	15% BCIS adjustment	£40/m^2	17.5%
Abnormals	2% Flooding	£1,000/unit (flood/ archeology)	5.85% sustainable design	£150/m^2 (surface car park) / £8,600/ space (deck)	6% - sustainable £924/flat (accessibility)
Professional Fees	10% on costs	8%	10%	10% +£2,000/unit	10%
Acquisition / Marketing	1.5%/2.5%	1.6%/2%	2.25% / 3% & £750/unit	19.5% (resi & non-resi)	6.8%/3.5%
Interest	7%	-	7%	6.5%	7%
Contingency	5% on costs	5%	5%	7.5%	5%
Developer Profit	20% on cost	20% GDV 17.5% (commercial)	20% market 6% affordable	20% on cost	20% market 6% affordable
Build out rates	~30pa	-	~50pa / 24 months (100)	50pa	4-5/units pcm (48-60pa)
Density/Net to Gross	66%	50% / 100dph	60% / 75dph	85%	70dph

4.1 Residential Unit Size Assumptions

4.1.1 The Homes England Development Appraisal Tool (used for the purposes of this study) requires unit size inputs. The Government's optional nationally described space standard[16] (see Table 6) requires viability testing in order to justify its adoption. This document provides sizes based upon the number of bedrooms, bed spaces and storey heights. The LDC Affordable Housing Supplementary Planning Document (July 2018) advises that these standards are applied and where possible, LDC will always seek 2 bedroom flats able to house 4 persons where viable. In addition, we have also taken into consideration the size assumptions for flats applied by the most recent Local Plan and Affordable Housing Viability Assessment - Prepared for SDNP (BNP Paribas, August 2017).

4.1.2 Therefore for the purposes of the modelling we have assumed the following unit sizes:

- 1 bedroom: 50m^2
- 2 bedroom: 70m^2
- 3 bedroom: 95m^2
- 4 bedroom: 108m^2

Table 6 Minimum gross internal floor areas and storage (m2)

Number of bedrooms(b)	Number of bed spaces (persons)	1 storey dwellings	2 storey dwellings	3 storey dwellings	Built-in storage
1b	1p	39 (37)[2]			1.0
	2p	50	58		1.5
2b	3p	61	70		2.0
	4p	70	79		
3b	4p	74	84	90	2.5
	5p	86	93	99	
	6p	95	102	108	
4b	5p	90	97	103	3.0
	6p	99	106	112	
	7p	108	115	121	
	8p	117	124	130	
5b	6p	103	110	116	3.5
	7p	112	119	125	
	8p	121	128	134	
6b	7p	116	123	129	4.0
	8p	125	132	138	

[16] Accessed at:
https://www.gov.uk/guidance/housing-optional-technical-standards f

4.2 Market Housing Price Assumptions

4.2.1 The preceding analysis does not reveal simple clear patterns with sharp boundaries for particular areas found in and around the town.

4.2.2 We have used the current asking prices from active new build developments, the general pattern of all house prices across the study area (including analysis of prices paid and the second hand market) and existing research from LDC, EBC and SDNP to form a view on the price assumptions to be used in the appraisal to calculate a Gross Development Value. The prices are reflective of today's values for Seaford and comparable surrounding areas and have been informed by market values to reality check the assumptions. It is important to note at this stage that these professional judgements are broad brush for the purposes of a high level study to test the sites/schemes being considered by STC and LDC, as required by the NPPF, and to inform the emerging NDP. The values between new developments and within new developments will vary considerably in reality based on location, situation, unit type and the state of the market at the point of marketing the properties.

4.2.3 The Harman Guidance advises that viability testing should use current prices; we have used the following price assumptions for this study:

Table 7 Market housing price assumptions (2019)

Type	Price £/m2	m^2	Price £/unit
1 bed flat	3800	50	£190,000
2 bed flat	3800	70	£266,000
3 bed flat	3800	95	£361,000
4 bed flat	3800	108	£410,400

4.2.4 Due to the lack of recent new build transactions recorded for Seaford on the Land Registry database, the more recent marketing data and second hand market data has been factored into the final assumptions. The above prices broadly reflect a blend of the prices assumed for Seaford and comparable areas within ~10 miles. The price assumptions do not exceed what is being achieved in higher value areas nearby. There is no compelling evidence to diverge too far from the Lewes flatted price assumption (£4,141/m^2) contained in the most recent SDNP viability study (August 2017). Zoopla's report of a -1.45% value change in Seaford for the past 12 months and the RICS Residential Market Survey comments for the South East suggest that a more conservative price would be appropriate.

4.3 Affordable Housing Price Assumptions

4.3.1 For the purposes of affordable housing values, we have drawn upon the Valuation Office Agency Local Housing Allowance rates for the Eastbourne Broad Rental Market Area (for affordable rented products) and The Regulator for Social Housing Statistical Data Return 2017/18 (for social rent products)[17]. In both cases it is necessary to use the rental information and convert it into values (£/m2). We have calculated the annual rent (net of management costs, voids, repairs etc.) and then capitalised the net annual rent assuming yields of 5%. For shared ownership products we have simply assumed a value 70% of open market values.

	SDR – Affordable Rent average weekly rent	VOA Local Housing Allowance
1 bed	150.3	120.03
2 bed	180.08	151.5
3 bed	221.94	182.45
4 bed	239.72	235.34

[17] The Statistical Data Return (SDR) is an annual survey completed by all English PRPs (Private Registered Providers). It collects data on stock size, location and types, PRP characteristics, rents and activities over the year. Accessed at: https://www.gov.uk/government/collections/statistical-data-return-statistical-releases

Table 8 Affordable Rents for Eastbourne Broad Rental Market Area (Source: VOA LHA)

Affordable Rent	Per Week	Per Month	Per Year
One Bedroom Rate	£120.03	£520.13	£6,241.56
Two Bedrooms Rate	£151.50	£656.50	£7,878.00
Three Bedrooms Rate	£182.45	£790.62	£9,487.40
Four Bedrooms Rate	£235.34	£1,019.81	£12,237.68

Table 9 Capitalised Affordable Rents less voids, management costs and overheads (2019)

	1 bed	2 bed	3 bed	4 bed
Assumed AR	£6,241.56	£7,878.00	£9,487.40	£12,237.68
Net Rent	£4,993.25	£6,302.40	£7,589.92	£9,790.14
Value	£99,864.96	£126,048.00	£151,798.40	£195,802.88
m2	50	70	95	108
£/m2	£1,997.30	£1,800.69	£1,597.88	£1,812.99

4.3.2 Based upon the above analysis the below price assumptions have been applied in the modelling:

Table 10 Affordable housing price assumptions

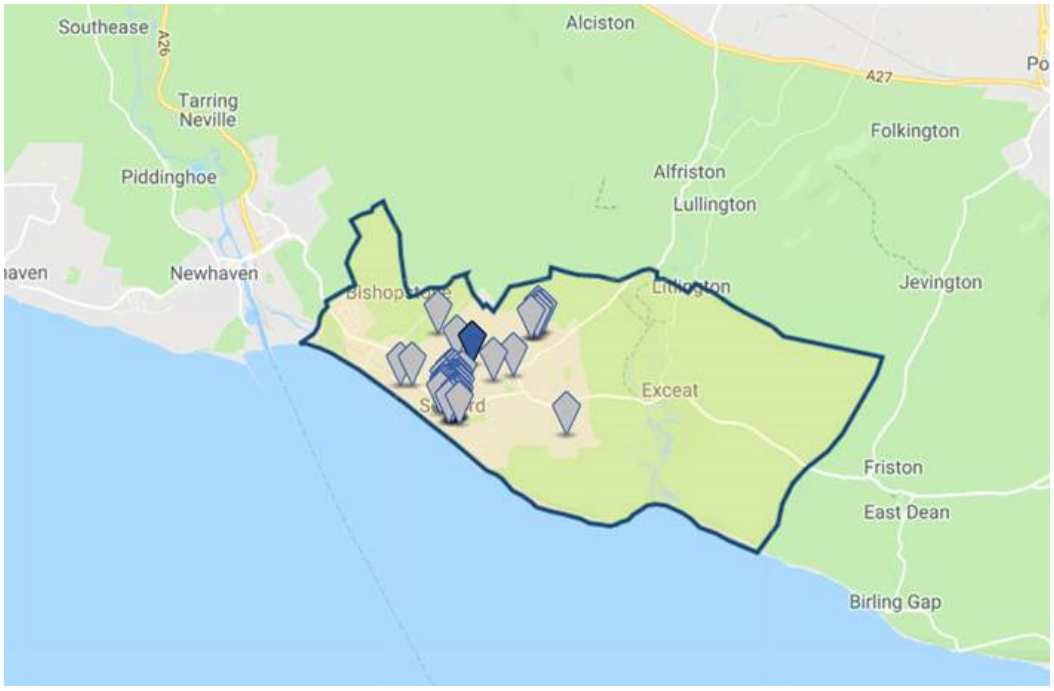
Type	Price £/m2	m^2	Price £/unit
1 bed flat – affordable rent	1850	50	92500
2 bed flat – affordable rent	1850	70	129500
3 bed house – affordable rent	1850	95	175750
4 bed house – affordable rent	1850	108	199800
1 bed flat – shared ownership	2660	50	133000
2 bed flat – shared ownership	2660	70	186200
3 bed house – shared ownership	2660	95	252700
4 bed house – shared ownership	2660	108	287280

4.4 Non-Residential Price Assumptions

4.4.1 The emerging proposals for the Dane Valley site includes an option for the refurbishment of an existing 2 storey employment building with approximately 1,100 m^2 GFA and accompanying parking (~29 spaces).

4.4.2 In order to provide an accurate assessment of the GDV of non-residential property, it is necessary to collect local information on commercial property rents, yields and values. We have collected readily available data from CoStar for Seaford BN25 post code (see Figure 6) and reviewed local estate agents websites and EGi Property Link (see Appendices C and D).

Figure 7 CoStar area of search - Seaford BN25



4.4.3 For the purposes of the model, assumptions have been made for the likely rent (£/m2 basis) and yield (%) of the commercial element, which is assumed to be use class B1. This would permit office and light industrial uses.

4.4.4 A 'yield' is a way of classifying how risky a commercial property investment may be. The "yield" is the rent as a proportion of the purchase price. In determining development value, there is an inverse relationship i.e. as the yield goes up, the value goes down. The example overleaf illustrates how a yield is used as the multiplier to calculate a value for a commercial property where the value/asking price is not known or advertised.

4.4.5 A 'yield' is a form of benchmark to help classify particular types of commercial property in particular locations, e.g. the London office market information for yields is of great interest to commercial developers in London depending on the type of office and location (City vs. Canary Wharf etc.) The concept of the 'yield' is crucial to understanding the dynamics of investment in commercial property. For example, it may be reasonable to expect a supermarket occupied by a major chain to be relatively low risk, whereas a speculative office development occupied by a start-up in a less desirable (lower demand) area would not offer the same assurances that the tenant will remain solvent or that the owner will be able to re-let the property quickly.

Yield Example

The formula for calculating value is: (100/yield) x rent = Value

In this example a commercial unit is let at £12,500 per annum and a property of this type in this location could expect to achieve a yield 5%

Therefore calculation is performed as follows:

(100/5) x 12,500 p.a. = £250,000

If we assume the unit is 250m^2, its value on a £ per m^2 basis = £1000/m^2

Source: Regenerate Ltd

4.4.6 The commercial data collected for this study is not exhaustive and represents a snapshot in time. Local yields will vary from property to property and will be affected by site-specific factors such as location; terms of the lease; and strength of covenant with the tenant (e.g. do they pay their rent on time or are they likely to go out of business resulting in a letting void). For the purposes of this report and viability testing for a Neighbourhood Plan high-level assurance that development is viable is required. Recreating a developer's approach or business model is not the purpose of the modelling. Instead, the requirements of the NPPF/PPG are paramount. The commercial elements of the Dane Valley site are subsidiary to the residential elements and will not be the major determinant as to whether the site is viable. However, the data collected provides sufficient confidence that the assumptions for rent, yields and values are broadly in line with local evidence.

Table 11 B1 rents data

Source	£/m^2/year
Past viability studies rents	£48 - 161
CoStar average rents (Appendix C)	£56.83 - 58.23
Local comparables rents (Appendix D)	£131 - 307

4.4.7 On the basis of local evidence we have assumed a rent of £100/m^2/year and a yield of 7.5%.

4.5 Policy Costs

4.5.1 We have reviewed the SPC Pre-submission Draft to assess whether any of the emerging policies and allocations carry additional costs over and above the building regulations and extant LDC requirements and obligations:

NDP Policy	Policy Cost
SEA1 Development within or affecting the SDNP	N/A
SEA2 Design	Good design is cost neutral and adds value.
SEA3 Conservation Areas	N/A
SEA4 Bishopstone Conservation Area	N/A
SEA5 Areas of Established Character	Good design is cost neutral and adds value.
SEA6 Development on the Seafront	N/A
SEA7 Recreational Facilities	N/A
SEA8 Local Green Spaces	N/A
SEA9 Allotments	N/A
SEA10 Health Facilities	N/A
SEA11 New Business Space	The values for the B1 elements reflect the policy requirements
SEA12 Visitor Accommodation in Seaford	N/A
SEA13 Footpath to Church Lane	N/A
SEA14 Safeguarding Future Transport Projects	N/A
SEA15 Site Allocations	Scenarios 2 and 3 are appraised on the basis of 131 and 104 units.
SEA16 Dane Valley Project	The appraisals reflect the policy requirements in full
SEA17 Seaford Planning Boundary	N/A
SEA18 Windfall Development	N/A
SEA19 Utility Infrastructure	Covered in construction and external costs.

4.6 Construction Costs

4.6.1 The SDNP Viability Study (2017) assumed relatively high residential construction costs (£1,745/m^2) based upon a typical greenfield edge of settlement site, adjusted to provide for a high quality specification and opening up costs. The figures for our assumptions are drawn from the Building Cost Information Service (BCIS) median costs for new build rebased to Lewes (see **Appendix C**). An additional 15% net to gross assumption is made for flats to account for common areas.

Table 12 BCIS median build costs summary

Building function	Median BCIS New Build £/m2
Flats (apartments) 3-5 storey	£1,544/m^2
Purpose built / Advance factories/offices – mixed facilities (class B1)	£988 - 1,419/m^2

4.8 External Costs

4.8.1 In addition to the BCIS £/m^2 build cost figures (which cover the costs of the foundations up to the roof), allowance needs to be made for a range of site costs (footpaths, roads, car parking, landscaping and other external costs). Many of these external items will depend on individual site circumstances and can only be accurately estimated following a more detailed scheme design and assessment of each site (including further ground investigations for the western portion of the site). This is not practical within this study unless estimates are readily available for site specific issues. The modelling assumes 10% of construction costs for external works.

4.9 Demolition, Drainage and Remediation

4.9.1 Annex 1 (Generic Quantitative Risk Assessment and Outline Remediation Strategy) and Annex 2 (Surface Water Flood Attenuation) include feasibility studies for the Dane Valley site on the topics of flooding and land contamination. The findings and recommendations contained within the two reports have been used to estimate costs for site drainage and remediation. This process has drawn upon the expertise of AECOM cost management consultants and the following documents: Guidance on dereliction, demolition and remediation costs (HCA, 2015); and Spon's Civil Engineering and Highway Works Price Book (AECOM, 2018).

4.9.2 AECOM drainage engineers recommend underground geocellular attenuation rather than the use of above ground attenuation features such as ponds or basins due to the need to maximise the developable area. Assuming that the site will have 85% impermeable area the need for on-site attenuation to manage surface water runoff generated from the site itself will amount to approximately 1,400m^3 based on a discharge rate limited to 5 litres/second for all storm events up to the 1 in 100 years plus 40% climate change allowance. Annex 2 also recommends the use of source control measures (examples include green roofs, tree pits, permeable paving & rainwater harvesting) to complement the main attenuation but we haven't quantified these as they will depend on the detailed design of the scheme, but any attenuation volume provided by these features would reduce the volume of storage required in the main attenuation feature.

4.9.3 Annex 2 identifies the need to enable overland flow from off site to continue to flow through the site rather than being attenuated on site. In the current feasibility study the on-site attenuation has only considered the storage required for surface water runoff generated from the site itself (i.e. rain falling directly onto the site in rainfall events) and does not provide attenuation for overland flow which could enter the site from the surrounding areas. The development should enable the overland flow to continue on its current flow path so there is no change to the risk of flooding from this source off site. Future proposals for redevelopment will need to ensure the development itself will not be affected by this overland flow but this can be achieved by design features such as providing a flow route using ground levels, raising finished floor levels etc.)

4.9.4 By attenuating the rainfall that falls on the site and controlling the discharge rate from the post developed site this will provide a betterment compared to the predeveloped site which is assumed to discharge uncontrolled into the existing drainage network. Further detail on potential off site attenuation options to help reduce the overland flows which reach the site and subsequently the lower part of the catchment will be confirmed following receipt of additional mapping from LDC.

4.9.5 Annex 2 recommends that an attenuation tank with a 1,400m^3 capacity is installed to support a development of up to 165 units. Installation of an attenuation tank of this size will also need to account for dead space of +10% i.e. 1,540m^3. Using a rate of £30,000/100m^3 (as advised by the AECOM water team), the purchase and delivery of the storage tank is estimated at £462,000. A further adjustment of +50% is assumed for installation (labour, plant etc.) and +20% for contractors preliminaries, overheads and profit = **Total £785,400.**

4.9.6 Costs are also assumed for the possible removal of soil (excavation and disposal) associated with the installation of the attenuation tank. SPON's[18] provides a range of costs for dealing

[18] SPON's p40 Indicative costs of land remediation techniques for 2018 (excluding general items, testing, landfill tax and backfilling)

with hazardous (£40-100/m^3) and non-hazardous (£75-200/m^3) soils. We have assumed the top of each range with an additional £50/m^3 added both types to account for general items and backfilling (therefore £150/m^3 and £250/m^3 respectively). We have assumed a 50/50 split of hazardous and non-hazardous soils in our assumptions. In addition, further adjustments are made for: Main Contractors Preliminaries, overheads and profit +20%; Professional fees +10%; and Design development and construction contingency 15%: **Total = £446,600**.[19]

4.9.7 Landfill tax is assumed to be nil. There is a difference in level across the study area and so it is assumed that re-using fill on-site may be necessary. At this stage it is not certain that landfill tax will be incurred at all. If the soil goes to a treatment centre and can be re-used then no landfill tax will be incurred – there is a chance of this happening with the non-hazardous soils from the attenuation tanks (based on a location under the car park between the blocks on plot 5 in the south east of the site). The landfill tax rates are as follows: £2.80/tonne for Inert waste; and £88.95/tonne for both Non-Hazardous and Hazardous soils. We are not proposing that any of the soil in the upper 1m would be classed as Inert. Further investigations conducted alongside the detailed scheme design should look at whether there is a need to re-use site won materials to raise levels at the site. If there is a need on-site then the volume of materials requiring off-site disposal can be minimised.

4.9.8 We have assumed that the large concrete gas holder base is being disposed as concrete for re-use and is exempt from landfill tax. At WS18-02 it is 0.6m thick. The base surface of the holder is ~0.6- 0.9m bgl so once it is removed there will be a hole 1.2 – 1.5m deep into which tanks can be placed (although there are some spoil heaps in it that would need to be removed first). The base of the holder has an area of ~1,025m^2. If part of the holder is under the footprint of the future buildings and is unavailable for the tanks then, subject to geotechnical suitability, those parts of the excavation to remove it could be suitable for re-use of soils removed from elsewhere on site to create space for the tanks.

4.9.9 General site-wide remediation cost estimates are based on the 'Guidance on dereliction, demolition and remediation costs' (HCA, 2015). Annex 1 has been used to inform whether a higher or lower cost is likely across all plots. It assumes most of the upper 1 metre of soil could stay on site and so would not need to be disposed of off-site to reduce environmental risk. It is deeper soil contamination and groundwater that is likely to incur the majority of cost.

4.9.10 Ground investigations have helped to inform indicative costs for remediation of the site, in advance of forming a preferred remediation strategy for the proposed development of the site. The costs are provided as a potential range for remediation of the Dane Valley site based on an area of 1.139ha (see Annex 1). The methodology used does not look at specific remediation techniques but looks at the size of the site, the sensitivity of the end use, sensitivity of controlled waters, source of contamination etc. The range of costs are as follows: low £565,000, medium £1,040,000; and high £1,520,000

4.9.11 Further ground investigation, including DQRA, will be required to determine which contamination related risks require remediation and the preparation of a remediation strategy will be necessary to discharge planning conditions and to clarify remediation costs. There is greater uncertainty in assessing potential costs when plots are less than 1ha due to potential constraints in terms of area to work within and therefore it is assumed that all remedial works would be either undertaken on whole site at same time or conducted for plots 5 and 7 as part of a substantial first phase. However the main approach will be to try and minimise the amount of material that goes off site.

4.9.12 It seems likely that plot 5 and plot 7 would qualify for landfill tax relief. The shallow material from plot 5 appears chemically suitable for reuse under hardstanding or buildings, provided there is a requirement for the material e.g. instead of importing clean material to site you could use this instead – it would have to be suitable from geotechnical standpoint also, no geotechnical testing has been conducted. This could significantly reduce the amount of material that has to be disposed to landfill.

4.9.13 This may not be the case for material from other plots, plots 1 and 2 in particular where there may be high concentrations of volatile compounds that shouldn't be put under buildings. If we are unable to re-use material from plot 5 then a reasonably conservative estimate is that 50% of the material going off site should be considered as hazardous waste (as per paragraph 4.8.4). Table 13 (overleaf) sets out the assumptions applied to each plot based on the information from Annex 1 and the professional judgements of the AECOM land contamination

[19] (770m^3 @ £250/m^3) + (770m^3 @ £150/m^3) x 1.45

team. The HCA variable cost estimates include contractor's preliminaries, profit and fees etc. On this basis the remediation costs for the site are: **Total = £800,000 (whole site); and £334,000 (plots 5 and 7 first phase).**

Table 13 Site Remediation Costs by Plot

Plot		Area	Low	Med	High
1	0.151	0.151	£ 75,000.00	£ 138,000.00	£ 201,000.00
2	0.11	0.11	£ 55,000.00	£ 101,000.00	£ 147,000.00
3	0.021	0.021	£ 10,400.00	£ 20,000.00	£ 28,000.00
~~4~~	~~0.028~~		-	-	-
5	0.34	0.34	£ 169,000.00	£ 311,000.00	£ 453,000.00
~~6~~	~~0.148~~		-	-	-
7	0.334	0.334	£ 165,000.00	£ 305,000.00	£ 445,000.00
~~8~~	~~0.024~~		-	-	-
9	0.13	0.13	£ 65,000.00	£ 119,000.00	£ 174,000.00
10	0.153	0.05049	£ 25,000.00	£ 46,000.00	£ 67,300.00
		1.14	**£ 564,400.00**	**£ 1,040,000.00**	**£ 1,515,300.00**
	£ 800,000.00		*Assumes High for plots 1, 2 and 3 and Low for plots 5, 7, 9 and 10*		
	£ 683,000.00		*Assumes Medium for plots 1, 2 and 3 and Low for plots 5, 7, 9 and 10*		

4.9.14 For the demolition of existing buildings and site clearance, we have assumed a site area of 12,800m^2 and a Gross External Area of 2,200m^2 for the existing buildings on plots 1, 2, 3, 9 and 10 (part of). Based upon the nature of the buildings on the site we have assumed the lower range costs: **Total = £208,200.** For the scenario testing of a first phase of development on plots 5 and 7 only we have assumed an over extra cost of £nil for demolition and site clearance and assumed that general site clearance is included for under the external costs.

Table 14 Demolition and Site Clearance for Plots 1, 2, 3, 9 and 10 (part of)

Item	Industrial Non Complex	£	Sub-Total
Removal of redundant services	Fixed (£000 per site)	20	20,000
Site clearance	Variable (£/m2 site area - 12,800m2)	5	64,000
Demolitions	Variable (£/m2 existing building GEA - 2,200m2)	11	24,200
Site investigation	Fixed (£000 per site)	10	10,000
Fees	Fixed (£000 per site)	90	90,000
		TOTAL	**£208,200**

4.10 Contingency

4.10.1 The LDC Viability Assessment assumes a generic average of 5% contingency (see Glossary). This is to account for risk relating to a specific scheme and will vary from site to site.

4.11 Professional Fees

4.11.1 The majority of previous viability studies have assumed professional fees of circa 10% of costs for this area. This has been adopted in the modelling.

4.12 S106 Contributions/CIL

4.12.1 The LDC CIL charging schedule states a contribution of £90/m2 (residential) and a residual site specific mitigation cost and £1000/unit via s106 has also been assumed in the modelling.

4.13 VAT

4.13.1 For simplicity it has been assumed throughout, that either Value Added Tax (VAT) does not arise, or that it can be recovered in full. Costs in this report are deemed net of VAT as all VAT on new build is recoverable including for site clearance and demolition if let as part of the development contract.

4.14 Interest Rate

4.14.1 Our appraisals assume 7% per annum for debit balances (the cost of borrowing money from the lender). This may seem high given the very low base rate figure (0.5% April 2018), but this reflects the banks' view of risk for housing developers. The Development Appraisal Tool utilises a simple cash flow to calculate interest. We accept that is a simplification however, due to the high level and broad brush nature of this analysis, we believe that it is appropriate.

4.15 Voids

4.15.1 On a scheme comprising mainly of individual houses one would normally assume only a nominal void period (the time that elapses before income is accrued by the developer) as the housing would not be progressed if there was no demand. In the case of apartments in blocks this flexibility is reduced. Whilst these may provide scope for early marketing, the ability to tailor construction pace to market demand is more limited. For the purpose of the present study a three month void period is assumed for all residential.

4.16 Phasing and Timetable

4.16.1 Each dwelling is assumed to be built over a nine month period. The phasing programme for an individual site will reflect market take-up and would, in practice, be carefully estimated taking into account the site characteristics and, in particular, the size and the expected level of market demand. The modelled assumptions reflect site size and development type.

4.16.2 Average sales rate for each site of between 2 and 4 per month, depending on the size of the development and location, with the first sales taking place 6 months after a start on site.

4.16.3 It is assumed a maximum delivery rate of 30-50 market units per year per outlet[20]. On smaller sites slower rates are assumed to reflect the nature of the developer likely to bring smaller sites forward.

[20] A large site would typically involve multiple developers who would be active at any one time. The precise number of active sales outlets at any one time could vary, but would typically start with a few for big sites (especially when creating a new 'place') and increase over time to a steady state. How many active outlets exist on one site will vary depending on:

- The location, nature and scale of the site, as well as its layout and phasing approach. This will influence how many separate housebuilders could be on site at any one time;
- The scale of demand within the wider housing market, General economic conditions such as job security and job mobility, and general consumer confidence about buying/moving, as well as mortgage availability;

4.16.4 We believe that these are conservative assumptions and do, properly, reflect current practice. This is the appropriate assumption to be in line with the PPG and Harman Guidance.

4.17 Site Holding Costs and Receipts

4.17.1 Each site is assumed to proceed immediately and so, other than interest on the site cost during construction, there is no allowance for holding costs, or indeed income, arising from ownership of the site.

4.18 Site Purchase Costs

4.18.1 Site purchase costs are set at 3.50% for surveyor's fees and legal fees of 0.75%. Stamp Duty Land Tax is calculated at the prevailing rates (as at May 2018).

4.19 Sales and Marketing Costs

4.19.1 Agents' fees and marketing fees are assumed to be a blended rate of 3% and legal fees of £750/unit. Disposal costs of affordable housing can be reduced significantly in the real world depending on the type of product so in fact the marketing and disposal of the affordable element is probably less expensive than this in reality. This is not represented in the modelling but is one contributing factor to the lower developer's return assumption for affordable housing.

4.20 Developer's Profit

4.20.1 An allowance needs to be made for developers' profit / return and to reflect the risk of development. We have considered the RICS's 'Financial Viability in Planning' (August 2012)[21], the Harman Guidance Viability Testing Local Plans, Advice for planning practitioners (June 2012), and referred to the HCA's Economic Appraisal Tool. None of these documents are prescriptive, but they do set out some different approaches.

4.20.2 The Harman Guidance says:

Return on development and overhead
The viability assessment will require assumptions to be made about the average level of developer overhead and profit (before interest and tax).
The level of overhead will differ according to the size of developer and the nature and scale of the development. A 'normal' level of developer's profit margin, adjusted for development risk, can be determined from market evidence and having regard to the profit requirements of the providers of development finance. The return on capital employed (ROCE) is a measure of the level of profit relative to level of capital required to deliver a project, including build costs, land purchase, infrastructure, etc.
Appraisal methodologies frequently apply a standard assumed developer margin based upon either a percentage of Gross Development Value (GDV) or a percentage of development cost. The great majority of housing developers base their business models on a return expressed as a percentage of anticipated gross development value, together with an assessment of anticipated return on capital employed. Schemes with high upfront capital costs generally require a higher gross margin in order to improve the return on capital employed. Conversely, small scale schemes with low infrastructure and servicing costs provide a better return on capital employed and are generally lower risk investments. Accordingly, lower gross margins may be acceptable.
This sort of modelling – with residential developer margin expressed as a percentage of GDV – should be the default methodology, with alternative modelling techniques used as the exception. Such an exception might be, for example, a complex mixed use development with

- The business strategy and physical capacity of the homebuilder, Each housebuilder would build out units at a rate that fits their business plan, and short/long term approach to their strategic land portfolios; and
- The type and variety of products, pricing, and extent of competition from other properties for sale both within the site itself and wider geographic area.

Some of the larger national builders can even operate more than one outlet off a single site, and running these as entirely separate construction and sales outlets under different brands or aimed at different market segments.

[21] Accessed at: http://www.rics.org/Documents/Financial%20viability%20in%20planning.pdf

only small scale specialist housing such as affordable rent, sheltered housing or student accommodation.

4.20.3 At the Shinfield appeal[22] (January 2013) the inspector considered this specifically saying:

Developer's profit
43. The parties were agreed that costs [i.e. developer profit] should be assessed at 25% of costs or 20% of gross development value (GDV). The parties disagreed in respect of the profit required in respect of the affordable housing element of the development with the Council suggesting that the figure for this should be reduced to 6%. This does not greatly affect the appellants' costs, as the affordable housing element is 2%, but it does impact rather more upon the Council's calculations.

44. The appellants supported their calculations by providing letters and emails from six national housebuilders who set out their net profit margin targets for residential developments. The figures ranged from a minimum of 17% to 28%, with the usual target being in the range 20-25%. Those that differentiated between market and affordable housing in their correspondence did not set different profit margins. Due to the level and nature of the supporting evidence, I give great weight [to] it. I conclude that the national housebuilders' figures are to be preferred and that a figure of 20% of GDV, which is at the lower end of the range, is reasonable.

4.20.4 Broadly there are four different approaches that could be taken:

- To set a different rate of return on each site to reflect the risk associated with the development of that site. This would result in a lower rate on the smaller and simpler sites – such as the greenfield sites, and a higher rate on the brownfield sites.
- To set a rate for the different types of unit produced – say 20% for market housing and 6% for affordable housing, as suggested by the HCA.
- To set the rate relative to costs and thus reflect risks of development.
- To set the rate relative to the development's Gross Development Value (as normally preferred by developers).

4.20.5 In deciding which option to adopt, it is important to note that we are not trying to re-create any particular developer's business model. Different developers will always adopt different models and have different approaches to risk. The LDC Viability Assessment adopted an overall profit level based on 20% of GDV for market housing and 6% for affordable housing - the modelling uses the same approach.

4.21 Landowner's Return (EUV+)

4.21.1 In order to assess development viability, it is necessary to analyse Existing Use Values (EUV) i.e. the value of the land in its current use before planning consent is granted, for example, as agricultural land. Alternative Use Values (AUV) refers to any other potential use for the site that doesn't require planning permission. For example, a greenfield site may have an alternative use as a pony paddock.

4.21.2 For the purpose of the study, it is necessary to take a comparatively simplistic approach to determining the EUV/AUV. In practice, a wide range of considerations could influence the precise value that should apply in each case, and at the end of extensive analysis the outcome might still be contentious. For sites previously in agricultural use, then agricultural land represents the existing use value. The focus of this study is predominantly brownfield sites, as such industrial land values are likely to make up the majority of sites tested.

4.21.3 The results from appraisals are compared with the EUV set out above in order to form a view about the sites' viability. This is a controversial part of the viability process and the area of conflicting guidance between the Harman Guidance and the RICS Guidance. In the context of this report it is important to note that it does not automatically follow that, if the Residual

[22] APP/X0360/A/12/2179141 (Land at The Manor, Shinfield, Reading RG2 9BX)

Value produces a surplus over the EUV, the site is viable. The land market is more complex than this, the landowner and developer must receive a sufficient return in reward for taking on risk. The PPG includes a definition of land value as follows:

> ***Land Value***
>
> *To define land value for any viability assessment, a benchmark land value should be established on the basis of the existing use value (EUV) of the land, plus a premium for the landowner. The premium for the landowner should reflect the minimum return at which it is considered a reasonable landowner would be willing to sell their land. The premium should provide a reasonable incentive, in comparison with other options available, for the landowner to sell land for development while allowing a sufficient contribution to comply with policy requirements. This approach is often called 'existing use value plus' (EUV+).*
>
> *In order to establish benchmark land value, plan makers, landowners, developers, infrastructure and affordable housing providers should engage and provide evidence to inform this iterative and collaborative process.*
>
> *Paragraph: 013 Reference ID: 10-013-20180724 Revision date: 24 07 2018*

4.21.1 It is clear that for land to be released for development, the plus/uplift/premium over the EUV needs to be sufficiently large to provide an incentive to the landowner(s) to release the site and cover any other appropriate costs required to bring the site forward for development. It is therefore appropriate and an important part of this assessment to have regard to the market value of land.

4.21.2 The reality of the market is that each and every landowner has different requirements and different needs and will judge whether or not to sell by their own criteria. We therefore have to consider how large such an 'uplift' or 'premium' (above EUV) should be to broadly provide a return to incentivise the landowner to release their land for development. The assumptions must be a generalisation as in practice the size of the uplift will vary from case to case depending on how many landowners are involved, each landowner's attitude and their degree of involvement in the current property market, the location of the site and so on. Nationally it is typical that a 20-30% increase about the EUV for industrial/residential land would be sufficient to induce a landowner to sell their site.

4.21.3 The approach adopted aligns with the Harman Guidance and Planning Advisory Service (PAS) advice and has been subject to scrutiny at examination hearings. The EUV+ approach was endorsed by the Planning Inspector who approved the London Mayoral CIL Charging Schedule in January 2012[23] and continues to be accepted by the Inspectorate for the purposes of plan making.

4.21.4 LDC has commissioned a number of well researched viability studies that have variously supported: the LDC Community Infrastructure Levy ('CIL'); Core Strategy (2016); and the Affordable Housing SPD (July 2018). We have also reviewed viability studies in neighbouring Eastbourne and South Downs National Park.

Table 15 Benchmark Land Values within past studies

	LDC/SDNP Viability Study (HDH 2011)	EBC Viability Study (NCS 2013)	SDNP Viability Study (DSP 2014)	EBC Viability Study (C&W 2016)	SDNP Viability Study (BNP 2017)
Residential Benchmark Land Values	-	£1,230,000/Ha (Low) – £1,600,000/Ha (High)	£1,500,000 - £2,000,000/Ha	£1,230,000/Ha	-
Non-Residential Benchmark Land Values	£900,000/Ha (AUV) £1,080,000/Ha (BLV)	£450,000/Ha	£850,000 - £1,500,000/Ha	£450,000/Ha	£850,000 per gross hectare

[23] Paragraphs 7 to 9 of Report On The Examination Of The Draft Mayoral Community Infrastructure Levy Charging Schedule by Keith Holland BA (Hons) DipTP MRTPI ARICS an Examiner appointed by the Mayor Date: 27th January 2012

4.21.5 The LDC Viability Study (2011) tests a range of typologies against the Benchmark Land Values (EUV+) of £1,020,000/ha for Industrial/Brownfield land. The Inspector examining the Core Strategy commented on viability as follows:

The Affordable Housing and CIL Viability Study (AHVS) (CD 053) (2011) has tested various targets and thresholds across the district, including taking into account the introduction of the Community Infrastructure Levy (CIL) and the full Level 4 requirements of the Code for Sustainable Homes as they then were. It provides robust evidence that includes sensitivity testing and which has not been seriously challenged, that a districtwide target of 40%, with a graduated threshold essentially based on the number of new units, would be viable in the vast majority of cases.

4.21.6 Seaford does not have the highest house values for East Sussex but its location, connectivity to Brighton and Eastbourne and services make it an attractive area for house buyers and developers. It is important to appreciate that assumptions on EUV+ can only be broad approximations, subject to a wide margin of uncertainty. We take account of this uncertainty in drawing conclusions and recommendations from our analysis and the appraisals.

4.21.7 In addition to this local evidence, the Ministry for Housing, Communities and Local Government (now MHCLG) published *Land value estimates for policy appraisal 2017* (May 2018)[24]. This states residential land values in Lewes of £4,345,000 /hectare and £3,525,000/hectare for Eastbourne. The valuations have been undertaken using a truncated residual valuation model. The purpose of these values is to use in appraising public sector land projects from a social perspective, in line with HM Treasury Green Book principles. The values assume nil Affordable Housing provision, CIL or s106/s278. This means that they should not be seen as estimates of market values or benchmark land values. The figures provided are appropriate to a single, hypothetical site and should not be taken as appropriate for all sites in the locality. However, this data is useful for benchmarking purposes.

4.21.8 The estimated average industrial/out of town office land value in the Coast to Capital area (based on Brighton and Hove) is £ £1,800,000/hectare. The value estimates for industrial land can be used as for benchmarking land values for developments on brownfield land. These are provided for hypothetical sites in England assuming:

- A typical urban, brownfield location, with nearby uses likely to include later, modern residential developments
- All services are assumed available to the edge of the site
- Use is restricted to industrial/warehouse and full planning consent is in place
- There are no abnormal site constraints or contamination and/or remediation issues

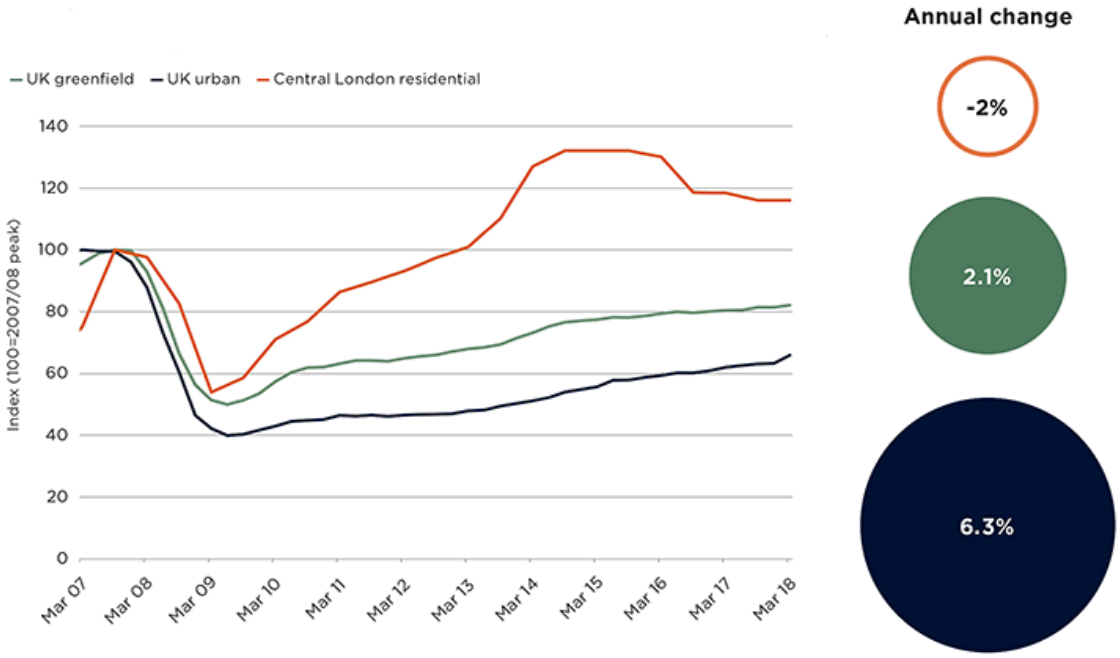
[24] Accessed at: https://www.gov.uk/government/publications/land-value-estimates-for-policy-appraisal-2017

4.21.9 Savills, in Market in Minutes - UK residential development land (January 2018)[25], reported that nationally:

'…greenfield land values remain relatively flat. Values rose 0.1% in the last quarter of 2017, taking annual growth to 1.7% – in line with 2016 growth of 1.8%. The land market therefore remains benign, with land value growth remaining below house price growth on average…Across the UK, urban development land values increased by 0.5% in Q4 2017, with annual growth of 4.0%, more than double the growth in greenfield land values…Urban land value growth continues to outperform greenfield land, albeit from a lower base…To maintain relatively benign land market conditions with additional developers, more consents will be needed.'

4.21.10 Savills produced a land value growth chart in April 2018[26] plotting land value growth for the UK since the 2007/08 peak (Figure 8 Savills land value growth since 2007/08 peak below).

Figure 8 Savills land value growth since 2007/08 peak



4.21.11 On the basis of the evidence available it is considered that £850,000/hectare for brownfield/industrial sites is a reasonable assumption for EUV for Seaford. Therefore a 20% premium would equate to an EUV+ of £1,020,000/hectare.

4.21.12 For brownfield sites like Dane Valley it is assumed that they will be less costly to open up, being close to existing infrastructure/services, but they will carry demolition and remediation costs. The EUV assumptions for this study use a proxy land value based upon the most applicable use (and excluding any premium).

4.21.13 The residual values produced by the HCA Development Appraisal Toolkit (deployed for the modelling in this study) are on the basis of the gross site. The models assumes the developer is required to purchase all of the land including land that would be required for public open space, SUDs, social infrastructure etc. The appraisal results display the residual values on a gross site basis, per gross hectare basis and per net hectare basis (the net developable area).

[25] Accessed at: http://pdf.euro.savills.co.uk/uk/market-in-minute-reports/uk-residential-development-land-january-2018.pdf
[26] Accessed at: https://www.savills.co.uk/research_articles/229130/240942-0/market-in-minutes--uk-residential-development-land---april-2018

5 Site assumptions

5.1 Scheme mix

5.1.1 Core Policy 1- Affordable Housing within the adopted LDC Joint Core Strategy, in combination with the Affordable Housing Supplementary Planning Document (July 2018), requires affordable housing provision of 40% on sites of 10 or more residential units or a site area of 0.5 hectares or more.

5.1.2 Core Policy 2 and the updated LDC Affordable Housing Supplementary Planning Document (July 2018), set out that in Lewes there is a requirement for 1 and 2 bed properties. The SPD recommends that the housing mix for affordable reflects the information gathered from the Council's Housing Register. This provides an indication of the need for each dwelling type. With reference to this, LDC expects the affordable housing units within each development to be provided broadly in line with the dwelling mix set out below. LDC states that they will negotiate the appropriate dwelling mix on a site by site basis based upon the latest evidence of needs in the site locality.

Affordable Housing

- 1 bedroom: 50%
- 2 bedrooms: 30%
- 3 bedrooms: 15%
- 4+ bedrooms: 5%

5.1.3 For market housing the SHMA does not provide a precise housing mix recommendation. Core Policy 2 (Housing Type, Mix and Density) in the LDC Core Strategy sets out an expectation that housing developments (both market and affordable) should provide a range of dwelling types and sizes to meet the identified local need, based on the best available evidence. This need will generally include 1 and 2 bedroom homes for single person households and couples with no dependents. Account will also need to be given to the existing character and housing mix of the vicinity. For the purposes of this study we have assumed the following mix for the market housing elements:

Market Housing

- 1 bedroom: 30%
- 2 bedroom: 40%
- 3 bedroom: 20%
- 4 bedroom: 10%

5.2 Dane Valley Site

5.2.1 This section details the broad assumptions used to test the site. The capacity analysis is on the basis of net housing densities and previous masterplan and design guide technical support provided to STC. The revised site area excludes some plots covered in the masterplan (see Figure 9 overleaf). The gross site size is assumed as 1.28 hectares based on the study area (Figure 10 overleaf). The viability modelling has been applied to three main scenarios reflecting the AECOM masterplan (2017) and Neighbourhood Plan allocation policy which envisages a development of the whole site, but also a comprehensive first phase for plots 5 and 7 should external factors delay delivery of plots to the west of the site:

- Scenario 1: Masterplan - whole site (165 units/1,146m2 B1)
- Scenario 2: Neighbourhood Plan - whole site (131 units/1,146m2 B1)
- Scenario 3: First phase – plots 5 & 7 (104 units)

Figure 9 AECOM Masterplan Option 1 (November 2017)

Figure 10 Site area subject to viability assessment (source: Google Earth)

Assumptions summary

5.2.2 Based upon the preceding analysis, the below table is a summary of the main assumptions that have been fed into the viability modelling.

Table 16 Modelling and site assumptions summary sheet

Input	Value / Cost
Schemes subject to testing	Scenario 1: Masterplan - whole site (165 units/1,146m^2 B1) Scenario 2: Neighbourhood Plan - whole site (131 units/1,146m^2 B1) Scenario 3: First phase – plots 5 & 7 (104 units)
Sales values per square metre	Market Flat £3,800 Affordable Rent Flat £1,850 (based on LHA VOA) Intermediate Flat £2,660 (70% of market value)
Site mix	Affordable Housing 1 bed: 50% / 2 bed: 30% / 3 bed: 15% / 4 bed: 5% Market Housing 1 bed: 30% / 2 bed: 40% / 3 bed: 20% / 4 bed: 10%
Unit sizes	1 bedroom: 50m^2 2 bedroom: 70m^2 3 bedroom: 95m^2 4 bedroom: 108m^2
Build costs	Flats £1,544 B1 Office/Industrial £1,000
External Costs	10% of build costs
Professional fees	10% of build costs
Contingency	5% of build costs
Over extras	Drainage £785,400 Soil excavation and disposal £446,600 Remediation £800,000 Demolition and site clearance £208,200
Site purchase costs (based on residual land value)	Agents fees 1.00% Legal fees 0.50% SDLT at HMRC rate
Marketing/Sales fees	3.5%
Developer's profit	20% of Gross Development Value of Market Units 6% of Gross Development Value of Affordable Units
Finance costs	7% per annum
Phasing and timetable	25 months
S106/CIL	£1,000 per unit / £90 per m^2
Affordable housing	40%
Affordable housing tenure	75% Affordable Rented 25% Intermediate
EUV+	£850,000 - £1,000,000/Net Ha

6 Conclusion

6.1.1 This chapter presents the results of residual appraisal (the detailed appraisal summary sheets are provided in **Appendix F** to this report). Development appraisals for the modelled sites have utilised the HCA's Development Appraisal Tool, a spread sheet-based financial analysis package publicly available online[27]. The HCA Development Appraisal Tool generates a gross residual value for the whole site and also a gross per hectare residual value. It does not automatically generate a residual value on the basis of the net developable area on a per hectare basis.

6.1.2 The appraisals use the residual valuation approach – that is, they are designed to assess the value of the land after taking into account the costs of development, the likely income from sales and/or rents and an appropriate amount of developers' profit. The payment would represent the sum paid in a single tranche on the acquisition of a site. In order for the proposed development to be described as viable, it is necessary for this value to exceed the EUV+.

Appraisal results

6.1.3 The development appraisal model incorporates build costs, abnormal costs (where applicable), and infrastructure costs and financial assumptions for the scheme. The results are summarised in this section deploying Red, Amber, Green scoring:

- **Green Viable** – where the Residual Value per net hectare exceeds the indicative EUV+ (Threshold /Benchmark) per hectare (i.e. a sufficient uplift or premium to provide a competitive return for the landowner to incentivise them to release their land).
- **Amber Marginal/Unviable** – where the appraisal produces a positive Residual Value above the EUV but not above the EUV+ per net hectare. These sites should still be considered unviable when measured against the benchmark/threshold – however depending on the nature of the site and the owner it may come forward with some amendments to the scheme if it is close to the EUV+.
- **Red Unviable** – where the Residual Value does not exceed the EUV or EUV+. These sites should not be considered deliverable and the Qualifying Body should consider carefully if the site can be considered developable during the entire plan period.

6.1.4 The residual valuation method is suitable for the objectives of this study and is in accordance with the National Planning Policy Framework, Planning Practice Guidance and non-statutory guidance published by the RICS and Local Housing Delivery Group. The process is based on high level modelling and assumptions for development costs and values. The process adopted by many developers is similar, hence the use of contingency sums, external site cost allowances, the developers profit assumptions (20% of GDV) and the generally cautious approach e.g. 5% contingency. The landowner's return of £1,020,000/net hectare is appropriate based on the available evidence that was available in January 2019.

6.1.5 Whilst a scheme may be shown as viable, a change in construction costs or drop in prices could make the scheme unviable. Tenure balancing, densification and/or lower policy requirements could potentially be used to provide an additional viability cushion. It is our view that the NDP policies can be adjudged to be effective and the Dane Valley allocation is developable in the plan making context on the basis of the results. The results are shown on the basis of the gross site residual value (the maximum that could theoretically be paid to the landowner); gross hectare basis (a figure generated by the HCA tool); and a per net hectare basis (for the purposes of testing it against the EUV+ and comparison between sites).

[27] Accessed at: https://www.gov.uk/government/publications/development-appraisal-tool

Table 17 Modelling results @ 40% affordable housing

	Site	EUV Per Hectare	EUV+ (Per Net Developable Hectare)	Gross Site Residual Value	Per Gross Ha Residual Value	Per Net Developable Ha Residual Value
1	Scenario 1 – 40% AH / Profit 20%	*£850,000*	*£1,020,000*	-£1,045,804	-£817,034	-£2,475,860
2	Scenario 2 – 40% AH / Profit 20%	*£850,000*	*£1,020,000*	-£1,338,611	-£1,045,790	-£4,056,396
3	Scenario 3 – 40% AH / Profit 20%	£850,000	£1,020,000	-£649,311	-£850,998	-£4,058,193
4	Scenario 1 – 30% AH / Profit 20%	£850,000	£1,020,000	-£175,216	-£136,888	-£530,957
5	Scenario 2 – 30% AH / Profit 20%	£850,000	£1,020,000	-£675,662	-£527,861	-£2,047,460
6	Scenario 3 – 30% AH / Profit 20%	£850,000	£1,020,000	-£155,308	-£203,549	-£970,675
7	Scenario 1 – 20% AH / Profit 20%	£850,000	£1,020,000	£646,320	£504,937	£1,958,545
8	Scenario 2 – 20% AH / Profit 20%	£850,000	£1,020,000	-£42,995	-£33,590	-£130,287
9	Scenario 3 – 20% AH / Profit 20%	£850,000	£1,020,000	£446,178	£584,769	£2,788,612
10	Scenario 1 – 40% AH / Profit 15%	£850,000	£1,020,000	£85,578	£66,858	£259,327
11	Scenario 2 – 40% AH / Profit 15%	£850,000	£1,020,000	-£430,749	-£336,523	-£1,305,300
12	Scenario 3 – 40% AH / Profit 15%	£850,000	£1,020,000	£58,670	£76,893	£366,687
13	Scenario 1 – 40% AH / Profit 10%	£850,000	£1,020,000	£1,163,298	£908,827	£3,525,145
14	Scenario 2 – 40% AH / Profit 10%	£850,000	£1,020,000	£460,403	£359,690	£1,395,160
15	Scenario 3 – 40% AH / Profit 10%	£850,000	£1,020,000	£736,534	£965,314	£4,603,337
16	Scenario 1 – 40% AH / Profit 6%	£850,000	£1,020,000	£2,017,918	£1,576,498	£6,114,903
17	Scenario 2 – 40% AH / Profit 6%	£850,000	£1,020,000	£1,146,014	£895,324	£3,472,769
18	Scenario 3 – 40% AH / Profit 6%	£850,000	£1,020,000	£1,271,341	£1,666,239	£7,945,881
19	Scenario 1 – 25% AH (50/50 SO/AR) / Profit 20% / 3900/m^2	£850,000	£1,020,000	£1,332,952	£1,041,368	£4,039,248
20	Scenario 2 – 25% AH (50/50 SO/AR) / Profit 20% / 3900/m^2	£850,000	£1,020,000	£596,892	£466,322	£1,808,763
21	Scenario 3 – 25% AH (50/50 SO/AR) / Profit 20% / 3900/m^2	£850,000	£1,020,000	£882,225	£1,156,258	£5,513,906

Summary and recommendations

6.1.6 The modelling adopts a conservative approach to the assumptions, for example, in some cases the external costs and over extras (demolition, drainage, remediation, soil excavation and disposal) may be cheaper following detailed design and further investigations attached to future planning applications. Similarly higher values than £3,800/m^2 have been recorded locally, especially for retirement housing products which can achieve >£5,000/m^2 (the schemes model do not include any element of this).

6.1.7 At full policy compliance (i.e. 40% affordable housing and 75/25 tenure split between affordable rented/shared ownership) none of the scenarios tested are viable based on a benchmark land value/EUV+ of £1,020,000/net ha (Table 17 – appraisals 1-3). Similarly at 30% affordable housing none of the scenarios produce a viable scheme (Table 17 – appraisals 4-6).

6.1.8 Scenarios 1 (165 units whole site) and 3 (104 units plots 5 & 7) only begin to produce marginally viable results when the affordable housing percentage is reduced to 20% (while the tenure split is fixed). However, the residual values produced would be unlikely to incentivise the landowners to release their land for redevelopment (Table 17 – appraisals 7-9).

6.1.9 The modelling also includes sensitivity testing whereby the affordable housing level is fixed at 40% but the developer's profit for market housing is adjusted in order to try and replicate a non-traditional delivery model e.g. a scheme delivered by a housing association and/or a joint venture whereby the landowner/developer retain a longer term interest in the site. When the developer's profit is set at 15% of GDV for market units the scenarios remains unviable (Table 17 – appraisals 10-12). However, at increments of 10% and 6% of GDV this begins to produce viable schemes (Table 17 – appraisals 13-18). The Planning Practice Guidance states (our ***emphasis***):

> *For the purpose of plan making an assumption of **15-20% of gross development value (GDV) may be considered a suitable return to developers** in order to establish the viability of plan policies. **Plan makers may choose to apply alternative figures** where there is evidence to support this according to the type, scale and risk profile of planned development. **A lower figure may be more appropriate in consideration of delivery of affordable housing** in circumstances where this guarantees an end sale at a known value and reduces risk. **Alternative figures may also be appropriate for different development types.**[28]*

6.1.10 At the time of writing this report, there is recorded interest in the site from a well-established housing association and therefore an alternative delivery model may be possible for this site. Paragraph 118 of the NPPF gives substantial weight to the value of using suitable brownfield land within settlements for homes and supports appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land. Paragraph 118 also encourages the development of under-utilised land and buildings, especially if this would help to meet identified needs for housing where land supply is constrained and available sites could be used more effectively. Seaford's location between the English Channel and South Downs National Park limits the amount of suitable land available. In addition, the National Planning Policy Framework Paragraph 63 states (our ***emphasis***): "*…To support the re-use of brownfield land, where vacant buildings are being reused or redeveloped, **any affordable housing contribution due should be reduced** by a proportionate amount."*

6.1.11 Related to the above the modelling has tested the three scenarios against 25% affordable housing target and 50/50 split between shared ownership and affordable rent tenures. In addition, the appraisal on rows 19-21 have been modelled on the basis of a slightly higher £/m^2 for market flats (£3,900/m^2) and shared ownership products (£2,730/m^2). These appraisals demonstrate what may be required to achieve a viable scheme i.e. a different approach to the affordable housing tenures (stipulated in the Affordable Housing SPD), lower affordable housing requirement and slightly improved sales values reflecting incorporation of an element of older peoples housing (Table 17 – appraisals 19-21).

6.1.12 It is clear that a flexible policy approach will be required in order to realise delivery of this underutilised brownfield plots. The modelling results indicate that an affordable housing level of around 25% could yield a viable scheme. As discussed, the methodology employed for this plan making viability study is high-level. In addition, the Lewes District Council should investigate additional sources of finance to help bring the site forward. For example, should the neighbourhood plan meet the basic conditions and pass the referendum there would be an opportunity for the

[28] How should a return to developers be defined for the purpose of viability assessment? Paragraph: 018 Reference ID: 10-018-20180724 Revision date: 24 07 2018. Accessed at: https://www.gov.uk/guidance/viability

neighbourhood portion of the Community Infrastructure Levy to be used to de-risk the site further. In addition, capital funding from LDC or alternative (non-traditional) delivery models[29] could help to bring the site forward in compliance with policy.

6.1.13 At present the neighbourhood plan allocation states that circa 131 units would be delivered on the Dane Valley site. The modelling would suggest that a more flexible allocation that would permit higher densities may be appropriate (subject to detailed design and compliance with extant LDC policy and the STC design guidance).

6.1.14 In addition to housing number and density, LDC and STC should consider the merits of allowing a more flexible approach to the affordable housing mix. The 2018 NPPF includes a wider definition for affordable housing and it may be that a higher proportion of Intermediate products would aid viability of the site and/or simply allow lower affordable housing contributions.

6.1.15 The appraisal results show that the site can be considered developable over the plan period with a number of the appraisal scenarios producing positive residual land values at levels sufficient to satisfy the EUV+/benchmark land value for coastal towns in Lewes.

6.1.16 The District Council should consider the contents of this report and decide whether the Dane Valley allocation should be amended either to make it more flexible or precise (in terms of the policy wording). In all cases adjustments to the affordable housing requirements, density and tenure balance could help to improve the viability of the site. In general an affordable housing target of 40% would be challenging and will require an alternative approach to the typical private housebuilder model and/or alternative sources of funding to de-risk the site ready for development.

6.1.17 In conclusion, the Dane Valley site whilst challenging could play a role in delivering much needed housing locally and can help to facilitate development through economic cycles expected over the course of the plan period. In cooperation with LDC, the landowners should now discuss the most appropriate way to take the site forward. The allocation of the land within the Neighbourhood Plan would help to de-risk the site and provide certainty. Based on the results of the appraisals we would recommend an allocation that permits higher densities and would advocate a flexible approach in the delivery of affordable housing.

6.1.18 The residual values within this report do not constitute market values for land and should not be considered as such. Each site has its own specific constraints that are likely to inform the final prices paid for land in Seaford.

6.1.19 For the purposes of plan making the information produced by the modelling should help to frame discussions between landowners/developers, LDC and the Town Council, with regards to the applications that will be forthcoming. Annexes 1 and 2 should be reviewed and further investigations conducted as appropriate in advance of a planning application.

[29] Public Private Joint Ventures, Community Land Trust or partnerships with bodies such as Homes England.

Appendix A Land Registry Prices Paid 2013 – 2018

Price paid	Deed date	Property type	Address 1	Address 2	Street	Town	Postcode	Total Floor Area	£/m2
304500	07/09/2018	F	FLAT 31	HORTSLEY, 5	SUTTON PARK ROAD	SEAFORD	BN25 1FA	56	5437.5
309500	28/06/2018	F	FLAT 28	HORTSLEY, 5	SUTTON PARK ROAD	SEAFORD	BN25 1FA	56	5526.786
269500	28/06/2018	F	FLAT 30	HORTSLEY, 5	SUTTON PARK ROAD	SEAFORD	BN25 1FA	52	5182.692
421950	15/06/2018	F	FLAT 29	HORTSLEY, 5	SUTTON PARK ROAD	SEAFORD	BN25 1FA	75	5626
386000	23/03/2018	F	FLAT 11	HORTSLEY, 5	SUTTON PARK ROAD	SEAFORD	BN25 1FA	75	5146.667
410500	23/03/2018	F	FLAT 36	HORTSLEY, 5	SUTTON PARK ROAD	SEAFORD	BN25 1FA	74	5547.297
368725	03/01/2018	S		12	SUTTON MEWS	SEAFORD	BN25 3PT	105	3511.667
348500	30/03/2017	T		8	SUTTON MEWS	SEAFORD	BN25 3PT	101	3450.495
359500	16/02/2017	T		7	SUTTON MEWS	SEAFORD	BN25 3PT	101	3559.406
353500	30/01/2017	T		6	SUTTON MEWS	SEAFORD	BN25 3PT	101	3500
264950	24/10/2016	F	FLAT 6	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	74	3580.405
194950	26/08/2016	F	FLAT 24	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	55	3544.545
349950	04/08/2016	T		9	SUTTON MEWS	SEAFORD	BN25 3PT		
364950	06/05/2016	S		13	SUTTON MEWS	SEAFORD	BN25 3PT	107	3410.748
369950	04/05/2016	T		11	SUTTON MEWS	SEAFORD	BN25 3PT	105	3523.333
344950	06/04/2016	T		10	SUTTON MEWS	SEAFORD	BN25 3PT	92	3749.457
590000	10/02/2016	D	4	CLIFF TOPS	CLIFF ROAD	SEAFORD	BN25 1BH	192	3072.917
597500	04/12/2015	D	1	CLIFF TOPS	CLIFF ROAD	SEAFORD	BN25 1BH	192	3111.979
157000	24/11/2015	F	FLAT 4	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	52	3019.231
154000	18/09/2015	F		FLAT 1, 14A	SUTTON CROFT LANE	SEAFORD	BN25 1RY	54	2851.852
209950	31/07/2015	F	FLAT 35	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	66	3181.061
264950	23/07/2015	F	FLAT 5	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	74	3580.405
262450	08/07/2015	F	FLAT 2	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	80	3280.625

259950	03/07/2015	F	FLAT 26	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	68	3822.794
177500	19/06/2015	F		11A	SUTTON PARK ROAD	SEAFORD	BN25 1QX	103	1723.301
173000	28/05/2015	F	FLAT 11	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	65	2661.538
185000	20/05/2015	F	FLAT 2	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	52	3557.692
405000	20/05/2015	D		8	HOLTERS WAY	SEAFORD	BN25 3HS	124	3266.129
194950	20/05/2015	F	FLAT 25	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	56	3481.25
168500	11/05/2015	F	FLAT 7	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	65	2592.308
159950	01/05/2015	F	FLAT 1	13	CLINTON LANE	SEAFORD	BN25 1NS	55	2908.182
145000	24/04/2015	F	FLAT 2	13	CLINTON LANE	SEAFORD	BN25 1NS	68	2132.353
155000	24/04/2015	F	FLAT 1	14	CLINTON LANE	SEAFORD	BN25 1NS	68	2279.412
179950	09/03/2015	F	FLAT 14	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	56	3213.393
426500	27/02/2015	D	3	CLIFF TOPS	CLIFF ROAD	SEAFORD	BN25 1BH		
239950	25/02/2015	F	FLAT 17	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	71	3379.577
167500	16/02/2015	F	FLAT 5	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	65	2576.923
165000	09/01/2015	F	FLAT 10	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	68	2426.471
179950	12/12/2014	F	FLAT 4	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	60	2999.167
179950	09/12/2014	F	FLAT 19	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	57	3157.018
239950	28/11/2014	F	FLAT 18	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	71	3379.577
179950	26/11/2014	F	FLAT 3	CHENEYS LODGE, 24A	SUTTON AVENUE	SEAFORD	BN25 4LG	38	4735.526
170000	21/11/2014	F	FLAT 9	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	65	2615.385
140000	26/09/2014	F	FLAT 3	QUEENS HALL, 47A	BROAD STREET NORTH	SEAFORD	BN25 1NR	71	1971.831
160000	20/08/2014	F	5	CLINTON COURT	SUTTON PARK ROAD	SEAFORD	BN25 1UJ	72	2222.222
140000	17/07/2014	F	3	CLINTON COURT	SUTTON PARK ROAD	SEAFORD	BN25 1UJ	65	2153.846
341950	08/05/2014	F	FLAT 17	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	74	4620.946
399950	08/05/2014	F	FLAT 45	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	74	5404.73
336950	29/04/2014	F	FLAT 4	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	74	4553.378
429950	25/04/2014	F	FLAT 51	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	103	4174.272

193950	25/04/2014	F	FLAT 8	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	54	3591.667
349950	24/04/2014	F	FLAT 49	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	76	4604.605
244950	22/04/2014	F	FLAT 46	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4621.698
329950	22/04/2014	F	FLAT 50	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	65	5076.154
349950	17/04/2014	F	FLAT 29	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	76	4604.605
229950	16/04/2014	F	FLAT 39	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4338.679
209950	11/04/2014	F	FLAT 36	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	52	4037.5
209950	10/04/2014	F	FLAT 34	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	3961.321
344950	31/03/2014	F	FLAT 40	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	74	4661.486
320739	28/03/2014	F	FLAT 15	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	74	4334.311
209950	28/03/2014	F	FLAT 24	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	3961.321
214950	28/03/2014	F	FLAT 25	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4055.66
329950	28/03/2014	F	FLAT 35	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	67	4924.627
214950	28/03/2014	F	FLAT 37	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4055.66
349950	28/03/2014	F	FLAT 41	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	76	4604.605
214950	26/03/2014	F	FLAT 11	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4055.66
329950	21/03/2014	F	FLAT 31	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	81	4073.457
329950	19/03/2014	F	FLAT 28	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	74	4458.784
199950	18/03/2014	F	FLAT 19	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	54	3702.778
219950	18/03/2014	F	FLAT 26	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4150
209950	14/03/2014	F	FLAT 12	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	3961.321
209950	11/03/2014	F	FLAT 10	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	3961.321
189950	10/03/2014	F	FLAT 21	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	3583.962
220739	07/03/2014	F	FLAT 14	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	53	4164.887
330565	07/03/2014	F	FLAT 18	EVERSLEY COURT	DANE ROAD	SEAFORD	BN25 1FF	81	4081.049
162000	20/02/2014	F	1	CLINTON COURT	SUTTON PARK ROAD	SEAFORD	BN25 1UJ	85	1905.882
250000	04/11/2013	T		1	CRICKETFIELD ROAD	SEAFORD	BN25 1FE	76	3289.474

200600	12/04/2013	T		5	HINDOVER CRESCENT	SEAFORD	BN25 3NP	73	2747.945

Appendix B New Build Market Survey (January 2019)

Source	Developer	Scheme	Type of development	Town	Town / Post code	Beds	m2*	Price £	£/m2
Prime Location	Unknown	Sutton Mews	T	Seaford	BN25	3	*123*	350,000	2845.5
Prime Location	Si Homes	Crouch Lane	S	Seaford	BN25	2	*76*	335,000	4407.9
Prime Location	Pegasus Life	Hortsley	F	Seaford	BN25 2AR	2	*75*	599,950	7999.3
Prime Location	Pegasus Life	Hortsley	F	Seaford	BN25 2AR	2	*75*	385,950	5146.0
Prime Location	Pegasus Life	Hortsley	F	Seaford	BN25 2AR	1	*55*	249,950	4544.5
Smart New Homes	Clarion (affordable home)	Old Station Court	F	Polegate	BN26 6EH	2	*74*	72,625	981.4
Smart New Homes	Clarion (affordable home)	Old Station Court	F	Polegate	BN26 6EH	1	*59*	83,750	1419.5
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24 5DX	2	*55*	237,950	4326.4
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24 5DX	2	*55*	237,950	4326.4
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24	3	*67*	275,950	4118.7
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24	3	*67*	275,950	4118.7
Smart New Homes	Persimmon	Mill Valley	S	Pevensey	BN24	3	*72*	277,950	3860.4
Smart New Homes	Persimmon	Mill Valley	S	Pevensey	BN24	4	*96*	321,950	3353.6
Smart New Homes	Persimmon	Mill Valley	S	Pevensey	BN24	4	*96*	321,950	3353.6
Smart New Homes	Persimmon	Mill Valley	D	Pevensey	BN24	3	*78*	321,950	4127.6
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	5	*82*	384,950	4694.5
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	4	*98*	369,950	3775.0
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	4	*98*	369,950	3775.0
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	4	*98*	359,950	3673.0
Prime Location	Persimmon	Mill Valley	T	Pevensey	BN24	3	*67*	275,950	4118.7
Prime Location	Persimmon	Mill Valley	T	Pevensey	BN24	3	*78*	295,950	3794.2
Prime Location	Persimmon	Mill Valley	T	Pevensey	BN24	3	*78*	289,950	3717.3
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	3	*78*	325,950	4178.8

Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	3	*78*	325,950	4178.8
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	4	*96*	359,950	3749.5
Prime Location	Persimmon	Mill Valley	T	Pevensey	BN24	3	*78*	289,950	3717.3
Prime Location	Persimmon	Mill Valley	T	Pevensey	BN24	3	*78*	293,950	3768.6
Prime Location	Persimmon	Mill Valley	T	Pevensey	BN24	3	*78*	293,950	3768.6
Smart New Homes	Persimmon	Mill Valley	S	Pevensey	BN24	3	*79*	289,950	3670.3
Smart New Homes	Persimmon	Mill Valley	S	Pevensey	BN24	3	*79*	289,950	3670.3
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24	3	*79*	293,950	3720.9
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24	3	*79*	293,950	3720.9
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24	3	*79*	293,950	3720.9
Prime Location	Persimmon	Mill Valley	D	Pevensey	BN24	3	*75*	322,950	4306.0
Prime Location	Persimmon	Mill Valley	S	Pevensey	BN24	4	*96*	323,950	3374.5
Smart New Homes	Persimmon	Mill Valley	S	Pevensey	BN24	4	*96*	321,950	3353.6
Smart New Homes	Persimmon	Mill Valley	T	Pevensey	BN24 5DX	2	*60*	239,950	3999.2
Prime Location	Barratt	Chalkers Rise	S	Peacehaven	BN10	4	*139*	389,995	2805.7
Prime Location	Barratt	Chalkers Rise	S	Peacehaven	BN10	4	*139*	389,995	2805.7
Prime Location	Barratt	Chalkers Rise	T	Peacehaven	BN10	3	*95*	374,995	3947.3
Prime Location	Barratt	Chalkers Rise	D	Peacehaven	BN10	3	*95*	354,995	3736.8
Prime Location	Barratt	Chalkers Rise	D	Peacehaven	BN24	3	*75*	329,950	4399.3
Smart New Homes	Bellway	Pelham Place	S	Hailsham	BN27	3	*75*	299,995	3999.9
Smart New Homes	Bellway	Pelham Place	S	Hailsham	BN27	3	*75*	304,995	4066.6
Prime Location	Unknown	Woodacres	S	Hailsham	BN27	3	*95*	345,000	3631.6
Prime Location	Linden Homes	Millwood Park	D	Hailsham	BN27	4	*97*	419,950	4329.4
Prime Location	Linden Homes	Millwood Park	D	Hailsham	BN27	4	*97*	419,950	4329.4
Prime Location	Bellway	Pelham Place	D	Hailsham	BN27	4	*91*	324,995	3571.4
Prime Location	Bellway	Pelham Place	D	Hailsham	BN27	4	*113*	384,995	3407.0
Prime Location	Unknown	Woodacres Way	D	Hailsham	BN27 3YN	4	*72*	400,000	5555.6

Prime Location	Unknown	Coach Barn Lane	D	Hailsham	BN27 3YN	5	*85*	440,000	5176.5
Prime Location	Unknown	Woodacres Way	D	Hailsham	BN27 3YN	3	*95*	355,000	3736.8
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*61*	249,950	4097.5
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*61*	239,950	3933.6
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*122*	375,000	3073.8
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*61*	249,950	4097.5
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*61*	195,650	3207.4
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*61*	250,000	4098.4
Prime Location	Fivewalk Homes	The Avenue	F	Eastbourne	BN21	2	*61*	229,000	3754.1

Appendix C CoStar Non-Residential Data

Industrial

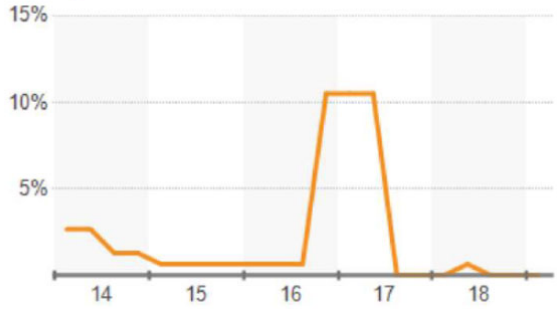
Availability	Survey	5-Year Avg
Rent Per SF	£5.30	£5.41
Vacancy Rate	0.0%	2.2%
Vacant SF	0	1,728
Availability Rate	0.0%	3.8%
Available SF	0	2,905
Sublet SF	0	0
Months on Market	-	2.7

Inventory	Survey	5-Year Avg
Existing Buildings	12	12
Existing SF	77,572	77,572
12 Mo. Const. Starts	0	0
Under Construction	0	0
12 Mo. Deliveries	0	0

Demand	Survey	5-Year Avg
12 Mo. Absorption SF	0	624
12 Mo. Leasing SF	0	2,487

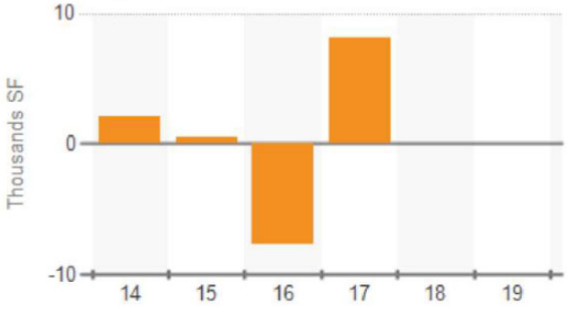
Sales	Past Year	5-Year Avg
Sale Price Per SF	-	-
Asking Price Per SF	-	-
Sales Volume (Mil.)	£0.0	£0.0
Yield	-	-

Vacancy Rate



Asking Rent Per SF

Net Absorption



17/01/2019

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Office

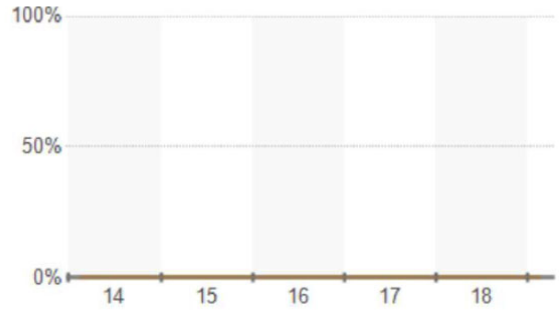
Availability	Survey	5-Year Avg
Rent Per SF	£5.34	£5.28
Vacancy Rate	0.0%	0.0%
Vacant SF	0	0
Availability Rate	0.0%	9.9%
Available SF	0	2,320
Sublet SF	0	0
Months on Market	-	3.5

Inventory	Survey	5-Year Avg
Existing Buildings	8	8
Existing SF	23,531	23,531
12 Mo. Const. Starts	0	0
Under Construction	0	0
12 Mo. Deliveries	0	0

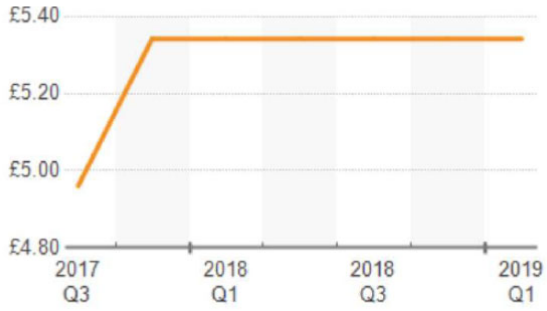
Demand	Survey	5-Year Avg
12 Mo. Absorption SF	0	0
12 Mo. Leasing SF	15,160	3,529

Sales	Past Year	5-Year Avg
Sale Price Per SF	-	-
Asking Price Per SF	-	-
Sales Volume (Mil.)	£0.0	£0.0
Yield	-	-

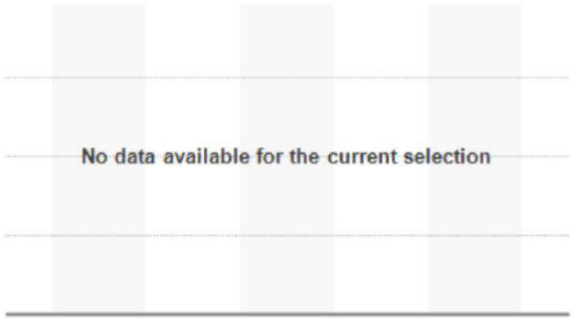
Vacancy Rate



Asking Rent Per SF



Net Absorption



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Retail

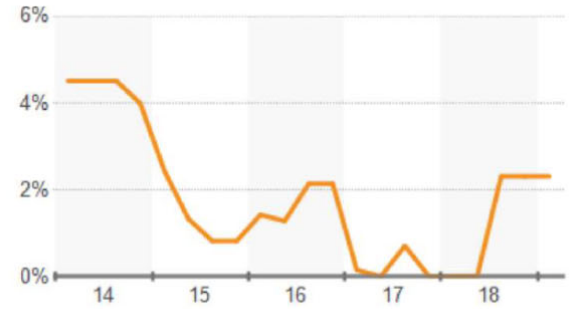
Availability	Survey	5-Year Avg
Rent Per SF	£10.42	£17.14
Vacancy Rate	2.3%	1.8%
Vacant SF	3,250	2,492
Availability Rate	2.3%	2.3%
Available SF	3,250	3,254
Sublet SF	3,250	763
Months on Market	5.8	8.1

Inventory	Survey	5-Year Avg
Existing Buildings	63	63
Existing SF	140,982	140,982
12 Mo. Const. Starts	0	0
Under Construction	0	0
12 Mo. Deliveries	0	0

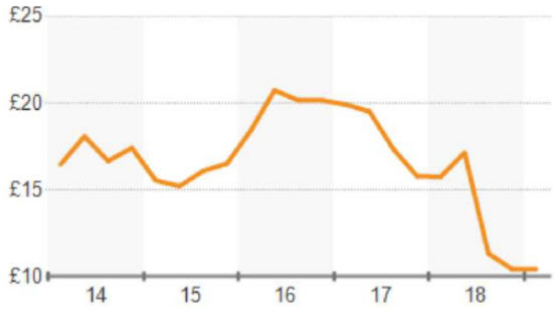
Demand	Survey	5-Year Avg
12 Mo. Absorption SF	-3,250	-90
12 Mo. Leasing SF	1,264	3,976

Sales	Past Year	5-Year Avg
Sale Price Per SF	-	£164
Asking Price Per SF	-	£168
Sales Volume (Mil.)	£0.0	£0.4
Yield	-	7.0%

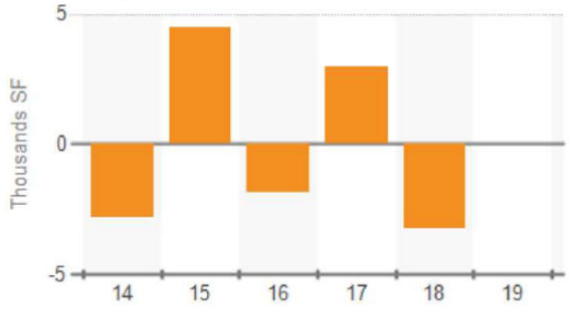
Vacancy Rate



Asking Rent Per SF



Net Absorption



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Appendix D Non-Residential Property Particulars (Jan' 2019)

Table 18 The Hub, Drove Road, Newhaven

	m^2	Rent £/pa	£/m^2/year
Unit 1	57.80	8060.00	**139.45**
Unit 2	45.80	6188.00	**135.11**
Unit 7	83.20	11500.00	**138.22**
Unit 9	58.30	8060.00	**138.25**
Unit 10	61.20	8060.00	**131.70**

Table 19 Newhaven Enterprise Centre, Denton Island, Newhaven

	Sqft	m^2	Rent £/pcm	Rent £/pa	£/m^2 /year	*Notes*
Unit 3	227.00	21.09	515.00	6180.00	**293.04**	*3 person office, situated on the ground floor*
Unit 23	332.00	30.84	700.00	8400.00	**272.34**	*3-5 person office, first floor with views towards the South Downs*
Unit 43	348.00	32.33	735.00	8820.00	**272.81**	*6-8 person office*
Unit 44	586.00	54.44	1185.00	14220.00	**261.20**	*8-10 person office*
Unit 47	308.00	28.61	640.00	7680.00	**268.40**	*6-8 person office*
Unit 49	458.00	42.55	905.00	10860.00	**255.23**	*6-8 person office, first floor with views towards the South Downs*
Unit 18	545.00	50.63	995.00	11940.00	**235.82**	*Ground floor workshop with up and over doors*
Unit 21	364.00	33.82	745.00	8940.00	**264.37**	*4-5 person office, first floor with interconnecting door to unit 22*
Unit 22	231.00	21.46	550.00	6600.00	**307.54**	*2-3 person office, first floor with interconnecting door to unit 21*

Newhaven Enterprise Centre, Denton Island, Newhaven, BN9 9BA

FLUDE commercial
INCORPORATING GARNER WOOD

TO LET

INDUSTRIAL

High quality serviced office / light industrial units
Various sizes

KEY FEATURES

- High spec office accommodation
- Open plan light industrial units
- Available on all inclusive & flexible terms
- Good parking / yard provisions

Location

The property is located to the south end of Denton Island. The Island is accessed via a bridge off North way, which forms part of the A259 South Coast Road.

Newhaven is approx 9 miles from Brighton and Eastbourne.

Accommodation

Newhaven Enterprise Centre is a purpose built business centre over 2 and 3 storeys throughout. It boasts a mix of office and light industrial accommodation.

EPC

B (43)

Terms

The suites / units are offered on inclusive and flexible lease terms. Please contact us for more information.
Please see availability overleaf.

Legal Fees & VAT

Each party to bear their own legal costs incurred. Rents and prices are quoted exclusive of, but may be subject to VAT.

Viewings

Strictly by appointment through the agents
Flude Commercial.
Please contact: **Alex Roberts**
Telephone: **01273 727070**
Email: **a.roberts@flude.com**

FLUDE commercial
INCORPORATING GARNER WOOD

Flude Commercial for themselves and for the vendors or lessors of this property whose agents they are give notice that: i) these particulars are set out in good faith and are believed to be correct but their accuracy cannot be guaranteed and they do not form any part of any contract; ii) no person in the employment of Flude Commercial has any authority to make or give any representation or warranty whatsoever in relation to this property.

Please note that whilst we endeavour to confirm the prevailing approved planning use for properties we market, we can offer no guarantees in this regard. Planning information is stated to the best of our knowledge. Interested parties are advised to make their own enquiries to satisfy themselves in respect of planning issues.

We advise interested parties to make their own enquiries to the local authority to verify the above and the level of business rates payable in view of possible transitional arrangements and small business relief.

Agency | Lease Advisory | Management | Valuation | Rating | Investment | Development

Newhaven Enterprise Centre, Denton Island, Newhaven, BN9 9BA

Schedule

Type	Unit	Size (sq ft)	Monthly Fee	Notes
OFFICE				
	Unit 3	227	£515.00	3 person office, situated on the ground floor
	Unit 23	332	£700.00	3-5 person office, first floor with views towards the South Downs
	Unit 43	348	£735.00	6-8 person office
	Unit 44	586	£1,185.00	8-10 person office
	Unit 47	308	£640.00	6-8 person office
	Unit 49	458	£905.00	6-8 person office, first floor with views towards the South Downs
STUDIO WORKSHOPS				
	Unit 18	545	£995.00	Ground floor workshop with up and over doors
MULTIPLE UNIT SPACE				
	Unit 21	364	£745.00	4-5 person office, first floor with interconnecting door to unit 22
	Unit 22	231	£550.00	2-3 person office, first floor with interconnecting door to unit 21

New office studios

Office suites from
452 ft² to 3,321 ft² (42m²-309m²)
with excellent parking

the hub | DROVE ROAD NEWHAVEN

NEW OFFICE STUDIOS

- TO LET
- FLEXIBLE EASY IN/EASY OUT TERMS
- IDEAL FOR NEW OR RAPIDLY EXPANDING BUSINESSES
- EXCELLENT PARKING
- CLOSE TO TOWN CENTRE & PUBLIC TRANSPORT

A development by

cross|stone
URBAN REGENERATION

the hub | DROVE ROAD NEWHAVEN

Oakley
Your Sussex property expert

AVAILABILITY SCHEDULE

North Wing Availability Schedule

Unit	Size	Inclusive Rent Per Week
1	622 sq ft	AVAILABLE £155 per week (£8,060 per annum)
2	493 sq ft	AVAILABLE £119 per week (£6,188 per annum)
3	493 sq ft	LET
4	491 sq ft	LET
5	452 sq ft	LET
6	492 sq ft	LET
7	896 sq ft	AVAILABLE £221 (£11,500 per annum)

South Wing Availability Schedule

Unit	Size	Inclusive Rent Per Week
8	514 sq ft	LET
9	628 sq ft	AVAILABLE £155 (£8,060 per annum)
10	659 sq ft	AVAILABLE £155 (£8,060 per annum)
11	659 sq ft	LET
12	861 sq ft	LET
Total	**3,321 sq ft**	

Rent
Rent is paid monthly by standing order and is inclusive of service charge costs, with the exception of electricity which is individually metered and business rates.

The first month's rent is payable upon signing the lease with a 2 month security deposit.

Business Rates
Currently being assessed, further guidance upon application.

VAT
Rents will be subject to VAT.

Viewing
Strictly by appointment through Sole Agents Oakley Commercial

Ben Pettett: T: 01273 645773
ben@oakleyproperty.com

Leigh Doherty: T: 01273 627411
leigh@oakleyproperty.com

crossstone URBAN REGENERATION www.crossstone.co.uk

Appendix E BCIS Construction Costs

BCIS® RICS®

£/m2 study

Description: Rate per m2 gross internal floor area for the building Cost including prelims.

Last updated: 01-Sep-2018 02:05

› Rebased to Lewes (111; sample 20)

Maximum age of results: Default period

Building function (Maximum age of projects)	£/m² gross internal floor area						Sample
	Mean	Lowest	Lower quartiles	Median	Upper quartiles	Highest	
New build							
282.12 Advance factories/offices - mixed facilities (class B1)							
Generally (15)	1,468	504	992	1,516	1,737	2,501	16
Up to 500m2 GFA (20)	2,235	1,859	-	2,345	-	2,501	3
500 to 2000m2 GFA (15)	1,281	504	1,131	1,419	1,565	1,696	6
Over 2000m2 GFA (15)	1,298	689	816	1,072	1,608	2,482	7
282.22 Purpose built factories/Offices - mixed facilities (15)	1,161	482	905	988	1,303	2,485	17
320. Offices							
Generally (15)	1,979	885	1,465	1,844	2,283	6,122	132
Air-conditioned							
Generally (15)	2,113	1,268	1,622	1,964	2,379	6,122	38
1-2 storey (15)	1,917	1,268	1,592	1,851	2,076	3,665	13
3-5 storey (15)	2,191	1,355	1,617	1,935	2,447	6,122	18
6+ storey (15)	2,165	1,849	2,056	2,192	2,314	2,392	6
Not air-conditioned							
Generally (15)	1,946	1,071	1,418	1,839	2,283	3,557	65
1-2 storey (15)	1,887	1,119	1,330	1,826	2,257	3,350	36
3-5 storey (15)	1,973	1,071	1,518	1,746	2,266	3,557	26
6+ storey (20)	2,498	1,936	-	2,572	-	2,913	4
320.1 Offices with shops, banks, flats, etc							
Generally (15)	1,978	1,273	1,466	1,956	2,345	3,573	16
1-2 storey (20)	1,495	1,273	1,334	1,366	1,551	2,065	8
3-5 storey (15)	1,903	1,319	1,468	1,625	2,398	2,643	7
6+ storey (15)	2,280	1,485	1,910	2,063	2,495	3,573	6
321. Artist's studios (20)	1,601	960	-	1,823	-	2,021	3
340. Mixed commercial developments (15)	1,464	881	1,094	1,127	1,771	2,449	5
810. Housing, mixed developments (15)	1,400	707	1,213	1,364	1,549	3,181	1200
810.1 Estate housing							
Generally (15)	1,377	663	1,175	1,336	1,517	4,714	1772

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Building function (Maximum age of projects)	£/m² gross internal floor area						Sample
	Mean	Lowest	Lower quartiles	Median	Upper quartiles	Highest	
Single storey (15)	1,545	781	1,320	1,478	1,744	4,714	290
2-storey (15)	1,338	663	1,163	1,308	1,464	2,658	1345
3-storey (15)	1,366	862	1,098	1,319	1,544	2,826	133
4-storey or above (15)	2,692	1,439	-	2,476	-	4,376	4
810.11 Estate housing detached (15)	1,758	1,054	1,343	1,555	1,799	4,714	20
810.12 Estate housing semi detached							
Generally (15)	1,366	683	1,178	1,329	1,500	2,534	421
Single storey (15)	1,558	965	1,328	1,505	1,751	2,534	76
2-storey (15)	1,329	683	1,169	1,306	1,459	2,355	325
3-storey (15)	1,248	926	1,042	1,179	1,352	2,025	20
810.13 Estate housing terraced							
Generally (15)	1,407	873	1,175	1,351	1,551	4,376	372
Single storey (15)	1,550	1,042	1,291	1,444	1,792	2,270	44
2-storey (15)	1,377	873	1,172	1,336	1,537	2,658	270
3-storey (15)	1,387	877	1,095	1,287	1,496	2,826	57
4-storey or above (5)	4,376	-	-	-	-	-	1
816. Flats (apartments)							
Generally (15)	1,630	792	1,358	1,556	1,848	5,543	957
1-2 storey (15)	1,551	963	1,316	1,492	1,717	2,917	231
3-5 storey (15)	1,610	792	1,356	1,544	1,836	3,184	640
6+ storey (15)	2,013	1,144	1,617	1,913	2,146	5,543	83
818. Housing with shops, offices, workshops or the like (15)	1,973	927	1,560	1,741	2,269	5,020	90

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Appendix F Modelling Summary Sheets

Site Address	Dane Valley Site	Date of appraisal	23/01/2019
Site Reference	40% Affordable Housing 165 units	Net Residential Site Area	0.3281
File Source		Author & Organisation	David Carlisle, AECOM
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0

Press for 4 page detail

CAPITAL VALUE OF OPEN MARKET HOUSING				**£27,253,600**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency			**£13,679,113**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£13,574,487**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£8,959,810**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£8,959,810**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency			**£8,271,935**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£687,875**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs			£0		
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£36,213,410**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME			**£21,951,048**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£14,262,362**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME			**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME				**£37,414,458**	
TOTAL BUILD COSTS			**£23,265,776**		
TOTAL CONTRIBUTION TO SCHEME COSTS					**£14,148,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,100,000	12,727	5.6%	1,640,625
Over extra - Drainage		£785,400	4,760	2.1%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.2%	348,906
Over extra - Remediation		£800,000	4,848	2.1%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.6%	162,656
		£4,340,200		11.6%	3,390,781
Other site costs					
Fees and certification	10.0%	£2,090,576	12,670	5.6%	1,633,263
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£6,430,776**	38,974		
Statutory 106 costs		**£858,388**	5,202		
Total Marketing Costs		**£953,876**			
Total Direct Costs			**£31,508,816**		

Finance and acquisition costs			
Land Payment	-£1,045,804	-10,564 per OM home	-817,034 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£10,458		
Legal Fees	-£5,229		
Stamp Duty	£0		
Total Interest Paid	£803,520		
Total Finance and Acquisition Costs		**-£257,971**	
Total Operating Profit		**£6,163,612**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£37,414,457**	
Surplus/(Deficit) at completion 1/11/2021		**£1**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **23.1%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -2.8% Peak Cash Requirement -£10,070,128

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 131 units 20% Developer F	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1			
	Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£21,865,200**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency			**£10,974,570**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£10,890,630**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£6,993,780**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£6,993,780**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency			**£6,477,171**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£516,609**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs			£0		
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£28,858,980**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME			**£17,451,741**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£11,407,239**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME			**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME				**£30,060,028**	
TOTAL BUILD COSTS			**£18,766,469**		
TOTAL CONTRIBUTION TO SCHEME COSTS					**£11,293,559**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.7%	1,328,125
Over extra - Drainage		£785,400	5,995	2.6%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.5%	348,906
Over extra - Remediation		£800,000	6,107	2.7%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.7%	162,656
		£3,940,200		13.1%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,662,071	12,688	5.5%	1,298,493
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,602,271**	42,765		
Statutory 106 costs		**£688,247**	5,254		
Total Marketing Costs		**£765,282**			
Total Direct Costs			**£25,822,269**		

Finance and acquisition costs			
Land Payment	-£1,338,611	-16,944 per OM home	-1,045,790 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£13,386		
Legal Fees	-£6,693		
Stamp Duty	£0		
Total Interest Paid	£613,076		
Total Finance and Acquisition Costs		**-£745,615**	
Total Operating Profit		**£4,983,374**	
(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)			
TOTAL COST		**£30,060,028**	
Surplus/(Deficit) at completion 1/11/2021			**£0**
Present Value of Surplus (Deficit) at 23/1/2019			**£0**

Scheme Investment MIRR **22.7%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value	-4.5%	Peak Cash Requirement	-£7,799,809

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 104 units 20% Developer F	Net Residential Site Area	0.16	
File Source	Plots 5 and 7 only	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£17,054,400**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£8,559,936**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£8,494,464**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£5,740,330**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£5,740,330**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£5,285,112**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£455,218**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs		£0			
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£22,794,730**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£13,845,048**			
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£8,949,682**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**			
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**£0**
GROSS DEVELOPMENT VALUE OF SCHEME				**£22,794,730**	
TOTAL BUILD COSTS		**£13,845,048**			
TOTAL CONTRIBUTION TO SCHEME COSTS					**£8,949,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,400,000	13,462	6.1%	1,834,862
Over extra - Drainage		£785,400	7,552	3.4%	1,029,358
Over extra - Soil excavation and disposal		£446,600	4,294	2.0%	585,321
Over extra - Remediation		£334,000	3,212	1.5%	437,746
Over extra - Demmolition and site clearance		£0			
		£2,966,000		13.0%	3,887,287
Other site costs					
Fees and certification	10.0%	£1,318,576	12,679	5.8%	1,728,147
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£4,284,576**	41,198		
Statutory 106 costs		**£537,200**	5,165		
Total Marketing Costs		**£596,904**			
Total Direct Costs			**£19,263,728**		

Finance and acquisition costs			
Land Payment	-£649,311	-10,473 per OM home	-850,998 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£6,493		
Legal Fees	-£3,247		
Stamp Duty	£0		
Total Interest Paid	£477,166		
Total Finance and Acquisition Costs		**-£181,885**	
Total Operating Profit		**£3,712,886**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£22,794,730**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **24.0%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -2.8% Peak Cash Requirement -£5,909,248

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	30% Affordable Housing 165 units	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£32,113,800**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£16,118,543**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£15,995,257**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£6,638,780**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£6,638,780**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£6,152,931**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£485,849**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£38,752,580**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME	**£22,271,473**			
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£16,481,107**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME	**£1,314,728**			
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£39,953,628**	
TOTAL BUILD COSTS	**£23,586,201**			
TOTAL CONTRIBUTION TO SCHEME COSTS				**£16,367,426**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,100,000	12,727	5.3%	1,640,625
Over extra - Drainage		£785,400	4,760	2.0%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.1%	348,906
Over extra - Remediation		£800,000	4,848	2.0%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.5%	162,656
		£4,340,200		10.9%	3,390,781
Other site costs					
Fees and certification	10.0%	£2,121,093	12,855	5.3%	1,657,104
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees	**£6,461,293**		39,159		
Statutory 106 costs	**£1,010,812**		6,126		
Total Marketing Costs	**£1,123,983**				
Total Direct Costs		**£32,182,289**			

Finance and acquisition costs			
Land Payment	-£175,216	-1,510 per OM home	-136,888 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£1,752		
Legal Fees	-£876		
Stamp Duty	£0		
Total Interest Paid	£934,618		
Total Finance and Acquisition Costs	**£756,773**		
Total Operating Profit	**£7,014,566**		

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£39,953,628**	
Surplus/(Deficit) at completion 1/11/2021		**(£)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **24.8%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -0.4% Peak Cash Requirement -£11,173,382

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	30% Affordable Housing 131 units 20% Developer F	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£25,353,600**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency			**£12,725,466**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£12,628,134**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£5,219,380**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£5,219,380**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency			**£4,827,361**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£392,019**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs			£0		
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£30,572,980**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME			**£17,552,828**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£13,020,152**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME			**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME				**£31,774,028**	
TOTAL BUILD COSTS			**£18,867,556**		
TOTAL CONTRIBUTION TO SCHEME COSTS					**£12,906,472**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.4%	1,328,125
Over extra - Drainage		£785,400	5,995	2.5%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.4%	348,906
Over extra - Remediation		£800,000	6,107	2.5%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.7%	162,656
		£3,940,200		12.4%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,671,698	12,761	5.3%	1,306,014
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,611,898**	42,839		
Statutory 106 costs		**£798,447**	6,095		
Total Marketing Costs		**£887,376**			
Total Direct Costs			**£26,165,277**		

Finance and acquisition costs				
Land Payment	-£675,662	-7,344	per OM home	-527,861 per hectare
Arrangement Fee	£0	0.0%	of interest	
Misc Fees (Surveyors etc)	£0	0.00%	of scheme value	
Agents Fees	-£6,757			
Legal Fees	-£3,378			
Stamp Duty	£0			
Total Interest Paid	£707,770			
Total Finance and Acquisition Costs		**£21,973**		
Total Operating Profit		**£5,586,779**		

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£31,774,028**	
Surplus/(Deficit) at completion 1/11/2021		**(£)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **24.3%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -2.1% Peak Cash Requirement -£8,581,740

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	30% Affordable Housing 104 units 20% Developer F	Net Residential Site Area	0.16	
File Source	Plots 5 and 7 only	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£20,181,800**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£10,129,639**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£10,052,161**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£4,076,400**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£4,076,400**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£3,839,383**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£237,017**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs		£0			
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£24,258,200**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£13,969,022**			
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£10,289,178**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**			
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**£0**
GROSS DEVELOPMENT VALUE OF SCHEME				**£24,258,200**	
TOTAL BUILD COSTS		**£13,969,022**			
TOTAL CONTRIBUTION TO SCHEME COSTS					**£10,289,178**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,400,000	13,462	5.8%	1,834,862
Over extra - Drainage		£785,400	7,552	3.2%	1,029,358
Over extra - Soil excavation and disposal		£446,600	4,294	1.8%	585,321
Over extra - Remediation		£334,000	3,212	1.4%	437,746
Over extra - Demmolition and site clearance		£0			
		£2,966,000		12.2%	3,887,287
Other site costs					
Fees and certification	10.0%	£1,330,383	12,792	5.5%	1,743,621
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£4,296,383**	41,311		
Statutory 106 costs		**£635,341**	6,109		
Total Marketing Costs		**£706,363**			
Total Direct Costs			**£19,607,109**		

Finance and acquisition costs			
Land Payment	-£155,308	-2,128 per OM home	-203,549 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£1,553		
Legal Fees	-£777		
Stamp Duty	£0		
Total Interest Paid	£552,975		
Total Finance and Acquisition Costs		**£395,337**	
Total Operating Profit		**£4,255,753**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£24,258,200**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **25.9%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -0.6% Peak Cash Requirement -£6,516,324

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	20% Affordable Housing 165 units	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£36,609,200**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£18,374,872**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£18,234,328**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£4,363,680**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£4,363,680**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£4,045,371**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£318,309**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£40,972,880**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£22,420,242**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£18,552,638**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£42,173,928**	
TOTAL BUILD COSTS		**£23,734,970**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£18,438,957**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,100,000	12,727	5.0%	1,640,625
Over extra - Drainage		£785,400	4,760	1.9%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.1%	348,906
Over extra - Remediation		£800,000	4,848	1.9%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.5%	162,656
		£4,340,200		10.3%	3,390,781
Other site costs					
Fees and certification	10.0%	£2,135,261	12,941	5.1%	1,668,173
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£6,475,461**	39,245		
Statutory 106 costs		**£1,153,071**	6,988		
Total Marketing Costs		**£1,281,322**			
Total Direct Costs			**£32,644,824**		

Finance and acquisition costs			
Land Payment	£646,320	4,860 per OM home	504,937 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£6,463		
Legal Fees	£3,232		
Stamp Duty	£21,816		
Total Interest Paid	£1,058,060		
Total Finance and Acquisition Costs		**£1,735,890**	
Total Operating Profit		**£7,793,214**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£42,173,928**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **25.4%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 1.5% Peak Cash Requirement -£12,178,346

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	20% Affordable Housing 131 units 20% Developer F	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£28,747,000**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency			**£14,428,680**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£14,318,320**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£3,740,430**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£3,740,430**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency			**£3,444,573**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£295,857**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs			£0		
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£32,487,430**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME			**£17,873,253**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£14,614,177**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME			**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME				**£33,688,478**	
TOTAL BUILD COSTS			**£19,187,981**		
TOTAL CONTRIBUTION TO SCHEME COSTS					**£14,500,497**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.0%	1,328,125
Over extra - Drainage		£785,400	5,995	2.3%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.3%	348,906
Over extra - Remediation		£800,000	6,107	2.4%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.6%	162,656
		£3,940,200		11.7%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,702,215	12,994	5.1%	1,329,855
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,642,415**	43,072		
Statutory 106 costs		**£905,000**	6,908		
Total Marketing Costs		**£1,006,145**			
Total Direct Costs			**£26,741,541**		

Finance and acquisition costs			
Land Payment	-£42,995	-413 per OM home	-33,590 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£430		
Legal Fees	-£215		
Stamp Duty	£0		
Total Interest Paid	£804,134		
Total Finance and Acquisition Costs		**£760,495**	
Total Operating Profit		**£6,186,442**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£33,688,478**	
Surplus/(Deficit) at completion 1/11/2021		**(£)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **25.7%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -0.1% Peak Cash Requirement -£9,416,581

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	20% Affordable Housing 104 units 20% Developer F	Net Residential Site Area	0.16	
File Source	Plots 5 and 7 only	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£22,948,200**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£11,518,149**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£11,430,051**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£2,763,100**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£2,763,100**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£2,527,165**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£235,935**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs		£0			
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£25,711,300**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£14,045,314**			
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£11,665,986**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**			
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**£0**
GROSS DEVELOPMENT VALUE OF SCHEME				**£25,711,300**	
TOTAL BUILD COSTS		**£14,045,314**			
TOTAL CONTRIBUTION TO SCHEME COSTS					**£11,665,986**

External Works & Infrastructure Costs (£)		Per unit	% of GDV	per Hectare
Site Preparation/Servicing	£0			
Roads and Sewers	£0			
Services (Power, Water, Gas, Telco and IT)	£0			
Strategic Landscaping	£0			
Off Site Works	£0			
Externals	£1,400,000	13,462	5.4%	1,834,862
Over extra - Drainage	£785,400	7,552	3.1%	1,029,358
Over extra - Soil excavation and disposal	£446,600	4,294	1.7%	585,321
Over extra - Remediation	£334,000	3,212	1.3%	437,746
Over extra - Demmolition and site clearance	£0			
	£2,966,000		11.5%	3,887,287
Other site costs				
Fees and certification 10.0%	£1,337,649	12,862	5.2%	1,753,144
Other Acquisition Costs (£)	£0			
Site Abnormals (£)				
De-canting tenants	£0			
Decontamination	£0			
Other	£0			
Other 2	£0			
Other 3	£0			
Other 4	£0			
Other 5	£0			
	£0			
Total Site Costs inc Fees	**£4,303,649**	41,381		
Statutory 106 costs	**£722,424**	6,946		
Total Marketing Costs	**£803,187**			
Total Direct Costs		**£19,874,573**		

Finance and acquisition costs			
Land Payment	£446,178	5,376 per OM home	584,769 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£4,462		
Legal Fees	£2,231		
Stamp Duty	£11,809		
Total Interest Paid	£637,997		
Total Finance and Acquisition Costs		**£1,102,677**	
Total Operating Profit		**£4,734,049**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£25,711,300**	
Surplus/(Deficit) at completion 1/11/2021		**(£)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **26.3%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 1.7% Peak Cash Requirement -£7,229,198

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 165 units 15% Developer F	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£27,253,600**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£13,679,113**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£13,574,487**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£8,959,810**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£8,959,810**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£8,271,935**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£687,875**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£36,213,410**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£21,951,048**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£14,262,362**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£37,414,458**	
TOTAL BUILD COSTS		**£23,265,776**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£14,148,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,100,000	12,727	5.6%	1,640,625
Over extra - Drainage		£785,400	4,760	2.1%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.2%	348,906
Over extra - Remediation		£800,000	4,848	2.1%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.6%	162,656
		£4,340,200		11.6%	3,390,781
Other site costs					
Fees and certification	10.0%	£2,090,576	12,670	5.6%	1,633,263
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£6,430,776**	38,974		
Statutory 106 costs		**£858,388**	5,202		
Total Marketing Costs		**£953,876**			
Total Direct Costs			**£31,508,816**		

Finance and acquisition costs			
Land Payment	£85,578	864 per OM home	66,858 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£856		
Legal Fees	£428		
Stamp Duty	£0		
Total Interest Paid	£1,017,848		
Total Finance and Acquisition Costs		**£1,104,710**	
Total Operating Profit		**£4,800,932**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£37,414,457**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **19.6%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 0.2% Peak Cash Requirement -£11,275,165

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 131 units 15% Developer P	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£21,865,200**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£10,974,570**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£10,890,630**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£6,993,780**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£6,993,780**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£6,477,171**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£516,609**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£28,858,980**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£17,451,741**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£11,407,239**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£30,060,028**	
TOTAL BUILD COSTS		**£18,766,469**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£11,293,559**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.7%	1,328,125
Over extra - Drainage		£785,400	5,995	2.6%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.5%	348,906
Over extra - Remediation		£800,000	6,107	2.7%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.7%	162,656
		£3,940,200		13.1%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,662,071	12,688	5.5%	1,298,493
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,602,271**	42,765		
Statutory 106 costs		**£688,247**	5,254		
Total Marketing Costs		**£765,282**			
Total Direct Costs			**£25,822,269**		

Finance and acquisition costs			
Land Payment	-£430,749	-5,453 per OM home	-336,523 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	-£4,307		
Legal Fees	-£2,154		
Stamp Duty	£0		
Total Interest Paid	£784,856		
Total Finance and Acquisition Costs		**£347,646**	
Total Operating Profit		**£3,890,114**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£30,060,028**	
Surplus/(Deficit) at completion 1/11/2021		**(£)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **19.4%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value -1.4% Peak Cash Requirement -£8,766,572

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 104 units 15% Developer F	Net Residential Site Area	0.16	
File Source	Plots 5 and 7 only	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£17,054,400**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£8,559,936**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£8,494,464**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£5,740,330**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£5,740,330**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£5,285,112**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£455,218**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£22,794,730**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£13,845,048**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£8,949,682**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**£0**
GROSS DEVELOPMENT VALUE OF SCHEME			**£22,794,730**	
TOTAL BUILD COSTS		**£13,845,048**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£8,949,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,400,000	13,462	6.1%	1,834,862
Over extra - Drainage		£785,400	7,552	3.4%	1,029,358
Over extra - Soil excavation and disposal		£446,600	4,294	2.0%	585,321
Over extra - Remediation		£334,000	3,212	1.5%	437,746
Over extra - Demmolition and site clearance		£0			
		£2,966,000		13.0%	3,887,287
Other site costs					
Fees and certification	10.0%	£1,318,576	12,679	5.8%	1,728,147
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£4,284,576**	41,198		
Statutory 106 costs		**£537,200**	5,165		
Total Marketing Costs		**£596,904**			
Total Direct Costs			**£19,263,728**		

Finance and acquisition costs			
Land Payment	£58,670	946 per OM home	76,893 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£587		
Legal Fees	£293		
Stamp Duty	£0		
Total Interest Paid	£611,285		
Total Finance and Acquisition Costs		**£670,835**	
Total Operating Profit		**£2,860,166**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£22,794,729**	
Surplus/(Deficit) at completion 1/11/2021		**£1**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **20.3%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 0.3% Peak Cash Requirement -£6,663,335

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 165 units 10% Developer F	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£27,253,600**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£13,679,113**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£13,574,487**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£8,959,810**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£8,959,810**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£8,271,935**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£687,875**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£36,213,410**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£21,951,048**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£14,262,362**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£37,414,458**	
TOTAL BUILD COSTS		**£23,265,776**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£14,148,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,100,000	12,727	5.6%	1,640,625
Over extra - Drainage		£785,400	4,760	2.1%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.2%	348,906
Over extra - Remediation		£800,000	4,848	2.1%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.6%	162,656
		£4,340,200		11.6%	3,390,781
Other site costs					
Fees and certification	10.0%	£2,090,576	12,670	5.6%	1,633,263
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£6,430,776**	38,974		
Statutory 106 costs		**£858,388**	5,202		
Total Marketing Costs		**£953,876**			
Total Direct Costs			**£31,508,816**		

Finance and acquisition costs			
Land Payment	£1,163,298	11,750 per OM home	908,827 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£11,633		
Legal Fees	£5,816		
Stamp Duty	£47,665		
Total Interest Paid	£1,238,977		
Total Finance and Acquisition Costs		**£2,467,390**	
Total Operating Profit		**£3,438,252**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£37,414,457**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **15.3%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 3.1% Peak Cash Requirement -£12,476,138

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 131 units 10% Developer F	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£21,865,200**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£10,974,570**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£10,890,630**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£6,993,780**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£6,993,780**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£6,477,171**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£516,609**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£28,858,980**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£17,451,741**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£11,407,239**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£30,060,028**	
TOTAL BUILD COSTS		**£18,766,469**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£11,293,559**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.7%	1,328,125
Over extra - Drainage		£785,400	5,995	2.6%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.5%	348,906
Over extra - Remediation		£800,000	6,107	2.7%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.7%	162,656
		£3,940,200		13.1%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,662,071	12,688	5.5%	1,298,493
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,602,271**	42,765		
Statutory 106 costs		**£688,247**	5,254		
Total Marketing Costs		**£765,282**			
Total Direct Costs			**£25,822,269**		

Finance and acquisition costs			
Land Payment	£460,403	5,828 per OM home	359,690 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£4,604		
Legal Fees	£2,302		
Stamp Duty	£12,520		
Total Interest Paid	£961,076		
Total Finance and Acquisition Costs		**£1,440,906**	
Total Operating Profit		**£2,796,854**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£30,060,028**	
Surplus/(Deficit) at completion 1/11/2021		**(£)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **15.5%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 1.5% Peak Cash Requirement -£9,730,074

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 104 units 10% Developer F	Net Residential Site Area	0.16	
File Source	Plots 5 and 7 only	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£17,054,400**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£8,559,936**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£8,494,464**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£5,740,330**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£5,740,330**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£5,285,112**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£455,218**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs		£0			
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£22,794,730**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£13,845,048**			
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£8,949,682**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**			
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**£0**
GROSS DEVELOPMENT VALUE OF SCHEME				**£22,794,730**	
TOTAL BUILD COSTS		**£13,845,048**			
TOTAL CONTRIBUTION TO SCHEME COSTS					**£8,949,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,400,000	13,462	6.1%	1,834,862
Over extra - Drainage		£785,400	7,552	3.4%	1,029,358
Over extra - Soil excavation and disposal		£446,600	4,294	2.0%	585,321
Over extra - Remediation		£334,000	3,212	1.5%	437,746
Over extra - Demmolition and site clearance		£0			
		£2,966,000		13.0%	3,887,287
Other site costs					
Fees and certification	10.0%	£1,318,576	12,679	5.8%	1,728,147
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£4,284,576**	41,198		
Statutory 106 costs		**£537,200**	5,165		
Total Marketing Costs		**£596,904**			
Total Direct Costs			**£19,263,728**		

Finance and acquisition costs				
Land Payment	£736,534	11,880	per OM home	965,314 per hectare
Arrangement Fee	£0	0.0%	of interest	
Misc Fees (Surveyors etc)	£0	0.00%	of scheme value	
Agents Fees	£7,365			
Legal Fees	£3,683			
Stamp Duty	£26,327			
Total Interest Paid	£749,646			
Total Finance and Acquisition Costs		**£1,523,555**		
Total Operating Profit		**£2,007,446**		

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£22,794,730**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **15.7%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 3.2% Peak Cash Requirement -£7,414,879

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 165 units 6% Developer Pr	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£27,253,600**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£13,679,113**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£13,574,487**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£8,959,810**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£8,959,810**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£8,271,935**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£687,875**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£36,213,410**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£21,951,048**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£14,262,362**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£37,414,458**	
TOTAL BUILD COSTS		**£23,265,776**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£14,148,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,100,000	12,727	5.6%	1,640,625
Over extra - Drainage		£785,400	4,760	2.1%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.2%	348,906
Over extra - Remediation		£800,000	4,848	2.1%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.6%	162,656
		£4,340,200		11.6%	3,390,781
Other site costs					
Fees and certification	10.0%	£2,090,576	12,670	5.6%	1,633,263
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£6,430,776**	38,974		
Statutory 106 costs		**£858,388**	5,202		
Total Marketing Costs		**£953,876**			
Total Direct Costs			**£31,508,816**		

Finance and acquisition costs			
Land Payment	£2,017,918	20,383 per OM home	1,576,498 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£20,179		
Legal Fees	£10,090		
Stamp Duty	£90,396		
Total Interest Paid	£1,418,952		
Total Finance and Acquisition Costs		**£3,557,535**	
Total Operating Profit		**£2,348,108**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£37,414,458**	
Surplus/(Deficit) at completion 1/11/2021		**(£1)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **12.2%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 5.4% Peak Cash Requirement -£13,433,685

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 131 units 6% Developer Pr	Net Residential Site Area	0.3281	
File Source		Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£21,865,200**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency			**£10,974,570**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£10,890,630**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£6,993,780**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£6,993,780**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency			**£6,477,171**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£516,609**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs			£0		
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£28,858,980**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME			**£17,451,741**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£11,407,239**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME			**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME				**£30,060,028**	
TOTAL BUILD COSTS			**£18,766,469**		
TOTAL CONTRIBUTION TO SCHEME COSTS					**£11,293,559**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.7%	1,328,125
Over extra - Drainage		£785,400	5,995	2.6%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.5%	348,906
Over extra - Remediation		£800,000	6,107	2.7%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.7%	162,656
		£3,940,200		13.1%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,662,071	12,688	5.5%	1,298,493
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,602,271**	42,765		
Statutory 106 costs		**£688,247**	5,254		
Total Marketing Costs		**£765,282**			
Total Direct Costs			**£25,822,269**		

Finance and acquisition costs			
Land Payment	£1,146,014	14,507 per OM home	895,324 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£11,460		
Legal Fees	£5,730		
Stamp Duty	£46,801		
Total Interest Paid	£1,105,508		
Total Finance and Acquisition Costs		**£2,315,513**	
Total Operating Profit		**£1,922,246**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£30,060,028**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **12.3%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 3.8% Peak Cash Requirement -£10,498,258

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	40% Affordable Housing 104 units 6% Developer Pr	Net Residential Site Area	0.16	
File Source	Plots 5 and 7 only	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£17,054,400**	£ 3,230 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£8,559,936**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£8,494,464**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£5,740,330**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£5,740,330**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£5,285,112**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£455,218**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£22,794,730**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£13,845,048**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£8,949,682**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**£0**
GROSS DEVELOPMENT VALUE OF SCHEME			**£22,794,730**	
TOTAL BUILD COSTS		**£13,845,048**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£8,949,682**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,400,000	13,462	6.1%	1,834,862
Over extra - Drainage		£785,400	7,552	3.4%	1,029,358
Over extra - Soil excavation and disposal		£446,600	4,294	2.0%	585,321
Over extra - Remediation		£334,000	3,212	1.5%	437,746
Over extra - Demmolition and site clearance		£0			
		£2,966,000		13.0%	3,887,287
Other site costs					
Fees and certification	10.0%	£1,318,576	12,679	5.8%	1,728,147
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees	**£4,284,576**		41,198		
Statutory 106 costs	**£537,200**		5,165		
Total Marketing Costs	**£596,904**				
Total Direct Costs		**£19,263,728**			

Finance and acquisition costs				
Land Payment	£1,271,341	20,505	per OM home	1,666,239 per hectare
Arrangement Fee	£0	0.0%	of interest	
Misc Fees (Surveyors etc)	£0	0.00%	of scheme value	
Agents Fees	£12,713			
Legal Fees	£6,357			
Stamp Duty	£53,067			
Total Interest Paid	£862,254			
Total Finance and Acquisition Costs		**£2,205,732**		
Total Operating Profit		**£1,325,270**		

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£22,794,731**	
Surplus/(Deficit) at completion 1/11/2021		**(£1)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **12.5%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 5.6% Peak Cash Requirement -£8,014,096

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	25% Affordable Housing 165 units 20% Profit 3900/	Net Residential Site Area	0.3281	
File Source	50/50 split Affordable Rent and Intermediate.	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1			
	Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£35,376,900**	£ 3,315 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£17,301,065**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£18,075,835**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£6,013,540**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£6,013,540**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£5,008,554**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£1,004,986**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£41,390,440**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£22,309,619**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£19,080,821**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME			**£42,591,488**	
TOTAL BUILD COSTS		**£23,624,347**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£18,967,141**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£2,150,000	13,030	5.0%	1,679,688
Over extra - Drainage		£785,400	4,760	1.8%	613,594
Over extra - Soil excavation and disposal		£446,600	2,707	1.0%	348,906
Over extra - Remediation		£800,000	4,848	1.9%	625,000
Over extra - Demmolition and site clearance		£208,200	1,262	0.5%	162,656
		£4,390,200		10.3%	3,429,844
Other site costs					
Fees and certification	10.0%	£2,124,726	12,877	5.0%	1,659,942
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£6,514,926**	39,484		
Statutory 106 costs		**£1,085,459**	6,579		
Total Marketing Costs		**£1,238,192**			
Total Direct Costs			**£32,462,923**		

Finance and acquisition costs			
Land Payment	£1,332,952	10,664 per OM home	1,041,368 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£13,330		
Legal Fees	£6,665		
Stamp Duty	£56,148		
Total Interest Paid	£1,117,679		
Total Finance and Acquisition Costs		**£2,526,772**	
Total Operating Profit		**£7,601,793**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£42,591,488**	
Surplus/(Deficit) at completion 1/11/2021		**(£1)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **24.2%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 3.1% Peak Cash Requirement -£12,898,341

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	25% Affordable Housing 131 units 20% Profit 3900/	Net Residential Site Area	0.3281	
File Source	50/50 split Affordable Rent and Intermediate.	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential and B1 Use	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING				**£28,119,000**	£ 3,315 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£13,751,591**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING					**£14,367,409**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)				**£4,799,840**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING				**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)				**£4,799,840**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£3,997,688**	£ 1,621 psqm		
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING					**£802,152**
Value of Residential Car Parking				**£0**	
Car Parking Build Costs		£0			
Capitalised Annual Ground Rents				**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME				**£32,918,840**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£17,749,279**			
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME					**£15,169,561**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME				**£1,201,048**	
COSTS OF NON-RESIDENTIAL SCHEME		**£1,314,728**			
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL					**-£113,680**
GROSS DEVELOPMENT VALUE OF SCHEME				**£34,119,888**	
TOTAL BUILD COSTS		**£19,064,007**			
TOTAL CONTRIBUTION TO SCHEME COSTS					**£15,055,881**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,700,000	12,977	5.0%	1,328,125
Over extra - Drainage		£785,400	5,995	2.3%	613,594
Over extra - Soil excavation and disposal		£446,600	3,409	1.3%	348,906
Over extra - Remediation		£800,000	6,107	2.3%	625,000
Over extra - Demmolition and site clearance		£208,200	1,589	0.6%	162,656
		£3,940,200		11.5%	3,078,281
Other site costs					
Fees and certification	10.0%	£1,690,408	12,904	5.0%	1,320,631
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£5,630,608**	42,982		
Statutory 106 costs		**£862,412**	6,583		
Total Marketing Costs		**£984,165**			
Total Direct Costs			**£26,541,191**		

Finance and acquisition costs			
Land Payment	£596,892	6,029 per OM home	466,322 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£5,969		
Legal Fees	£2,984		
Stamp Duty	£19,345		
Total Interest Paid	£861,058		
Total Finance and Acquisition Costs		**£1,486,248**	
Total Operating Profit		**£6,092,449**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£34,119,888**	
Surplus/(Deficit) at completion 1/11/2021		**(£1)**
Present Value of Surplus (Deficit) at 23/1/2019		**(£)**

Scheme Investment MIRR **24.4%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 1.7% Peak Cash Requirement -£10,057,311

Site Address	Dane Valley Site	Date of appraisal	23/01/2019	Press for 4 page detail
Site Reference	25% Affordable Housing 104 units 20% Developer F	Net Residential Site Area	0.16	
File Source	50/50 split Affordable Rent/Shared Ownership Plots	Author & Organisation	David Carlisle, AECOM	
Scheme Description	Redevelopment of Industrial/Brownfield Site for Residential	Registered Provider (whe	0	

CAPITAL VALUE OF OPEN MARKET HOUSING			**£22,245,600**	£ 3,315 psqm
BUILD COST OF OPEN MARKET HOUSING inc Contingency		**£10,879,206**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM OPEN MARKET HOUSING				**£11,366,394**
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (EXCLUDING OTHER FUNDING)			**£3,755,600**	
OTHER SOURCES OF AFFORDABLE HOUSING FUNDING			**£0**	
CAPITAL VALUE OF ALL AFFORDABLE HOUSING (INCLUDING OTHER FUNDING)			**£3,755,600**	
BUILD COST OF AFFORDABLE HOUSING inc Contingency		**£3,127,962**	£ 1,621 psqm	
CONTRIBUTION TO SCHEME COSTS FROM AFFORDABLE HOUSING				**£627,638**
Value of Residential Car Parking			**£0**	
Car Parking Build Costs		£0		
Capitalised Annual Ground Rents			**£0**	
TOTAL CAPITAL VALUE OF RESIDENTIAL SCHEME			**£26,001,200**	
TOTAL BUILD COST OF RESIDENTIAL SCHEME		**£14,007,168**		
TOTAL CONTRIBUTION OF RESIDENTIAL SCHEME				**£11,994,032**
CAPITAL VALUE OF NON-RESIDENTIAL SCHEME			**£0**	
COSTS OF NON-RESIDENTIAL SCHEME		**£0**		
CONTRIBUTION TO SCHEME COSTS FROM NON-RESIDENTIAL				**£0**
GROSS DEVELOPMENT VALUE OF SCHEME			**£26,001,200**	
TOTAL BUILD COSTS		**£14,007,168**		
TOTAL CONTRIBUTION TO SCHEME COSTS				**£11,994,032**

External Works & Infrastructure Costs (£)			Per unit	% of GDV	per Hectare
Site Preparation/Servicing		£0			
Roads and Sewers		£0			
Services (Power, Water, Gas, Telco and IT)		£0			
Strategic Landscaping		£0			
Off Site Works		£0			
Externals		£1,400,000	13,462	5.4%	1,834,862
Over extra - Drainage		£785,400	7,552	3.0%	1,029,358
Over extra - Soil excavation and disposal		£446,600	4,294	1.7%	585,321
Over extra - Remediation		£334,000	3,212	1.3%	437,746
Over extra - Demmolition and site clearance		£0			
		£2,966,000		11.4%	3,887,287
Other site costs					
Fees and certification	10.0%	£1,334,016	12,827	5.1%	1,748,383
Other Acquisition Costs (£)		£0			
Site Abnormals (£)					
De-canting tenants		£0			
Decontamination		£0			
Other		£0			
Other 2		£0			
Other 3		£0			
Other 4		£0			
Other 5		£0			
		£0			
Total Site Costs inc Fees		**£4,300,016**	41,346		
Statutory 106 costs		**£681,953**	6,557		
Total Marketing Costs		**£778,596**			
Total Direct Costs			**£19,767,733**		

Finance and acquisition costs			
Land Payment	£882,225	11,311 per OM home	1,156,258 per hectare
Arrangement Fee	£0	0.0% of interest	
Misc Fees (Surveyors etc)	£0	0.00% of scheme value	
Agents Fees	£8,822		
Legal Fees	£4,411		
Stamp Duty	£33,611		
Total Interest Paid	£676,537		
Total Finance and Acquisition Costs		**£1,605,606**	
Total Operating Profit		**£4,627,861**	

(i.e. profit after deducting sales and site specific finance costs but before deducting developer overheads and taxation)

TOTAL COST	**£26,001,200**	
Surplus/(Deficit) at completion 1/11/2021		**£0**
Present Value of Surplus (Deficit) at 23/1/2019		**£0**

Scheme Investment MIRR **25.0%** (before Developer's returns and interest to avoid double counting returns)

Site Value as a Percentage of Total Scheme Value 3.4% Peak Cash Requirement -£7,689,458

Appendix 1 Generic Quantitative Risk Assessment and Outline Remediation Strategy

AECOM Imagine it. Delivered.

Southern Gas Networks Site, Dane Valley, Seaford

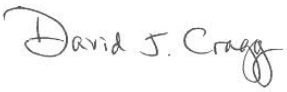
Appendix 1:
Generic Quantitative Risk Assessment and Outline Remediation Strategy
Feasibility Study Support

Lewes District Council

Project number: 60590532

26 February 2019

Quality information

Prepared by	Checked by	Approved by
		
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Revision History

Revision	Revision date	Details Authorized	Name	Position
0	31 January 2019	1st Draft	Tim Rolfe	Principal Environmental Consultant
1	26 February 2019	Final	Tim Rolfe	Principal Environmental Consultant

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1. Introduction

1.1 General

AECOM Infrastructure & Environment UK Limited (hereafter referred to as AECOM) was commissioned by Lewes District Council (LDC; the Client) to undertake an interpretative geo-environmental (land contamination) risk assessment report for former gasworks located at Blatchington Road, Seaford, BN25 2AN (the "Site). A Site Location Plan and a Site Plan for the site which were prepared by Advisian are presented in **Appendix A**. The Site forms part of a collection of plots that are proposed to be redeveloped for principally residential housing under the Dane Valley redevelopment scheme and is currently referred to as Plot 5 in that scheme.

The objective of this report is to provide an interpretive assessment of the land condition at the Site to identify and assess potential environmental land quality liabilities and constraints to the future redevelopment of the Site, including an assessment of the potential risks to environmental receptors in close proximity to the Site; and to provide an outline remediation strategy for the mitigation of land contamination risks in the context of the proposed redevelopment. This report interprets data presented in a factual report prepared by Advisian[1] (**Ref. 1**) and is intended to be read in conjunction with that report.

AECOM has previously undertaken a Preliminary Risk Assessment[2] (PRA, **Ref. 2**) for this Site on behalf of Seaford Town Council. The information in the PRA report has been used to develop the scope of this Generic Quantitative Risk Assessment (GQRA) and outline remediation strategy.

1.2 Objectives

The specific objectives of the land contamination assessment are as follows:

- Undertake a GQRA of field monitoring and laboratory chemical data to evaluate human health, property and controlled water risk based on the contaminated land exposure assessment (CLEA), Remedial Targets Methodology (RTM) and BS8485:2015 (for ground gases);
- The update and revision of the conceptual site model (CSM) developed in the PRA, evaluating potential pollutant linkages;
- Risk Evaluation, to consider whether or not the linkages identified in the CSM represent unacceptable risk to identified receptors, liabilities to future site developers and constraints to future development;
- And outline remediation strategy for mitigating risks from identified pollutant linkages in the context of the proposed development
- A foundation options assessment informing on potential specifications for future engineering design of the development; and,
- Update of the existing estimated remedial costs for the wider site and develop an outline remediation strategy to support the proposed development.

The investigation was designed to also recover geotechnical information to inform foundation and engineering design. The geotechnical interpretation will be provided separate to this report.

1.3 Proposed Development

The Site currently comprises part of a parcel of derelict land extending between Blatchington Road and Chichester Road. AECOM understands that detailed redevelopment plans are yet to be finalised, but will generally include a residential land use with large areas of hardstanding and some limited areas of landscaping.

[1] Advisian (September 2018), Environmental Assessment Factual Site Investigation Report (Draft) Blatchington Road, Seaford.
[2] AECOM (November 2017); Dane Valley, Seaford, Preliminary Environmental Risk Assessment

1.4 Assessment Methodology

The following methodology was adopted by AECOM to meet the objectives of the study:

- A review of the previous AECOM PRA, utilising the preliminary CSM formulated;
- Assessment of previous investigation data including the factual report prepared by Advisian for Plot 5, comprising a GQRA, formulation of conclusions and an outline remediation strategy and a foundation options assessment.

The assessment was undertaken in accordance with the British Standard 10175 and the Environment Agency (EA) guidance CLR 11 – Model Procedures for the Management of Land Contamination (2004) (**Ref. 3**).

1.5 Sources of Information

- Advisian (September 2018); Blatchington Road, Seaford, East Sussex, Environmental Assessment Factual Site Investigation Report (Draft) (**Ref. 1**);
- AECOM (November 2017); Dane Valley, Seaford, Preliminary Environmental Risk Assessment (**Ref. 2**);
- Grimble & Clarke (2018); A brief history of Seaford Town Gasworks and notes on the model of the gasworks as it was in 1915 (**Ref. 4**).

A list of other references referred to is provided in the References appendix at the back of this report.

2. Environmental Setting and Desk Study Summary

2.1 Site Location and Description

The Site is located between Chichester Road and Blatchington Road in East Sussex centred on a National Grid Reference E:548407 N:099395, approximately 300m to the north of Seaford Train Station. The wider development is currently formed by 10 smaller plots of land comprising open space with a mix of hardstanding and vegetation, and a number of commercial units. This report focuses on Plot 5 (henceforth referred to as "the Site") of the wider development. Plot 5 covers an area of 0.4ha, which is currently occupied by areas of dense vegetation, and concrete hardstanding in the west of the Site related to a former gasholder. Furthermore, a small area in the north-east of the Site is occupied by a PRS (pressure reducing station). A photograph in the Advisian report (Plate 9) shows 'underground storage chambers in the centre of site' but no further information on these is presented in the report.

The Site is bounded to the north by a brick wall, which forms a retaining wall where there is a break in slope downwards of approximately 1m to a hardstanding area adjacent to the north of the Site. Beneath the base of the retaining wall is a culvert. The Site is bounded to the south, east and west by a chain link fence.

The land use surrounding the Site comprises a mixture of commercial properties including a car and motorcycle centre to the north and a bowling club to the east, as well as areas of residential land use to the south and west.

2.2 Site History

A review of previous investigation data, along with historical notes (Grimble & Clarke) indicates that the Site was adjacent to Seaford Gasworks, located 50m to the south-west of the Site, since the 1870s. The gasworks infrastructure comprised a number of above ground tanks, underground pipework, two gasholders, a retort house and storage units for materials related to the production process (coke, coal, iron-oxide and tar). Information provided in the Phase II Report (Advisian, 2018), indicates that the former gasworks was operational between c.1874 and c.1961. The Site comprised open fields up until 1927, at which time a new gas holder was constructed in the eastern part of the Site, whilst the remainder of the Site was occupied by allotments. Furthermore, it should be noted that the former gasworks production area may have extended across the western boundary prior to the extension in c.1927, however the exact boundary of the gasworks relative to the Site is unclear from the historical information available.

In 1962, the gasholder in the east of the Site was removed, and a new gasholder with a larger footprint was constructed in the western part of the Site, as well as a governor house and booster house. An electrical substation can be seen in the southern part of the Site in 1974 mapping, which was removed by 2017 (no longer shown on aerial photography). The new gasholder and associated buildings constructed on Site in the 1970s were demolished by 2002, with the majority of the Site occupied by areas of grassland and concrete relating to the former buildings, the Site has since remained unchanged.

2.3 Geology, Hydrogeology and Hydrology

A review of information available in previous reports and online sources (BGS GeoIndex^{TM}) indicates that the Site is underlain by Made Ground above superficial deposits of Alluvium and possibly Head deposits comprising clays, sands and gravels, above Chalk bedrock of the Newhaven Chalk Formation. Previous Site investigation data indicates that the Made Ground underlying the Site comprises variable sandy gravel, silty gravelly sand and sandy gravelly clay and is between 0.49m and 2.79m thick, present to a maximum depth of 2.80m (Advisian, 2018). The Alluvium recorded thicknesses of between 0.3m and 6.0m, made up of sandy gravelly clay and silty sandy clay to a maximum depth of 6.6m. A layer of peat 1.6m thick was recorded in one of the boreholes located in the centre of the Site, but was not recorded elsewhere on Site. The Alluvium is underlain by Chalk bedrock which was encountered to a depth of 9m below ground level, the base of which was not proven. The Chalk encountered was structureless not competent bedrock.

The absence of made ground or fill beneath the centre of the larger gas holder was confirmed by the intrusive investigation carried out by Advisian (2018), with the borehole drilled in this location recording concrete to 0.6m underlain by Alluvium. The former gasholder present in the east of the Site may extend further below ground, however intrusive works in this area carried out by Advisian (2018) only reached maximum depths of 0.5m and the base of the made ground was not proven.

The Alluvium and Head deposits are classified by the Environment Agency (EA) as Secondary Undifferentiated Aquifer, whilst the Newhaven Chalk Formation is classified by the Environment Agency (EA) as a Principal Aquifer. The Site does not lie within an Environment Agency Source Protection Zone with regards to the extraction of water for potable supply, furthermore it is understood that the pumping station adjacent to the south-west of the Site does not pump groundwater and is not known to have ever pumped groundwater. There are no groundwater abstractions within 1km of the Site.

The Site is within a Nitrate Vulnerable Zone and an Archaeological Notification Area (DES9166) due to the discovery of medieval pottery in 1929. There are no other designations regarding sensitive sites within 500m of the Site.

Groundwater at the Site was recorded at depths ranging between 2.0m and 6.6m below ground level, with standing elevations (AOD) of between 0.444m and 0.728m. A potentiometric surface plot of groundwater within the Newhaven Chalk Formation is presented in **Figure 1**, with groundwater flow shown to be towards the north-west in the first monitoring round and the west in the second monitoring round. The site lies within a dry valley in that there is no permanent watercourse, however it is noted that the Groundsure report presented in the AECOM Phase 1 report (**Ref. 1**) notes the site has potential for both groundwater and surface water flooding.

AECOM's previous report (**Ref. 1**) noted anecdotal evidence for the possible presence of a culvert running along the Site's northwestern boundary. AECOM has undertaken detailed investigation of publically available information on drains in the area as part of a flood risk assessment for the site and has not identified anything to suggest that a culvert is present. It is therefore concluded that there is not a culvert and therefore this possibility has not been assessed further.

A pond is located approximately 165m to the northeast, and the English Channel is approximately 650m southwest of the Site. There are no other water features within 500m of the Site.

2.4 Previous Reports

The following information is summarised from Section 5 of the Advisian Phase II Report (2018), the original reports were not available for review.

In 1999 WYG completed an Environmental Desk Study Factual Report for the Site at Blatchington Road, Seaford. This summarised the Site location, geology, hydrogeology and Site history. The former use of the Site as part of a larger gasworks between c.1874 and c.1971 was confirmed by WYG. A Site walkover carried out by WYG in conjunction with the Desk Study found a gasholder base approximately 1.5m bgl in the centre of the Site, as well as a booster house, MEG (monoethylene glycol) fogger unit and underground storage chambers.

In 2002 Atkins carried out an Environmental Assessment Site Investigation which included the preparation of a factual report and an intrusive site investigation, which comprised a total of six boreholes (WS1-WS3, BH1-BH3), eight trial pits (TP1-TP8) and one surface water sample, with associated groundwater and soil sampling. The Atkins site investigation locations are shown on Figure 4 of the Advisian report, presented in **Appendix A** of this report. Made ground was encountered in all but one location (BH3, near eastern site boundary) across the Site, to a maximum depth of 2.3m bgl. This was underlain by silty clay and flint gravel, above chalk bedrock. Visual and olfactory evidence of contamination was identified in numerous locations within the made ground, which included black and blue staining, hydrocarbon odour and an acrid odour. Further visual and olfactory evidence of contamination was also identified in the superficial deposits, which included black staining and hydrocarbon odour. Free phase hydrocarbons were reported in two boreholes (BH3 (eastern boundary of Site) and WS2 (within larger gas holder). Grey staining was noted in chalk in BH3 at 9.5m bgl.

Chemical analysis of 56 soil samples and 9 groundwater samples analysed by Atkins identified ‘high’ cyanide concentrations in soil samples from TP1, TP5 and TP6 taken from the made ground in the west of the Site, and ‘elevated’ ammonium and PAHs in chalk groundwater within one borehole (BH3).

3. Preliminary Conceptual Site Model

3.1 General

Based on the AECOM PRA report, a preliminary CSM was prepared in order to assist in scoping further investigations. Potential sources of contamination, receptors and pollutant pathways identified for the Site are summarised below.

3.2 Sources of Potential Contamination

Contamination sources have been identified as follows:

3.2.1 Onsite Sources

- Made Ground of unknown quality potentially imported to the Site as part of its historic development or resulting from demolition of former buildings;
- Historical uses of the Site including former gas works and an electrical substation (1927-1974).
- Infill material of unknown quality use to fill relict below ground gas works structures (west and east of Site, 1927-2002);
- Ground gas (ie. methane and carbon dioxide) arising from any organic deposits within the Alluvium beneath the Site and also Made Ground depending on its organic matter content.
- Former gasholders (west and east of the Site, 1927-2002)
- Former gas works buildings/structures (northeast of Site, 1927-1974).

3.2.2 Offsite Sources

- Former gas works and associated buildings including a retort house, above and below ground storage tanks for process materials and products, gasholders, fuel and gas lines (adjacent to 50m west, 1863-1962);
- Current garages/car repair businesses, coach works and car valeting services adjacent or near to the Site to the west.
- Former builder's yard and associated warehouse and garage to the northwest of the Site (1963 to 2014).

3.3 Potential Contaminants of Concern

In view of the former Site activities and long history of urban/ industrial development in this area, the following potential main contaminants of concern were identified for the Site in the PRA:

- Metals – associated with Made Ground, former gasworks on Site;
- Polycyclic aromatic hydrocarbons (PAHs) - associated with Made Ground and gas works operations on Site and the current and former garages off-site. Elevated concentrations have been identified in groundwater within the underlying chalk bedrock;
- Total Petroleum Hydrocarbons (TPH) - associated with Made Ground and gas works operations and above ground tanks on Site and the former and current garages off-site.
- Phenols – associated with the former gas works operations on and off Site.
- Asbestos containing materials (ACMs) – associated with Made Ground and demolition rubble from former buildings;
- Solvents - associated with the former gas works;
- Sulphur and nitrogen-based inorganic and organic compounds – associated with the former gas works operations on Site;
- Ammoniacal Nitrogen - associated with the former gas works operations on Site. Elevated concentrations were identified in groundwater within the underlying chalk bedrock;

- Cyanides - associated with the former gas works operations on Site. Elevated concentrations were identified in Made Ground on Site;
- Polychlorinated biphenyls (PCBs) associated with a former substation on site; and
- Methane and carbon dioxide associated with biodegradation of putrescible fill materials or hydrocarbon based contaminants.

The list above is based on information provided by the EA/NHBC/CIEH 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (**Ref. 5**), together with the Department of the Environment Industry Profiles and in house experience from the investigation of similar sites.

3.4 Receptors and Pathways

Identified potential receptors and pathways associated with the proposed development are summarised in **Table 1** below.

Table 1. Potential Source-Pathway-Receptor Linkages

Source	Pathway	Receptor
Metal, inorganic and organic chemical impact within the Made Ground and superficial deposits Ground-gas associated with Made Ground and Alluvium ACMs in Made Ground (applicable to human health only)	Direct contact (ingestion, dermal contact, inhalation of dusts) with contaminated soils and asbestos fibres in areas of soft landscaping Inhalation of volatile organic vapours/ground gas from impacted soils	Construction workers Future residents of the proposed site development
	Dermal contact, ingestion, inhalation of soil dust (including asbestos)	Construction Workers
	Inhalation of volatile organic vapours/ground gas from impacted soils	Future residents of the proposed site development
	Inhalation of impacted soil dusts (including asbestos) during construction works	Site Neighbours (Commercial and Residential) Construction workers
	Leaching via surface water infiltration Lateral groundwater migration from off Site Direct transfer of chemicals in Made Ground to the aquifer during piling	Groundwater (in Secondary Undifferentiated Aquifer and Principal Aquifer)
	Leaching during direct contact between impacted soils and groundwater, then lateral migration in groundwater. Pathway not confirmed and may only be active during high water table periods.	Groundwater (in Secondary Undifferentiated Aquifer and Principal Aquifer)
	Corrosion of foundations / services and permeation of water supply and drainage pipes	Development Infrastructure
	Lateral migration of impacted groundwater	Water quality in the Chalk Principal Aquifer
	Dermal contact with chemically impacted groundwater and inhalation of volatile vapours from chemically impacted groundwater	Construction Workers
	Inhalation of volatile vapours from chemically impacted groundwater	Future residents of the proposed site development

4. Site Investigation Works

4.1 General

An intrusive site investigation (SI) was undertaken between 16th July 2018 and 19th July 2018 by Advisian on behalf of SGN. The main objectives of the SI were as follows:

- To provide sufficient information to characterise ground and groundwater conditions to supplement the findings of previous work.

The Advisian factual report (**Ref. 1**) should be referred to for details required that are not presented in this report.

4.2 Scope of Site Investigation

The scope of the intrusive SI as described by Advisian was as follows:

- "*Completion of a Health, Safety, Security and Environmental (HSSE) Construction Phase Plan (pre-works).*
- *Completion and supervision of services/utilities assessments.*
- *Review of all available factual data relating to site status, environmental setting and site history.*
- *Supervision of a targeted intrusive site investigation, including borehole drilling, window sampling and hand pitting to determine geology and the hydrogeological regime beneath the Site as well as identify any historical sub-surface structures and site constraints.*
- *Identification of visual and olfactory evidence of contamination in soils and groundwater where present across the Site and logging of soils.*
- *Collection and analysis of environmental samples including in-situ photo ionisation detector (PID) readings.*
- *Topographical surveying of the completed exploratory hole locations.*
- *Waste handling of arisings and disposal to appropriate licenced facility.*
- *Post site investigation monitoring including two rounds of groundwater and vapour monitoring and recording of field geochemical parameters, as well as collection of samples for laboratory analysis.*
- *Completion of in-situ permeability testing to estimate hydraulic conductivity of groundwater in completed exploratory hole locations.*
- *Reporting of site investigation findings."*

4.3 Methodology

4.3.1 SI Works Rationale

No rationale was provided in the Advisian Phase II Factual Report (2018) however consideration has been given by AECOM regarding the expected conditions and presence/location of subsurface and surface structures on site to infer the likely rationale. Shallow intrusive works (hand pits) appear to target the former gasholders, whilst deep monitoring wells were installed in the corners and centre of the Site presumably to give good coverage and inform upon the groundwater flow direction.

Table 2. AECOM's inferred rationale for each exploratory hole

Exploratory Hole Reference	Inferred Rationale
MW18-01	Located in the southwest of the Site to provide general coverage of ground and groundwater flow conditions, likely down-hydraulic gradient of Site. Next to former trial pit PT7 where an 'acrid odour' was reported (Atkins 2002)
MW18-02	Located in the west of the Site near TP1, TP5 and TP6 where blue staining and

Exploratory Hole Reference	Inferred Rationale
	cyanide was previously reported (Atkins 2002) and to provide general coverage of ground and groundwater flow conditions, likely down-hydraulic gradient of Site.
MW18-03	Located in the northeast of the Site adjacent to off-site former garage/ builders yard and near hydrocarbon odour previously reported at BH1 (Atkins 2002).
MW18-04	Located in the east of the Site to provide general coverage of ground and groundwater flow conditions, likely up-hydraulic gradient.
MW18-05	Located in the south of the Site to assess the ground and groundwater conditions near borehole BH3 (Atkins 2002) where NAPL was previously reported.
MW18-06	Located in the centre/ east of the Site to assess the ground conditions between the former gasholders.
WS18-01	Located in the west of the Site to assess ground conditions in the vicinity of the former gasholder and adjacent to previous trial pit TP5 (Atkins 2002).
WS18-02	Located in the centre of the Site to assess ground conditions beneath the former larger gasholder and near window sample WS2 where NAPL was previously reported (Atkins 2002).
WS18-03	Located in the north of the Site to assess ground conditions in the vicinity of the former gasholders and on north-western Site boundary.
VW18-01	Located in the southeast of the Site to assess ground vapour conditions in the vicinity of the former gasholder and on boundary near to houses east of the site.
VW18-02	Located in the southwest of the Site to assess ground vapour conditions in close proximity to commercial premises adjacent to the Site.
HP18-01	Located in the northeast of the Site to assess ground conditions within the remnant below ground smaller gas holder structure.
HP18-02	Located in the northeast of the Site to assess ground conditions within the remnant below ground smaller gas holder structure and former MEG tank.
HP18-03	Located in the southwest of the Site to assess ground conditions in the vicinity of the former larger gasholder.

4.3.2 Borehole Drilling

The ground investigation utilised window-less sampling and combined percussive/ rotary core rig drilling techniques to drill the boreholes. Prior to any drilling works commencing, each location was checked for buried services by CC Ground Investigations Ltd through review of utility service plan information and using a Cable Avoidance Tool (CAT) and Genny (where appropriate). At the cleared location, a hand-dug service inspection pit was then advanced from ground level to 1.50 m bgl prior to commencement of drilling, as a further check for buried services.

Two locations (MW18-03A and MW18-06A) refused on obstructions and were not progressed or completed as boreholes. In these cases, the borehole location was altered slightly and the borehole progressed to the target depth (Advisian, 2018).

Clean drilling techniques were employed during drilling to prevent cross contamination between geological strata. This involved reducing casing size from 128mm to 113mm between the made ground and superficial deposits.

4.3.3 Hand Pits

A total of three hand dug pits were excavated to a maximum depth of 0.5m and backfilled with soil arisings.

4.3.4 Groundwater and Ground Gas Installations

All window sample and percussive/rotary boreholes were completed for groundwater monitoring purposes, constructed with 50mm diameter High Density Polyethylene (HDPE) monitoring standpipes with a slotted well screen surrounded by 1-2mm gravel filter pack designed primarily to monitor groundwater within the Newhaven Chalk Formation and/or superficial Alluvium deposits.

Ground gas installations within VW18-01 and VW18-02 were constructed with 50mm diameter HDPE monitoring standpipes, with a slotted well screen surrounded by 1-2mm gravel filter pack. A layer of bentonite was installed above the filter pack in each well.

Monitoring Well installations are summarised in **Table 3** below

Table 3. Groundwater and Ground Gas Monitoring Installation Details

Exploratory Hole	Borehole Depth (m bgl)	Response Zone / Slotted Standpipe (m bgl)	Targeted Strata	Standpipe Diameter (mm)
MW18-01	8	5.0-8.0	NCF	50
MW18-02	8.6	6.1-8.6	NCF	50
MW18-03	7.5	5.0-7.5	NCF	50
MW18-04	7	4.0-7.0	NCF	50
MW18-05	7	4.0-7.0	ALV/NCF	50
MW18-06	9	7.5-9.0	NCF	50
WS18-01	7	5.0-7.0	ALV/NCF	50
WS18-02	7	5.0-7.0	ALV/NCF	50
WS18-03	6	4.0-6.0	ALV/NCF	50
VW18-01	1.3	0.7–1.3	MG	50
VW18-02	1.5	0.4-1.0	MG	50

- MG – Made Ground, ALV – Alluvium, NCF – Newhaven Chalk Formation
- m bgl – meters below ground level

4.3.5 Soil Logging and Sampling

Soils were observed and logged by an experienced Advisian field geologist in accordance with BS5930 2015 'Code of practice for ground investigations' and also BS EN ISO 14688-1:2002.

During logging the field geologist inspected the arisings for possible visual and olfactory indications of hydrocarbon contamination or discoloured/ stained soils. A PID was used to measure soil headspace for ionisable hydrocarbons. These observations are presented on the exploratory borehole logs.

Soil samples for geo-environmental testing were generally collected from each encountered lithology, as well as being collected from observed areas of contamination (i.e. staining and odour) and based on the PID readings. Soil samples were transferred directly into laboratory-supplied containers and labelled for shipment, under chain of custody procedures.

Specific details of sample scheduling can be found in **Table 4** below.

4.3.6 Groundwater and Ground Gas Monitoring

The borehole installations were developed on completion of the drilling works using a Whale^{TM} electronic submersible pump and purging a total of three well volumes of water. Groundwater and ground gas sampling rounds were undertaken on two occasions (13th August and 20th August 2018) following the completion of the drilling works, groundwater monitoring was undertaken using the low flow sampling method. In addition, in-situ permeability testing (slug testing) of the underlying chalk aquifer was carried out on 30th August 2018 in wells MW18-01, MW18-02 and MW18-04.

Specific details regarding the groundwater monitoring rounds, permeability testing, and ground gas monitoring rounds can be found in Section 6 of the Advisian Phase II Report (2018), along with the accompanying analytical results.

4.3.7 Laboratory Testing

UKAS and MCERTS accredited laboratory testing (where applicable) was scheduled on selected samples by Advisian. The geo-environmental laboratory analysis was undertaken by both i2 Analytical UK Ltd (soil, leachate and groundwater sample analysis) and Exova Jones (vapour sample analysis). A summary of the type and number of tests scheduled is included in **Table 4.**

Table 4. Summary of Geo-environmental Testing

Test	Total Number of Samples Scheduled
SGN Soil Suite - General Inorganics – pH, total cyanide, complex cyanide, free cyanide, thiocyanate, sulphate, chloride, elemental sulphur, ammonia, loss of ignition and organic matter. Phenols – catechol, resorcinol, cresols, naphthols, isoprophylphenol, phenol, trimethylphenol, xylenols and ethylphenols, total phenols, Polycyclic aromatic hydrocarbons (PAHs) (16 speciated). – naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene and benzo(ghi)perylene. Heavy metals/metalloids - arsenic, barium, beryllium, boron, cadmium, chromium (hexavalent), chromium (III), copper, lead, mercury, nickel, selenium, vanadium and zinc. BTEX – benzene, toluene, ethylbenzene, xylenes and MTBE. TPH (C10-C40).	42[1]
Fraction Organic Carbon (FOC)	9
Asbestos Screen	42
Asbestos Identification	11
Asbestos Quantification	3
Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG)	15
Waste Acceptance Criteria (WAC) testing	1
SGN Leachate Suite General Inorganics – pH, electrical conductivity, total cyanide, complex cyanide, free cyanide, thiocyanate, sulphate, chloride, sulphide, sulphur, ammonium, dissolved organic carbon. Phenols – catechol, resorcinol, cresols, naphthols, isoprophylphenol, phenol, trimethylphenol, xylenols and ethylphenols. Total Phenols. Polycyclic Aromatic Hydrocarbons (PAH) (USEPA 16) – naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene and benzo(ghi)perylene. Heavy metals/metalloids – arsenic, barium, beryllium, boron, cadmium, chromium (hexavalent), chromium (III), copper, lead, mercury, nickel, selenium, vanadium and zinc. BTEX – benzene, toluene, ethylbenzene, xylenes and MTBE. Total Petroleum hydrocarbons (TPH) (C10 – C40). TPH CWG.	15
SGN Water Suite General Inorganics – pH, electrical conductivity, total cyanide, complex cyanide, free cyanide, thiocyanate, sulphate, chloride, sulphide, sulphur, ammonium, dissolved organic carbon and total suspended solids. Phenols – catechol, resorcinol, cresols, naphthols, isoprophylphenol, phenol, trimethylphenol, ethylphenols and dimethylphenol. Total Phenols. Polycyclic Aromatic Hydrocarbons (PAH) (USEPA 16) – naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene and benzo(ghi)perylene.	21[2]

Test	Total Number of Samples Scheduled
Heavy metals/metalloids – arsenic, barium, beryllium, boron, cadmium, chromium (hexavalent), chromium (III), copper, lead, mercury, nickel, selenium, vanadium and zinc. BTEX – benzene, toluene, ethylbenzene, xylenes and MTBE; and, Total Petroleum hydrocarbons (TPH) (C10 – C40).	
TPH CWG (Groundwater)	18

[1]Includes duplicates and a samples of waste drilling arisings from skip

[2]Includes duplicates and trip blanks

The Advisian report includes a QA/QC assessment which concluded that the data was appropriate for reporting.

5. Ground Conditions

5.1 Sequence of Strata

The ground conditions have been assessed from the SI data outlined in the Phase II Report (Advisian, 2018). The sequence of strata encountered generally supports the published geology, comprising (from the top down): Made Ground, Alluvium and Chalk. Head Deposits were not identified, which is in line with the published geology that shows a boundary between the Alluvium and Head Deposits that runs approximately along the north-western site boundary.

Table 5 presents a summary of the sequence of strata beneath the Site.

Table 5. Geological Sequence of Strata

Strata	Range of Depths to Top (m bgl)	Range of Depths to Base (m bgl) & Elevation [mAOD]	Range of Thickness (m)	Comments
Made Ground	0-0.01	0.9 – 2.8 [2.25 to 0.98]	0.6-2.8	Encountered in all exploratory locations except WS18-02, where the concrete base of the gasholder extended to the top of the alluvium.
Alluvium	0.9-2.8	3.4-6.6 [0.17 to -3.75]	1.4 – 6.0	Encountered in all exploratory locations
Peat	5.4	7.0 [-3.38]	1.6	Encountered only in MW18-06.
Chalk	3.4-7.0	6.0-9.0[1] [-2.58 to -5.38]	0.4-4.1[1]	Encountered in all exploratory locations, full thickness not penetrated.

– [1] Not Fully Penetrated
– m bgl – meters below ground level

5.1.1 Made Ground

Made Ground was encountered in all locations (except WS18-02, within an empty gasholder base) and was variable in composition. Typically up to three different types of made ground were encountered across the Site (in order of increasing depth); variably sandy gravel, silty gravelly sand and sandy gravelly clay. The sand/gravel constituents comprise both natural and man-made materials – flint, red brick fragments, chalk, coal and clinker.

In WS18-02, where the base of the former gas holder is exposed, no made ground was encountered. In this location (positioned within the former gas holder towards the centre of the Site) a 0.6m layer of concrete extended from the surface to the top of the alluvium. It is possible that made ground is absent within the perimeter of the larger former gas holder in the centre of the Site, however this conclusion cannot be corroborated as WS18-02 was the only borehole located within the gas holder.

The thickness of Made Ground varied from 0.9m in MW18-01 positioned in the southwestern corner of the Site, to 2.8m in WS18-01 in the western corner of the Site adjacent to the former gasholder and the near retaining wall to the west. In general, thicker deposits of made ground were encountered in the north-west of the Site and thinner deposits of made ground were encountered in the south-west of the Site. Where thicker deposits of made ground were encountered, the deepest layer tended to be composed of orange/brown sandy gravelly clay, however where thinner deposits of made ground were present this layer wasn't always encountered. The uppermost made ground encountered in locations where made ground was comparably thin, was generally composed of brown/grey slightly clayey gravel. This vertical trend in the composition of made ground appears reasonably consistent across the Site.

The former gas holder in the north-east of the Site has been infilled, with both trial pits targeting this location to a maximum depth of 0.5m recording made ground of silty sand gravel and gravelly sand

from ground level to 0.5m depth. Neither handpit log reports the presence of a concrete gas holder base or other buried structure. A topographical survey figure presented in the Advisian report does not identify a change in ground level in the area of this former gas holder.

5.1.2 Alluvium

Alluvium was recorded in all boreholes and was described as orange/brown sandy gravelly clay and dark grey silty sandy clay, with the former being encountered at a shallower depth than the latter. The sand/gravel constituents comprise sub-angular to subrounded flint, chalk and chert. In general, finer silt-sized constituents were seen towards the base of this unit, with larger gravel sized constituents encountered towards the top. Furthermore, black staining and hydrocarbon odour was commonly observed towards the base of this unit, with occasional iron oxide staining.

The thickness of alluvium varied from 2.4m in MW18-04 positioned in the eastern corner of the Site, to 6.0m in WS18-02 positioned in the near the centre of the Site.

5.1.3 Peat

A layer of peat was recorded in MW18-06, described as dark brown clayey peat with a strong organic odour and slight diesel odour. This layer measured 1.6m in thickness and was located at a depth of 5.4m. It was not encountered in any other exploratory holes and therefore the extent of this peat layer cannot be confirmed, however given the positioning of MW18-06 in comparison to the remaining deeper boreholes (located towards the edges of the Site) it is likely that this peat layer is confined to the central region of the Site or represents part of a relic infilled narrow channel that has not been encountered in other locations.

5.1.4 Chalk

The Newhaven Chalk Formation was encountered in all boreholes described as structureless white chalk composed of an uncompacted matrix containing either slightly sandy silty gravel or slightly sandy silty gravel with cobbles, the latter being encountered at a greater depth. In some locations the structureless chalk without cobbles was not encountered, however both chalk horizons were described as weathering grade D/C. Boreholes encountering structureless chalk without cobbles were located towards the west of the Site, whereas chalk with coarser constituents was encountered towards the eastern area of the Site. Competent chalk was not encountered in any of the locations.

5.1.5 Field Observations of Contamination

Field observations of contamination are presented below in **Table 6**.

Table 6. Summary of Visual and Olfactory Observations

Exploratory Hole	Stratum	Depth (mbgl)	PID (ppm)	Visual and Olfactory Evidence
MW18-01	Made Ground	0.01-0.3	0	Clinker
	Alluvium	4.15	0	Black staining and specks
MW18-02	Made Ground	0.01-0.6	0	Coal
		0.2-0.3	0	Blue staining (spent oxide)
		0.6-0.2	0	Coal
	Alluvium	5.2	0	Black staining and specks
MW18-03	Made Ground	0.3-0.4	0	Blue staining (spent oxide)
		0.3-0.5	0	Coal
	Alluvium	2.0-3.0		Strong diesel odour
		2.9-3.0	27.8	Diesel staining and hydrocarbon globules
	Chalk	4.5-5.0	0.3	Slight diesel odour
MW18-03A	Made Ground	0.3-0.5	0	Coal
MW18-04	Made Ground	0.01-0.2	0	Coal
	Alluvium	2.9-3.0	3.4	Black staining and moderate hydrocarbon odour

Exploratory Hole	Stratum	Depth (mbgl)	PID (ppm)	Visual and Olfactory Evidence
		3.4-3.6	0.5	Slight diesel odour
MW18-05	Made Ground	0.01-0.7	0	Coal
		0.7-1.2	0	Coal and clinker
	Alluvium		9.2	Strong diesel odour
			43.5	Diesel staining and odour, hydrocarbon globules
	Chalk		7.6	Hydrocarbon globules and slight diesel odour
MW18-06	Made Ground	0.01-0.3	0	Coal
	Alluvium	2.1-3	31.7	Diesel staining and strong diesel odour, hydrocarbon globules
		3-4.7	3.6	Moderate diesel odour
		4.9-5.2	16.2	Black staining and moderate diesel odour
	Peat	5.4-7.0	1.0	Slight diesel odour
VW18-01	Made Ground	0.01-0.3	0	Clinker
VW18-02	Made Ground	0.01-0.8	0	Blue Staining (spent oxide)
WS18-01	Made Ground	0.01-0.3	0	Clinker
	Alluvium	4.3	0	Black specks
WS18-02	Alluvium	3.0-6.66	0	Black specks
WS18-03	Made Ground	0.01-1.6	0	Clinker
	Alluvium	2.5-3.0	236	Hydrocarbon globules and strong diesel odour
		3.0-4.3		Hydrocarbon globules and strong diesel odour
	Chalk	4.3-6.0	100.2	Hydrocarbon globules and strong diesel odour
HP18-02	Made Ground	0.01-0.5	0	Clinker

It should be noted that the response zones of the MW** and WS** wells are installed below the water table and therefore any light non-aqueous phase liquid (LNAPL) at these locations would not form a measureable layer within the wells.

5.2 Groundwater

5.2.1 During Drilling Works

Groundwater observations noted during drilling are summarised in **Table 7**. These observations are based on Advisian's drilling records.

Groundwater strikes in the boreholes were encountered at 5.1m to 9.8m bgl (25.9m AOD to 21.4m AOD) within the Alluvium or Chalk. Shallower perched water groundwater strikes were encountered in four of the eleven window sampler holes at 0.9m to 3.0m bgl (28.3m AOD to 31.1m AOD) within Made Ground or Alluvium.

Table 7. Summary of groundwater encountered during drilling

Exploratory Hole	Groundwater Strike (m bgl)	Groundwater rest level (m bgl)	Groundwater levels during monitoring (m bgl)	Screened Strata
MW18-01	5.5	4.5	3.44-3.46 (0.68-0.66)	Newhaven Chalk Formation
MW18-02	4.3	4	3.42-3.54 (0.58-0.46)	Newhaven Chalk Formation
MW18-03	-	-	2.59-2.75 (0.50-0.66)	Newhaven Chalk Formation

Exploratory Hole	Groundwater Strike (m bgl)	Groundwater rest level (m bgl)	Groundwater levels during monitoring (m bgl)	Screened Strata
MW18-04	3	2.8	2.69-2.82 (0.59-0.72)	Newhaven Chalk Formation
MW18-05	-	-	2.85-2.99 (0.57-0.71)	Alluvium & Newhaven Chalk Formation
MW18-06	-	-	2.8-2.97 (0.54-0.71)	Newhaven Chalk Formation
WS18-01	5.4	4.07	3.1-3.23 (0.44-0.57)	Alluvium & Newhaven Chalk Formation
WS18-02	6.6	2.55	1.99-2.07 (0.65-0.73)	Alluvium & Newhaven Chalk Formation
WS18-03	4.3	3.1	-	Alluvium & Newhaven Chalk Formation

5.2.2 Groundwater Level Monitoring

Groundwater monitoring standpipes were screened at selected depths to target the Newhaven Chalk Formation. Details of the installations and groundwater levels from the two rounds of monitoring completed to data are contained in the Advisian Phase II Report (**Ref. 1**) and also summarised in **Table 7**.

Groundwater within the four wells screened only in the Newhaven Chalk Formation was noted at levels between 0.461m AOD and 0.724m AOD (3.54m to 2.85m depth). Groundwater within the remaining four wells screened within both the Alluvium and Newhaven Chalk Formation was noted at levels between 0.444m AOD and 0.728m AOD (3.1m to 2.07m depth). Upon comparison, the groundwater in monitoring wells screened within both the alluvium and the chalk is recorded at a shallower depth than in monitoring wells screened only within the chalk when comparing holes near one another. However given the relatively small variation between water levels within both geological units, it is likely that there is at least some hydraulic connectivity between the two with also an element of downward gradient.

Groundwater contours developed based on the chalk aquifer groundwater elevations presented in **Table 7** infer a groundwater flow direction towards the north-west which is towards the centre of the dry valley in which the site lies. On 13 August 2018 the flow direction was north-north-west under a gradient of 0.005 and on 20 August 2018 the flow directions was west-north-west under a gradient of 0.017.

5.2.3 Hydraulic Conductivity Testing

Hydraulic conductivity testing was completed on three wells MW18-01, MW18-02 and MW18-04 using a ‘slug’ to perform three rising and three falling head tests. The slug dimensions and the groundwater levels immediately prior to each test are not provided in the Advisian report, therefore it is not possible to calculate the hydraulic conductivity of the wells.

The available raw data have been processed and indicate that the tests recovered relatively quickly within five to ten seconds, and showed an oscillatory response, which suggests highly permeably strata. This is typical for the chalk geology in which the response zones of these wells are installed. Tests in MW18-04 took slightly longer to recover than the other wells.

5.3 Ground Gas Monitoring

Two return ground-gas monitoring visits have been undertaken to date which coincide with the groundwater level monitoring. The ground gas monitoring data is summarised in **Table 8**.

Table 8. Summary of Ground-Gas Monitoring Results

Gas	Concentration Range	Location of Highest Value (lowest for O_2)
Methane (CH_4)	ND to 0.3% v/v	VW18-02 (13/08/2018)
Carbon dioxide (CO_2)	ND to 1.3% v/v	VW18-02(13/08/2018)
Oxygen (O_2)	20.7 to 21.2% v/v	VW18-01 (20/08/2018)
Carbon Monoxide (CO)	ND to 2.6ppm	VW18-02 (20/08/2018)
Hydrogen sulphide (H_2S)	ND	N/A
VOCs (PID readings)	ND	N/A
Flow (l/hr)	ND	N/A
Atmospheric pressure (m bar)	1003 to 1004 in Round 1 and 1017 to 1019 l/hr in Round 2	

- % v/v – percentage volume;
- ppm – parts per million;
- l/hr – litre/hour;
- m bar – millibar; and
- ND – Not detected above gas detection limits of apparatus. Detection limits of apparatus are:
  - Methane 0.1 % v/v.
  - Carbon dioxide 0.1 % v/v.
  - Oxygen 0.1 % v/v.
  - Hydrogen sulphide 0.1 ppm above 1 ppm then 1 ppm above 100 ppm.
  - Carbon monoxide 0.1 ppm above 1 ppm then 1 ppm above 100 ppm.
  - Flow 0.1 L/hr.

Atmospheric pressure ranged from 1003 mB to 1004 mB in Round 1 and 1017 mB to 1019 mB in Round 2, increasing slightly during the course of the two monitoring rounds.

Carbon dioxide was recorded at a maximum concentration of 1.3 % v/v in VW18-02 during the first monitoring round, which fell to 0% after purging. It was not detected again in this well in the second round. Carbon monoxide was reported at 2.6 ppm in in VW18-02 in the second round before purging, but not after purging.

Methane (1.3% v/v) was detected in VW18-02 whilst purging during the first monitoring round but were not detected during the second monitoring round.

No notable depleted oxygen concentrations were detected in either borehole during either of the monitoring rounds. Both boreholes were installed in or below material logged as ‘clayey’ or ‘clay’ and so would have been expected to report reduced oxygen content, therefore the absence of depleted oxygen may indicate ingress of ambient air into the samples. The Advisian report does not state whether or not any leak checking was undertaken.

A PID was used to monitor the boreholes for VOCs. No notably elevated concentrations of VOCs were detected in either borehole during either of the monitoring rounds.

6. Generic Quantitative Risk Assessment

6.1 Selection of Generic Assessment Criteria (GAC)

The purpose of a Generic Quantitative Risk Assessment (GQRA), as defined in CLR11, is to establish whether Generic Assessment Criteria (GAC) and assumptions about a site are appropriate for assessing risks and, if so, to apply them to site data in order to establish whether there are actual or potentially unacceptable risks.

The GQRA also determines whether further detailed assessment is required. In doing so, it confirms whether the contaminant linkages identified in the PRA are of concern or not.

For this GQRA, laboratory test results have been compared against a range of GAC published by authoritative national or international bodies, or developed in accordance with methodologies set out by these bodies.

The GAC selected for this assessment are based on the preliminary CSM and identified linkages in **Section 3.4**. The key aspects of the CSM relevant to GAC selection include:

- The proposed residential use of the Site following redevelopment.
- The presence of residential and commercial properties surrounding the Site.
- The classification of groundwater underlying the Site as a Secondary-Undifferentiated aquifer (Alluvium) and a Principal Aquifer (Newhaven Chalk Formation) and the absence of any nearby surface waters likely to receive groundwater from the site.

The GAC have been taken from the following sources, in order of preference, with two different generic land-use scenarios (high density residential and residential public open space) considered:

- LQM/CIEH Suitable 4 Use Levels (S4ULs);
- EIC/AGS/CL:AIRE GAC;
- AECOM (modified EIC/AGS/CL:AIRE);
- Defra Category 4 Screening Levels (C4SLs);
- Dutch Serious Risk Concentrations and Intervention Values;
- USEPA Regional Screening Levels (RSLs);
- SoBRA groundwater vapour GAC.

AECOM Soil GAC are available for two soil types – sand and sandy loam – and three total organic carbon contents (TOC) – 0.58-1.45%, 1.45-3.48% and >3.48%. Based on the information described in Section 6.1 above, and using the AECOM-derived geometrical mean concentration of 3.5% from nine shallow (0-1m bgl) soils samples at the Site, GAC have been selected for a sandy loam soil type with TOC >3.48%.

The high density residential (HDR) GAC are considered to be protective of users of both future residents on-site and off-site residents since they assess the indoor vapour inhalation pathway. However, they do not assess risk from direct contact and ingestion pathways, therefore the residential public open space GAC have been selected to assess risk in areas of proposed soft landscaping within the development. The HDR GAC are also protective of workers in the commercial properties adjacent to the site, for which they will provide conservative assessment.

The groundwater vapour GAC are available for a sandy soil type with a TOC content of 0.58% (1% soil organic matter). They assume that groundwater is 1m bgl, therefore they will be conservative for this site which has TOC content of >3.48% and depth of groundwater of over 2.0m bgl.

TPH fractions have additionally been assessed assuming an additive toxicological effect for each individual fraction as per Environment Agency guidance (2005). A hazard quotient (HQ) is calculated for each individual fraction by dividing the fraction concentration by its corresponding GAC. The HQs

for each TPH fraction in an individual TPH sample are then summed to calculate the hazard index (HI) for that sample. For any samples where the theoretical vapour saturation limit for individual fractions was exceeded, the contribution of each fraction to the total quotient has been limited to the risk at vapour saturation. An HI greater than 1.0 indicates an exposure that exceeds the health criteria value protective of additive adverse health effects.

6.1.1 Asbestos

UK derived risk based GAC for assessing asbestos in soil are not available. However, a range of threshold values for evaluating asbestos in soil concentrations are available from national and international organisations and these are summarised in **Table 9** below.

Table 9. Asbestos and ACM Criteria

Screening Criteria	Source	Applicability
0.1 % by weight	EA	Hazardous waste limit, applies to any form of asbestos (ACM, free fibres) in soil. Not risk based and not relevant to human health
0.001 % by weight	ICRCL	Applies to 'asbestos in soil' on the basis that asbestos in loose dry soils, at concentrations as low as 0.001% by weight, when disturbed, may give rise to measurable concentrations of airborne concentrations of asbestos in excess of 0.1 fibres/ml.
0.01%	Dutch Intervention Value	Only to be compared to the concentration of serpentine asbestos (chrysotile) + 10 x concentration of amphibole asbestos (amosite and crocidolite)
0.1% by weight	Dutch Screening Value	Only to be compared to non-friable asbestos content e.g. cement
0.001% by weight	Dutch Screening Value	Compared to respirable asbestos fibres. Respirable fibre content has not been reported as part of this site investigation and therefore this screening value will not be used.
0.001% by weight	Australian DOH	Asbestos fibres and friable asbestos
0.05% by weight	Australian DOH	ACM such as cement board

6.1.2 Controlled Waters GAC

For the assessment of linkages associated with potential adverse effects to controlled waters and taking into account the information presented above, GAC have been selected to be protective of groundwater as a drinking water resource and to be protective of surface water bodies that might be affected by lateral migration from affected groundwater. The water GAC have been taken from the following sources:

- UK Drinking Water Standards (DWS) – The Water Supply (Water Quality) Regulations 2016;
- World Health Organisation (WHO) Guidelines for Drinking Water Quality (3rd edition), 2011;
- World Health Organisation (WHO), 2008. Petroleum Products in Drinking-water. Background document for development of WHO Guidelines for Drinking-water Quality;
- USEPA Regional Screening Levels (RSLs) (tapwater); and,
- AECOM DWG (adopting WHO methodology).

To evaluate potential risks to controlled waters from reported soil concentrations, soil GAC were calculated as the theoretical soil concentrations that would partition at equilibrium to give a concentration in soil pore water equal to the water GAC selected from the above list. The soil properties required to complete this calculation (total porosity, air filled porosity, water filled porosity, dry bulk density) have been estimated using generic values for a sandy soil type from AECOM's internal soil properties database and a TOC content of 1%. The TOC content affects GAC for organic contaminants only. The selected 1% TOC content is likely to be conservative for shallow impacts but not for deeper impacts. However, deeper samples were typically from close to or below the water table and therefore are better represented by reference to measured groundwater impacts rather than theoretical partitioning equations.

Although groundwater data are available for the Site, soil screening is required to identify potentially significant areas of soil impact that might not yet have had sufficient time to impact groundwater, or to assess potential impacts to groundwater in areas of the site where groundwater data are absent. It is noted that this approach is generally conservative; however, the methodology is consistent with the Environment Agency's preferred approach as outlined within the RTM guidance document[3].

6.1.3 Property GAC

6.1.3.1 Aggressive Ground Conditions

The soil and groundwater data for sulphate have been compared against the BRE Special Digest 1: Concrete in Aggressive Ground (**Ref. 6**) thresholds to evaluate the likely concrete classification for any future development.

6.1.3.2 Ground Gas

The primary ground gas guidance in the UK is contained within BS8485:2015 (**Ref. 7**), CIRIA C665 (**Ref. 8**) and NHBC Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present (**Ref. 9**). These documents generally deal with the safe development of land affected by ground gases rather than assessing risks to existing receptors and as such the available screening values are not quantitatively risk-based in the same manner as the human health and controlled waters criteria summarized above. However, the acceptable risk threshold is generally considerably lower for site redevelopment under Planning than for Part 2A of the EPA and therefore the screening approach described in these documents is considered to be an appropriate starting point for the generic evaluation of ground gas risk at the Site. On this basis, the adopted ground gas GAC are as follows:

- Gas Screening Value (calculated as per CIRIA C665) of <0.07 litres per hour;
- Methane concentration <1% by volume; and
- Carbon dioxide concentration <5% by volume.

6.2 Soil Laboratory Results

A total of 43 No. soil samples were collected and tested for a range of Potential Contaminants of Concern (PCoC) as described in **Section 3.3**. Sample results were screened against a range of available human health and controlled waters GAC appropriate for the proposed future land-use and environmental site setting. Consideration was given to completing statistical assessment on the data, however given the limited sample number in each potential sample population, together with the potential for localised sources, this was not considered to be appropriate. Individual exceedances of human health and controlled waters GAC in soil samples are summarised in **Table 10** below and exceedances in soil leachate are presented in **Table 11**. The full tabulated results are included in **Tables 1**, **2** & **3**, **Appendix B**.

[3] Environment Agency, 2006. Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination

Table 10. Summary of Human Health and Controlled Waters Soil GAC Exceedances

	Contaminant of Concern	No. of samples	Concentration (mg/kg)		HH GAC		CW GAC	No. of GAC Exceedances		
			Minimum	Maximum	POSresi	HDR	Drinking Water	POS (res)	HDR	Drinking Water
BTEX										
	Benzene	32	<0.001	0.008	73	0.13	0.000731	0	0	1
	Ethylbenzene	32	<0.001	0.161	25,000	30	1.36	0	0	0
TPH	TPH aromatic >C5-C7	15	0.008	0.008	56,000	130	0.000731	0	0	1
	TPH aromatic >C7-C8	15	ND	<0.001	56,000	320	0.0101	0	0	0
	TPH aromatic >C8-C10	15	1	4	5,000	18	1.47	0	0	2
	TPH aromatic >C10-C12	15	1.1	69	5,000	100	4.78	0	0	4
	TPH aromatic >C12-C16	15	4.4	880	5,000	>Sat	2.27	0	0	10
	TPH aromatic >C16-C21	15	26	1400	3,800	>Sat	4.51	0	0	10
	TPH aromatic >C21-C35	15	72	1100	3,800	>Sat	12.7	0	0	10
TPH HI	TPH (groundwater)	15	<0.01	1.20	-	1.00	-	0	2	-
	TPH (soil)	15	<0.01	1.49	-	1.00	-	0	2	-
PAH										
	Naphthalene	32	<0.05	16	4,900	0.85	0.039	0	5	11
	Acenaphthylene	32	<0.05	16	15,000	-	0.328	0	0	15
	Acenaphthene	32	<0.05	7.9	15,000	-	0.423	0	0	6
	Fluorene	32	<0.05	17	9,900	-	0.339	0	0	6
	Phenanthrene	32	<0.05	58	3,100	-	0.22	0	0	20
	Anthracene	32	<0.05	25	74,000	-	5.06	0	0	3
	Fluoranthene	32	<0.05	79	3,100	-	0.728	0	0	18
	Pyrene	32	<0.05	66	7,400	-	1.46	0	0	18
	Benz(a)anthracene	32	<0.05	47	29	-	2.72	0	0	9
	Chrysene	32	<0.05	38	57	-	3.85	4	0	7
	Benzo(a)pyrene	32	<0.05	36	5.7	-	0.0129	3	0	22
	Dibenz(a,h)anthracene	32	<0.05	7	82	-	0.13	4	0	13
	Benzo(g,h,i)perylene	32	<0.05	25	0.58	-	sum of 4	0	0	0
	Benzo(b)fluoranthene	32	<0.05	77	640	-	sum of 4	2	0	0
	Benzo(k)fluoranthene	32	<0.05	33	7.2	-	sum of 4	0	0	0
Phenolics	Phenol	32	17	<0.1	1,300	-	1.91	0	0	0

	Contaminant of Concern	No. of samples	Concentration (mg/kg) Minimum	Maximum	HH GAC POSresi	HDR	CW GAC Drinking Water	No. of GAC Exceedances POS (res)	HDR	Drinking Water
Metals	Arsenic	32	7.4	62	79	-	5	0	0	32
	Barium	32	16	3,200	-	-	53.3	0	0	15
	Cadmium	32	<0.2	2	120	-	0.5	0	0	10
	Chromium (trivalent)	32	14	220	1,500	-		0	0	0
	Copper	32	7.2	180	12,000	-	200	0	0	0
	Lead	32	12	18,000	630	-	26.9	4	0	29
	Nickel	32	4.4	46	230	-	10	0	0	32
	Selenium	32	<1	2.4	1,100	-	0.5	0	0	10
	Zinc	32	31	1,500	81,000	-	114	0	0	1
	Chromium (hexavalent)	32	<0.1	<4	7.7	-		0	0	0
	Vanadium		17	73	2,000	-	1.09	0	0	32
Inorganics	Cyanide (Free)	32	<1	39	20	-	150	1	0	0
	Cyanide Total	32	<1	4,500	78	-		6	0	0
Asbestos	Asbestos Quantification - Total - %		<0.001	<0.001	<0.001	-		0	0	n/a

NOTES

' - ' : GAC not identified (usually no pathway)

Table 11. Summary of Human Health and Controlled Waters Soil GAC Exceedances (Soil Leachate)

Contaminant of Concern	No. of samples	Concentration (µg/l) Minimum	Maximum	Drinking Water GAC	No of Drinking Water GAC Exceedances
Thiocyanate	15	<0.2	0.2	0.004	1
Cyanide (Free)	15	<0.01	0.01	Use Total	0
Cyanide Total	15	<0.01	0.01	0.05	1

No other exceedances of Controlled Waters GAC were recorded within the data set.

No exceedances of Human Health HDR or Public Open Space (POS) GAC were recorded within the data set.

6.2.1 Human Health Exceedances

The screening of soil concentrations against GAC has identified the following exceedances of human health criteria:

HDR GAC

- The reported naphthalene concentrations exceeded HDR GAC in five samples (MW18-02/1, 0.2-0.3m; MW18-05/3, 4.2-4.3m; MW18-06/2, 2.1-2.2m; MW18-06/3, 4.9-5m and WS18-03/2, 2.6-2.7m). The maximum naphthalene concentration of 16 mg/kg was reported in sample MW18-06/2 (2.1-2.2m) taken from the Alluvium where diesel staining and hydrocarbon globules were observed during drilling. There were no other HDR GAC exceedances reported from the data set.
- TPH HI exceeded GAC in two samples, with TPH HI of 1.49 reported in MW18-06/2 (2.1-2.2m) and 1.39 reported in WS18-03/2 (2.6-2.7m), although no exceedances were reported for individual fractions. These the same samples as the naphthalene exceedances reported above.

POS Residential GAC

- Benzo(a)pyrene concentrations exceeded the public open space residential GAC in five samples (HP18-01, 0.1-0.2m; MW18-02/1, 0.2-0.3m; MW18-05/1, 0.15-0.2m; VW18-01/1, 0.2-0.3m and WS18-03/1, 0.1-0.2m). The maximum reported benzo(a)pyrene concentration was 36 mg/kg in sample MW18-02/1 (0.2-0.3m) taken from the Made Ground.
- Concentrations of dibenz(a,h)anthracene also exceeded the public open space GAC in the following eight samples: HP18-01, 0.1-0.2m; HP18-03, 0.2-0.3m; MW18-02/1, 0.2-0.3m; MW18-03/1 (0.3-0.4m); MW18-05/1, 0.15-0.2m; VW18-01/1, 0.2-0.3m and VW18-02/1 (0.15-0.25m) and WS18-03/1, 0.1-0.2m. The highest concentration of dibenz(a,h)anthracene (7mg/kg) was recorded in MW18-02/1 (0.2-0.3m) taken from the Made Ground.
- Concentrations of benzo(b)fluoranthene exceeded public open space residential GAC in two samples (HP18-01, 0.1-0.2m; MW18-02/1, 0.2-0.3m, MW18-05/1, 0.15-0.2m; VW18-01/1, 0.2-0.3m; VW18-02/1, 0.15-0.25m; and, WS18-03/1, 0.1-0.2m), with the maximum concentration (77mg/kg) recorded in MW18-02/1, 0.2-0.3m).
- Concentrations of lead exceeded the public open space residential GAC in four samples, with one marginal exceedance at VW18-02/1 (0.15-2m) and three potentially significant exceedances at HP18-03(0.2-0.3m), MW18-03/1 (0.3-0.4m) and MW18-06/1 (0.1-.0.2m). The maximum concentration (18,000 mg/kg) was reported at MW18-06/1.
- Concentrations of thiocyanate and free cyanide exceeded the GAC in one sample MW18-02/1, 0.2-0.3m where 23 mg/kg and 39 mg/kg were reported, respectively. Concentrations of total and complex cyanide were reported above GAC in six samples HP18-03, 0.2-0.3m; MW18-01/1, 0.1-0.2m, MW18-02/1, 0.2-0.3m; MW18-06/1 (0.1-.0.2m); VW18-02/1, 0.15-0.25m; and, VW18 02/2, 0.1-0.2m. The maximum total and complex cyanide concentrations were also in MW18-02/1, 0.2-0.3m (4,500 mg/kg for both compounds).
- There were no other exceedances of public open space residential GAC reported from the data set. Asbestos fibres were not quantifiable using an MDL of 0.001% in the three samples where asbestos was detected, and therefore the potential risks from asbestos in those samples are considered to be acceptable.
- In general, the highest concentrations of COPC exceeding public open space residential GAC were recorded in shallow samples taken from the made ground, with COPC recorded below GAC or below method detection limit (MDL) in corresponding deeper samples within the same location. Furthermore, the highest concentrations of COPC exceeding public open space residential GAC were recorded in MW18-02/1 (0.2-0.3m).

6.2.2 Human Health Risk Evaluation

6.2.2.1 Residential Land-use

HDR GAC

These GAC consider only the potential for intrusion of vapours from volatile compounds into buildings. The exceeded GAC for HDR risk were for naphthalene and TPH HI only. As the TPH HI are marginal and correspond with naphthalene concentrations that exceed naphthalene GAC by a greater magnitude, naphthalene concentrations are considered to be a suitable marker for risks from TPH vapours in soil to future receptors at this site so TPH has not been assessed further.

Two of the naphthalene exceedances are marginal and taken from below the water table (MW18-05/3 4.2-4.3m and MW18-06/3 4.9-5.0m), therefore there is no direct pathway from these soil impacts and they should be assessed based on the groundwater impacts at the same locations. Of the remaining three naphthalene impacts above GAC, MW18-02/1 0.2-0.2m, MW18-06/3 2.1-2.2m and WS18-03/1 2.6-2.7m, the exceedances of HDR GAC are by over an order of magnitude and are considered to represent potentially unacceptable risk to future on-site properties.

Risks to existing offsite residential properties from naphthalene in soil are considered to be acceptable on the basis that all off-site properties are over 15m from the locations of the exceedances whereas the GAC assume that the entire property is underlain by contamination.

In general concentrations of volatile compounds in soil are lower than commonly encountered in former gas works sites. This is consistent with the known site history, which is that it has not been used for gas production, and indicates that there has not been extensive dumping of waste materials containing volatile compounds on site. However, it is noted that the current site investigation has limited spatial density and contamination may exist that has not been identified during these works.

POS Residential GAC

These GAC consider only the potential for direct contact and ingestion of surface soil with future site users within soft landscaped areas of the development.

There were widespread exceedances of GAC for PAHs, with approximately half of the shallow (<1.0m bgl) samples returning concentrations above GAC for at least one of the PAHs. The initial screen has been completed with reference to the conservative LQM 2014 S4UL GAC. Further assessment has been completed using the DEFRA Category 4 Screening Level (C4SL) for benzo(a)pyrene[4] together with the approach recommended by Public Health England[5], whereby if PAH contamination is consistent with a coal tar source then benzo(a)pyrene concentrations can be used as a marker for risks from all of the PAHs. Based on the known site history as part of a gas works that would have produced coal tar and the ratios of the PAHs to benzo(a)pyrene, it is considered appropriate to use benzo(a)pyrene as a marker for risks from all PAHs at this site and risks from individual PAHs have not been assessed further.

The C4SL for benzo(a)pyrene in a POS Residential scenario is 10.0 mg/kg, as opposed to 5.7 mg/kg benzo(a)pyrene or 0.7 mg/kg coal tar as surrogate marker derived by LQM. The C4SL was exceeded in three samples, all of which were shallow samples from the upper 1m bgl: MW18-02/1, 0.2-0.3m; MW18-05/1, 0.15-0.2m; and, VW18-01/1, 0.2-0.3m. This represents 20% of the shallow samples (<1.0m bgl) that were analysed. There is not a clear spatial distribution to these samples. The C4SLs are considered representative of a value below which risks are 'acceptably low' therefore it is inferred that exceedance of this value represents potentially unacceptable risk from PAHs in the vicinity of these samples. Due to the heterogeneous nature of PAH concentrations in soil and the limited number of shallow soil samples (fifteen in the current SI, or one per 265 m^2) it is reasonably likely that there are other locations where benzo(a)pyrene concentrations exceed the C4SL. Similarly, more intensive sampling around the three locations may demonstrate that representative PAH concentrations in those areas are lower than those found in individual samples. Thus it is not

[4] Department for Environment Food and Rural Affairs (DEFRA), SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Policy Companion Document. 2014.
[5] Public Health England (PHE). Contaminated land information sheet: risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs)*. September 2017.

considered appropriate based on current information to divide the site into areas where PAHs are or are not considered to represent potential unacceptable risk.

Lead concentrations were reported above the POS Residential GAC, which is a C4SL, in four samples, all of which were in shallow soils, which represents 25% of shallow samples. There is not a clear pattern to the distribution, although the two samples with >10,000 mg/kg are relatively near one another in the northern part of the site. There are currently no published GAC protective of potential acute risks, however it is noted that the concentrations of 15,000 mg/kg at MW18-03 and 18,000 mg/kg at MW18-06 could be considered to represent potential acute risk as well as chronic risk.

Total/ complex cyanide concentrations were reported above the POS Residential GAC in six shallow samples over five locations, representing 33% of the sample locations. The locations are spread across the site rather than confined to a particular area. It should be noted that this GAC is based on Dutch Intervention Value that is protective of both chronic and acute risks and therefore statistical averaging of the concentrations over a larger area is not appropriate due to the potential acute risks. In addition, free cyanide was detected at one location, at a concentration nearly twice its GAC which is also protective of acute risks.

Asbestos fibres were detected in three samples, but were below the limit of quantification of 0.001% and therefore the detected concentrations are not considered to present unacceptable risk to health. However, it should be noted that the absence of quantifiable asbestos in the samples analysed should not be taken to confirm acceptable risks from asbestos across the whole area since asbestos contamination can be highly localised.

In conclusion, concentrations of PAHs, lead and cyanide in shallow soils are considered to represent potentially unacceptable risk to future site users. Cyanide contamination has been confirmed as widespread, and there is currently insufficient data to confirm that the PAHs and lead concentrations are not also widespread. None of the deeper soil samples analysed (>1.0m bgl) exceeded the POS Residential GAC which indicates that there may be potential for re-use of deeper soils, subject to further assessment and consideration of the sampling density of deeper strata. It is noted that the POS GAC for several hydrocarbon fractions and BTEX are likely to exceed concentrations where aesthetic considerations (odour, oily appearance) are unlikely to be acceptable in surface soils.

6.2.2.2 Adjacent Commercial Land-use

The majority of COPC that exceed GAC protective of human health are metals or low volatility PAHs and therefor there is not a viable pathway to the off-site commercial properties. Naphthalene in soil exceeded HDR GAC and is volatile, therefore presents a theoretical risk. However the maximum concentration detected was 16 mg/kg whereas AECOM has derived a GAC protective of Commercial use of 19 mg/kg which indicates that naphthalene on soil does not present unacceptable risk to the off-site commercial properties. Furthermore, concentrations of naphthalene in the soil vapour samples were below MDLs (see **Section 6.4**), indicating that there is not extensive lateral migration of this COPC. It is therefore concluded that risks to workers in the adjacent properties from contamination on the site are acceptable.

6.2.2.3 Waste Classification of Site Soils

A full waste characterisation is outside the scope of this report. However it is noted that multiple lead samples and possibly cyanide concentrations in shallow soils are likely to exceed Hazardous Waste thresholds, and therefore if these soils were to be disposed off-site then some or all of the shallow soil is likely to be considered as Hazardous Waste.

6.2.3 Controlled Waters Exceedances - Soils

The screening of soil concentrations against GAC has identified the following exceedances of controlled waters criteria:

- Of the fifteen samples, all aliphatic TPH fractions were below DWS GAC. All samples reported exceedances of TPH Aromatic fraction GAC, however in five of these the MDL was greater than the GAC and in the additional absence of significant concentrations of BTEX or PAHs in the

same samples, these five samples are not considered to represent exceedance of DWS GAC. The TPH Aromatic >C10 detections exceeded DWS GAC in the majority of samples, typically by up to two orders of magnitude. Lower molecular weight TPH Aromatic fractions were not detected except in MW18-05/5 (4.2-4.3m) and MW18-06/2 (2.1-2.2m) and WS18/03 (2.6-2.7), which typically exceeded GAC by up to an order of magnitude.

- Benzene was below the MDL in all 30 samples except for MW18-05/3 (4.2-4.3m) where 0.008 mg/kg were reported which marginally exceeds DWS GAC. The benzene MDL is greater than the GAC however in the absence of significant detections of other BTEX compounds or benzene range hydrocarbon fractions in the majority of samples they are not considered to be significantly exceeding GAC.
- Toluene, ethyl benzene and xylenes (TEX) were also below MDLs in the majority of the 30 samples and were below DWS GAC in all samples.
- Out of the 30 samples analysed for PAHS exceedances of DWS GAC were reported in approximately two thirds of samples, typically by one to three orders of magnitude. The majority of exceedances were in made ground samples.
- The majority of metals exceeded DWS GAC with at least five metals exceeding GAC in all samples. There was only one exceedance for zinc DWS GAC at MW18-06/1 (0.1m-0.2m) where 1,500 mg/kg were reported. Cadmium was detected in ten samples with a maximum of 2 mg/kg in MW18-06/1 (0.1m-0.2m), with all detections greater than GAC.

The full tabulated results are included in **Tables 1 & 2, Appendix B**.

The exceedances of controlled waters GAC for soil samples indicate the presence of theoretical sources based on partitioning and leaching to pore-water. However, the potential for the theoretical sources to have an unacceptable impact on groundwater receptors is dependent on the source concentrations being mobilised and migrating to groundwater, and subsequently migrating laterally in groundwater. These factors are discussed in the Controlled Waters Risk Evaluation section below.

6.2.4 Controlled Waters Exceedances – Soil Leachate

A total of fifteen samples were submitted for soil leachate analysis. These included most of the soil samples where greatest concentrations of PAHs, metals and cyanide compounds were reported. The laboratory certificates indicate that the leachate was prepared using the NRA leachate method which has a 10:1 ratio of water to soil and is not a zero headspace method.

- For TPH Fractions and BTEX all results were below MDLs with the exception of one sample WS18-03/2 where TPH aromatic fractions C10-C12 and C16-C21 exceeded DW GAC by a factor of approximately two. Concentrations of PAHs were below MDLs in the majority of samples and were below DWS GAC in all samples except for the naphthalene concentration in WS18-03/2 which was nearly an order of magnitude above DWS GAC.
- Metals concentrations were below their DWS GAC with the exceptions of arsenic in WS18-02/1 which exceeded the GAC by a factor of 1.2 and lead in three samples which exceeded the DWS GAC by factor of two to twenty.
- Leachable concentrations of thiocyanate in MW18-02/1 (0.2-0.3) exceed DWS GAC over two orders of magnitude. Concentrations of complex cyanide exceed DWS GAC in three samples, by up to two orders of magnitude in MW18/02 (0.2-0.3). This sample also contained the only detection of free cyanide which exceeded the DWS GAC by a factor of 2.4.

The full tabulated results are included in **Table 3, Appendix B**.

6.2.5 Controlled Waters Risk Evaluation

Limited hydrocarbon and BTEX soil GAC exceedances were reported together with multiple large magnitude PAH and metals soil GAC exceedances. However, the widespread absence of detectable hydrocarbon, BTEX or PAHs in soil leachate indicates that the detected soil concentrations of these compounds may represent relatively low risks to controlled waters. It is noted that as the leachate method used is not a zero headspace method then there could have been significant loss of volatile compounds during leaching and their absence in leachate should not be taken to mean that they are

not present. Rather, detected concentrations can be taken to confirm their presence and should be treated as minimum concentrations.

Metals were also reported at concentrations significantly above soil GAC, however concentrations of all metals in the leachate samples were generally below their MDLs and GAC indicating the detected metals in most soils samples are likely to present low risks to controlled waters. The exception was lead in three leachate samples which exceeded DW GAC by factors of two to twenty which may present unacceptable risk.

A soil GAC for cyanide was not identified, although concentrations of complex cyanide were reported above the MDL in approximately half of samples, thiocyanate was reported in five samples and free cyanide was report in one sample at 39 mg/kg. In the soil leachate results leachable cyanide was more localised with one significantly elevated result in the same sample where 39 mg/kg free cyanide was reported and two lower concentrations where no free cyanide was reported.

In conclusion, the measured soil and soil leachate concentrations indicate potentially acceptable risks from all contaminants apart from naphthalene in one sample, lead in three samples and cyanide compounds in one location. However, the absence of volatile compounds in the majority of leachate samples is not considered conclusive given the leachate preparation method used. Furthermore, it is recognised that soil sources may exist that were not sampled in the current investigation and therefore greater reliance should be placed on measured groundwater concentrations where they are available since these will reflect soil impacts from a greater volume of soil than point samples.

6.2.6 Summary of Risk Evaluation for Soil Sources (including soil leachate)

The following linkages associated with soil sources have been identified as posing potentially unacceptable risks to current or future site users and controlled waters if no further assessment or remedial works are undertaken:

- Naphthalene in soil to occupants of future houses via vapour intrusion. Potentially localised impacts.
- PAHs, lead and cyanide in shallow soils to occupants of future houses via direct contact and ingestion pathways. Likely to be widespread across site.
- Naphthalene, lead and cyanide compounds in soil to groundwater quality.

6.3 Groundwater Laboratory Results

Eighteen groundwater samples were collected over two monitoring rounds on the 13th August 2018 and 20th August 2018 and tested for a range of contaminants as described in **Section 3.3**. Groundwater samples were collected from boreholes MW18-01, MW18-02, MW18-03, MW18-04 and MW18-06 with response zones in the Chalk and MW18-05, WS18-01, WS18-02 and WS18-03 with response zones set in the Alluvium/Chalk.

6.3.1 Risks to Health from Groundwater

The screening of groundwater concentrations against GAC has identified the following exceedances of human health criteria:

- The benzene concentration of 2.3 mg/l reported in WS18-03 in both monitoring rounds exceeded the HDR GAC 0.21 mg/l, representing an exceedance by a factor of 11.
- Concentrations of TPH Aromatic C8-C10 and the TPH Hazard Index in WS18-03 marginally exceeded the HDR GAC by a factor of up to 1.2.

The full tabulated results are included in **Table 4, Appendix B**.

6.3.2 Risks to Controlled Waters from Groundwater

Sample results were screened against a range of available controlled waters GAC appropriate for the Sites hydrological and hydrogeological sensitivity. Individual exceedances of controlled waters GAC are summarised in **Table 11** below. The full tabulated results are included in **Table 5, Appendix B**.

Table 11. Summary of Controlled Waters Groundwater GAC Exceedances

Contaminant of Concern	No. of Samples	Minimum (µg/l)	Maximum (µg/l)	DWS (µg/l)	No. of DWS exceedances
Selenium	18	<0.6	25	10	2
Inorganics					
Thiocyanate	18	<200	1000	4	4
Cyanide (Total)	18	<10	3,700	10	7
Chloride	18	<150	480,000	250,000	15
TPH aromatic >C5-C7	18	<1	2,300	1	3
TPH aromatic >C7-C8	18	<1	2,300	700	2
TPH aromatic >C8-C10	18	<1	2,200	300	2
TPH aromatic >C10-C12	18	<10	2,500	90	3
TPH aromatic >C12-C16	18	<10	1,400	90	3
TPH aromatic >C16-C21	18	<10	410	90	2
Benzene	18	<1	2300	1	3
Toluene	18	<1	2000	300	2
Xylene (m,p)	18	<1	660	190	2
Xylene (o)	18	<1	750	190	2
Xylenes (total)	18	<1	1,150	500	2
Naphthalene	18	<0.01	14	6	1
Acenaphthylene	18	<0.01	11	18	2
Phenanthrene	18	<0.01	35	4	2
Benzo(a)pyrene	18	<0.01	0.2	0.01	1
Sum of 4 carcinogenic	18	<0.01	39.3	0.1	2

NOTES
*Excludes MDLs that exceed GAC

6.3.3 Controlled Waters Exceedances

6.3.3.1 Metals

The only metal impact in groundwater to exceed DWS GAC was selenium at WS18-02, which is installed across alluvium and chalk, where the GAC was exceeded by a factor of less than three.

6.3.3.2 Other Inorganics

Cyanide Compounds

Total cyanide exceeded the DWS GAC by nearly two orders of magnitude in MW18-02 and by nearly one order of magnitude in MW18-03. Exceedances by up to one order of magnitude were also reported in WS18-01 and WS18-03. Thiocyanate also exceeded DWS GAC by over two orders of magnitude in MW18-02 and WS18-03, but was not detected in other locations. The total cyanide comprised mostly complex cyanide, therefore the complex cyanide results return the same DWS GAC exceedances as total cyanide. Free cyanide was detected in one location only and did not exceed DWS GAC.

Chloride

Chloride concentrations exceeded DWS GAC across the site except at WS18-03.

Sulphate

The samples at MW18-02 exceeded the DWS GAC by a factor of less than two. Considering the localised nature of the exceedances and limited magnitude, this is not considered to represent unacceptable risk to the aquifer.

6.3.3.3 BTEX & TPH

BTEX concentrations were below MDLs across the majority of the site, except at MW18-05 and WS18-03. Benzene (and the corresponding TPH Aromatic >C5-C7 fraction) at MW18-05 exceeded DWS GAC by over an order of magnitude.

In WS18-03 concentrations of BTEX and TPH Aromatic >C8-C21 exceeded their respective DWS by up to three orders of magnitude, with the greatest exceedances reported for benzene. TPH Aliphatic fractions were all below MDLs.

6.3.3.4 PAHs

Concentrations of PAHs were generally below MDLs across the site with the exceptions of MW18-05 and WS18-03, which corresponds with the BTEX and TPH impacts. The PAHs reported above DWS GAC were naphthalene, acenaphthylene, phenanthrene, benzo(a)pyrene and Sum of 4 Carcinogenic PAHs.

6.3.3.5 Phenols

No concentrations of phenolic compounds were detected in the nine groundwater samples tested.

6.3.4 Summary of Risk Evaluation

Risks to Health from Contaminants in Groundwater

Benzene in groundwater at WS18-03 was found to present potentially unacceptable risk to occupants of a future development via vapour intrusion into houses. A marginal exceedance of the TPH HI in the same location is not considered to represent unacceptable risk. Details of the rest water level during groundwater monitoring are not provided in Table 1 of the Advisian report, however the rest level during drilling was 3.0m bgl, and ‘hydrocarbon globules’ were reported at the same depth. This indicates that the groundwater is likely to be deeper than the 1m depth assumed in derivation of the GAC. Furthermore, the log reports the impact to be overlain by ‘silty clay’ alluvium and ‘gravelly clay’ made ground rather than the sand soil type assumed in GAC derivation. The GAC are likely to overestimate risks at this site, however this cannot be confirmed without further assessment and/ or collection of vapour data at this location (there is no vapour well located near WS18-03) and therefore risks are currently considered to be potentially unacceptable.

Risks to Aquifer from Metals in Groundwater

Metals impacts were below DWS with the exception of limited isolated selenium exceedances in one well WS18-02 which are not considered likely to present unacceptable risk to the aquifer. The groundwater data support the soil leachate data which indicate that risks to the aquifer from site soils are likely to be acceptable. Therefore risks from metals in soils and groundwater to the wider aquifer are considered likely to be acceptable.

Risks to Aquifer from Cyanides in Groundwater

Total cyanides (including complex cyanide) or thiocyanate in groundwater were reported at one to over two orders of magnitude above DWS in groundwater at MW18-02, MW18-03, WS18-01 and WS18-03. All locations are located along the north-western site boundary and are therefore consistent with being down-hydraulic gradient of the on-site impacts in soil resulting in impact to groundwater. It is noted that elevated cyanide in groundwater may reduce or prevent microbial degradation of organic compounds by inhibiting microbial growth. There is not a clear vertical distinction between the cyanide impacts in alluvium and chalk. The cyanide impacts are considered to represent potentially unacceptable risks to water quality in the wider aquifer.

Risks to the Aquifer from Chloride in Groundwater

Chloride concentrations exceeded DWS GAC across the site except at WS18-03. The maximum exceedance was by a factor of less than two. There is no clear spatial or vertical pattern to the exceedances and wells on the up-hydraulic gradient south-eastern boundary which indicates that the concentrations are likely to be representative of background conditions in the area. As such the limited exceedances of the GAC are not considered to represent unacceptable risk the aquifer.

Risks to the Aquifer from Sulphate in Groundwater

The samples at MW18-02 exceeded the DWS GAC by a factor of less than two. Considering the localised nature of the exceedances, limited magnitude of the exceedances and relatively low toxicity of sulphate, this is not considered to represent unacceptable risk to the aquifer.

Risks to the Aquifer from TPH Fractions and BTEX in Groundwater

Localised exceedances of DWS GAC were reported for these compounds.

At MW18-05 exceedances of benzene DWS were reported in the first monitoring round but in the second there were no GAC exceedances and all compounds except for TPH >C12-C16 hydrocarbons were below MDLs. The results from the second monitoring round are broadly consistent with the soil analytical data for this location, although logged observations report 'hydrocarbon globules' in soils near the top of the response zone so hydrocarbon impact may have been expected to be more consistent. The potential source of this impact in terms of known site features is unclear. Although the well is on the up-hydraulic gradient site boundary, there is no known source of hydrocarbon off-site therefore an on-site source is more likely. Impacts are reported in soil at the base of the Alluvium and in Chalk but not above, indicating that a surface spill in this area of site is unlikely. Borehole MW18-06 is located down hydraulic gradient of MW18-05 and between MW18-05 and WS18-03 but is not significantly impacted, indicating that the two sources are unlikely to be related, and that the impact at MW15-05 may have low mobility. Current data suggest relatively low risks to controlled waters from this source.

At WS18-03 the benzene (and corresponding TPH Aromatic >C5-C7 fraction) concentration exceeded DWS GAC by three orders of magnitude. The toluene (and the corresponding TPH Aromatic >C7-C8 fraction) and xylenes concentrations exceeded DWS GAC by a factor of three. The TPH Aromatic >C8-C16 fractions exceeded DWS GAC by approximately an order of magnitude and the TPH Aromatic >C16-C21 fraction exceeded by a factor of up to five. These impacts were reported in both monitoring rounds. Soil impact, including 'hydrocarbon globules', at WS18-03 was reported from 2.5m bgl, again indicating that a surface source at this location is unlikely. Soil concentrations of BTEX and most hydrocarbon fractions at this location were relatively low with respect to their soil GAC, indicating that there may be a soil source that has not been identified up-hydraulic gradient of the WS18-03. Groundwater impacts by BTEX and TPH Aromatic C5 –C35 at WS18-03 are considered to represent potentially unacceptable risk the wider aquifer.

Risks to the Aquifer from PAHs in Groundwater

Concentrations of PAHs were generally below MDLs across the site with the exceptions of MW18-05 and WS18-03, which corresponds with the BTEX and TPH impacts noted above. The absence of widespread PAH impacts in groundwater correlates with the low concentrations in soil leachate and indicates that the relatively high magnitude impacts by PAHs in soil are not resulting in such significant impacts to groundwater, therefore the majority of soil PAH impacts are also not resulting in unacceptable impact to groundwater.

In MW18-03 the groundwater naphthalene concentration exceeded DWS GAC by a factor of 2.2. In WS18-03 concentrations of acenaphthylene, phenanthrene and benzo(a)pyrene exceeded DWS GAC by approximately an order of magnitude, whereas indeno-123-pyrene and Sum of 4 Carcinogenic PAHs exceeded the DWS GAC by over two orders of magnitude.

Both MW18-03 and WS18-03 are located on the down-hydraulic gradient north-western site boundary. Although PAHs typically have low mobility in the environment, the presence of hydrocarbon globules in soil at these locations indicates the potential for transport of an emulsion within any permeable horizons. Therefore potential risks from PAHs in groundwater to the aquifer and culvert and culvert are potentially unacceptable.

6.3.5 Summary of Risk Evaluation for Groundwater Sources

The following linkages associated with groundwater sources have been identified as posing potentially unacceptable risks to current or future site users and controlled waters if no further assessment or remedial works are undertaken.

- Benzene at WS18-03 to occupants of future houses via vapour intrusion. Potentially localised impact.
- Cyanide compounds at MW18-02, MW18-03, WS18-01 and WS18-03 to the wider aquifer.
- Benzene and TPH Aromatics >C10-C16 at MW18-05 to the aquifer. Possibly relatively low risk based on lower concentrations in second monitoring round.
- BTEX and TPH Aromatics C5-C35 at WS18-03 to the aquifer.
- Naphthalene at MW18-05 to the aquifer.
- Multiple PAHs including benzo(a)pyrene and Sum of 4 Carcinogenic at WS18-03 to the aquifer and culvert.

6.4 Soil Vapour Risk Assessment

Soil vapour samples were collected from two monitoring wells, VW18-01 and VW18-02 over two rounds on 13th and 20th August 2018. The data are presented in **Appendix B**. These have been compared against HDR GAC only, since there is not a viable pathway to public open space areas due to the dilution of soil vapours as they enter ambient air.

The majority of compounds analysed were below detection limits, therefore full GAC screening has not been completed and only compounds detected have been compared against GAC, where GAC are available. Five compounds were detected above their MDLs, which were trichlorofluoromethane, chloroform, dichloromethane, toluene and styrene. The maximum concentration reported was 369.6 µg/m^3, which was for chloroform at VW18-02 during the second monitoring round. All the detected compounds were at less than three times their method detection limit except for chloroform.

Of the compounds detected, GAC were identified for toluene and chloroform only, with HDR GAC of 2,610,000 µg/m^3 and 60,100 µg/m^3, respectively. The absence of GAC for the other compounds likely reflects a lack of suitable toxicological and /or physicochemical data from which to derive them. The toluene and chloroform concentrations are at least two orders of magnitude below their GAC and are not considered representative of unacceptable risk. It is noted that trichlorofluoromethane and dichloromethane are not typically associated with gas works use and given the relatively low concentrations of these compounds it is possible that they are artefacts of sampling and/ or analysis rather than true concentrations in soil vapour.

The vapour wells appear to have been targeted primarily to assess risks to off-site receptors rather than risks to future residents from on-site sources. Therefore they are not in the areas of site where the greatest soil and groundwater contamination was identified. As such the data from the vapour wells provide limited information with respect to potential risks to future residents of the proposed development, but they do appear to suggest that there are not widespread unacceptable vapour impacts in the south-western area of site.

In summary, the measured soil vapour concentrations are not considered to present unacceptable risk to off-site human health receptors, but risks to future residents are potentially unacceptable based on current data.

6.5 Ground Gas Risk Assessment

This presents a preliminary ground gas assessment using the ground-gas data obtained from the two monitoring visits undertaken to date and summarises additional information on potential ground gas risks from the site investigation data.

During the site investigation no specific sources of high ground gas generation potential were identified, such as putrescible material or layers of non-aqueous phase hydrocarbons that could potentially degrade to form gases. A layer of saturated peat was reported between 5.4m and 7.0m bgl

in MW18-06 which could result in locally elevated ground gas concentrations, but is not likely to result in gas flows. Therefor the site itself is considered to have relatively low ground gas generation potential, although there is potential for migration from off-site sources such as the former gas-production area to the south-west.

As low concentrations of methane and carbon dioxide have been recorded on Site, a quantitative ground-gas risk assessment has been undertaken and calculated based on the classification system set out in the BS8485:2015[6] and CIRIA C665[7] guidance documents. The Advisian report does not state whether atmospheric pressure was stable, rising or falling during or before the monitoring events. Atmospheric pressure data taken during monitoring indicates that pressure rose by 1 mB during the first round and rose by 2 mB during the second round. Therefore the monitoring is not considered to have been completed during 'worst case' conditions of sustained falling pressure.

The risk assessment methodology uses both the gas concentrations and gas flow rates to define the characteristic situation for a site based on the limiting gas volume flow for methane and carbon dioxide. The Gas Screening Value (GSV) is calculated using the maximum gas concentration as a fraction multiplied by the maximum recorded steady flow:

- Gas screening value (litres of gas per hour) = measured flow rate (l/hr) × (maximum gas concentration (percentage volume/volume)/100).

BS 8485:2015 suggests that the steady state flow rate should be used, unless there is a reason to take a worst case view in which case consideration can be given to using peak concentrations.

The calculated worst case GSV is presented in Table 13:

Table 13. Gas Screening Value Calculation

Gas	Maximum Steady Gas Flow (l/hr)	Maximum Gas Concentration % v/v)	GSV (Gas screening value)
Carbon Dioxide	0.01*	1.3	0.00013
Methane	0.01*	0.3	0.00003

*flow detection limit (<0.01l/hr)

The GSV calculated above results in a 'very low risk' ground gas classification and has the potential to place the site in 'Characteristic Situation 1'. Furthermore, the maximum recorded concentrations of carbon dioxide and methane were 1.3% v/v and 0.3% v/v respectively, both of which do not exceed GAC for ground gas derived from Part 2A of the EPA (outlined in section 6.13. If confirmed as representative conditions for the site then gas protection measures would not need to be considered for any future residential site development. However, the relatively low gas generation potential of the site notwithstanding, further monitoring rounds including some in 'worst case' conditions are required to confirm the Characteristic Situation. Furthermore, additional monitoring points would be required with points near the greatest soil and water impacts would also be required to make a full assessment. Therefore risks from ground gas (as opposed to soil vapour) are considered to be potentially acceptable but only subject to the collection of additional data and on the assumption that it confirms the current assessment.

6.6 Chemical Attack on Buried Concrete

An assessment has been undertaken in accordance with BRE Special Digest 1 (SD1:2005 Third Edition), 'Concrete in Aggressive Ground'. Soil chemistry testing (2:1 water soluble sulphate and pH) has been undertaken on selected samples and the results are presented in **Table 12** below.

[6] BS 8485:2015 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings
[7] CIRIA document C665:Assessing Risks Posed by Hazardous Ground Gases to Buildings (2007)

Table 12. Aggressive Chemical Environment for Concrete Classification

Stratum	Number of Tests	Characteristic 2:1 water soluble Sulphate (g/l)	Characteristic pH	Concrete Class
Made Ground	17	1.9	6.6	DS-3 / AC3
Natural	15	1.1	8.0	DS-2 / AC2

6.7 Updated Conceptual Site Model

The updated CSM presented in Table 14 summarises source-pathway-receptor linkages that could pose a potentially unacceptable risk to sensitive receptors following completion of the GQRA.

Table 14. Updated Conceptual Site Model

Source	Pathway	Receptor
Naphthalene in shallow and deep soil	Indoor inhalation of volatile organic vapours/ground gas from impacted soils	Future Site Users (Residential)
PAHs, lead and cyanide compounds in shallow soil	Direct contact (ingestion, dermal contact, inhalation of dusts) with contaminated soils in areas of soft landscaping. Includes potential acute as well as chronic risks from lead and cyanide.	Future Site Users (Residential)
Benzene in groundwater	Indoor inhalation of volatile organic vapours/ground gas from impacted groundwater	Future Site Users (Residential)
BTEX, TPH and PAHs (including naphthalene) in groundwater (and potential unidentified impact in soils)	Leaching via infiltration to saturated zone. Direct transfer of chemicals in Made Ground to the groundwater during excavations or piling. Lateral migration of contaminants in groundwater	Chalk Principal Aquifer
Cyanide compounds in shallow and deeper soil	Leaching via infiltration to saturated zone. Direct transfer of chemicals in Made Ground to the groundwater during excavations or piling. Lateral migration of contaminants in groundwater	Chalk Principal Aquifer
Ground gases	Ingress to future on-site buildings	Future Site Users (Residential) and structures

6.7.1 Data Gaps

The following data gaps have been identified during development of the CSM:

- Limited sample density for soil and groundwater. This could likely be improved by addition of data from the previous Atkins report that is referred to in the Advisian report.
- Vapour and ground gas sampling points located close to soil and ground gas sources, or positioned within footprint of buildings proposed in the future development (current sample points appear to be located to assess risks to off-site receptors).
- Limited number of groundwater and gas sampling visits.
- At locations where greatest hydrocarbon impacts were reported the well screen designs are such that light non-aqueous phase liquids (LNAPL) would not enter the well, therefore LNAPLs could be present that have not been reported.

- Off-site groundwater monitoring wells located down-hydraulic gradient of the Site to assess off-site impacts from the site and potential attenuation processes.
- Bioavailability data for lead and cyanide in soils to aid human health risk assessment.

7. Updated Foundations Options Assessment

A Foundations Options Assessment was presented in AECOM's previous report (**Ref 2)** for the wider Dane Valley site. Information from the Advisian investigation has been used to update this for the SGN site, which is referred to below as Plot 5.

7.1 Summary of Ground Conditions

The new information from Plot 5 indicates up to 2.8m of Made Ground (granular and cohesive layers) underlain by Alluvium (firm to soft clay) to between 3.4m and 7.0mbgl, below which is Chalk. Groundwater appears to be around 3mbgl across the site.

An existing ground investigation factual report is available for the plot immediately to the north of Plot 5, which was reviewed and summarised in AECOM's previous report. There are quite distinct differences in the superficial deposits recorded in the exploratory holes in each plot: Head Deposits are recorded in the northern plot with Alluvium absent, whereas on Plot 5 Alluvium is present and Head Deposits are absent. Assuming the GI information is correct there appears to be a rapid change in ground conditions along the north-western site boundary.

7.2 Potential Foundation Solutions

The presence of Made Ground and fairly extensive soft Alluvium across Plot 5 means that foundations extending into the Chalk e.g. piled foundations will be required to support the building loads (indicated to be 4-storey buildings).

The use of driven piles at the site is likely to be unsuitable due to the proximity of residential properties which could be affected by percussive installation of the piles. Furthermore, driven piles are unlikely to be acceptable due to the risk of pushing shallow contamination into the Chalk aquifer. Bored cast in-situ (CFA/bored) piled foundations are likely to be suitable although the presence of the predominantly soft saturated Alluvium would need to be taken into account and appropriate mitigation adopted during construction. Ground improvement techniques extending to the Chalk e.g. Vibro concrete columns are unlikely to be suitable for installation through Made Ground and soft Alluvium but this should be confirmed by a specialist contractor. Furthermore they would also create preferential pathways for contamination and their use is unlikely to be authorised by regulators. Any piling solution would be subject to a Piling Risk Assessment to assess potential risks from contamination in soils and water.

It is noted that ground levels across Plot 5 vary and that levels within the former gas holder are around 1.0 – 1.5m lower than surrounding ground levels. Any raising of ground level across the plot as part of the development could induce settlement in the underlying Made Ground and Alluvium, with the potential for long term settlement of the Alluvium, which would have to be considered in the foundation design and potentially where services enter buildings. Any buried obstructions e.g. the gas holder base and 'underground equipment storage' structure shown the Advisian plan should also be broken out.

If similar ground conditions extend beyond Plot 5 to the wider Dane Valley development then similar constraints on foundation options are likely to apply. As indicated previously, due to the size of the proposed buildings (4-5 storeys) the initial assessment is that piled foundations are likely to be the most suitable option to support the proposed loads. Similarly, for the low rise (2-storey) buildings piled foundations should be considered at this stage until further GI information including in-situ ground strength testing and geotechnical laboratory testing is available which may allow assessment of other foundation options.

8. Summary and Conclusions

8.1 General

The purpose of this report was to provide an interpretive assessment of the land condition at the Site to identify and assess potential environmental land quality liabilities and constraints to the future redevelopment of the Site.

8.2 Ground Conditions

The sequence of strata encountered generally supports the published geology, comprising Alluvium with thicknesses ranging between 1.4m and 6.0m, above chalk bedrock of the Newhaven Chalk Formation encountered from between 3.4-7.0m to a depth of between 6.0 and 9.0m (depth to base not proven). Furthermore, a thin layer of peat (1.6m thick) was encountered within one borehole (MW18-06 only) located in the centre of the Site, between the base of the Alluvium and top of the Newhaven Chalk Formation. Head Deposits shown on published geology close to or on site were not identified.

Made Ground was encountered across the Site at thicknesses ranging from 0.6m to >2.9m generally comprising three types with a consistent succession across the Site. In general thicker deposits of Made Ground were observed towards the northwest or west of the Site. Towards the east of site there was typically <1.5m thickness.

8.3 Geo-environmental Conclusions

Based on the findings of the intrusive site investigation, generic quantitative risk assessment, and risk evaluation, the principal conclusions include:

- No extensive gross contamination such as tars or layers of non-aqueous phase liquids were identified as is often the case with former gas works sites. This is consistent with the known history of the site, that it was used primarily for gas storage rather than gas manufacture. Evidence of NAPL was noted in some locations in the form of 'hydrocarbon globules' in soil.
- A borehole within the larger gasometer base, which is approximately 1.0m below the surrounding ground level, confirmed that is was primarily an above-ground rather than below-ground structure, as no made ground was present beneath it. A handpit in the smaller gasometer base was terminated in made ground at 0.5m depth, however it is likely to be of similar construction to the larger one (supported by historical aerial photographs of the site in which it appears to have similar above-ground construction).
- Naphthalene in soil and benzene in groundwater poses potentially unacceptable risks to occupants of future houses via vapour intrusion. Potentially localised impacts.
- PAHs, lead and cyanide in shallow soils pose potentially unacceptable risks to occupants of future houses via direct contact and ingestion pathways in communal soft landscaped areas. Likely to be widespread across site. Majority of impact appears to be in the upper 1m of soils.

  Concentrations of lead and cyanide are considered sufficiently high to present potential acute risks and therefore this should be taken into account when developing remedial strategies

  It is noted that the currently proposed development has the majority of the soft landscaped areas in the north of the wider proposed Dane Valley development with only small areas proposed within the footprint of Plot 5 which is mainly covered by buildings and hardstanding. Therefore the potential for direct contact and ingestion pathways is limited.
- Cyanide compounds and free cyanide in both shallow and deeper soils and also groundwater are considered to present potentially unacceptable risk to groundwater quality in the Chalk Principal aquifer.
- The widespread cyanide contamination in shallow soils suggests that the area was previously been used to spread spent gas purifier from the gas works. This would be consistent with common practice in gas works at the time.

- Groundwater impacts by BTEX and TPH Aromatic C5 –C35 are considered to represent potentially unacceptable risk to the wider aquifer. These might be relatively localised. Chemical concentrations of BTEX and the lower molecular weight hydrocarbons were relatively low compared to the groundwater impacts. However, 'hydrocarbon globules' were reported in saturated soils at several locations which appears to contradict the groundwater data. It is also possible that soil sources exist which were not identified during the current investigation. Therefore a soil source of BTEX and hydrocarbons cannot be ruled out.
- Groundwater impacts by PAHs including naphthalene, benzo(a)pyrene and Sum of 4 Carcinogenic PAHs are considered to represent potentially unacceptable risk to the wider aquifer. As with the BTEX and TPH impacts the potential exists for soil sources to exist that have not been identified.
- Groundwater data was collected at a time that was likely to be the seasonal low water table. It is possible that greater groundwater impacts will be present during seasonal high water tables when currently unsaturated impacts will be in contact with groundwater.
- Soil vapour concentrations were mostly below detection limits with some low detections reported that were well below GAC. This confirms low risks to occupants of off-site housing to the south-east and indicates low risks to commercial properties adjacent to the west. It also confirms low risk to future residents of properties planned to be built near the vapour wells, but does not confirm absence of vapour intrusion risk to residents of properties in other areas of site, including those where elevated naphthalene was found in soils or benzene was found in groundwater.
- On the basis of the limited gas monitoring data available risks from ground gases to future users and off-site buildings appears to be low, which is consistent with the ground gas conceptual model for the site. However, additional monitoring points and monitoring rounds are required to confirm the current data.
- Full waste classification of site soils has not been undertaken, however concentrations of contaminants in some soils, particularly shallow soils, are considered likely to result in classification as Hazardous Waste if those soils were to be disposed off-site or otherwise be considered to have become 'waste' as defined by waste management legislation.
- Data gaps were identified that should be addressed before detailed design of remedial works. These include: limited sample density (could be improved by use of previous site investigation data from the site); vapour and ground gas sampling points targeted on source areas; limited number of groundwater and gas monitoring / sampling visits during high water table season; groundwater monitoring of off-site wells; waste classification of site soils to determine potential off-site disposal costs, if required; and, bioavailbility testing of lead and cyanide in soils.

In summary, the findings of the site investigation and GQRA have identified a number of pollutant linkages posing a potentially unacceptable risk to future residential site users and controlled waters. These require further assessment and consideration for remediation options. The recommended approach to address the contaminant linkages of concern is presented in **Section 9**.

9. Outline Remediation Strategy

9.1 Linkages to be Addressed

The following pollutant linkages have been identified requiring further assessment and consideration for remediation options following the site investigation and GQRA.

Table 15: Linkages Requiring Further Assessment or Mitigation

Source	Pathway	Receptor
PAHs, lead and cyanide in shallow soil	Direct contact (ingestion, dermal contact, inhalation of dusts) with contaminated soils in areas of soft landscaping.	Future Site Users (Residential) Site Visitors
Cyanide in shallow and deeper soils and groundwater	Leaching via infiltration to saturated zone Direct transfer of chemicals in Made Ground to the groundwater during piling. Lateral migration of contaminants in groundwater and discharge to surface water	Chalk aquifer
BTEX and TPH Aromatic C5 –C35 in groundwater (and potentially unidentified soil sources)	Leaching via infiltration to saturated zone Direct transfer of chemicals in Made Ground to the groundwater during piling. Lateral migration of contaminants in groundwater and discharge to surface water	Chalk aquifer
Ground gas in soil	Migration into future buildings	Future site users and structures
Naphthalene in shallow and deeper soils, benzene in groundwater	Inhalation of volatile organic vapours/ground gas from impacted	Future Site Users (Residential)

9.2 Proposed Further Assessment

Further assessment should be undertaken before detailed remedial design. This will clarify the contaminants and areas requiring remediation. It is possible that the requirements for remediation could be reduced or removed for some pollutant linkages.

If available, previous site investigation data from the Site should be incorporated into the GQRA, and data from other plots within the proposed Dane Valley redevelopment incorporated also.

If there are still data gaps after incorporating other data, further site investigation of the Site is recommended, and ideally on sites down-hydraulic gradient of the Site.

If additional data becomes available for the Site, assessment should be completed to zone the site with respect to PAHs, lead and cyanides impacts in shallow soils with respect to the proposed soft landscaped areas, including statistical assessment if appropriate. Any statistical assessment should take into account the potential for acute risks from cyanide and lead. If the soft landscaped areas do not coincide with areas impacted above GAC then remedial measures should not be required to address linkages from these contaminants to future users, subject to regulatory agreement.

A DQRA should be completed for risks to health of future occupants from benzene and naphthalene in soils and groundwater.

A DQRA should be completed for all potential controlled waters linkages.

The ground gas GQRA should be updated following collection of additional data.

9.3 Remediation Options

9.3.1 Human Health Linkages

Remediation of the human health linkages described in **Table 15** above can be achieved using the following approaches:

- **Cover system**: a widely adopted remediation approach for mitigating potential risks to health from direct contact linkages such as those associated with the PAHs, lead and cyanide in shallow soil at the site. Affected soils can be covered with building footprints, hardstanding (such as the proposed car parking areas) or layers of 'clean' sub-soil/top-soil in landscaped areas. This approach is simple to implement and can often be incorporated into the development design with minimal abnormal remediation costs. If there is a requirement to raise land at Dane Valley to address potential flood risks then the imported material could potentially be used to also act as a cover system.
- **Excavation and off-site disposal**: can be adopted to remove both shallow and deep sources, including shallow soils within proposed soft landscaped or localised deeper sources. Can be a simple, cost-effective approach for addressing smaller volumes of contaminated material, or if there is a coincidental requirement to remove sub-surface soils for other reasons such as to create underground structures. Since reduction of site levels is unlikely to be acceptable at Dane Valley due to potential flooding risks, excavated material would likely have to be replaced with imported material. It is noted that installation of large below ground flood storage has been proposed as potential remedial option to address flooding risk at Dane Valley. The currently proposed structure would be 1m deep and have a total area of approximately 1,500m^2. Subject to the location of such a structure or structures, this could remove a significant volume of soils that present risks to both health and controlled waters.
- **Excavation and ex-situ treatment.** Soils are excavated and are treated on site (e.g. biopiles) to remove contaminants before being replaced in the ground. This approach may be suitable for volatile hydrocarbons (<C12) but requires both space on site and a more prolonged timescale for remediation. It is not suitable for metals, the more complex 5 – 6 ring PAHs such as benzo(a) pyrene, or cyanide contamination.

  Alternative ex-situ treatments that may be effective are excavation and treatment using thermal desorption, incineration or soil washing. These are relatively high cost options that are typically only suitable where there is a large volume of soil to remediate.
- **Installation of vapour/ gas membranes in the proposed building.** This may be suitable as an additional precaution in residential buildings where volatile contaminants such as the naphthalene, benzene and <C12 hydrocarbons are present and/ or there is a ground gas risk. However, it is not often used as the single protection measure against vapour inhalation due to the reliance on high quality installation and maintenance of the integrity of the membrane over a building's lifetime.
- **In-situ remediation** techniques may be suitable for significantly reducing concentrations of volatile contaminants in soils and / or groundwater in localised areas e.g. benzene. Possible techniques include air sparging of groundwater, soil vapour extraction, biosparging, dual phase extraction in the vadose zone above the water table (if combined with treatment of groundwater) or chemical oxidation of soils and / or groundwater. These techniques can be targeted at specific source areas and depths whilst avoiding the need for bulk excavations. They can be applied singly or in combination, tailored to suit the target contaminant and source depth. . They usually rely on the strata to be treated being relatively permeable, so may not be suitable for the cohesive soils typically present in the shallower soils at this site.

9.3.2 Controlled Waters Linkages

Remediation of the controlled waters linkages described in **Table 15** above can be achieved using the following approaches:

- **Impermeable cap.** Installation of a low permeability cap (e.g. clay liner in landscaped areas, hardstanding or building footprints) may significantly reduce infiltration and minimise mobilisation of contaminants in soil to groundwater. This must be considered when evaluating drainage options for the site, since sustainable infiltration drainage might not be acceptable in many parts of the site if impacted and untreated soils are left in-situ. This applies only to contaminants that are above the water table. It may not be appropriate on a site that is prone to groundwater flooding due to potential for mobilisation of the contamination by rising groundwater.
- **Soil Excavation and off-site disposal or ex-situ treatment and re-use.** As described in **Section 9.3.1** above, this approach using biopiles may be useful for removing localised heavily hydrocarbon impacted areas.

  Alternative ex-situ treatments that may be effective are excavation and treatment using thermal desorption, incineration or soil washing. These are relatively high cost options that a typically only suitable where there is a large volume of soil to remediate.

  Installation of in-ground barrier. A permeable reactive barrier can be used to prevent spread of the types of contaminants present at Dane Valley to the wider aquifer, but is unlikely to be suitable at this site due to the absence of a low permeability stratum below the chalk impact to 'key' the base of the barrier into. Such barriers also require long term maintenance which may conflict with commercial land transaction agreements with developers.
- **In-situ treatment:** Soil and groundwater source areas and migrating groundwater plumes of volatile contaminants could be treated using in-situ techniques including air sparging, SVE, dual phase (or multiphase) extraction and chemical oxidation as noted for mitigating human health risk as above. Such techniques are not considered suitable for cyanide. These techniques can be targeted at specific source areas and depths whilst avoiding the need for bulk excavations. They can be applied singly or in combination, tailored to suit the target contaminant and source depth. As noted in **Section 9.3.1**, they may not be suitable for the relatively low permeability shallower soils at this site. The structureless chalk may also be unsuitable for these types of methods due to retention of contaminants within the cohesive parts.
- **Pump and treat:** a groundwater remediation technology that is typically expensive, involves relatively long timescales and requires availability of a foul sewer that has capacity to take significant additional input of contaminated water. It is normally implemented before main construction works can commence. Given the nature of the shallow groundwater – being within relatively cohesive made ground/alluvium or structureless chalk and therefore likely relatively low hydraulic conductivity – this technique may not be feasible. A simpler form of pump and treat can be implemented (and may be necessary) during excavations for construction purposes by de-watering the excavations. There is a good chance that if excavations require de-watering during construction then the pumped water will need to be treated to remove contamination on site before discharge to foul sewer. Alternatively, water from excavations may require off-site disposal by tanker.
- **Monitored natural attenuation (MNA):** medium to long-term monitoring of impact to groundwater to demonstrate declining contaminant concentrations can be adopted in situations where validation of risk assessment results (that indicate acceptable risk) is required or where source removal remediation has been carried out and validation of a beneficial impact on nearby and down-gradient groundwater is required. This option is relatively low impact and can usually be fitted around construction programmes but the uncertain timescales can also lead to cost uncertainty. It is not typically suitable for cyanide contamination, and furthermore the presence of cyanide and other gasworks contaminants may inhibit processes that would enable MNA at other sites.

9.4 Recommended Approach

A number of feasible remediation options have been identified above for the contaminant linkages considered to be of concern following the site investigation and GQRA. Based on the current knowledge of the Site, the following approach is recommended:

- Completion of human health and controlled waters DQRA to improve the estimates of potential risk to receptors and allow more accurate scoping of remediation measures. It is anticipated that controlled waters DQRA will indicate that an unacceptable risk to the public water supply does not exist based on the relatively limited DWS exceedances identified in the Chalk aquifer.
- Additional assessment actions (i.e. targeted site data collection potentially including further intrusive works or collection of groundwater data down-hydraulic gradient of the site) and completion of detailed remediation options appraisal.
- Liaison with the Environment Agency to agree potential compliance points and target criteria for the site, which would significantly impact the remedial requirements to address Controlled Waters linkages.
- Detailed remediation design, completed with knowledge of detailed development proposals to ensure that remediation solutions most compatible with the development, and therefore most cost-effective, are chosen.

9.5 Possible Remediation Scenarios

Given the current information available for the Site and anticipated development proposals, a reasonable achievable combination of remediation solutions that might be necessary, and would not significantly impede site development, includes:

- Implementation of targeted site investigation works to assist with selection of remediation options;
- Cover system, including import of validated 'clean' subsoil and topsoil in the soft landscaped parts of the development that coincide with shallow impacts;
- Localised excavation (and either ex situ treatment and replacement or off-site treatment) of shallow soils heavily impacted with hydrocarbons, including VOC such as benzene and naphthalene, lead and cyanides;
- Betterment of shallow groundwater quality through de-watering and subsequent treatment of groundwater from construction excavations; and
- Implementation of relatively short-term programme of groundwater validation monitoring.

Additional considerations for preventing adverse environmental impacts include:

- Where piling is required for foundation solutions, a suitable piling technique, that prevents contaminants in shallow soils from being mobilised towards the deep groundwater, should be identified. If necessary, removal of shallow contaminants from areas to be piled may be necessary prior to commencement.

9.6 Potential Development Constraints and Opportunities

Primary development constraints are considered to be:

Physical – the concrete base of the large gasholder and other below ground structures that will require to be removed. Reduction in levels by soil removal may be problematic due to flood risks. The alluvium appears to have low strength and therefore piled foundations are likely to be required.

Environmental – if off-site soil disposal is required then a significant proportion may be classified as Hazardous Waste and attract relatively high treatment and disposal costs. Subject to findings of controlled waters DQRA and regulatory agreement of an appropriate compliance point contamination of groundwater, in particular by cyanides, may prove prohibitively expensive to remediate.

Regulatory – an application for planning permission is likely to attract a number of conditions related to the assessment and remediation of contaminated land. These will require close regulatory liaison to resolve.

Financial – the costs of further site characterisation and remediation currently have a relatively wide range.

Timescales – the time taken to fully characterise, remediate and achieve regulatory acceptance for the site are likely to add significantly to development time.

Primary opportunities during development are considered to be:

Physical – crushed concrete generated during demolition could potentially be re-used during development to reduce disposal costs. If there is a requirement to raise ground levels to reduce flood risks then this could be combined with the proposed cover system. If significant excavations are planned to create flood alleviation structures then it may be possible to co-locate these with require remedial excavations to reduce remedial costs. Ground strength data is not currently available for the Alluvium, if obtained it may be possible to design a foundation solution that requires less piling.

Environmental – further assessment may show that contamination is more localised than indicated by current data. If off-site wells can be installed, or existing ones in Plot 7 of the Dane Valley development utilised, then off-site impacts could be quantified to ensure an appropriate level of on-site remediation.

Regulatory – by engaging with regulators, in particular the Environment Agency, at an early stage including agreeing design of further works and remedial objectives, and liaising on some issues concurrently with ongoing works, the regulatory liaison period can be minimised.

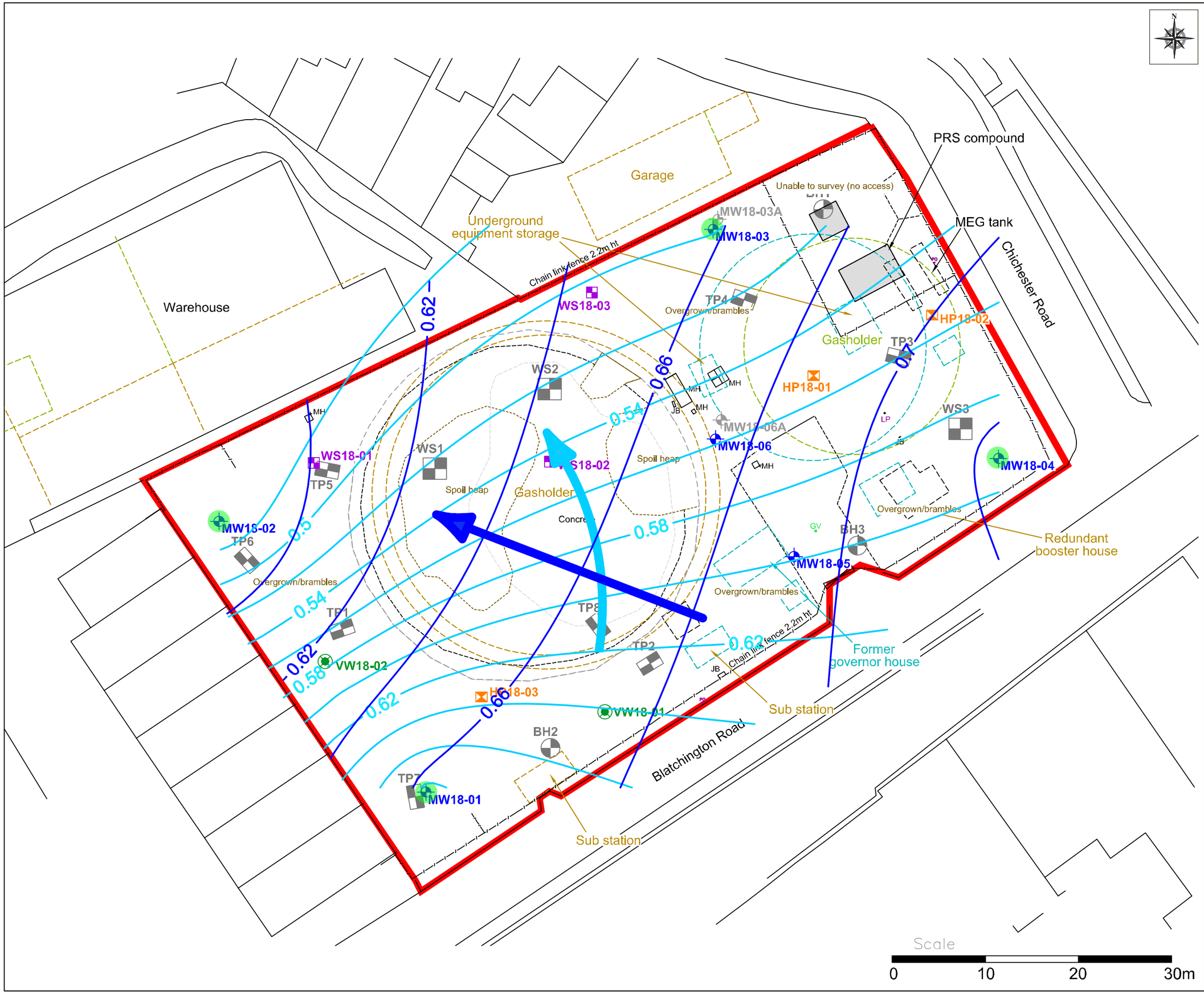
Financial – undertaking further works and incorporating existing data from both the Site (if available) and Plot 7 of the Dane Valley development, the range of assessment and remediation costs can be reduced.

Timescales – as noted above, these can be reduced by close regulatory liaison and also by careful of scheduling of further works to complete as much work concurrently as possible.

References

1. Advisian (September 2018), Environmental Assessment Factual Site Investigation Report (Draft) Blatchington Road, Seaford.
2. AECOM (November 2017); Dane Valley, Seaford, Preliminary Environmental Risk Assessment
3. Contaminated Land Report (CLR) 11 ‘Model Procedures for the Management of Land Contamination’ (2004);
4. Grimble & Clarke (2018); A brief history of Seaford Town Gasworks and notes on the model of the gasworks as it was in 1915.
5. EA/NHBC/CIEH ‘Guidance for the Safe Development of Housing on Land Affected by Contamination’, R&D 66. 2008.
6. BRE Special Digest (SD) 1: Concrete in Aggressive Ground, 2005 (SD1:2005 Third Edition);
7. BS 8485:2015 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings;
8. CIRIA document C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings (2007);
9. NHBC, Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present
10. Environment Agency, 2006. Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination;
11. Environment Agency website (www.environment-agency.gov.uk).

AECOM Figures



NOTES

Key:

- Site boundary
- Inferred groundwater contour (13/08/2018)
- Inferred groundwater contour (20/08/2018)
- Inferred groundwater flow direction (13/08/2018)
- Inferred groundwater flow direction (20/08/2018)
- Well included within calculation (response zone in chalk only)

All elevations in m aOD

*Figure taken from Adivision Project 52061–00, Blathcington Road, Seaford, Figure 4 ref: 2\52061–00

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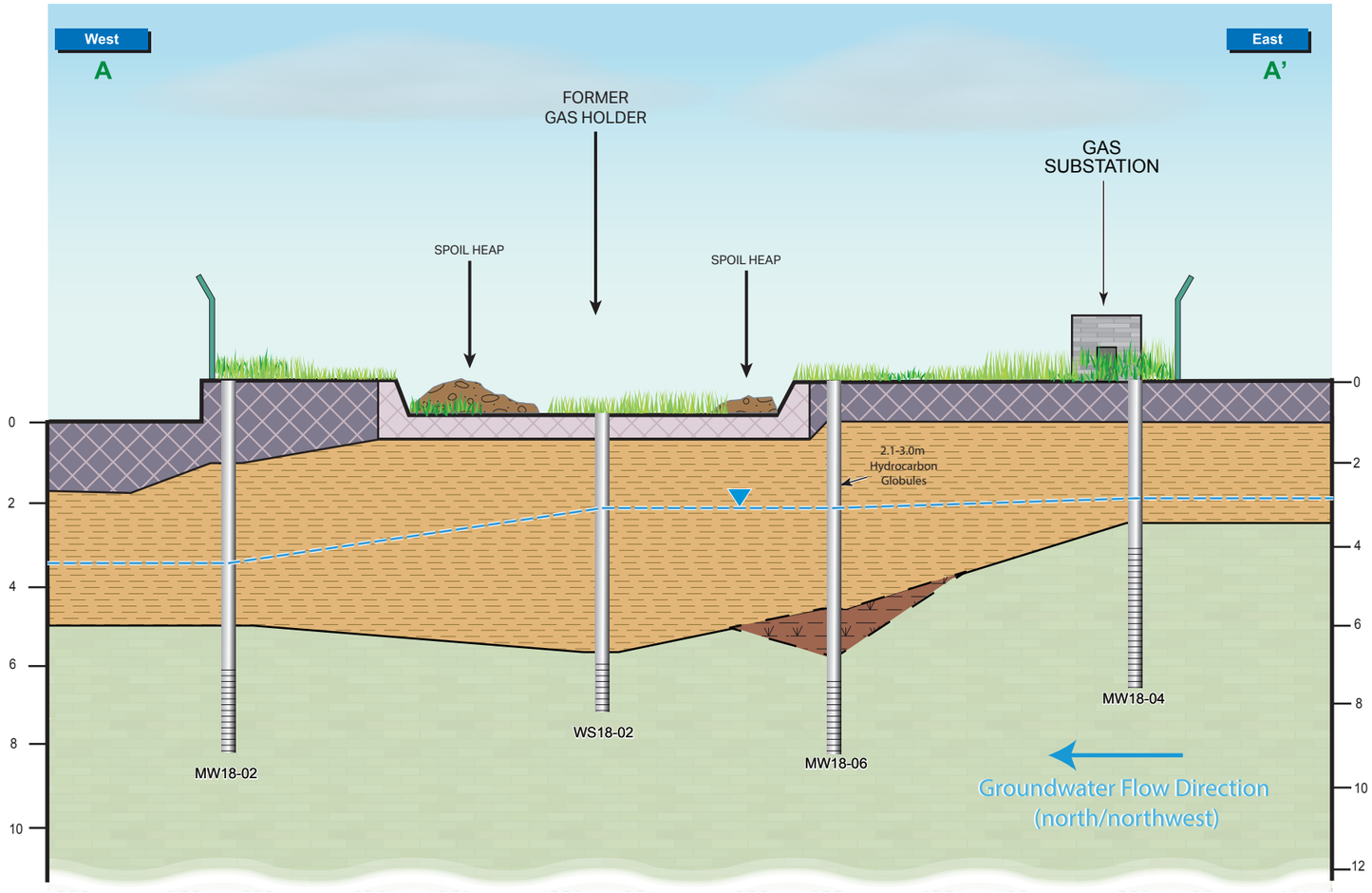
CLIENT
Lewes District Council

PROJECT
SGN Site, Dane Valley
Blatchington Road, Seaford,
East Sussex, BN25 2AN

DRAWING TITLE
Figure 1:
Potentiometric Surface Plots

DRAWN		CHECKED	APPROVED	DATE
MC		TR	TR	DEC 2018

SCALE	DRG No.	REV.
As Shown	60556156	



Potential Sources

On-site – Historical
- Part of former gas works (non-production area).

On-site - Current
- None.

Off-site – Historical
- Former gas works production area.
- Builders yard.

Chemicals of Potential Concern (COPCs)

- PAHs, lead and cyanide in shallow soil.
- Cyanide in deeper soils and groundwater
- Ammonia in groundwater.
- BTEX in groundwater (and potentially unidentified soil sources).
- Ground gases.
- Naphthalene in shallow and deep soils.

Potential Pathways

Human Health
- Vapours and soil gas – Inhalation/ migration into buildings.
- Particulate – Ingestion, inhalation, dermal contact with soil particulates in soft landscaped areas or during construction works and lateral migration of ground gases.
- Permeation – Migration of COPCs through plastic potable water supply pipes.

Controlled Waters
- Leaching of soils to underlying aquifers (Secondary A and Principal).
- Direct transfer during piling.
- Lateral migration in groundwater to wider Principal aquifer.

Potential Receptors

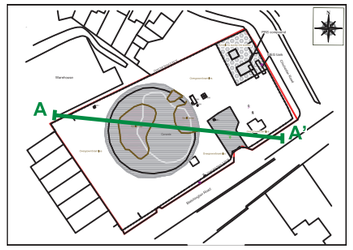
Human Health
- Future construction workers.
- Residents of future developments.
- Off-site residents and workers

Controlled Waters
- Water quality in wider Secondary A and Principal aquifers.

Potentially Complete Pollutant Linkages

Human Health
- Vapours and soil gas – Inhalation/ migration into buildings.
- Particulate – Ingestion, inhalation, dermal contact with soil particulates in soft landscaped areas or during construction works and lateral migration of ground gases.
- Permeation – Migration of COPCs through plastic potable water supply pipes.

Controlled Waters
- Leaching of soils to underlying aquifers (Secondary A and Principal).
- Direct transfer during piling.
- Lateral migration in groundwater to wider Principal aquifer.



KEY

- MADE GROUND
- FORMER GAS HOLDER (CONCRETE)
- ALLUVIUM
- PEAT
- NEWHAVEN CHALK FORMATION
- APPROXIMATE GROUNDWATER LEVEL AUGUST 2018

REV	DESCRIPTION	DRAWN	APPROVED	DATE

STATUS
FOR INFORMATION

CONSULTING ENGINEERS
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CLIENT
Lewes District Council

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Seaford, East Sussex, BN25 2AN

DRAWING TITLE
Figure 2
Conceptual Site Model

DRAWN		CHECKED	APPROVED	DATE
MC		JW	EP	Nov 2018

SCALE	DRG No.	REV.
NTS	60590532	

ORIGINAL DRAWING A3

Appendix A Figures from Advisian Factual Report

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PROJECT: 52061-00
BLATCHINGTON ROAD, SEAFORD

SGN

SITE LOCATION

Advisian
WorleyParsons Group

DRAWN BY	STATUS	APPROVER	PAPER SIZE	DATE	SCALE	OFFICE	T +44 (0)117 925 1304 www.advisian.com	FIGURE 1	REV
WM	DRAFT	-	A4	SEP 2018	1:25,000	LONDON			-

Q:\52061-00\FIGURES\FIGURE 1.CDR

Note: Locations and features shown are overlaid from relevant historical maps, site plans and reports. *All locations shown are approximate and are to be used for indicative purposes only.*

0 10 20 30m N

Warehouse
Garage
Underground equipment storage
Chain link fence 2.2m ht
PRS compound
MEG tank
Chichester Road
Unable to survey (no access)
BH1
MW18-03A
MW18-03
WS18-03
TP4
Overgrown/brambles
HP18-02
Gasholder
TP3
WS2
HP18-01
MH
JB
LP
WS3
MW18-06A
MW18-06
MW18-04
WS18-01
TP5
WS1
Spoil heap
WS18-02
Gasholder
Concrete
Spoil heap
MW18-02
TP6
Overgrown/brambles
GV
BH3
MW18-05
Overgrown/brambles
Redundant booster house
TP1
TP8
TP2
VW18-02
Chain link fence 2.2m ht
Former governor house
HP18-03
VW18-01
Sub station
BH2
Blatchington Road
TP7
MW18-01
Sub station

Approximate Site Centre: (548400, 99400)

Legend

- SGN site boundary
- Current structures
- Historical structures (unknown, except where labelled)
  Older maps — Overlaid from Landmark Envirocheck Report, 2017
- Historical structures
  Interpreted by WYG, Known Historical Site Features

Advisian Site Investigation Locations (2018)

- Borehole
- Borehole (refusal)
- Vapour well (shallow)
- Hand-dug pit
- Window sample

Previous Site Investigation Locations (Atkins, 2002)

- Trial pit
- Window sample
- Borehole

Drawing References:
Utiliscan, ref. UTI-0831-Seaford, 31/08/2018
Baseplan detail from Promap OS plan courtesy of SGN

PROJECT: 52061-00
BLATCHINGTON ROAD, SEAFORD

SGN

HISTORICAL STRUCTURES AND SITE INVESTIGATION LOCATIONS

Advisian
WorleyParsons Group

DRAWN BY	STATUS	APPROVER	PAPER SIZE	DATE	SCALE	OFFICE	T +44 (0)117 925 1304 www.advisian.com	FIGURE 4	REV
WM	DRAFT	-	A3	SEP 2018	1:400	LONDON			-

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Appendix B Geo-environmental Stage 2 Data Screening

Table 1
Soil Analytical Results Screened against Human Health GAC
Seaford Gas Works
LDC

Field_ID			DUP-01	DUP-02	HP18-01	HP18-02	HP18-03	MW18-01/1	MW18-01/2	MW18-01/3	MW18-01/4	MW18-02/1	MW18-02/2	MW18-02/3	MW18-02/4	MW18-03/1	MW18-03/2	MW18-03/3	MW18-03/4	MW18-04/1	MW18-04/2	MW18-04/3	MW18-05/1	MW18-05/2	MW18-05/3	MW18-05/4	MW18-06/1	MW18-06/2	MW18-06/3	MW18-06/4
Location_Code			MW18-04/1	WS18-02/2	HP18-01	HP18-02	HP18-03	MW18-01/1	MW18-01/2	MW18-01/3	MW18-01/4	MW18-02/1	MW18-02/2	MW18-02/3	MW18-02/4	MW18-03/1	MW18-03/2	MW18-03/3	MW18-03/4	MW18-04/1	MW18-04/2	MW18-04/3	MW18-05/1	MW18-05/2	MW18-05/3	MW18-05/4	MW18-06/1	MW18-06/2	MW18-06/3	MW18-06/4
Sample_Depth_Range			0.1-0.2	3.5-3.6	0.1-0.2	0.25-0.35	0.2-0.3	0.1-0.2	2-2.1	4.1-4.2	7.2-7.3	0.2-0.3	2.7-2.8	5.4-5.5	7.7-7.8	0.3-0.4	2.3-3	4-4.1	7-7.1	0.1-0.2	2.9-3	3.5-3.6	0.15-0.2	2-2.1	4.2-4.3	7.3-7.4	0.1-0.2	2.1-2.2	4.9-5	8.2-8.3
Sampled_Date_Time			18/08/2018	18/08/2018	17/07/2018	17/07/2018	17/07/2018	16/07/2018	16/07/2018	16/07/2018	16/07/2018	16/07/2018	16/07/2018	16/07/2018	16/07/2018	17/07/2018	17/07/2018	17/07/2018	17/07/2018	18/08/2018	18/08/2018	18/08/2018	18/08/2018	18/08/2018	18/08/2018	18/08/2018	19/07/2018	19/07/2018	19/07/2018	19/07/2018
Matrix_Description																														
Chem_Group	**ChemName**	**output unit**	**POS Resi**	**HDR Houses**																										
	TPH aliphatic >C5-C6	mg kg-1	600,000	**20**	-	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-
	TPH aliphatic >C6-C8	mg kg-1	620,000	**44**	-	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-
	TPH aliphatic >C8-C10	mg kg-1	13,000	**11**	-	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-
	TPH aliphatic >C10-C12	mg kg-1	13,000	**>Sat**	-	-	-	-	-	<1	-	<1	-	<1	-	<1	-	<1	<1	-	-	-	<1	-	<1	<1	3.4	-	<1	22	-	-
	TPH aliphatic >C12-C16	mg kg-1	13,000	**>Sat**	-	-	-	-	-	<2	-	<2	-	24	-	<2	-	6.8	<2	-	-	-	13	-	8.8	<2	93	-	<2	62	-	-
	TPH aliphatic >C16-C21	mg kg-1	13,000	**>Sat**	-	-	-	-	-	<8	-	<8	-	31	-	<8	-	24	<8	-	-	-	14	-	38	<8	72	-	<8	38	-	-
	TPH aliphatic >C21-C35	mg kg-1	13,000	**>Sat**	-	-	-	-	-	30	-	<8	-	66	-	<8	-	52	<8	-	-	-	<8	-	120	<8	52	-	<8	22	-	-
	TPH aromatic >C5-C7	mg kg-1	56,000	**130**	-	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	0.008	-	<0.001	<0.001	-	-
	TPH aromatic >C7-C8	mg kg-1	56,000	**320**	-	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-
	TPH aromatic >C8-C10	mg kg-1	5,000	**18**	-	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	1.6	-	<0.001	4	-	-
	TPH aromatic >C10-C12	mg kg-1	5,000	**100**	-	-	-	-	-	1.1	-	<1	-	9	-	<1	-	<1	<1	-	-	-	2.8	-	2.6	<1	13	-	3.3	64	-	-
	TPH aromatic >C12-C16	mg kg-1	5,000	**>Sat**	-	-	-	-	-	9.1	-	5	-	84	-	<2	-	4.4	<2	-	-	-	21	-	20	<2	880	-	16	440	-	-
	TPH aromatic >C16-C21	mg kg-1	3,800	**>Sat**	-	-	-	-	-	49	-	26	-	550	-	<10	-	45	<10	-	-	-	57	-	200	<10	1400	-	40	520	-	-
	TPH aromatic >C21-C35	mg kg-1	3,800	**>Sat**	-	-	-	-	-	150	-	72	-	1100	-	<10	-	170	<10	-	-	-	150	-	960	<10	870	-	84	270	-	-
	TPH Hazard Index	-		**1.00**	-	-	-	-	-	0.02	-	0.00	-	0.22	-	0.00	-	0.02	0.00	-	-	-	0.08	-	0.07	0.00	0.49	-	0.05	**1.49**	-	-
TPH	Total Petroleum Hydrocarbons	mg/kg			31	<10	420	330	570	270	26	110	-	2000	<10	<10	-	330	<10	<10	-	86	280	-	1700	<10	3600	-	190	1400	<10	-
	Total Aliphatics	mg/kg			-	-	-	-	-	39	-	<10	-	120	-	<10	-	83	<10	-	-	-	29	-	160	<10	220	-	<10	140	-	-
	Total Aromatics	mg/kg			-	-	-	-	-	210	-	100	-	1800	-	<10	-	220	<10	-	-	-	230	-	1200	<10	3200	-	140	1300	-	-
BTEX	Benzene	mg/kg	73	**0.13**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.008	-	<0.001	<0.001	<0.001	-
	Toluene	mg/kg	56,000	**320**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	0.006	<0.001	-
	Ethylbenzene	mg/kg	25,000	**30**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.064	-	<0.001	0.161	<0.001	-
	Xylene (m & p)	mg/kg	43,000	**29**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.02	-	<0.001	0.288	<0.001	-
	Xylene (o)	mg/kg	43,000	**28**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.047	-	<0.001	0.621	<0.001	-
	Xylenes (total)	mg/kg	43,000	**28**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.047	-	<0.001	0.909	<0.001	-
Oxygenates	MTBE	mg/kg		**33**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-
PAH	Naphthalene	mg/kg	4900	**0.85**	<0.05	<0.05	<0.05	<0.05	0.23	<0.05	<0.05	<0.05	-	**8.3**	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	0.5	<0.05	**0.9**	-	0.27	**16**	**0.94**	-
	Acenaphthylene	mg/kg	15000		<0.05	<0.05	1.7	0.67	0.67	0.32	<0.05	<0.05	-	16	<0.05	<0.05	-	0.8	<0.05	<0.05	-	<0.05	0.38	-	0.78	<0.05	8.1	-	<0.05	3.6	<0.05	-
	Acenaphthene	mg/kg	15000		<0.05	<0.05	0.52	<0.05	<0.05	<0.05	<0.05	<0.05	-	1.4	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	0.23	<0.05	7.9	-	<0.05	2.6	<0.05	-
	Fluorene	mg/kg	9900		<0.05	<0.05	0.78	0.3	<0.05	<0.05	<0.05	<0.05	-	3.5	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	0.32	<0.05	17	-	<0.05	7.6	<0.05	-
	Phenanthrene	mg/kg	3100		0.23	<0.05	6.3	2.2	1.4	0.77	<0.05	0.38	-	41	<0.05	<0.05	-	0.58	0.57	<0.05	-	0.71	<0.05	-	4	<0.05	58	-	1.3	23	<0.05	-
	Anthracene	mg/kg	74000		<0.05	<0.05	2.2	1.1	0.5	0.31	<0.05	0.19	-	25	<0.05	<0.05	-	0.31	<0.05	<0.05	-	0.17	<0.05	-	2	<0.05	16	-	0.44	6	<0.05	-
	Fluoranthene	mg/kg	3100		0.61	<0.05	12	5.3	3.7	3	0.32	1.7	-	79	<0.05	<0.05	-	2.2	0.27	<0.05	-	1.8	0.2	-	12	<0.05	16	-	2.7	5.7	<0.05	-
	Pyrene	mg/kg	7400		0.51	<0.05	11	4.8	3.4	2.8	0.36	1.8	-	66	<0.05	<0.05	-	3.6	0.45	<0.05	-	1.5	0.42	-	14	<0.05	26	-	2.5	9.4	<0.05	-
	Benz(a)anthracene	mg/kg	29		0.34	<0.05	5.9	2.6	2.1	1.6	0.2	0.89	-	47	<0.05	<0.05	-	2.2	0.22	<0.05	-	1.1	0.3	-	8.6	<0.05	8.7	-	1.9	3.9	<0.05	-
	Chrysene	mg/kg	57		0.4	<0.05	5.6	2.3	2.3	1.7	0.12	0.8	-	38	<0.05	<0.05	-	2.3	0.18	<0.05	-	0.96	0.32	-	6.8	<0.05	6.8	-	1.5	2.8	<0.05	-
	Benzo(a) pyrene	mg/kg	5.7		0.34	<0.05	7.4	3.1	2.3	1.9	0.3	1.3	-	36	<0.05	<0.05	-	4.2	<0.05	<0.05	-	1	0.9	-	17	<0.05	4.8	-	2.1	1.9	<0.05	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	82		0.26	<0.05	3.9	1.6	2.4	1.5	0.2	0.82	-	24	<0.05	<0.05	-	3.1	<0.05	<0.05	-	0.69	0.41	-	11	<0.05	1.7	-	1.3	0.5	<0.05	-
	Dibenz(a,h)anthracene	mg/kg	0.58		<0.05	<0.05	0.95	0.45	0.62	<0.05	<0.05	0.22	-	7	<0.05	<0.05	-	0.95	<0.05	<0.05	-	<0.05	<0.05	-	2.5	<0.05	<0.05	-	0.38	0.2	<0.05	-
	Benzo(g,h,i)perylene	mg/kg	640		0.3	<0.05	5.1	1.9	3	1.8	0.25	1.1	-	25	<0.05	<0.05	-	4.5	<0.05	<0.05	-	0.85	0.51	-	15	<0.05	2.1	-	1.7	0.62	<0.05	-
	Benzo(b)fluoranthene	mg/kg	7.2		0.38	<0.05	8.1	3.5	5.5	3	0.36	1.8	-	77	<0.05	<0.05	-	3.3	<0.05	<0.05	-	1.3	0.47	-	16	<0.05	3.9	-	2.4	1.4	<0.05	-
	Benzo(k)fluoranthene	mg/kg	190		0.25	<0.05	4.1	1.5	1.4	1.4	0.17	0.66	-	33	<0.05	<0.05	-	1.8	<0.05	<0.05	-	0.46	0.3	-	7.7	<0.05	1.5	-	0.78	0.55	<0.05	-
	PAH 16 Total	mg/kg			3.62	<0.8	75.7	31.3	29.3	20	2.28	11.6	-	527	<0.8	<0.8	-	29.7	1.69	<0.8	-	10.6	4.21	-	119	<0.8	179	-	19.2	85.8	0.94	-
SVOC	Naphtho[2,1-b]furan, 1,2-dimethyl-	mg/kg			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-
Phenolics	Trimethylphenols	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	Phenol	mg/kg	1300		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	Cresol Total	mg/kg			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-
	Phenols (Total Halogenated)	mg/kg			<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	-	<1.3	<1.3	-	<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	-
	resorcinol (m-dihydroxybenzene)	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	catechol (o-dihydroxybenzene)	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	Xylenols & Ethylphenols	mg/kg			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-
	2-isopropylphenol	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
Metals	Arsenic	mg/kg	79		18	62	7.4	9.4	16	12	15	10	-	16	14	58	-	13	7.7	16	-	15	16	-	13	18	8.4	-	17	16	8	-
	Barium	mg/kg			71	28	210	110	390	97	24	21	-	57	33	21	-	1500	16	31	-	81	25	-	200	42	17	-	2300	27	22	-
	Beryllium	mg/kg	2.2		1	1.2	0.69	0.56	0.84	0.48	0.62	0.83	-	0.2	0.98	0.96	-	1	0.64	0.99	-	0.98	0.85	-	2.1	0.81	0.54	-	0.85	0.76	1	-
	Cadmium	mg/kg	120		0.5	<0.2	0.5	0.4	<0.2	<0.2	<0.2	<0.2	-	<0.2	0.6	<0.2	-	0.5	<0.2	<0.2	-	0.5	<0.2	-	<0.2	<0.2	0.5	-	2	<0.2	<0.2	-
	Copper	mg/kg	12000		25	26	20	13	33	23	7.8	13	-	20	15	13	-	38	7.2	9.2	-	28	11	-	180	8.6	12	-	51	8.1	9.9	-
	Lead	mg/kg	630		75	29	300	110	1500	220	12	19	-	330	20	17	-	15,000	22	15	-	90	12	-	110	79	12	-	18,000	15	13	-
	Mercury	mg/kg	120		<0.3	<0.3	0.7	<0.3	<0.3	<0.3	<0.3	<0.3	-	0.6	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-
	Nickel	mg/kg	230		20	20	13	11	18	14	11	16	-	4.4	20	19	-	23	13	21	-	21	20	-	46	14	13	-	26	14	19	-
	Selenium	mg/kg	1100		1.3	2.4	<1	<1	1.4	<1	<1	<1	-	<1	<1	<1	-	1.5	<1	1	-	1.4	1.6	-	<1	<1	<1	-	1.2	<1	<1	-
	Vanadium	mg/kg	2000		48	73	23	25	36	26	36	45	-	24	46	50	-	36	34	56	-	42	35	-	54	50	17	-	38	39	54	-
	Zinc	mg/kg	81000		73	67	96	52	220	180	32	47	-	54	59	51	-	150	38	53	-	100	53	-	200	49	44	-	1500	34	52	-
	Chromium (hexavalent)	mg/kg	7.7		<4	<4	<4	<4	<4	<4	<4	<4	-	<4	<4	<4	-	<4	<4	<4	-	<4	<4	-	<4	<4	<4	-	<4	<4	<4	-
	Chromium (Trivalent)	mg/kg	1500		24	32	21	20	38	14	17	24	-	17	28	28	-	38	19	27	-	22	22	-	42	26	18	-	220	23	28	-
Organics	Organic Matter	%			-	-	-	-	-	2.6	-	-	-	8	-	-	-	3.7	-	-	-	3.8	-	-	4	-	-	-	3.5	-	-	-
Inorganics	Ammonia as NH4	mg/kg			2.1	6.5	<0.5	<0.5	0.7	1	<0.5	7.6	-	0.5	<0.5	8.5	-	1.6	3	3.6	-	1.5	1.5	-	1.9	11	0.7	-	<0.5	4.5	18	-
	Boron (Water Soluble)	mg/kg	11,000		3.6	7.5	0.9	1.6	2.4	1.9	2	3.7	-	0.3	5.7	7.5	-	2.3	3	5.8	-	1.3	2.2	-	1.6	5.4	2.4	-	2.9	3.7	9	-
	Water Soluble Chloride	mg/kg			16	55	16	18	28	31	54	50	-	40	75	240	-	22	19	18	-	17	18	-	85	9.2	63	-	10	28	140	-
	Thiocyanate	mg/kg	20		<5	7.3	<5	<5	<5	<5	<5	<5	-	23	<5	6.3	-	<5	<5	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	11	-
	Cyanide (Free)	mg/kg	20		<1	<1	<1	<1	<1	<1	<1	<1	-	39	<1	<1	-	<1	<1	<1	-	<1	<1	-	<1	<1	<1	-	<1	<1	<1	-
	cyanides-complex	mg/kg	50		<1	<1	8	2	160	63	<1	<1	-	4500	6	<1	-	10	<1	<1	-	<1	<1	-	<1	<1	<1	-	160	<1	<1	-
	Cyanide Total	mg/kg	78		<1	<1	8	2	160	63	<1	<1	-	4500	6	<1	-	10	<1	<1	-	<1	<1	-	<1	<1	<1	-	160	<1	<1	-
	Sulphate (soluble)	g/L			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphur	%			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Elemental Sulphur	mg/kg			<5	11	10	<5	8.2	5.7	<5	150	-	23	<5	210	-	<5	<5	<5	-	<5	<5	-	92	<5	58	-	<5	16	52	-
	Loss on ignition	%			5.2	3	2.4	2.6	3.6	3.5	1.1	1.6	-	10.6	4	3.4	-	5.2	1.2	2.1	-	5	2	-	4.1	1.9	1.4	-	4.9	2	2.5	-
	Moisture	%			12	31	4.9	4.6	5.5	4.3	17	17	20	7.2	18	27	19	6.9	18	21	22	8.5	18	20	13	17	25	21	9.6	19	28	20
Asbestos	Asbestos PCOM Quantification	mass %	0.001		-	-	<0.001	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asbestos Quantification - Total - %	%	0.001		-	-	<0.001	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Particle Size	Stones content (>50mm)	%			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Comments
GAC: Generic Assessment Criteria
POS Resi Public Open Space, Residential
HDR High Density Residential Houses
(blank): No assessment criteria available
Sat: Unacceptable risk not achieved due to calculated saturation of vapour pathway
- : Not analysed
Key
XXX Exceedance of Public Open Space (residential) GAC. Sandy Loam TOC >3.48%
XXX Exceedance of High Density Residential GAC

Table 1
Soil Analytical Results Screened against Human Health GAC
Seaford Gas Works
LDC

				Field_ID	VW18-01/1	VW18-01/2	VW18-02/1	VW18-02/2	WS18-01/1	WS18-01/2	WS18-01/3	WS18-02/1	WS18-02/2	WS18-02/3	WS18-03/1	WS18-03/2	WS18-03/3
				Location_Code	VW18-01/1	VW18-01/2	VW18-02/1	VW18-02/2	WS18-01/1	WS18-01/2	WS18-01/3	WS18-02/1	WS18-02/2	WS18-02/3	WS18-03/1	WS18-03/2	WS18-03/3
				Sample_Depth_Range	0.2-0.3	1.15-1.25	0.15-2.5	0.6-0.7	0.15-0.25	4.5-4.6	6.5-6.5	0.6-0.7	3.5-3.6	6.8-6.9	0.1-0.2	2.6-2.7	4.4-4.5
				Sampled_Date_Time	16/07/2018	16/07/2018	16/07/2018	16/07/2018	16/07/2018	18/08/2018	18/08/2018	17/07/2018	17/07/2018	17/07/2018	18/08/2018	18/08/2018	18/08/2018
				Matrix_Description													
Chem_Group	**ChemName**	**output unit**	**POS Resi**	**HDR Houses**													
	TPH aliphatic >C5-C6	mg kg^{-1}	600,000	**20**	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aliphatic >C6-C8	mg kg^{-1}	620,000	**44**	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aliphatic >C8-C10	mg kg^{-1}	13,000	**11**	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aliphatic >C10-C12	mg kg^{-1}	13,000	**>Sat**	-	-	-	<1	-	-	-	<1	-	-	-	23	-
	TPH aliphatic >C12-C16	mg kg^{-1}	13,000	**>Sat**	-	-	-	<2	-	-	-	<2	-	-	-	72	-
	TPH aliphatic >C16-C21	mg kg^{-1}	13,000	**>Sat**	-	-	-	<8	-	-	-	<8	-	-	-	<8	-
	TPH aliphatic >C21-C35	mg kg^{-1}	13,000	**>Sat**	-	-	-	<8	-	-	-	<8	-	-	-	<8	-
	TPH aromatic >C5-C7	mg kg^{-1}	56,000	**130**	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aromatic >C7-C8	mg kg^{-1}	56,000	**320**	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aromatic >C8-C10	mg kg^{-1}	5,000	**18**	-	-	-	<0.001	-	-	-	<0.001	-	-	-	1	-
	TPH aromatic >C10-C12	mg kg^{-1}	5,000	**100**	-	-	-	<1	-	-	-	<1	-	-	-	69	-
	TPH aromatic >C12-C16	mg kg^{-1}	5,000	**>Sat**	-	-	-	<2	-	-	-	<2	-	-	-	230	-
	TPH aromatic >C16-C21	mg kg^{-1}	3,800	**>Sat**	-	-	-	<10	-	-	-	<10	-	-	-	200	-
	TPH aromatic >C21-C35	mg kg^{-1}	3,800	**>Sat**	-	-	-	<10	-	-	-	<10	-	-	-	89	-
	TPH Hazard Index	-		**1.00**	-	-	-	0.00	-	-	-	0.00	-	-	-	**1.39**	-
TPH	Total Petroleum Hydrocarbons	mg/kg			1900	170	360	<10	200	<10	-	<10	<10	-	790	690	-
	Total Aliphatics	mg/kg			-	-	-	<10	-	-	-	<10	-	-	-	100	-
	Total Aromatics	mg/kg			-	-	-	<10	-	-	-	<10	-	-	-	590	-
BTEX	Benzene	mg/kg	73	**0.13**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Toluene	mg/kg	56,000	**320**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Ethylbenzene	mg/kg	25,000	**30**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.038	-
	Xylene (m & p)	mg/kg	43,000	**29**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.088	-
	Xylene (o)	mg/kg	43,000	**28**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.16	-
	Xylenes (total)	mg/kg	43,000	**28**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.248	-
Oxygenates	MTBE	mg/kg		**33**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
PAH	Naphthalene	mg/kg	4900	**0.85**	<0.05	<0.05	0.54	<0.05	0.26	<0.05	-	<0.05	<0.05	-	0.24	**7.3**	-
	Acenaphthylene	mg/kg	15000		0.86	0.36	2.1	<0.05	0.8	<0.05	-	<0.05	<0.05	-	1.6	0.85	-
	Acenaphthene	mg/kg	15000		0.48	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	0.43	-
	Fluorene	mg/kg	9900		0.48	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	1.6	-
	Phenanthrene	mg/kg	3100		11	0.94	2.6	<0.05	2	<0.05	-	<0.05	<0.05	-	1	5.3	-
	Anthracene	mg/kg	74000		4.4	0.4	1.3	<0.05	0.76	<0.05	-	<0.05	<0.05	-	0.53	1.1	-
	Fluoranthene	mg/kg	3100		35	3.2	9.6	0.39	6	<0.05	-	<0.05	<0.05	-	4.3	1.4	-
	Pyrene	mg/kg	7400		34	3.2	8.1	0.36	5.5	<0.05	-	<0.05	<0.05	-	7.4	2.3	-
	Benz(a)anthracene	mg/kg	29		20	1.8	5.7	0.24	3.6	<0.05	-	<0.05	<0.05	-	5	0.82	-
	Chrysene	mg/kg	57		18	1.8	6.7	0.22	3.6	<0.05	-	<0.05	<0.05	-	5.4	0.6	-
	Benzo(a) pyrene	mg/kg	5.7		25	2.4	5.7	0.3	4.5	<0.05	-	<0.05	<0.05	-	9.3	0.45	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	82		16	1.5	7	0.2	2.9	<0.05	-	<0.05	<0.05	-	3.6	<0.05	-
	Dibenz(a,h)anthracene	mg/kg	0.58		4.1	0.3	1.9	<0.05	0.76	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
	Benzo(g,h,i)perylene	mg/kg	640		20	1.8	6.6	0.23	3.5	<0.05	-	<0.05	<0.05	-	5	<0.05	-
	Benzo(b)fluoranthene	mg/kg	7.2		29	3.7	16	0.43	6.9	<0.05	-	<0.05	<0.05	-	8.4	0.35	-
	Benzo(k)fluoranthene	mg/kg	190		9.3	0.87	4.2	0.21	1.5	<0.05	-	<0.05	<0.05	-	2.5	0.15	-
	PAH 16 Total	mg/kg			227	22.2	78.1	2.58	42.4	<0.8	-	<0.8	<0.8	-	54.2	22.6	-
SVOC	Naphtho[2,1-b]furan, 1,2-dimethyl-	mg/kg			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-
Phenolics	Trimethylphenols	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	Phenol	mg/kg	1300		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	Cresol Total	mg/kg			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
	Phenols (Total Halogenated)	mg/kg			<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	-	<1.3	<1.3	-	<1.3	<1.3	-
	resorcinol (m-dihydroxybenzene)	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	catechol (o-dihydroxybenzene)	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	Xylenols & Ethylphenols	mg/kg			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
	2-isopropylphenol	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Metals	Arsenic	mg/kg	79		18	9.8	14	16	19	25	-	14	15	-	48	16	-
	Barium	mg/kg			170	80	71	39	320	28	-	30	32	-	110	20	-
	Beryllium	mg/kg	2.2		1.3	0.71	0.3	0.36	0.96	1.3	-	0.68	1.1	-	1.2	0.91	-
	Cadmium	mg/kg	120		<0.2	0.5	<0.2	<0.2	0.9	<0.2	-	<0.2	0.5	-	<0.2	<0.2	-
	Copper	mg/kg	12000		110	25	85	40	34	12	-	78	12	-	28	11	-
	Lead	mg/kg	630		310	100	710	63	590	23	-	12	15	-	170	12	-
	Mercury	mg/kg	120		1.3	<0.3	0.4	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
	Nickel	mg/kg	230		40	16	8.8	8.7	19	19	-	13	18	-	19	17	-
	Selenium	mg/kg	1100		<1	<1	<1	<1	1.6	<1	-	<1	1.1	-	<1	<1	-
	Vanadium	mg/kg	2000		37	33	23	25	35	61	-	42	52	-	49	50	-
	Zinc	mg/kg	81000		73	72	67	32	190	56	-	31	51	-	110	45	-
	Chromium (hexavalent)	mg/kg	7.7		<4	<4	<4	<4	<4	<4	-	<4	<4	-	<4	<4	-
	Chromium (Trivalent)	mg/kg	1500		19	21	18	21	39	34	-	21	30	-	28	26	-
Organics	Organic Matter	%			5.1	-	3.4	-	-	-	-	-	-	-	-	1	-
Inorganics	Ammonia_as_NH4	mg/kg			0.7	1.4	<0.5	<0.5	<0.5	5.9	-	1	9.9	-	0.8	5.7	-
	Boron (Water Soluble)	mg/kg	11,000		1.4	0.7	0.6	0.6	2.4	7.4	-	1.5	4	-	2.5	4.8	-
	Water Soluble Chloride	mg/kg			33	12	19	21	32	49	-	23	81	-	9.5	31	-
	Thiocyanate	mg/kg	20		<5	<5	<5	<5	<5	<5	-	<5	7	-	<5	<5	-
	Cyanide (Free)	mg/kg	20		<1	<1	5	1	<1	<1	-	<1	<1	-	<1	<1	-
	cyanides-complex	mg/kg	50		15	5	300	290	49	<1	-	<1	<1	-	3	<1	-
	Cyanide Total	mg/kg	78		15	5	310	290	49	<1	-	<1	<1	-	3	<1	-
	Sulphate (soluble)	g/L			-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphur	%			-	-	-	-	-	-	-	-	-	-	-	-	-
	Elemental Sulphur	mg/kg			220	<5	17	<5	<5	24	-	<5	<5	-	<5	<5	-
	Loss on ignition	%			8.6	4	5.2	4.8	6	2.6	-	1.7	1.6	-	4.4	2.4	-
	Moisture	%			2.6	14	11	11	8	29	25	16	20	22	11	18	23
Asbestos	Asbestos PCOM Quantification	mass %	0.001		<0.001	-	-	-	-	-	-	-	-	-	-	-	-
	Asbestos Quantification - Total - %	%	0.001		<0.001	-	-	-	-	-	-	-	-	-	-	-	-
Particle Size	Stones content (>50mm)	%			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Comments
GAC: Generic Assessment Criteria
POS Resi Public Open Space, Residential
HDR High Density Residential Houses
(blank): No assessment criteria available
Sat: Unacceptable risk not achieved due to calculated saturation of vapour pathway
- : Not analysed
Key
XXX Exceedance of Public Open Space (residential) GAC. Sandy Loam TOC >3.48%
XXX Exceedance of High Density Residential GAC

Table 2
Soil Analytical Results Screened Against Controlled Waters GAC
Seaford Gas Works
LDC

				Field_ID	HP18-01	HP18-02	HP18-03	MW18-01/1	MW18-01/2	MW18-01/3	MW18-01/4	MW18-02/1	MW18-02/2	MW18-02/3	MW18-02/4	MW18-03/1	MW18-03/2	MW18-03/3	MW18-03/4	MW18-04/1	MW18-04/2	MW18-04/3	MW18-05/1	MW18-05/2	MW18-05/3	MW18-05/4
				Location_Code	HP18-01	HP18-02	HP18-03	MW18-01/1	MW18-01/2	MW18-01/3	MW18-01/4	MW18-02/1	MW18-02/2	MW18-02/3	MW18-02/4	MW18-03/1	MW18-03/2	MW18-03/3	MW18-03/4	MW18-04/1	MW18-04/2	MW18-04/3	MW18-05/1	MW18-05/2	MW18-05/3	MW18-05/4
				Sample_Depth_Range	0.1-0.2	0.25-0.35	0.2-0.3	0.1-0.2	2-2.1	4.1-4.2	7.2-7.3	0.2-0.3	2.7-2.8	5.4-5.5	7.7-7.8	0.3-0.4	2.3-3	4-4.1	7-7.1	0.1-0.2	2.9-3	3.5-3.6	0.15-0.2	2-2.1	4.2-4.3	7.3-7.4
Chem_Group	**ChemName**	**output unit**	**EQL**	**DWS Soil GAC**																						
	TPH aliphatic >C5-C6	mg kg-1	<0.001	**161**	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-
	TPH aliphatic >C6-C8	mg kg-1	<0.001	**621**	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-
	TPH aliphatic >C8-C10	mg kg-1	<0.001	**92.1**	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-
	TPH aliphatic >C10-C12	mg kg-1	<1	**722**	-	-	-	<1	-	<1	-	<1	-	<1	-	<1	<1	-	-	-	<1	-	<1	<1	3.4	-
	TPH aliphatic >C12-C16	mg kg-1	<2	**16,100**	-	-	-	<2	-	<2	-	24	-	<2	-	6.8	<2	-	-	-	13	-	8.8	<2	93	-
	TPH aliphatic >C16-C21	mg kg-1	<8	**1,890,000**	-	-	-	<8	-	<8	-	31	-	<8	-	24	<8	-	-	-	14	-	38	<8	72	-
	TPH aliphatic >C21-C35	mg kg-1	<8	**22,800,000**	-	-	-		-	<8	-	66	-	<8	-	52	<8	-	-	-	<8	-	120	<8	52	-
	TPH aromatic >C5-C7	mg kg-1	<0.001	**0.000731**	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	**0.008**	-
	TPH aromatic >C7-C8	mg kg-1	<0.001	**0.0101**	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-
	TPH aromatic >C8-C10	mg kg-1	<0.001	**1.47**	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	**1.6**	-
	TPH aromatic >C10-C12	mg kg-1	<1	**4.78**	-	-	-	1.1	-	<1	-	**9**	-	<1	-	<1	<1	-	-	-	2.8	-	2.6	<1	**13**	-
	TPH aromatic >C12-C16	mg kg-1	<2	**2.27**	-	-	-	**9.1**	-	**5**	-	**84**	-	<2	-	**4.4**	<2	-	-	-	**21**	-	**20**	<2	**880**	-
	TPH aromatic >C16-C21	mg kg-1	<10	**4.51**	-	-	-	**49**	-	**26**	-	**550**	-	<10	-	**45**	<10	-	-	-	**57**	-	**200**	<10	**1400**	-
	TPH aromatic >C21-C35	mg kg-1	<10	**12.7**	-	-	-	**150**	-	**72**	-	**1100**	-	<10	-	**170**	<10	-	-	-	**150**	-	**960**	<10	**870**	-
TPH	Total Petroleum Hydrocarbons	mg/kg	<10		420	330	570	270	26	110	-	2000	<10	<10	-	330	<10	<10	-	86	280	-	1700	<10	3600	-
	Total Aliphatics	mg/kg	<10		-	-	-	39	-	<10	-	120	-	<10	-	83	<10	-	-	-	29	-	160	<10	220	-
	Total Aromatics	mg/kg	<10		-	-	-	210	-	100	-	1800	-	<10	-	220	<10	-	-	-	230	-	1200	<10	3200	-
BTEX	Benzene	mg/kg	<0.001	**0.0007**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	**0.008**	-
	Toluene	mg/kg	<0.001	**1.47**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-
	Ethylbenzene	mg/kg	<0.001	**1.36**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.064	-
	Xylene (m & p)	mg/kg	<0.001	**0.859**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.02	-
	Xylene (o)	mg/kg	<0.001	**0.82**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.047	-
	Total Xylenes	mg/kg	<0.001	**2.29**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	0.067	-
Oxygenates	MTBE	mg/kg	<0.001	**0.686**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-
PAH	Naphthalene	mg/kg	<0.05	**0.039**	<0.05	<0.05	**0.23**	<0.05	<0.05	<0.05	-	**8.3**	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	**0.5**	<0.05	**0.9**	-
	Acenaphthylene	mg/kg	<0.05	**0.328**	**1.7**	**0.67**	**0.67**	0.32	<0.05	<0.05	-	**16**	<0.05	<0.05	-	**0.8**	<0.05	<0.05	-	<0.05	**0.38**	-	**0.78**	<0.05	**8.1**	-
	Acenaphthene	mg/kg	<0.05	**0.423**	**0.52**	<0.05	<0.05	<0.05	<0.05	<0.05	-	**1.4**	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	0.23	<0.05	**7.9**	-
	Fluorene	mg/kg	<0.05	**0.339**	**0.78**	0.3	<0.05	<0.05	<0.05	<0.05	-	**3.5**	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	0.32	<0.05	**17**	-
	Phenanthrene	mg/kg	<0.05	**0.22**	**6.3**	**2.2**	**1.4**	**0.77**	<0.05	**0.38**	-	**41**	<0.05	<0.05	-	**0.58**	**0.57**	<0.05	-	**0.71**	<0.05	-	**4**	<0.05	**58**	-
	Anthracene	mg/kg	<0.05	**5.06**	2.2	1.1	0.5	0.31	<0.05	0.19	-	**25**	<0.05	<0.05	-	0.31	<0.05	<0.05	-	0.17	<0.05	-	2	<0.05	**16**	-
	Fluoranthene	mg/kg	<0.05	**0.728**	**12**	**5.3**	**3.7**	**3**	0.32	**1.7**	-	**79**	<0.05	<0.05	-	**2.2**	0.27	<0.05	-	**1.8**	0.2	-	**12**	<0.05	**16**	-
	Pyrene	mg/kg	<0.05	**1.46**	**11**	**4.8**	**3.4**	**2.8**	0.36	**1.8**	-	**66**	<0.05	<0.05	-	**3.6**	0.45	<0.05	-	**1.5**	0.42	-	**14**	<0.05	**26**	-
	Benz(a)anthracene	mg/kg	<0.05	**2.72**	**5.9**	2.6	2.1	1.6	0.2	0.89	-	**47**	<0.05	<0.05	-	2.2	0.22	<0.05	-	1.1	0.3	-	**8.6**	<0.05	**8.7**	-
	Chrysene	mg/kg	<0.05	**3.85**	**5.6**	2.3	2.3	1.7	0.12	0.8	-	**38**	<0.05	<0.05	-	2.3	0.18	<0.05	-	0.96	0.32	-	**6.8**	<0.05	**6.8**	-
	Benzo(a) pyrene	mg/kg	<0.05	**0.0129**	**7.4**	**3.1**	**2.3**	**1.9**	**0.3**	**1.3**	-	**36**	<0.05	<0.05	-	**4.2**	<0.05	<0.05	-	**1**	**0.9**	-	**17**	<0.05	**4.8**	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05		3.9	1.6	2.4	1.5	0.2	0.82	-	24	<0.05	<0.05	-	3.1	<0.05	<0.05	-	0.69	0.41	-	11	<0.05	1.7	-
	Dibenz(a,h)anthracene	mg/kg	<0.05	**0.13**	**0.95**	**0.45**	**0.62**	<0.05	<0.05	**0.22**	-	**7**	<0.05	<0.05	-	**0.95**	<0.05	<0.05	-	<0.05	<0.05	-	**2.5**	<0.05	<0.05	-
	Benzo(g,h,i)perylene	mg/kg	<0.05		5.1	1.9	3	1.8	0.25	1.1	-	25	<0.05	<0.05	-	4.5	<0.05	<0.05	-	0.85	0.51	-	15	<0.05	2.1	-
	Benzo(b)fluoranthene	mg/kg	<0.05		8.1	3.5	5.5	3	0.36	1.8	-	77	<0.05	<0.05	-	3.3	<0.05	<0.05	-	1.3	0.47	-	16	<0.05	3.9	-
	Benzo(k)fluoranthene	mg/kg	<0.05		4.1	1.5	1.4	1.4	0.17	0.66	-	33	<0.05	<0.05	-	1.8	<0.05	<0.05	-	0.46	0.3	-	7.7	<0.05	1.5	-
	PAH 16 Total	mg/kg	<0.8		75.7	31.3	29.3	20	2.28	11.6	-	527	<0.8	<0.8	-	29.7	1.69	<0.8	-	10.6	4.21	-	119	<0.8	179	-
SVOC	Naphtho[2,1-b]furan, 1,2-dimethyl-	mg/kg	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	<0.2	-
Phenolics	Trimethylphenols	mg/kg	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	Phenol	mg/kg	<0.1	**1.91**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	Cresol Total	mg/kg	<0.3	**Cannot back calculate. Incor**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	-
	Phenols (Total Halogenated)	mg/kg	<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	-	<1.3	<1.3	-	<1.3	<1.3	<1.3	-
	resorcinol (m-dihydroxybenzene)	mg/kg	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	catechol (o-dihydroxybenzene)	mg/kg	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
	Xylenols & Ethylphenols	mg/kg	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	-
	2-isopropylphenol	mg/kg	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
Metals	Arsenic	mg/kg	<1	**5**	**7.4**	**9.4**	**16**	**12**	**15**	**10**	-	**16**	**14**	**58**	-	**13**	**7.7**	**16**	-	**15**	**16**	-	**13**	**18**	**8.4**	-
	Barium	mg/kg	<1	**53.3**	**210**	**110**	**390**	**97**	24	21	-	**57**	33	21	-	**1500**	16	31	-	**81**	25	-	**200**	42	17	-
	Beryllium	mg/kg	<0.01	**20.4**	0.69	0.56	0.84	0.48	0.62	0.83	-	0.2	0.98	0.96	-	1	0.64	0.99	-	0.98	0.85	-	2.1	0.81	0.54	-
	Cadmium	mg/kg	<0.2	**0.5**	**0.5**	0.4	<0.2	<0.2	<0.2	<0.2	-	<0.2	**0.6**	<0.2	-	**0.5**	<0.2	<0.2	-	**0.5**	<0.2	-	<0.2	<0.2	**0.5**	-
	Copper	mg/kg	<1	**200**	20	13	33	23	7.8	13	-	20	15	13	-	38	7.2	9.2	-	28	11	-	180	8.6	12	-
	Lead	mg/kg	<1	**26.9**	**300**	**110**	**1500**	**220**	12	19	-	**330**	20	17	-	**15,000**	22	15	-	**90**	12	-	**110**	**79**	12	-
	Mercury	mg/kg	<0.3	**Cannot back calculate. Incor**	**0.7**	<0.3	<0.3	<0.3	<0.3	<0.3	-	**0.6**	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	-
	Nickel	mg/kg	<1	**10**	**13**	**11**	**18**	**14**	**11**	**16**	-	4.4	**20**	**19**	-	**23**	**13**	**21**	-	**21**	**20**	-	**46**	**14**	**13**	-
	Selenium	mg/kg	<1	**0.5**	<1	<1	**1.4**	<1	<1	<1	-	<1	<1	<1	-	**1.5**	<1	**1**	-	**1.4**	**1.6**	-	<1	<1	<1	-
	Vanadium	mg/kg	<1	**1.09**	**23**	**25**	**36**	**26**	**36**	**45**	-	**24**	**46**	**50**	-	**36**	**34**	**56**	-	**42**	**35**	-	**54**	**50**	**17**	-
	Zinc	mg/kg	<1	**228**	96	52	220	180	32	47	-	54	59	51	-	150	38	53	-	100	53	-	200	49	44	-
	Chromium (hexavalent)	mg/kg	<4		<4	<4	<4	<4	<4	<4	-	<4	<4	<4	-	<4	<4	<4	-	<4	<4	-	<4	<4	<4	-
	Chromium (Trivalent)	mg/kg	<1		21	20	38	14	17	24	-	17	28	28	-	38	19	27	-	22	22	-	42	26	18	-
Inorganics	Boron (Water Soluble)	mg/kg	<0.1		0.9	1.6	2.4	1.9	2	3.7	-	0.3	5.7	7.5	-	2.3	3	5.8	-	1.3	2.2	-	1.6	5.4	2.4	-
	Ammonia_as_NH4	mg/kg	<0.5		<0.5	<0.5	0.7	1	<0.5	7.6	-	0.5	<0.5	8.5	-	1.6	3	3.6	-	1.5	1.5	-	1.9	11	0.7	-
	Water Soluble Chloride	mg/kg	<1		16	18	28	31	54	50	-	40	75	240	-	22	19	18	-	17	18	-	85	9.2	63	-
	Cyanide (Free)	mg/kg	<1		<1	<1	<1	<1	<1	<1	-	39	<1	<1	-	<1	<1	<1	-	<1	<1	-	<1	<1	<1	-
	Thiocyanate	mg/kg	<1		<5	<5	<5	<5	<5	<5	-	23	<5	6.3	-	<5	<5	<5	-	<5	<5	-	<5	<5	<5	-
	cyanides-complex	mg/kg	<1		8	2	160	63	<1	<1	-	4500	6	<1	-	10	<1	<1	-	<1	<1	-	<1	<1	<1	-
	Cyanide Total	mg/kg	<1	**Cannot back calculate. Incor**	8	2	160	63	<1	<1	-	4500	6	<1	-	10	<1	<1	-	<1	<1	-	<1	<1	<1	-
	Sulphate (soluble), 16 hrs, 2:1	mg/kg	<1		170	110	1200	1100	210	1400	-	3600	660	1700	-	89	27	44	-	51	75	-	550	53	240	-
	Elemental Sulphur	mg/kg	<1		10	<5	8.2	5.7	<5	150	-	23	<5	210	-	<5	<5	<5	-	<5	<5	-	92	<5	58	-

Comments
GAC: Generic Assessment Criteria
(blank): No assessment criteria available
- : Not analysed

Key
XXX Exceedance of GAC_WTV_EN/WA_DWS-SAND 1%TOC

Table 2
Soil Analytical Results Screened Against Controlled Waters GAC
Seaford Gas Works
LDC

				Field_ID	MW18-06/1	MW18-06/2	MW18-06/3	MW18-06/4	VW18-01/1	VW18-01/2	VW18-02/1	VW18-02/2	WS18-01/1	WS18-01/2	WS18-01/3	WS18-02/1	WS18-02/2	WS18-02/3	WS18-03/1	WS18-03/2	WS18-03/3
				Location_Code	MW18-06/1	MW18-06/2	MW18-06/3	MW18-06/4	VW18-01/1	VW18-01/2	VW18-02/1	VW18-02/2	WS18-01/1	WS18-01/2	WS18-01/3	WS18-02/1	WS18-02/2	WS18-02/3	WS18-03/1	WS18-03/2	WS18-03/3
				Sample_Depth_Range	0.1-0.2	2.1-2.2	4.9-5	8.2-8.3	0.2-0.3	1.15-1.25	0.15-2.5	0.6-0.7	0.15-0.25	4.5-4.6	6.5-6.5	0.6-0.7	3.5-3.6	6.8-6.9	0.1-0.2	2.6-2.7	4.4-4.5
Chem_Group	**ChemName**	**output unit**	**EQL**	**DWS Soil GAC**																	
	TPH aliphatic >C5-C6	mg kg-1	<0.001	**161**	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aliphatic >C6-C8	mg kg-1	<0.001	**621**	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aliphatic >C8-C10	mg kg-1	<0.001	**92.1**	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aliphatic >C10-C12	mg kg-1	<1	**722**	<1	22	-	-	-	-	-	<1	-	-	-	<1	-	-	-	23	-
	TPH aliphatic >C12-C16	mg kg-1	<2	**16,100**	<2	62	-	-	-	-	-	<2	-	-	-	<2	-	-	-	72	-
	TPH aliphatic >C16-C21	mg kg-1	<8	**1,890,000**	<8	38	-	-	-	-	-	<8	-	-	-	<8	-	-	-	<8	-
	TPH aliphatic >C21-C35	mg kg-1	<8	**22,800,000**	<8	22	-	-	-	-	-	<8	-	-	-	<8	-	-	-	<8	-
	TPH aromatic >C5-C7	mg kg-1	<0.001	**0.000731**	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aromatic >C7-C8	mg kg-1	<0.001	**0.0101**	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	TPH aromatic >C8-C10	mg kg-1	<0.001	**1.47**	<0.001	**4**	-	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	1	-
	TPH aromatic >C10-C12	mg kg-1	<1	**4.78**	3.3	**64**	-	-	-	-	-	<1	-	-	-	<1	-	-	-	**69**	-
	TPH aromatic >C12-C16	mg kg-1	<2	**2.27**	**16**	**440**	-	-	-	-	-	<2	-	-	-	<2	-	-	-	**230**	-
	TPH aromatic >C16-C21	mg kg-1	<10	**4.51**	**40**	**520**	-	-	-	-	-	<10	-	-	-	<10	-	-	-	**200**	-
	TPH aromatic >C21-C35	mg kg-1	<10	**12.7**	**84**	**270**	-	-	-	-	-	<10	-	-	-	<10	-	-	-	**89**	-
TPH	Total Petroleum Hydrocarbons	mg/kg	<10		190	1400	<10	-	1900	170	360	<10	200	<10	-	<10	<10	-	790	690	-
	Total Aliphatics	mg/kg	<10		<10	140	-	-	-	-	-	<10	-	-	-	<10	-	-	-	100	-
	Total Aromatics	mg/kg	<10		140	1300	-	-	-	-	-	<10	-	-	-	<10	-	-	-	590	-
BTEX	Benzene	mg/kg	<0.001	**0.0007**	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Toluene	mg/kg	<0.001	**1.47**	<0.001	0.006	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Ethylbenzene	mg/kg	<0.001	**1.36**	<0.001	0.161	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.038	-
	Xylene (m & p)	mg/kg	<0.001	**0.859**	<0.001	0.288	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.088	-
	Xylene (o)	mg/kg	<0.001	**0.82**	<0.001	0.621	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.16	-
	Total Xylenes	mg/kg	<0.001	**2.29**	<0.001	0.999	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	0.248	-
Oxygenates	MTBE	mg/kg	<0.001	**0.686**	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
PAH	Naphthalene	mg/kg	<0.05	**0.039**	**0.27**	**16**	**0.94**	-	<0.05	<0.05	**0.54**	<0.05	**0.26**	<0.05	-	<0.05	<0.05	-	**0.24**	**7.3**	-
	Acenaphthylene	mg/kg	<0.05	**0.328**	<0.05	**3.6**	<0.05	-	**0.86**	**0.36**	**2.1**	<0.05	**0.8**	<0.05	-	<0.05	<0.05	-	**1.6**	**0.85**	-
	Acenaphthene	mg/kg	<0.05	**0.423**	<0.05	**2.6**	<0.05	-	**0.48**	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	**0.43**	-
	Fluorene	mg/kg	<0.05	**0.339**	<0.05	**7.6**	<0.05	-	**0.48**	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	**1.6**	-
	Phenanthrene	mg/kg	<0.05	**0.22**	**1.3**	**23**	<0.05	-	**11**	**0.94**	**2.6**	<0.05	**2**	<0.05	-	<0.05	<0.05	-	**1**	**5.3**	-
	Anthracene	mg/kg	<0.05	**5.06**	0.44	**6**	<0.05	-	4.4	0.4	1.3	<0.05	0.76	<0.05	-	<0.05	<0.05	-	0.53	1.1	-
	Fluoranthene	mg/kg	<0.05	**0.728**	**2.7**	**5.7**	<0.05	-	**35**	**3.2**	**9.6**	0.39	**6**	<0.05	-	<0.05	<0.05	-	**4.3**	**1.4**	-
	Pyrene	mg/kg	<0.05	**1.46**	**2.5**	**9.4**	<0.05	-	**34**	**3.2**	**8.1**	0.36	**5.5**	<0.05	-	<0.05	<0.05	-	**7.4**	**2.3**	-
	Benz(a)anthracene	mg/kg	<0.05	**2.72**	1.9	**3.9**	<0.05	-	**20**	1.8	**5.7**	0.24	**3.6**	<0.05	-	<0.05	<0.05	-	**5**	0.82	-
	Chrysene	mg/kg	<0.05	**3.85**	1.5	2.8	<0.05	-	**18**	1.8	**6.7**	0.22	3.6	<0.05	-	<0.05	<0.05	-	**5.4**	0.6	-
	Benzo(a) pyrene	mg/kg	<0.05	**0.0129**	**2.1**	**1.9**	<0.05	-	**25**	**2.4**	**5.7**	**0.3**	**4.5**	<0.05	-	<0.05	<0.05	-	**9.3**	**0.45**	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05		1.3	0.5	<0.05	-	16	1.5	7	0.2	2.9	<0.05	-	<0.05	<0.05	-	3.6	<0.05	-
	Dibenz(a,h)anthracene	mg/kg	<0.05	**0.13**	**0.38**	**0.2**	<0.05	-	**4.1**	**0.3**	**1.9**	<0.05	**0.76**	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
	Benzo(g,h,i)perylene	mg/kg	<0.05		1.7	0.62	<0.05	-	20	1.8	6.6	0.23	3.5	<0.05	-	<0.05	<0.05	-	5	<0.05	-
	Benzo(b)fluoranthene	mg/kg	<0.05		2.4	1.4	<0.05	-	29	3.7	16	0.43	6.9	<0.05	-	<0.05	<0.05	-	8.4	0.35	-
	Benzo(k)fluoranthene	mg/kg	<0.05		0.78	0.55	<0.05	-	9.3	0.87	4.2	0.21	1.5	<0.05	-	<0.05	<0.05	-	2.5	0.15	-
	PAH 16 Total	mg/kg	<0.8		19.2	85.8	0.94	-	227	22.2	78.1	2.58	42.4	<0.8	-	<0.8	<0.8	-	54.2	22.6	-
SVOC	Naphtho[2,1-b]furan, 1,2-dimethyl-	mg/kg	<0.2		<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-
Phenolics	Trimethylphenols	mg/kg	<0.1		<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	Phenol	mg/kg	<0.1	**1.91**	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	Cresol Total	mg/kg	<0.3	**Cannot back calculate. Incor**	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
	Phenols (Total Halogenated)	mg/kg	<1.3		<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	-	<1.3	<1.3	-	<1.3	<1.3	-
	resorcinol (m-dihydroxybenzene)	mg/kg	<0.1		<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	catechol (o-dihydroxybenzene)	mg/kg	<0.1		<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
	Xylenols & Ethylphenols	mg/kg	<0.3		<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
	2-isopropylphenol	mg/kg	<0.1		<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Metals	Arsenic	mg/kg	<1	**5**	**17**	**16**	**8**	-	**18**	**9.8**	**14**	**16**	**19**	**25**	-	**14**	**15**	-	**48**	**16**	-
	Barium	mg/kg	<1	**53.3**	**2300**	27	22	-	**170**	**80**	**71**	39	**320**	28	-	30	32	-	**110**	20	-
	Beryllium	mg/kg	<0.01	**20.4**	0.85	0.76	1	-	1.3	0.71	0.3	0.36	0.96	1.3	-	0.68	1.1	-	1.2	0.91	-
	Cadmium	mg/kg	<0.2	**0.5**	**2**	<0.2	<0.2	-	<0.2	**0.5**	<0.2	<0.2	**0.9**	<0.2	-	<0.2	**0.5**	-	<0.2	<0.2	-
	Copper	mg/kg	<1	**200**	51	8.1	9.9	-	110	25	85	40	34	12	-	78	12	-	28	11	-
	Lead	mg/kg	<1	**26.9**	**18,000**	15	13	-	**310**	**100**	**710**	**63**	**590**	23	-	12	15	-	**170**	12	-
	Mercury	mg/kg	<0.3	**Cannot back calculate. Incor**	<0.3	<0.3	<0.3	-	**1.3**	<0.3	**0.4**	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
	Nickel	mg/kg	<1	**10**	**26**	**14**	**19**	-	**40**	**16**	8.8	8.7	**19**	**19**	-	**13**	**18**	-	**19**	**17**	-
	Selenium	mg/kg	<1	**0.5**	**1.2**	<1	<1	-	<1	<1	<1	<1	**1.6**	<1	-	<1	**1.1**	-	<1	<1	-
	Vanadium	mg/kg	<1	**1.09**	**38**	**39**	**54**	-	**37**	**33**	**23**	**25**	**35**	**61**	-	**42**	**52**	-	**49**	**50**	-
	Zinc	mg/kg	<1	**228**	**1500**	34	52	-	73	72	67	32	190	56	-	31	51	-	110	45	-
	Chromium (hexavalent)	mg/kg	<4		<4	<4	<4	-	<4	<4	<4	<4	<4	<4	-	<4	<4	-	<4	<4	-
	Chromium (Trivalent)	mg/kg	<1		220	23	28	-	19	21	18	21	39	34	-	21	30	-	28	26	-
Inorganics	Boron (Water Soluble)	mg/kg	<0.1		2.9	3.7	9	-	1.4	0.7	0.6	0.6	2.4	7.4	-	1.5	4	-	2.5	4.8	-
	Ammonia_as_NH4	mg/kg	<0.5		<0.5	4.5	18	-	0.7	1.4	<0.5	<0.5	<0.5	5.9	-	1	9.9	-	0.8	5.7	-
	Water Soluble Chloride	mg/kg	<1		10	28	140	-	33	12	19	21	32	49	-	23	81	-	9.5	31	-
	Cyanide (Free)	mg/kg	<1		<1	<1	<1	-	<1	<1	5	1	<1	<1	-	<1	<1	-	<1	<1	-
	Thiocyanate	mg/kg	<1		<5	<5	11	-	<5	<5	<5	<5	<5	<5	-	<5	7	-	<5	<5	-
	cyanides-complex	mg/kg	<1		160	<1	<1	-	15	5	300	290	49	<1	-	<1	<1	-	3	<1	-
	Cyanide Total	mg/kg	<1	**Cannot back calculate. Incor**	160	<1	<1	-	15	5	310	290	49	<1	-	<1	<1	-	**3**	<1	-
	Sulphate (soluble), 16 hrs, 2:1	mg/kg	<1		110	39	140	-	3900	3900	3600	3500	120	160	-	120	600	-	86	32	-
	Elemental Sulphur	mg/kg	<1		<5	16	52	-	220	<5	17	<5	<5	24	-	<5	<5	-	<5	<5	-

Comments
GAC: Generic Assessment Criteria
(blank): No assessment criteria available
- : Not analysed

Key
XXX Exceedance of GAC_WTV_EN/WA_DWS-SAND 1%TOC

Table 3
Soil Leachate Analytical Results Screened against Controlled Waters GAC
Seaford Gas Works
LDC

Location_Code			MW18-01/1	MW18-01/2	MW18-02/1	MW18-02/2	MW18-03/1	MW18-03/2	MW18-04/1	MW18-04/2	MW18-05/1	MW18-05/2	MW18-06/1	MW18-06/2	WS18-02/1	WS18-03/2
Depth (m)			0.10-0.20	2.00-2.10	0.20-0.30	2.70-2.80	0.30-0.40	2.90-3.00	0.10-0.20	2.90-3.00	0.15-0.20	2.00-2.10	0.10-0.20	2.10-2.20	0.60-0.70	2.60-2.70
Sampled_Date			16/07/2018	16/07/2018	16/07/2018	16/07/2018	17/07/2018	17/07/2018	18/07/2018	18/07/2018	18/07/2018	18/07/2018	18/07/2018	18/07/2018	17/07/2018	18/07/2018
Chem_Group	**ChemName**	**output unit**	**GAC_DWS**													
TPH Fractions	TPH aliphatic >C5-C6	µg/L	**15,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C6-C8	µg/L	**15,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C8-C10	µg/L	**300**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C10-C12	µg/L	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C12-C16	µg/L	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C16-C21	µg/L	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C21-C35	µg/L	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH aromatic >C5-C7	µg/L	**1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	TPH aromatic >C7-C8	µg/L	**700**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	TPH aromatic >C8-C10	µg/L	**300**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	6.1
	TPH aromatic >C10-C12	µg/L	**90**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**190**
	TPH aromatic >C12-C16	µg/L	**90**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	80
	TPH aromatic >C16-C21	µg/L	**90**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**100**
	TPH aromatic >C21-C35	µg/L	**90**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH	Total Petroleum Hydrocarbons	µg/L		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	376.1
	Total Aliphatics	µg/L		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Total Aromatics	µg/L		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	376.1
BTEX	Benzene	µg/L	**1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Toluene	µg/L	**700**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ethylbenzene	µg/L	**300**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
	Xylene (m & p)	µg/L	**Use total**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Xylene (o)	µg/L	**Use total**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	5
	Total Xylenes	µg/L	**190**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	5
Oxygenates	MTBE	µg/L	**1800**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
PAH	Naphthalene	µg/L	**6**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.6	<0.01	2.3	<0.01	**47.7**
	Acenaphthylene	µg/L	**18**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.3	<0.01	3
	Acenaphthene	µg/L	**18**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.3	<0.01	3
	Fluorene	µg/L	**12**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.9	<0.01	0.2	<0.01	0.5
	Phenanthrene	µg/L	**4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.8	<0.01	0.2	<0.01	0.4
	Anthracene	µg/L	**90**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	<0.01
	Fluoranthene	µg/L	**4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	<0.01
	Pyrene	µg/L	**9**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01
	Benz(a)anthracene	µg/L	**3.5**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Chrysene	µg/L	**7**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(a) pyrene	µg/L	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Indeno(1,2,3-c,d)pyrene	µg/L	**Use Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Dibenz(a,h)anthracene	µg/L	**0.07**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(g,h,i)perylene	µg/L	**Use Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(b)fluoranthene	µg/L	**Use Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(k)fluoranthene	µg/L	**Use Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Sum of 4 carc. PAHs (DWS)	µg/L	**0.1**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	PAH 16 Total	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	0.2	<0.2	0.2
Phenolics	Trimethylphenols	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenol	µg/L	**5800**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Isopropyl phenol	mg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Ethylphenol & Dimethylphenol	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenols (Total Halogenated)	µg/L		<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5
	Cresols by HPLC (W)	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	resorcinol (m-dihydroxybenzene)	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Napthols	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	catechol (o-dihydroxybenzene)	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	µg/L	**10**	4	2	< 1	< 1	< 1	2	6	1	9	5	2	5	**12**	< 1
	Barium	µg/L	**1300**	15.1	2.5	55.6	4.6	31.4	4.9	12.4	6.8	8.9	4.2	29.5	4.1	6.8	6.2
	Beryllium	µg/L	**12**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
	Cadmium	µg/L	**5**	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Copper	µg/L	**2000**	31.6	12	13.3	23	7.9	1.9	8.2	2.5	19.8	14.4	15	11.4	3.5	3.5
	Lead	µg/L	**10**	**22**	1	3	< 1	**200**	2	3	2	4	2	**100**	2	3	2
	Mercury	µg/L	**1**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	Nickel	µg/L	**20**	3.6	0.6	< 0.3	1.8	2.4	0.6	1.7	1	1.4	0.7	1.2	0.8	0.7	0.8
	Selenium	µg/L	**10**	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
	Vanadium	µg/L	**86**	8.2	< 17	< 17	< 17	2.7	8.2	11.2	3.7	14.8	7	< 17	< 17	19.6	3.4
	Zinc	µg/L	**6000**	41.6	4.5	6.9	13	11.1	3.8	8.3	8.2	5.8	4.4	59.5	11.8	3.1	2.9
	Chromium (III+VI)	µg/L	**50**	3.7	0.5	< 0.4	0.8	2.1	1.8	1.8	1.9	0.5	0.5	3.9	0.7	2.7	1.4
	Chromium (hexavalent)	µg/L	**Use Cr (total)**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
	Chromium (Trivalent)	µg/L	**Use Cr (total)**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	2	< 1
Organics	Dissolved Organic Carbon	mg/L		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Inorganics	Ammonium as NH4	mg/L	**1.5**	0.26	0.041	0.11	0.30	< 0.015	0.11	0.023	< 0.015	0.11	1.1	0.031	0.092	< 0.015	0.42
	Thiocyanate	mg/L	**0.004**	< 0.2	< 0.2	**1.2**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
	Cyanide (Free)	mg/L	**Use CN Total**	<0.01	<0.01	**0.12**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	cyanides-complex	mg/L	**Use CN Total**	**0.0881**	< 10	**9.437**	**0.3442**	0.0293	< 10	< 10	0.0178	0.0211	< 10	0.0166	< 10	< 10	0.0113
	Cyanide (CN) Total	mg/L	**0.05**	0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01	0.01
	Chloride	mg/L	**250**	< 4.0	7.0	< 4.0	5.4	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
	Sulphur	µg/L		2.77	0.817	606	14.7	1.76	0.531	0.797	1.52	4.24	0.680	1.80	0.614	1.05	0.754
	Easily Liberated Sulphide	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Sulphate (soluble)	mg/L	**250**	8.3	2.5	**1820**	44.2	5.3	1.6	2.4	4.5	12.7	2.0	5.4	1.8	3.1	2.3

Comments
GAC: Generic Assessment Criteria
(blank): No assessment criteria available

Key
XXX Exceedance of CW/WE

Table 4
Groundwater Analytical Results Screened against Human Health GAC
Seaford Gas Works
LDC

Location_Code				MW18-01		MW18-02		MW18-03		MW18-04		MW18-05		MW18-06		WS18-01		WS18-02		WS18-03	
Field_ID				MW18-01	MW18-01	MW18-02	MW18-02	MW18-03	MW18-03	MW18-04	MW18-04	MW18-05	MW18-05	MW18-06	MW18-06	WS18-01	WS18-1	WS18-02	WS18-02	WS18-03	WS18-03
Monitoring_Round				13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018
Chem_Group	**ChemName**	**output unit**	**GAC_HDR**																		
TPH	TPH aliphatic >C5-C6	µg/L	**1,900**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C6-C8	µg/L	**1,500**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C8-C10	µg/L	**57**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C10-C12	µg/L	**37**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C12-C16	µg/L	**>Solubility**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C16-C21	µg/L	**>Solubility**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C21-C35	µg/L	**>Solubility**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aromatic >C5-C7	µg/L	**210,000**	<1	<1	<1	<1	<1	<1	<1	<1	23	<1	<1	-	<1	<1	<1	<1	2300	2300
	TPH aromatic >C7-C8	µg/L	**220,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	2000	1300
	TPH aromatic >C8-C10	µg/L	**1,900**	<1	<1	<1	<1	<1	<1	<1	<1	61	<1	<1	-	<1	<1	<1	<1	**2100**	**2200**
	TPH aromatic >C10-C12	µg/L	**6,800**	<10	<10	<10	<10	<10	<10	<10	<10	150	<10	<10	-	<10	<10	<10	<10	2500	1200
	TPH aromatic >C12-C16	µg/L	**39,000**	<10	<10	<10	<10	<10	<10	<10	<10	170	77	87	-	<10	<10	<10	<10	1400	660
	TPH aromatic >C16-C21	µg/L	**>Solubility**	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	<10	-	<10	<10	<10	<10	160	410
	TPH aromatic >C21-C35	µg/L	**>Solubility**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH Hazard Index	-	**1.00**	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.02	0	0.02	0.02	0.02	0.02	**1.15**	**1.20**
	Total Petroleum Hydrocarbons	µg/L		<10	<10	<10	<10	<10	<10	<10	<10	340	80	90	70	<10	<10	<10	<10	4000	2200
	Total Aliphatics	µg/L		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	Total Aromatics	µg/L		<10	<10	<10	<10	<10	<10	<10	<10	420	77	87	-	<10	<10	<10	<10	6100	8000
BTEX	Benzene	µg/L	**210**	<1	<1	<1	<1	<1	<1	<1	<1	23	<1	<1	<1	<1	<1	<1	<1	**2300**	**2300**
	Toluene	µg/L	**230,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2000	1300
	Ethylbenzene	µg/L	**10,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	140	120
	Xylene (m & p)	µg/L	**9,500**	<1	<1	<1	<1	<1	<1	<1	<1	5	<1	<1	<1	<1	<1	<1	<1	740	660
	Xylene (o)	µg/L	**12,000**	<1	<1	<1	<1	<1	<1	<1	<1	14	<1	<1	<1	<1	<1	<1	<1	750	490
	Xylenes (total)	µg/L	**9,500**	<1	<1	<1	<1	<1	<1	<1	<1	19	<1	<1	<1	<1	<1	<1	<1	1490	1150
Oxygenates	MTBE	µg/L		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAH	Naphthalene	µg/L	**220**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Acenaphthylene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	120	66
	Acenaphthene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	11	6.9
	Fluorene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Phenanthrene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	35	19
	Anthracene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	8.5	4.3
	Fluoranthene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.7	1.2
	Pyrene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	4.3	1.7
	Benz(a)anthracene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.6	<0.01
	Chrysene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5	<0.01
	Benzo(a) pyrene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01
	Indeno(1,2,3-c,d)pyrene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39	25
	Dibenz(a,h)anthracene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(g,h,i)perylene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(b)fluoranthene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01
	Benzo(k)fluoranthene	µg/L	**>Solubility**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01
	PAH 16 Total	µg/L	**>Solubility**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	29	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	220	120
Phenolics	Trimethylphenols	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenol	µg/L	**>Solubility**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenols (Total Halogenated)	µg/L		<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5
	Isopropyl phenol	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Ethylphenol & Dimethylphenol	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Cresols by HPLC (W)	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Napthols	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	resorcinol (m-dihydroxybenzene	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	catechol (o-dihydroxybenzene)	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Other	Ammonia_as_NH4	mg/L		0.084	0.066	0.21	0.3	0.3	0.15	<0.015	0.018	0.18	0.1	0.094	0.13	0.16	0.14	0.23	0.2	0.31	0.63
	Thiocyanate	mg/L		<0.2	<0.2	1	0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6	0.2
	Cyanide (Free)	mg/L		<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	cyanides-complex	µg/L		370	210	3700	1900	20	<10	<10	<10	30	20	20	20	50	40	<10	<10	100	120
	Cyanide Total	mg/L		0.37	0.21	3.7	1.9	0.02	<0.01	<0.01	<0.01	0.03	0.02	0.02	0.02	0.05	0.04	<0.01	<0.01	0.1	0.12

Comments
GAC: Generic Assessment Criteria
(blank): No assessment criteria available
- : Not analysed

Key
XXX Exceedance of CW/WE Water. DWS - England/Wales
XXX Exceedance of CW/WE Water. Aquatic Toxicity - England/Wales - Freshwater

Table 5
Groundwater Analytical Results Screened Against Controlled Waters GAC
Seaford Gas Works LDC

				Location_Code	MW18-01		MW18-02		MW18-03		MW18-04		MW18-05		MW18-06		WS18-01		WS18-02		WS18-03	
				Field_ID	MW18-01	MW18-01	MW18-02	MW18-02	MW18-03	MW18-03	MW18-04	MW18-04	MW18-05	MW18-05	MW18-06	MW18-06	WS18-01	WS18-1	WS18-02	WS18-02	WS18-03	WS18-03
				Monitoring_Round	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018	13/08/2018	20/08/2018
				Screened Strata	CHALK		CHALK		CHALK		CHALK		CHALK/ ALLUVIUM		CHALK		ALLUVIUM/ CHALK		ALLUVIUM/ CHALK		ALLUVIUM/ CHALK	
Chem_Group	**ChemName**	**output unit**	**EQL**	**GAC_DWS**																		
	TPH aliphatic >C5-C6	µg/L	<1	**15,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C6-C8	µg/L	<1	**15,000**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C8-C10	µg/L	<1	**300**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	TPH aliphatic >C10-C12	µg/L	<10	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C12-C16	µg/L	<10	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C16-C21	µg/L	<10	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aliphatic >C21-C35	µg/L	<10	**300**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH aromatic >C5-C7	µg/L	<1	**1**	<1	<1	<1	<1	<1	<1	<1	<1	**23**	<1	<1	-	<1	<1	<1	<1	**2300**	**2300**
	TPH aromatic >C7-C8	µg/L	<1	**700**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	**2000**	**1300**
	TPH aromatic >C8-C10	µg/L	<1	**300**	<1	<1	<1	<1	<1	<1	<1	<1	61	<1	<1	-	<1	<1	<1	<1	**2100**	**2200**
	TPH aromatic >C10-C12	µg/L	<10	**90**	<10	<10	<10	<10	<10	<10	<10	<10	**150**	<10	<10	-	<10	<10	<10	<10	**2500**	**1200**
	TPH aromatic >C12-C16	µg/L	<10	**90**	<10	<10	<10	<10	<10	<10	<10	<10	**170**	77	87	-	<10	<10	<10	<10	**1400**	**660**
	TPH aromatic >C16-C21	µg/L	<10	**90**	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	<10	-	<10	<10	<10	<10	**160**	**410**
	TPH aromatic >C21-C35	µg/L	<10	**90**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
TPH	Total Petroleum Hydrocarbons	µg/L	<1		<10	<10	<10	<10	<10	<10	<10	<10	340	80	90	70	<10	<10	<10	<10	4000	2200
	Total Aliphatics	µg/L	<1		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
	Total Aromatics	µg/L	<1		<10	<10	<10	<10	<10	<10	<10	<10	420	77	87	-	<10	<10	<10	<10	6100	8000
BTEX	Benzene	µg/L	<	**1**	<1	<1	<1	<1	<1	<1	<1	<1	**23**	<1	<1	<1	<1	<1	<1	<1	**2300**	**2300**
	Toluene	µg/L	<1	**700**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**2000**	**1300**
	Ethylbenzene	µg/L	<1	**300**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	140	120
	Xylene (m & p)	µg/L	<1	**190**	<1	<1	<1	<1	<1	<1	<1	<1	5	<1	<1	<1	<1	<1	<1	<1	**740**	**660**
	Xylene (o)	µg/L	<1	**190**	<1	<1	<1	<1	<1	<1	<1	<1	14	<1	<1	<1	<1	<1	<1	<1	**750**	**490**
	Total Xylenes	µg/L	<1	**500**	<1	<1	<1	<1	<1	<1	<1	<1	19	<1	<1	<1	<1	<1	<1	<1	**1490**	**1150**
Oxygenates	MTBE	µg/L	<1	**1800**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAH	Naphthalene	µg/L	<0.01	**6**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**14**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Acenaphthylene	µg/L	<0.01	**18**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**120**	**66**
	Acenaphthene	µg/L	<0.01	**18**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	11	6.9
	Fluorene	µg/L	<0.01	**12**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Phenanthrene	µg/L	<0.01	**4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**35**	**19**
	Anthracene	µg/L	<0.01	**90**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	8.5	4.3
	Fluoranthene	µg/L	<0.01	**4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.7	1.2
	Pyrene	µg/L	<0.01	**9**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	4.3	1.7
	Benz(a)anthracene	µg/L	<0.01	**3.5**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.6	<0.01
	Chrysene	µg/L	<0.01	**7**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5	<0.01
	Benzo(a) pyrene	µg/L	<0.01	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.2**	<0.01
	Indeno(1,2,3-c,d)pyrene	µg/L	<0.01	**Use PAHs Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**1.9**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39	25
	Dibenz(a,h)anthracene	µg/L	<0.01	**0.07**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(g,h,i)perylene	µg/L	<0.01	**Use PAHs Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Benzo(b)fluoranthene	µg/L	<0.01	**Use PAHs Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01
	Benzo(k)fluoranthene	µg/L	<0.01	**Use PAHs Sum of 4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01
	PAHs Sum of 4 carcinogenic		<0.01	**0.1**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**39.3**	**25**
	PAH 16 Total	µg/L	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	220	120
Phenolics	Trimethylphenols	µg/L	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenol	µg/L	<0.5	**5800**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Napthols	µg/L	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenols (Total Halogenated)	µg/L	<0.5		<0.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5
	Isopropyl phenol	mg/L	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Ethylphenol & Dimethylphenol	µg/L	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Cresols by HPLC (W)	µg/L	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	resorcinol (m-dihydroxybenzene)	µg/L	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	catechol (o-dihydroxybenzene)	µg/L	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	µg/L	<0.1	**10**	0.5	0.8	1.2	1.6	0.9	0.6	0.3	0.5	1.3	0.8	1.3	1.1	1.1	1.5	1.5	2.2	1.6	5.7
	Barium	µg/L	<1	**1300**	13	12	24	15	54	37	22	17	41	31	38	29	12	7	36	24	19	18
	Beryllium	µg/L	<0.1	**12**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Boron	µg/L	<10	**1000**	420	330	750	670	490	290	130	120	430	340	570	550	590	570	540	600	520	580
	Cadmium	µg/L	<0.02	**5**	<0.02	<0.02	0.1	0.1	0.02	<0.02	<0.02	<0.02	0.02	0.04	0.03	0.03	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	Copper	µg/L	<0.1	**2000**	6.5	4.4	2.3	5.8	1.6	2.6	<0.5	3	4.6	4.1	11	7	8.5	6.3	3.1	3	5.5	5.5
	Lead	µg/L	<0.2	**10**	0.3	<0.2	0.3	<0.2	1.5	1.7	<0.2	<0.2	0.3	0.4	0.6	0.2	0.5	<0.2	0.2	<0.2	0.2	<0.2
	Mercury	µg/L	<0.05	**1**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Nickel	µg/L	<0.1	**20**	1.2	1.2	4.9	5.5	5.4	6.7	0.9	1.3	3.6	4.2	4.5	6.2	3.5	4.6	3	4	3.9	5.7
	Selenium	µg/L	<0.1	**10**	6	7.1	8.2	8.6	5.7	5.6	7	6	6.2	5.4	7.8	6.9	6.2	5.4	**25**	**14**	8	6.3
	Vanadium	µg/L	<0.1	**86**	0.2	0.4	0.6	0.7	<0.2	0.7	0.3	0.4	0.2	0.2	0.2	0.3	0.3	0.5	2.5	3.1	0.3	0.4
	Zinc	µg/L	<1	**6000**	2.3	6.1	3.1	10	4.7	6.4	1.9	5.4	9.5	4.9	4.8	7.4	5.5	4	3.2	3.7	3.4	3.9
	Chromium (III+VI)	µg/L	<5	**50**	-	0.9	-	0.5	-	0.5	-	0.8	-	0.5	-	0.4	-	0.4	-	0.6	-	0.4
	Chromium (hexavalent)	µg/L	<5	**Use Chromium (total)**	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Chromium (Trivalent)	µg/L	<1	**Use Chromium (total)**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1
Inorganics	Ammonia_as_NH4	mg/L	<0.015	**1.5**	0.084	0.066	0.21	0.3	0.3	0.15	<0.015	0.018	0.18	0.1	0.094	0.13	0.16	0.14	0.23	0.2	0.31	0.63
	Chloride	mg/L	<1	**250**	**370**	**290**	**340**	**350**	**250**	200	**480**	**360**	**280**	**250**	**390**	**320**	**310**	**250**	**440**	**340**	240	180
	Thiocyanate	mg/L	<0.2	**0.004**	<0.2	<0.2	**1**	**0.5**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.6**	**0.2**
	Cyanide (Free)	mg/L	<0.01	**Use Cyanide Total**	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	cyanides-complex	µg/L	<10	**Use Cyanide Total**	**370**	**210**	**3700**	**1900**	**20**	<10	<10	<10	**30**	**20**	**20**	**20**	**50**	**40**	<10	<10	**100**	**120**
	Cyanide Total	mg/L	<0.01	**0.05**	**0.37**	**0.21**	**3.7**	**1.9**	0.02	<0.01	<0.01	<0.01	0.03	0.02	0.02	0.02	**0.05**	0.04	<0.01	<0.01	**0.1**	**0.12**
	Sulphur	µg/L	<100		81,070	49,970	326,300	140,900	23,830	19,020	33,400	26,070	20,390	17,800	24,970	20,630	50,300	37,230	56,370	45,500	27,460	23,690
	Easily Liberated Sulphide (Moistu	mg/L	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Sulphate (soluble)	mg/L	<1	**250**	243	150	**979**	**423**	71.5	57.1	100	78.2	61.2	53.4	74.9	61.9	151	112	169	137	82.4	71.1
Field	pH	pH_Units	-	**6.5 to 9.5**	7.3	7.3	7	7.1	7.2	7.2	7.5	7.4	7	7.1	7.2	7.1	7.5	7.4	7.5	7.4	7.1	7.1
	Electrical Conductivity	µS/cm	<100	**2,500**	1900	1800	2900	2700	1400	1500	2000	1800	1600	1600	1900	1900	1800	1800	2100	2100	1600	1600

Comments
GAC: Generic Assessment Criteria
(blank): No assessment criteria available
- : Not analysed

Key
XXX Exceedance of CW/WE Water. DWS - England/ Wales

		Sample Location	VW18-01	VW18-02	DUP-01	VW18-01	DUP-B	VW18-02	**TRIPBLANK**
		Depth							
		Sample dated	13/08/2018	13/08/2018	13/08/2018	20/08/2018	20/08/2018	20/08/2018	20/08/2018
		Stratum	MG	MG	MG	MG	MG	MG	-
Analytical Parameter (Vapour Analysis)	Units	LOD							
General Inorganics									
Vinyl Chloride #	ug/m3	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8
Dichlorodifluoromethane (F-12)	ug/m3	<12.4	<12.4	<12.4	<12.4	<12.4	<12.4	<12.4	<12.4
Chloromethane	ug/m3	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1
Bromomethane #	ug/m3	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8
Chloroethane #	ug/m3	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Trichlorofluoromethane (F-11) #	ug/m3	<8.4	**13.5**	**16.3**	**24.7**	**19.1**	**20.8**	**27**	<8.4
1,1-Dichloroethene (1,1 DCE)	ug/m3	<5.9	<5.9	<5.9	<5.9	<5.9	<5.9	<5.9	<5.9
Dichloromethane (DCM) #	ug/m3	<50	**109**	**59**	**82**	<50	<50	<50	<50
Trans-1,2-Dichloroethene	ug/m3	<5.9	<5.9	<5.9	<5.9	<5.9	<5.9	<5.9	<5.9
1,1-Dichloroethane #	ug/m3	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1
cis-1,2-Dichloroethene #	ug/m3	<4	<4	<4	<4	<4	<4	<4	<4
2,2-Dichloropropane	ug/m3	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9
Bromochloromethane (Int Std)	ug/m3	<7.9	NA	NA	NA	NA	NA	NA	NA
Chloroform #	ug/m3	<7.3	**226.1**	<7.3	<7.3	**333.5**	**369.6**	<7.3	<7.3
1,1,1-Trichloroethane #	ug/m3	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2
1,1-Dichloropropene	ug/m3	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8
Carbon Tetrachloride #	ug/m3	<9.4	<9.4	<9.4	<9.4	<9.4	<9.4	<9.4	<9.4
1,2-Dichloroethane #	ug/m3	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1
Benzene #	ug/m3	<4.8	<4.8	<4.8	<4.8	<4.8	6.4	<4.8	<4.8
Trichloroethene (TCE) #	ug/m3	<8.1	<8.1	<8.1	<8.1	<8.1	<8.1	<8.1	<8.1
1,2-Dichloropropane #	ug/m3	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9
Dibromomethane	ug/m3	<10.7	<10.7	<10.7	<10.7	<10.7	<10.7	<10.7	<10.7
Bromodichloromethane	ug/m3	<10.1	<10.1	<10.1	<10.1	<10.1	<10.1	<10.1	<10.1
cis-1,3-Dichloropropene #	ug/m3	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8
Toluene #	ug/m3	<5.7	**21.1**	**23.4**	**13.9**	**20.3**	**28.3**	**15.8**	<5.7
trans-1,3-Dichloropropene #	ug/m3	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8
1,1,2-Trichloroethane #	ug/m3	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2
Tetrachloroethene (PCE) #	ug/m3	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2
1,3-Dichloropropane	ug/m3	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9
Dibromochloromethane	ug/m3	<12.8	<12.8	<12.8	<12.8	<12.8	<12.8	<12.8	<12.8
1,2-Dibromoethane #	ug/m3	<11.5	<11.5	<11.5	<11.5	<11.5	<11.5	<11.5	<11.5
Chlorobenzene #	ug/m3	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9	<6.9
1,1,1,2-Tetrachloroethane	ug/m3	<10.3	<10.3	<10.3	<10.3	<10.3	<10.3	<10.3	<10.3
Ethylbenzene #	ug/m3	<6.5	**7.8**	<6.5	<6.5	**7.8**	**8.7**	<6.5	<6.5
m&p - Xylenes #	ug/m3	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5
o-Xylene #	ug/m3	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5
Styrene #	ug/m3	<6.4	**10.6**	**7.7**	<6.4	**9.8**	**10.6**	**8.1**	<6.4
Bromoform	ug/m3	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5
Isopropylbenzene	ug/m3	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4
1,1,2,2-Tetrachloroethane #	ug/m3	<10.3	<10.3	<10.3	<10.3	<10.3	<10.3	<10.3	<10.3
Bromobenzene	ug/m3	<9.6	<9.6	<9.6	<9.6	<9.6	<9.6	<9.6	<9.6
1,2,3-Trichloropropane	ug/m3	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0
Propylbenzene	ug/m3	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4
2-Chlorotoluene	ug/m3	<7.8	<7.8	<7.8	<7.8	<7.8	<7.8	<7.8	<7.8
1,3,5-Trimethylbenzene #	ug/m3	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4
4-Chlorotoluene	ug/m3	<7.8	<7.8	<7.8	<7.8	<7.8	<7.8	<7.8	<7.8
Tert-Butylbenzene	ug/m3	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2
1,2,4-Trimethylbenzene #	ug/m3	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4	<7.4
Sec-Butylbenzene	ug/m3	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2
4-Isopropyltoluene	ug/m3	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2
1,4-Dichlorobenzene #	ug/m3	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0
1,3-Dichlorobenzene #	ug/m3	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0
n-Butylbenzene	ug/m3	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2
1,2-Dichlorobenzene #	ug/m3	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0
1,2-Dibromo-3-chloropropane	ug/m3	<14.5	<14.5	<14.5	<14.5	<14.5	<14.5	<14.5	<14.5
1,2,4-Trichlorobenzene	ug/m3	<11.1	<11.1	<11.1	<11.1	<11.1	<11.1	<11.1	<11.1
Hexachlorobutadiene	ug/m3	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0
Naphthalene	ug/m3	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
1,2,3-Trichlorobenzene	ug/m3	<11.1	<11.1	<11.1	<11.1	<11.1	<11.1	<11.1	<11.1
Methyl tertiary butyl ether	ug/m3	<5.4	<5.4	<5.4	<5.4	<5.4	<5.4	<5.4	<5.4
Sum of VOC USEPA compounds	ug/m3		**388.1**	**106.4**	**120.6**	**390.5**	**444.4**	**50.9**	0

Key

Values in bold exceed LOD

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Appendix 2 Surface Water Flood Attenuation

Dane Valley Feasibility Study

Appendix 2: Surface Water Drainage Attenuation

Lewes District Council

Project number: 60590532

February 2019

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
P01	18 January 2019	Draft for Comment		John Rapley	Associate
P02	25 February 2019	Final		John Rapley	Associate

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Figures

Tables

1. Introduction

Scope of Work

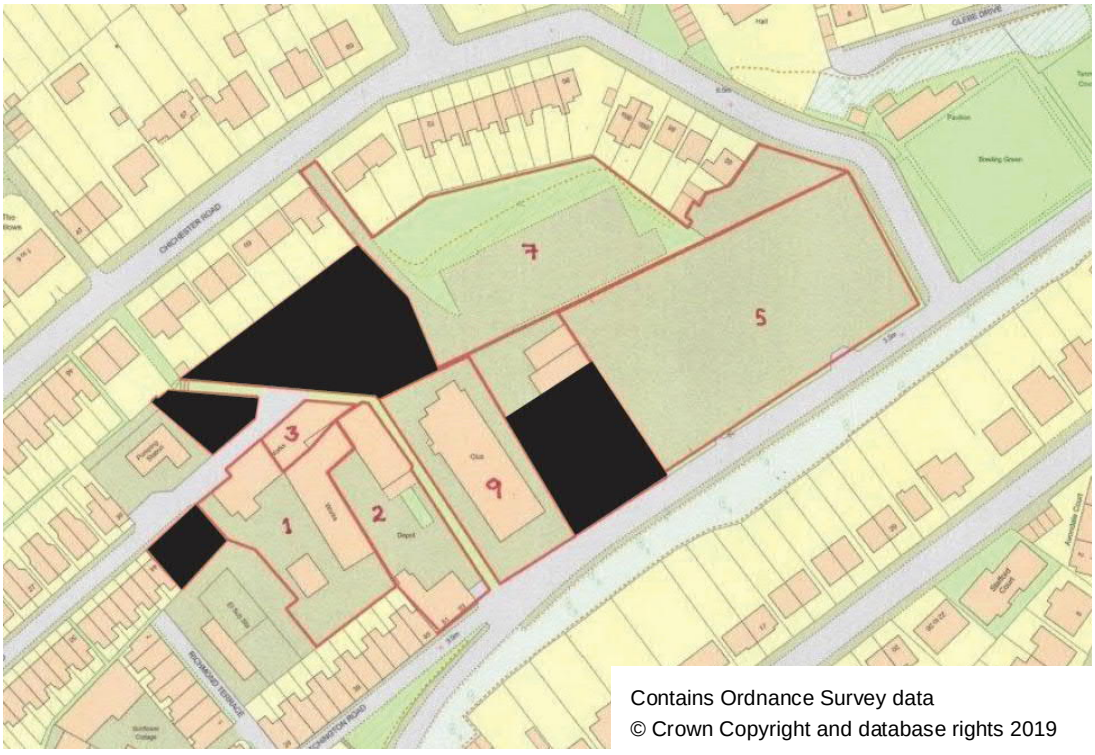
1.1 AECOM have been commissioned by Lewes District Council to undertake a feasibility study to assess the options for surface water attenuation for a potential redevelopment site referred to as Dane Valley which is located within Seaford, East Sussex. Dane Valley ("the Site") is a brownfield site located on the edge of Seaford town centre which currently consists of commercial units and vacant plots.

1.2 There is a known flood risk to the Site from both overland flow (surface water) and sewers. Any development at the Site must manage surface water runoff to ensure that there is no increase to the risk of surface water flooding in the area and, where possible, aim to reduce flood risk overall.

1.3 This report details the findings of the appraisal of potential solutions to manage surface water runoff and reduce the risk of flooding to the site.

Site Description

1.4 The Site is located between Chichester Road and Blatchington Road within the established urban area of Seaford (See Figure 1-1). It is formed of 10 smaller plots of land, however, plots 4, 6, 8 and part of 10 (shaded in black) were not included as part of the feasibility study. The total area of the included plots is approximately 1.22ha.



Contains Ordnance Survey data
© Crown Copyright and database rights 2019

Figure 1-1: Plot Layout (as provided by Lewes District Council)

Data Collection

Site Walkover

1.5 A walkover of the site and key areas was undertaken on the 12th October 2018. Information gathered during the site visit informed the appraisal of attenuation options for the study.

LiDAR Data

1.6 LiDAR data has been acquired from the Environment Agency and used to ascertain the topography of the site and surrounding catchment. The Digital Terrain Model (DTM) for the catchment can be seen in Figure 1-2. The topography of the catchment shows higher ground to the north east of the catchment (approximately 100m Above Ordnance Datum (AOD)) where the topography decreases in height in a south westerly direction towards the Site (approximately 4mAOD).

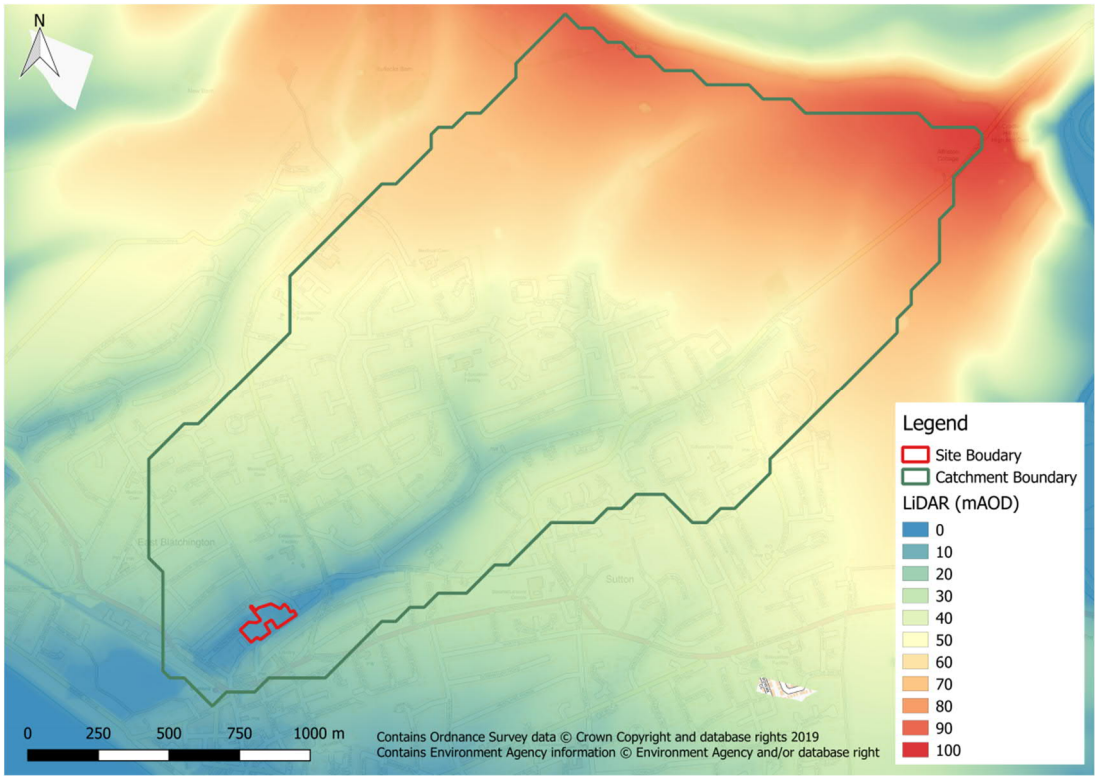


Figure 1-2: LiDAR Digital Terrain Model of the Catchment

1.7 The LiDAR DTM for the Site is displayed in Figure 1-3.

1.8

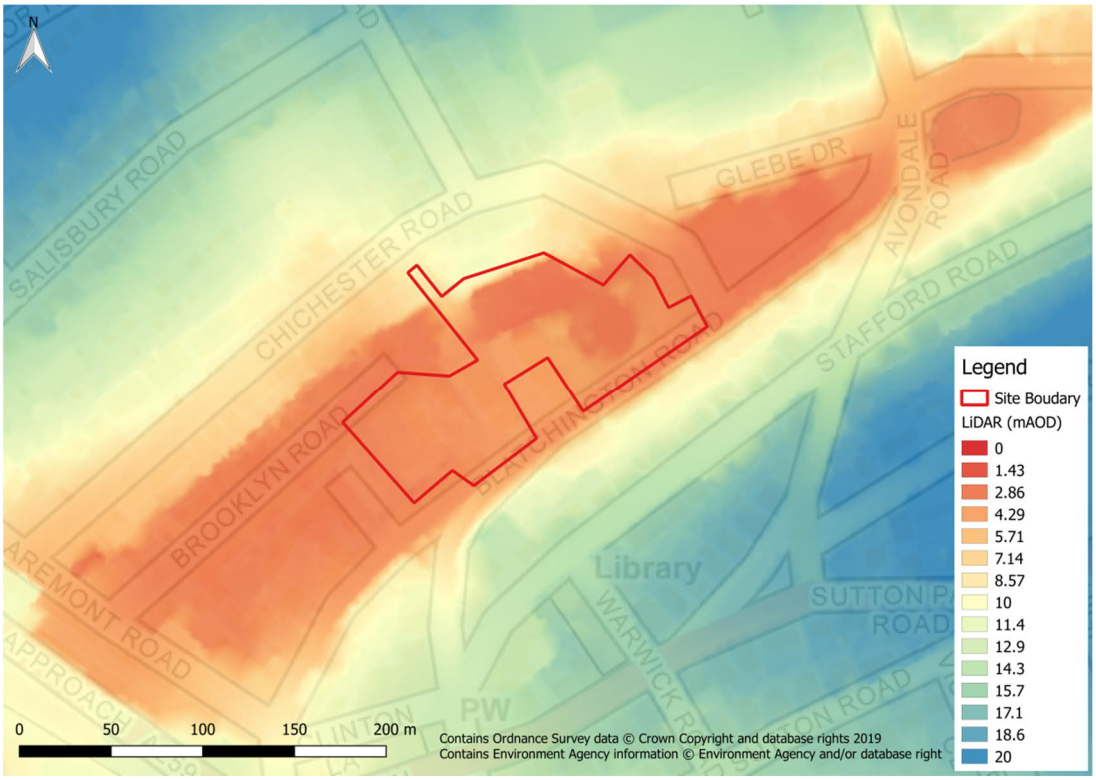


Figure 1-3: LiDAR Digital Terrain Model of the Site

Topographic Survey

1.9 The detailed local topography of the Site has been confirmed using topographical survey data for each of the plots. This confirmed that the level of the majority of the Site ranges from 2.5mAOD to 4.5mAOD with a steep slope located at the northern boundary of plot 7.

2. Flood Risk to the Site

2.1 One of the key risks for the site is surface water flooding. Due to the topography of the catchment, the main flood flow paths converge towards the Site, with a large amount of the flow coming from the north east along Vale Road. Figure 2-1 shows the extent and direction of flow of surface water flooding in the area according to the Risk of Flooding from Surface Water mapping available on the .gov.uk website.

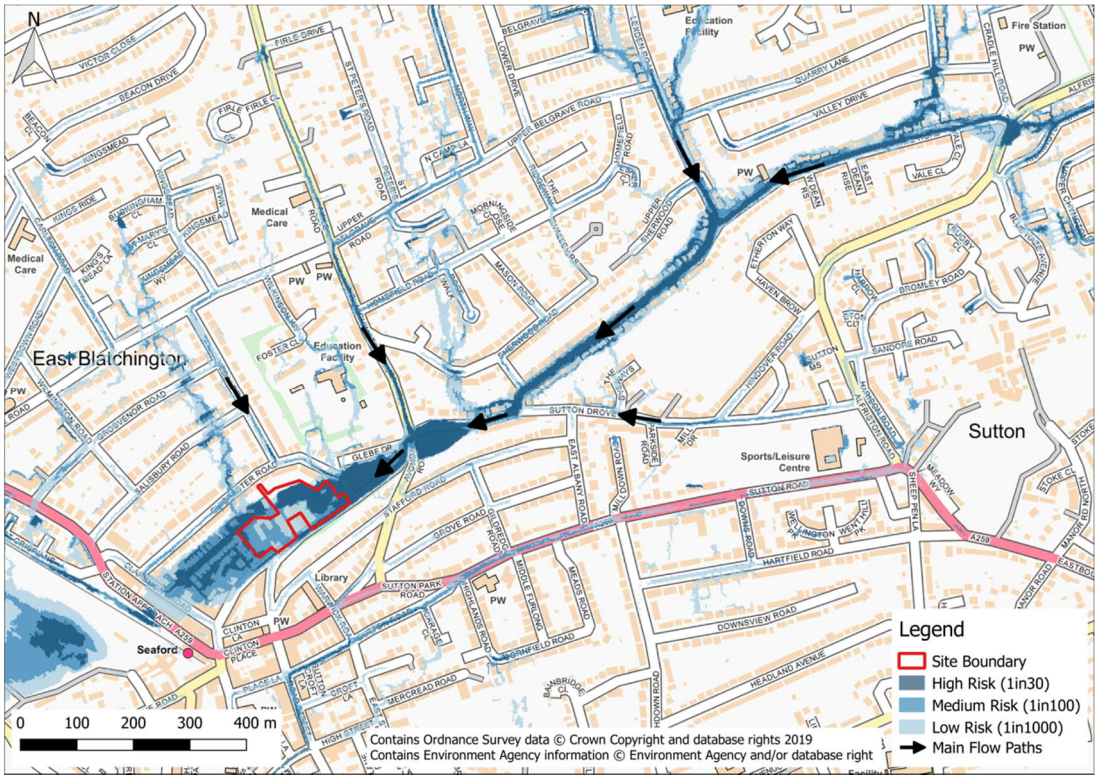


Figure 2-1: Surface Water Flood Risk Flow Paths

2.2 According to the Risk of Flooding from Surface Water mapping the majority of plot 5 & 7 are at high risk (>3.3% Annual Exceedance Probability (AEP)) of flooding from surface water. The remainder of the site is at medium (between 1 and 3.3% AEP) or low (between 0.1% and 1% AEP) risk.

2.3 In addition, the historic River Dane runs from east to west through the site. This watercourse has been culverted underneath the Site at a previously unspecified date. Historic flooding incidents from this source have been documented within the Peacehaven, Newhaven and Seaford Surface Water Management Plan (SWMP)[1] and the Seahaven Flood Plan (SFP)[2]. The risk of fluvial flooding to the site is not modelled, however, the culverted River Dane could present a source of flooding to the site.

2.4 A further historic flooding issue exists with respect to highways drainage and sewer infrastructure. This risk relates to the Brooklyn Road pumping station to the west of the Site. The pumping station receives combined sewer flow (a combination of foul and surface water) and services 40% of the population of Seaford. A combination of blocked highway drainage and overland flow causes the pumping station to become overwhelmed. Further details on the causes of flooding are documented in the SWMP and SFP. Due to the reliance on a pumped combined sewer system, the flood risk of sewer flooding for the Site is High.

[1] Peacehaven, Newhaven and Seaford Surface Water Management Plan (SWMP), Capita, 2014
[2] Seahaven Flood Plan (SFP), East Sussex, 2015

2.5 According to the British Geological Survey Susceptibility to Groundwater Flooding dataset, the site is identified within or immediately adjacent to an area with the potential for groundwater flooding of properties below ground due to the underlying Chalk bedrock[1].

2.6 The risk of tidal flooding to the site is very low due to the topography of the land between the sea and the Site.

3. On-site Attenuation

Overview

3.1 The surface water flood risk at the Site emanates from overland flow within the catchment, predominantly from the north east direction. As water reaches the Site, a low point in the topography, it spreads and flows over the entire ground surface. Due to the high risk of surface water flooding to neighbouring areas, raising of levels on Site could increase the flood risk elsewhere and would not be feasible. Therefore, a route would need to be created to allow the overland flow to continue through the site. This would be required to result in no increase to the existing surface water flood risk to the site itself or elsewhere.

3.2 As part of the redevelopment there is an opportunity to manage surface water runoff from the Site which would provide betterment compared to the existing situation by providing onsite attenuation to reduce the rate at which runoff is discharged from the Site into the drainage network. This would contribute towards alleviating the pressure on the capacity within the existing drainage network. Without any attenuation element to the design, flooding issues associated with the existing drainage network and Brooklyn Road pumping station could be exacerbated.

3.3 The options for providing on-site attenuation as part of the sustainable drainage system (SuDS) design for the redevelopment of the Site have been appraised to identify the feasible options that could be taken forward.

Attenuation Options

3.4 Potential attenuation options were developed through a desk study using available data. The four potential on-site attenuation options identified for the Site are detention basins, ponds, swales and attenuation storage tanks.

Detention Basins

3.5 On-line detention basins are landscaped depressions which are dry in normal conditions. During storm events, the basin fills and becomes a storage area for runoff to enable discharge from the site to be controlled. They can also be off-line whereby the runoff is diverted at a specified discharge threshold. In addition, there is also the potential for the basin to be vegetated which can provide water treatment.

Ponds

3.6 Ponds are detention basins with a permanent pool of water. They are capable of providing both attenuation and treatment of the surface water runoff using vegetation. The attenuation storage is provided above the permanent pool and a flow control system can be used to control the outflow based on the water level.

Swales

3.7 Swales are shallow, open channels that are flat bottomed and vegetated and can be used for attenuating surface water runoff. They may have a variety of profiles (uniform or non-uniform) however the standard channel is broad and shallow and covered in vegetation to slow the water and facilitate sedimentation.

Attenuation Storage Tanks

3.8 Attenuation tanks are used for below ground void space for the temporary storage of surface water run off before controlled use. The maintainability of attenuation tank storage systems requires consideration due to the systems being underground and

thus any issues will remain unseen. The recommended storage structure is using geocellular storage systems.

Attenuation Calculations

3.9 Calculations have been carried out in order to ascertain how much storage may be required to discharge into the current drainage system at a controlled rate. The calculations have been carried out for three different scenarios: 100%, 75% and 50% impermeable drained area, in accordance with IH124 methodology. The following calculation inputs/assumptions have been used:

- A 40% climate change allowance has been applied; and
- The discharge rate from the Site has been set at 5l/s.

3.10 Based on the three scenarios the total attenuation volumes were calculated and are provided in Table 3-1. An overview of the calculations is provided in Appendix A.

Table 3-1: Calculated Site Attenuation Volumes

Estimated Impermeable Area on the Redeveloped Site	Required attenuation volume with a site discharge rate of 5l/s
50%	682m^3
75%	1178m^3
100%	1674m^3

Assumptions and Considerations

3.11 The following assumptions and considerations have been applied to the option appraisal:

- Underlying soil is chalk and thus is assumed permeable and has a good potential for infiltration. However, due to ground contamination and high ground water levels, it has been assumed that infiltration will not be a feasible discharge method at the Site.
- Invert levels of the potential discharge points on the existing sewer network or culverted watercourse will affect the depth of storage possible. For the feasibility study it has been assumed that the invert levels of any discharge connection point will be suitable to facilitate a gravity discharge from the Site.
- The exact discharge location to the sewer network or culverted watercourse is to be determined by the developer in conjunction with the Lead Local Flood Authority and Southern Water.
- Any attenuation features should not to be placed near existing retaining walls as excavation could compromise the stability of the walls.
- Any required slopes of attenuation features will be taken as 1 in 4.
- Drainage design will be more flexible if the site is flat. Re-profiling the site is recommended. There is the potential for a slight fall to the south west or toward the road to the south east.
- Storage to be located at suitable elevations within the site to avoid the need for a pumped system.

Option Appraisal

3.12 The advantages and disadvantages of the attenuation options are presented in Table 3-2.

Table 3-2: Advantages and Disadvantages of Attenuation Options

No.	Option	Details	Advantages	Disadvantages
1	Dry Detention Basin	- Max slope 1 in 3 but preferable 1 in 4 - Max 2m deep	- More attenuation can be achieved than with the same depth of wet basin - Easy to maintain as part of landscaping	- Limited water treatment if not suitable for infiltration - Large amount of above ground space required
2	Wet Attenuation Basin (i.e. Pond)	- Needs between 0.5-1m of permanent water - Max slope 1 in 3 but 1 in 4 preferable - Max 2m deep - Gentle slope to outlet (1 in 100) - Rock roll could be used to ensure side slope of wet section can be steeper	- Habitat creation - Water Treatment (settlement of sediments) - Aesthetically pleasing feature - Easy to maintain as part of landscaping	- More area needed for the same depth compared to a dry basin - May be large and thus limited options for location
3	Swale	- Minimum length 5m - Maximum depth 0.4m to 0.6m - Bottom Width 0.5 to 2m - Max slope 1 in 3 but 1 in 4 preferable	- Easy to maintain as part of landscaping - Aesthetic and biodiversity benefits	- Very large amount of area needed in comparison to other above ground options - Likely to limit access points to the site, if located around the edge
4	Underground Tank	- Depth to cover 0.6m under vehicle loading (0.5m with standard loading) - 2 options Standard Duty (SD) or Heavy Duty (HD).	- Underground therefore allows more space for above ground development - High storage volume - Potential for installation beneath roads/car parks - Can be used with permeable paving to provide water treatment - Designed for easy & cheap maintenance	- No water treatment included (silt traps do not count as water treatment) unless used with permeable paving - Maintenance of below ground features can be more problematic than above ground features - Large in size

3.13 Based on the volume of storage required for the Site at 75% impermeable area the following plan areas have been calculated for a number of options (Table 3-3).

Table 3-3: Calculation of Approximate Plan Areas of Potential Options

Option	Depth (m)	Plan Area (m^2)	Percentage of Site
Attenuation Basin dry	1m dry (1.5m if wet pond)	1450m^2	11.5%
Attenuation Basin dry	1.5m dry	1100m^2	9%
Attenuation Basin wet (pond)	1m	2550m^2	20%
2 Smaller Attenuation Basins dry	1m (1.5m if ponds)	1650m^2	13%
Swale (2m bottom width)	0.6m	3000m^2 (450m length)	24%
Underground Tank - e.g. ACO Stormbrixx - Standard Duty (SD)	1 layer: 1.5m	1300m^2	10%
Underground Tank - e.g. ACO Stormbrixx - Standard Duty (SD)	2 layer: 2.5m	650m^2	5%
Underground Tank - e.g. ACO Stormbrixx - Heavy Duty (HD)	1 layer: 1.2m	2050m^2	16%
Underground Tank - e.g. ACO Stormbrixx - Heavy Duty (HD)	2 layer: 1.8m	1025m^2	8%

3.14 The percentage of the site taken up by each option has been calculated based on a total site area of 1.25ha. Figure 3-1 and Figure 3-2 display the approximate size of each of the options, above ground and below ground respectively, in the context of the Site.

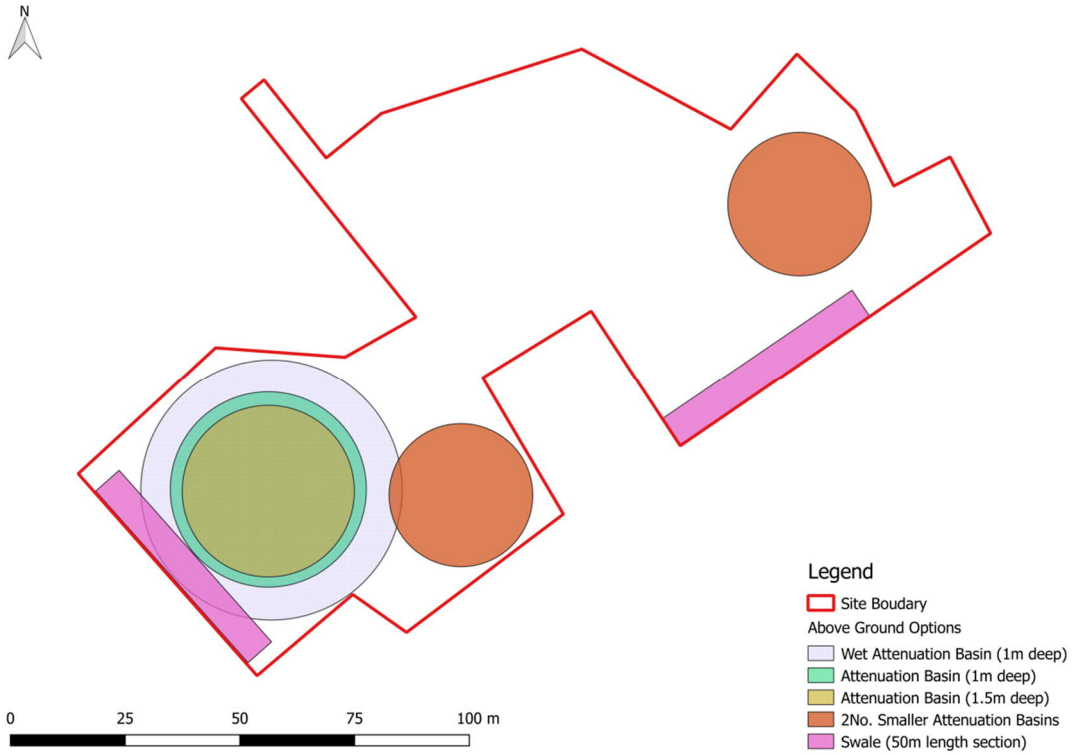


Figure 3-1: Approximate Sizes of the Potential Above Ground Options in the context of the Site area

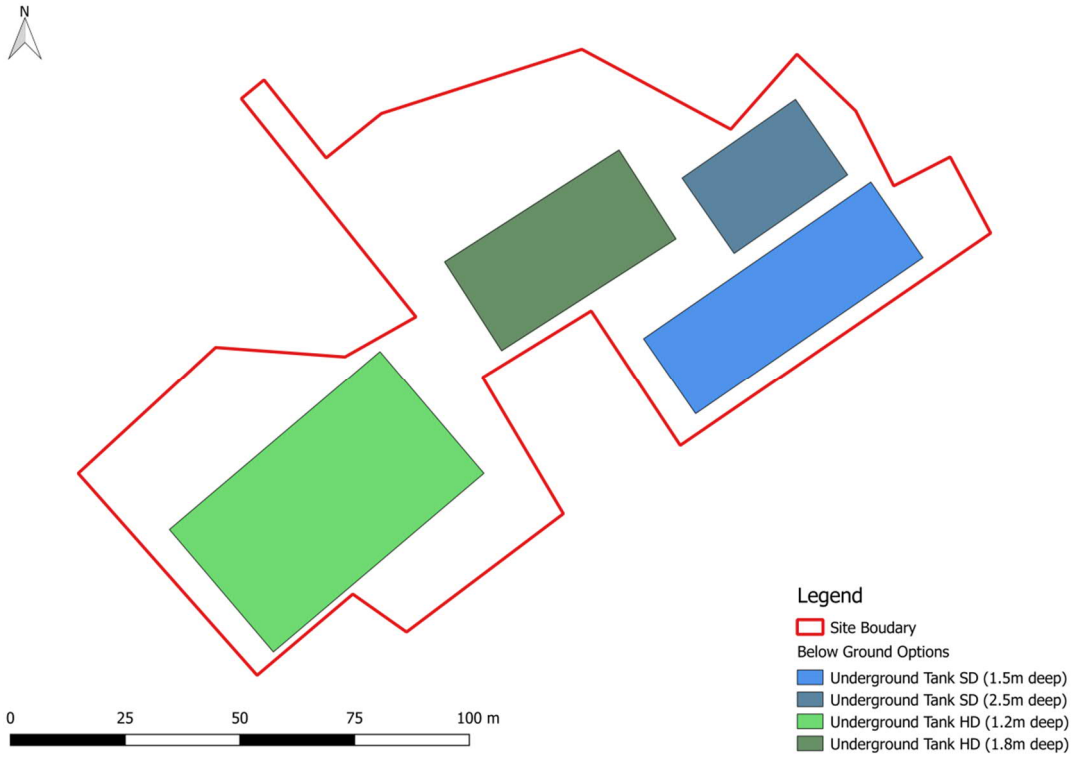


Figure 3-2: Approximate Sizes of the Potential Below Ground Options in the context of the Site area

3.15 A combination of options may be feasible in order to meet the total amount of storage required.

Source Control Measures

3.16 Additional source control measures such as, green roofs, rainwater harvesting, pervious paving and arboricultural options (e.g. Green Blue Urban), could also be used within the site. The storage capacity of these options can be limited but including them in the SuDS scheme for the development would lead to a reduction in the required volume of storage within the main attenuation feature(s).

3.17 A combination of source control measures would complement the main attenuation features and help increase the sustainability of the development.

Green Roofs

3.18 Greed roofs are a planted soil layer constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation. Blue roofs can also be used which include the storage of water without the use of vegetation.

3.19 They are an effective option for using space that is already available at the top of buildings and also have the potential to create an aesthetically pleasing space for building occupiers to utilise. In addition, they help to decrease the percentage of impermeable area on the site.

Rainwater Harvesting

3.20 Rainwater harvesting systems are where rainwater is collected from roofs or other paved surfaces in a tank for use on site. The system can include water treatment elements and should include a specific storage provision if used to manage runoff.

Pervious Paving

3.21 Pervious paving is structural paving which allows runoff to soak in. This can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can then be stored in the sub-base and discharged.

3.22 Pervious paving can be used in combination with an underground attenuation tank and can be used for both pavements and vehicular loaded areas such as car parks.

Green Blue Urban

3.23 Green Blue Urban are cell systems used as a way to introduce trees into urban areas which provide aeration, irrigation and space to guide the tree roots. The cells can be used as part of a stormwater management system with 95% of the RootSpace system available for storage/attenuation. In addition, the large open voids within the RootSpace system allow for large pipes to be integrated into the system.

3.24 These cell systems provide a larger amount of storage than some of the other source control measures, however, they are very expensive.

4. Recommendations

On-Site Attenuation

4.1 Due to the large plan area required for the above ground options (detention basin, pond, and swales), the below ground option (attenuation tank) is the most feasible for this site considering the need to propose a financially viable development. This will allow more space for the development while still achieving the necessary surface water attenuation volume. Combining this with source control measures, such as green roofs, permeable paving and green blue arboriculture, will ensure that the required storage is met while also contributing towards sustainable development.

4.2 As a result of the potentially high groundwater level, in addition to the unknown depths of the existing drainage that will be connected into, only one layer of attenuation tank modules is recommended. There are still a number of unknowns linked to the groundwater levels and the invert levels of the existing sewer network and culverted watercourse and thus this is the most conservative approach until further information is known.

4.3 It is understood that the redevelopment proposals could have an impermeable area of approximately 85% and thus a larger quantity of storage would we required than those detailed previously in Table 3-1 (1376m^3). Therefore, for the recommended one layer of standard duty attenuation tank an approximate plan area would be 1500m^2, although this could be reduced through the use of source control measures.

Appendix A Surface water storage requirements

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Amanda Magloire
Site name:	Dane Valley
Site location:	Seaford

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

Latitude:	50.77515° N
Longitude:	0.10256° E

Reference:	6490891
Date:	2018-11-12T11:07:43

Methodology	IH124

Site characteristics

Total site area (ha)	1.22
Significant public open space (ha)	0
Area positively drained (ha)	1.22
Pervious area contribution (%)	30
Impermeable area (ha)	1.22
Percentage of drained area that is impermeable (%)	100
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	1.22
Net impermeable area for storage volume design (ha)	1.22

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage

	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
Qbar total site area (l/s)	0.22	--
SOIL type	1	1
HOST class	N/A	N/A
SPR	0.1	0.1

Hydrology

	Default	Edited
SAAR (mm)	750	750
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.3	0.3
Rainfall 100 yrs 6 hrs	70	
Rainfall 100 yrs 12 hrs	99.12	
FEH/FSR conversion factor	1.18	1.18
Hydrological region	7	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	0.22	0.22
Qbar net site area (l/s)	0.22	0.22
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

Estimated storage volumes

	Default	Edited
Interception storage (m^3)	49	49
Attenuation storage (m^3)	1625	1625
Long term storage (m^3)	0	0
Treatment storage (m^3)	146	146
Total storage *(excluding treatment)* (m^3)	1674	1674

This report was produced using the Storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for use of this data in the design or operational characteristics of any drainage scheme.

HR Wallingford
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Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Amanda Magloire
Site name:	Dane Valley
Site location:	Seaford

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

Latitude:	50.77515° N
Longitude:	0.10256° E

Reference:	6490891
Date:	2018-11-12T11:05:55

Methodology	IH124

Site characteristics

Total site area (ha)	1.22
Significant public open space (ha)	0
Area positively drained (ha)	1.22
Pervious area contribution (%)	30
Impermeable area (ha)	0.915
Percentage of drained area that is impermeable (%)	75
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	1.22
Net impermeable area for storage volume design (ha)	0.92

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage

	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
Qbar total site area (l/s)	0.22	--
SOIL type	1	1
HOST class	N/A	N/A
SPR	0.1	0.1

Hydrology

	Default	Edited
SAAR (mm)	750	750
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.3	0.3
Rainfall 100 yrs 6 hrs	70	
Rainfall 100 yrs 12 hrs	99.12	
FEH/FSR conversion factor	1.18	1.18
Hydrological region	7	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	0.22	0.22
Qbar net site area (l/s)	0.22	0.22
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

Estimated storage volumes

	Default	Edited
Interception storage (m^3)	37	37
Attenuation storage (m^3)	1141	1141
Long term storage (m^3)	0	0
Treatment storage (m^3)	110	110
Total storage *(excluding treatment)* (m^3)	1178	1178

This report was produced using the Storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for use of this data in the design or operational characteristics of any drainage scheme.

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Amanda Magloire
Site name:	Dane Valley
Site location:	Seaford

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

Latitude:	50.77515° N
Longitude:	0.10256° E

Reference:	6490891
Date:	2018-11-12T11:02:55

Methodology	IH124

Site characteristics

Total site area (ha)	1.22
Significant public open space (ha)	0
Area positively drained (ha)	1.22
Pervious area contribution (%)	30
Impermeable area (ha)	0.61
Percentage of drained area that is impermeable (%)	50
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	1.22
Net impermeable area for storage volume design (ha)	0.63

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage

	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
Qbar total site area (l/s)	0.22	--
SOIL type	1	1
HOST class	N/A	N/A
SPR	0.1	0.1

Hydrology

	Default	Edited
SAAR (mm)	750	750
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.3	0.3
Rainfall 100 yrs 6 hrs	70	
Rainfall 100 yrs 12 hrs	99.12	
FEH/FSR conversion factor	1.18	1.18
Hydrological region	7	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	0.22	0.22
Qbar net site area (l/s)	0.22	0.22
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

Estimated storage volumes

	Default	Edited
Interception storage (m^3)	24	24
Attenuation storage (m^3)	658	658
Long term storage (m^3)	0	0
Treatment storage (m^3)	73	73
Total storage *(excluding treatment)* (m^3)	682	682

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