5 SUSTAINABILITY AND SUSTAINABLE DESIGN PRINCIPLES

5.1 Introduction

5.1.1 This chapter provides a brief overview of the aspirations of the project in delivering sustainability within the development proposals, to create an environmentally responsible, low carbon development.

5.2 Design Principles and Aspirations

5.2.1 As well as being innovative in its concept and provision, the scheme will be developed incorporating a number of initiatives to meet the challenge of sustainable development.

The Masterplan *(Ref Illustrative Masterplan)*

5.2.2 The Masterplan has been prepared to show the arrangement of buildings within the strategic landscape framework.

Tourist Accommodation Concept

5.2.3 The concept behind the development seeks to provide a sustainable high quality accommodation facility that can be fully flexible in its approach to users and timescales. Existing provision and examples within the region have been studied and assessed (*Refer to Chapter 3.0 and 12.0*), and the following proposals have been developed to encompass the perceived needs and requirements of existing tourists whilst providing an alternative concept to attract new visitors and users.

5.2.4 This concept has been developed and is now being successfully used by several companies to sell the ownership of properties but remain the managers under a legal agreement. Cygnet Investments proposes developing a proportion of its estate and splitting ownership and management using a similar hybrid solution. The rationale for this trend being that specialist property owners then optimise the property value while specialist operators deliver the expected standard of service.

5.2.5 Cygnet's proposals are that a number of the pavilions being developed will be sold to a number of purchasers who wish to own a fraction of the property; they will use it on a rotating basis throughout the year.

5.2.6 Studies have shown that most buyers will be acquiring properties for leisure purposes; this will enable Cygnet to offer high quality accommodation at more affordable prices. This proposition not only benefits the individual property owner but will result in greater levels of occupation throughout the year, thus optimising site occupation and levels of tourist flows in the area.

Leisure Complex

5.2.7 Unlike other recent water park developments, most of which tend to be insular private concerns generally off-limit to the public; the proposed leisure building will provide not only facilities for the site's short term residents but also include year round facilities open to non-residents as a pay and go facility. Such facilities include a swimming pool and gymnasium. This building will therefore integrate part of the site with the local population, provide a range of needed facilities and avoid a totally exclusive and insular development.

5.2.8 The leisure building will be located near the site entrance at the northeast corner of lake 104. The architectural style will be contemporary and in keeping with the general principles behind the design of the residential units.

5.2.9 Materials used in construction will be in keeping with the rest of the development and comprise tiled and copper roofs with elevations comprising glazing, cedar cladding and Cotswold stone. Reference will be taken in its design to its lakeside setting with nautical organic elements being incorporated in the massing, shape and detail.

Pavilions

5.2.10 A range of sizes are proposed from 2 bedroom apartments, 2 bedroom units through to 3, 4, 5 and 6 bedroom residences all of which will be generous in internal space standards. Internally the units will be planned to give the master bedroom panoramic lake views with the main living accommodation on the first floor to maximize views. Each unit will have one unassigned car parking space in a communal screened area.

5.2.11 Pavilions are to be designed in a contemporary style and to be finished internally in a range of high quality finishes while maintaining a legible and cohesive design code. Each unit will be based on a grid and frame structure formed in steel and clad in oak or stone. Some frames will be fabricated off site, which will avoid unnecessary noise and site disturbance and minimize foundation work on site. The basic frame structure can then be in filled on a plot-by-plot basis with regard to water views and privacy requirements. Some infill panels will be fabricated off site to minimize site disturbance, but others will need to be erected on site.

5.2.12 The infill panel materials will be a mixture of clear glass, tinted/fine shot blasted glass where panoramic views out or daylight are required, through to opaque Cotswold stone panels, rendered panels, Cedar clad panels etc where privacy dictates. In this way the aspect of each unit would be controlled with respect to its neighbours and the views of the lakes. The roofing materials likewise would be assessed plot by plot with a variety of materials used, Cotswold stone slates, verdi-gris copper on prominent plots and natural slates. In this manner the whole site would be built from a similar grid and frame style structure with variety in form, appearance and roof pitch adding to an interesting and undulating roofscape and built form. Where possible the use of sustainable materials will be given priority.

5.2.13 Access to some of the units will involve raised timber walkways through reed beds, timber jetties as well as normal ground level access.

Eco Pavilions

5.2.14 The Pavilions proposed around Lake 103A will take on a highly sustainable and low impact approach, which will act as an exemplar for sustainable and eco friendly design and construction. The pavilions themselves will sit within the landscape and will aim to minimise their impact in all respects on their surrounding context.

5.2.15 These units will take on a different design approach to the pavilions elsewhere on the site and will incorporate measures such as green roofs.

Climate Change

5.2.16 There is growing scientific evidence to suggest that the earth's temperature is rising and will continue to do so as a result of human actions. The primary cause is seen as the rise in CO2 emissions from burning fossil fuels. Climate change affects us all either directly or indirectly and the negative impacts include increased storms, flooding, droughts and destruction of eco-systems, which cannot easily adapt.

5.2.17 This development has considered how the effects of global climate change might have a direct or indirect effect on its operation and as importantly how it can contribute towards reducing CO2 production through its construction and operation processes and being energy efficient.

5.2.18 Of the effects of global climate change, the scheme is arguably most susceptible to an increased risk of flooding due to the low-lying nature of the ground. The Environment Agency is responsible for matters associated with flood risk and prevention and the scheme will accord with their standards. A flood risk assessment is included in *Appendix 11.1 (Technical Appendix Document 1)*

5.3 Building Design

5.3.1 The buildings will use high volumes of glass, wood and stone materials which are renewable and reduce the need for large amounts of concrete/cement products in walls and floors as the cement industry is a high producer of CO2 in its processes. Some of the buildings will incorporate Cotswold stone, which is in local supply. Aggregates and gravels for road and footpath construction will be sourced from local quarries or won from site during the earth moving operations.

Energy Efficiency.

5.3.2 Where possible, buildings will be orientated to face due south or west to maximise solar gain. This also affords opportunity to site solar panels on pavilions where orientation permits them being sited on the roof.

5.3.3 There are a number of initiatives that will be incorporated into the design and employed to ensure high-energy efficiency is achieved across the development. These include:

- a) Rainwater Harvesting

  The roof water drainage from pavilions and the leisure centre will be collected in underground tanks and reused as domestic WC flushing and washing machine supplies. Using average rainfall figures this will require a 300 litre capacity tank for the two-bedroom unit and up to 780 litres capacity tank for the six-bedroom unit (based on the average rainfall figure of 123.2mm per annum).

- b) Grey Water

  It is not intended to use grey water recycling due to its duplication of use with rainwater harvesting and the relatively short lifespan of grey water. Grey water stored for more than 24 hours can become foul black water and unsuitable for re-use. Due to the short-term nature of the occupancy it is unlikely that the grey water would always be changed every 24 hours. Use of grey water for garden watering is not possible due to contamination of the water table.

- c) Solar Heating

  It is intended to use photovoltaic cells (solar panels) on the roof of the leisure where roof space and orientation permits to partially heat the swimming pool. Each individual pavilion (where orientation permits) will have roof-mounted panels (a solar array) ranging in capacity from 1kw up to 3kw for the larger roof areas. Any larger capacity would result in visually unacceptable complete roof coverings by solar panels. Size of panels will range from approximately 756mm x 6800mm for 1kw to 2268mm x 6800mm for 3kw

- d) Geothermal Heat Pump System

  The air conditioning energy load will be partly supplied by a hybrid geothermal heat pump system using the existing water table under the car park, subject to a further detailed geological investigation.

5.3.4 Other initiatives include:

- Sealed double glazing units.

- Dual flush WC's allowing short and half flushes
- CFC free insulation in floors and roofs
- CFC free refrigerators and freezers
- 'A' rated energy efficient appliances such as dishwashers.
- Low energy and solar lighting.

5.4 Building Construction

5.4.1 Prefabricated elements will be used in as much of the construction process as practically possible. This has many advantages, including:

- reduced time for site erection.
- reduced noise during construction.
- reduced energy in construction.
- controlled factory fitted and finished components.
- controlled sources of materials to ensure that they are from renewable sources.
- less site wastage.

Foundation Design

5.4.2 The buildings will be erected using pad foundations to support a 3m column grid reducing the amount of concrete needed compared to a raft foundation and disturbance to the ground.

Site-mix mortar

5.4.3 The cement industry is identified as a major contributor to CO2 production and on traditional building sites, uncontrolled mortar mixing can be a major source of wastage either from over production or increased strengths of mortars. The majority of mortar will be either mixed off site under factory-controlled conditions or from a controlled site compound to encourage more efficient use and less wastage. Any surplus suitable aggregates encountered during the earthworks operation will be recycled and used for footpaths and where lean-mix concrete is required

Cut and Fill

5.4.4 The re-profiling of the banks to create increased shorelines has been done to achieve a balance in the cut and fill earthworks operation and should not require any export of material. Local fill material is in good supply if better quality fill material is required to be imported to create the new building platforms within the water, where granular materials would be less suitable.

Waste Management.

5.4.5 Suppliers and sub-contractors are to accept responsibility for removing and recycling waste from site. The main contractor will provide facilities for segregation of waste, enabling materials to be recycled on site or sent back to the suppliers.

Sustainable Urban Drainage

5.4.6 The scheme will adopt a sustainable urban drainage approach to dealing with surface water run-off from hard surfaces. This will incorporate the use of filtration trenches and soakaways to collect water from roads and roofs, which will achieve 'greenfield' run-off rates and maintain water quality.

5.5 Landscape

Wood Products

5.5.1 The scheme will use certified sustainable harvested (e.g. Forest Stewardship Council-FSC) timber such as larch heartwood and Douglas Fir (from UK sources) or hardwoods from certified renewable sources. Copies of the certification for all the materials delivered to the site are to be made available on request. The planning authority will be advised if certified materials will not be used for part of the project.

5.5.2 Preservative treatments will be avoided containing the following: CCA (copper/chrome/arsenic/salts), creosote, Permethrin, Lindane, PCP (penat chloro phenol), TBTO (tri butyl tin oxide), Biflouride compounds.

Fencing

5.5.3 Living willow fences, hazel hurdles and birch panels will be used, where some degree of screening or privacy is required in such as in car parks. Some willow material will be cut from site or sourced locally.

Wood finishes

5.5.4 It is intended that most timber surfaces will be left with a natural finish to meld with the hues of the natural landscape. Some natural stains such as Danish, linseed or teak oil will be used on external timber furniture. As second preference high solids alkyd paint and mineral paint may be used for external wall panels.

Topsoils

5.5.5 The scheme will recycle topsoil won from site. It is intended that low fertility grassland will be created using subsoil or low fertility topsoil sown with a non-competitive grass mix to allow for natural recolonisation.

5.5.6 Only peat free composts, mulches and soil conditioners are to be used/specified. Generally the use of fertilizers will also be prohibited to avoid run-off off phosphates and nitrates into adjacent watercourses. Where fertilizers are used they must be made from 100% non-chemical sources i.e. 'organic' fertilisers.

5.5.7 No pesticides or herbicides shall be used on this project without prior agreement with the planning authority.

Plants

5.5.8 The landscape rationale is to create a scheme, which has a strong sense of place, and will be achieved using stock of local provenance or from nurseries recommended under the 'Flora locale' scheme. No exotic species will be introduced without prior consent from the planning authority.

Protection of Existing Vegetation

5.5.9 A landscape survey has been carried out to identify important landscape features that should be retained and enhanced. These will be maintained and protected during construction works in accordance with BS: 5837: 1991 'Trees in relation to Construction'.