Great Keppel Island Environmental Impact Statement

Visual Assessment Technical Report

Prepared for
Tower Holdings

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GREAT KEPPEL ISLAND
VISUAL ASSESSMENT TECHNICAL REPORT

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GREAT KEPPEL ISLAND VISUAL ASSESSMENT

1. INTRODUCTION

GKI Resort Pty Ltd proposes to develop parts of Great Keppel Island, including redevelopment of an existing resort on the Island. The Great Keppel Island Resort Revitalisation Plan incorporates tourism and resort facilities and villas, a golf course, marina and research facility, an upgraded airstrip and conservation management over a large proportion of the Island. This report addresses the visual quality and scenic amenity impacts of the Project, as part of an Environmental Impact Assessment responding to the Terms of Reference (ToR) issued by the Co-Ordinator General in June 2011 and the Department of Sustainability, Environment, Water, Population and Communities and the Great Barrier Reef Marine Park Authority in February 2011.

The relevant sections of the ToR are 3.2.2 (Scenic Amenity) and 3.2.3 (Iconic Values), but matters of visual impact are also minor parts of sections 3.2.4 and 3.2.5.

Great Keppel Island is part of the Keppel Group of Islands located approximately 12km offshore from Yeppoon on the Central Queensland Coast. At approximately 1,478 hectares in area, Great Keppel Island is the largest Island in the group, and is located adjacent to several smaller Islands (Halfway, Humpy, Miall, Middle and North Keppel Islands). All are within the Great Barrier Reef World Heritage Area (GBRWHA).

While parts of Great Keppel Island have been subject to grazing, most of the Island appears natural. A relatively small proportion is developed, including an existing resort at Fisherman's Beach (currently closed; awaiting redevelopment) and the existing airstrip, plus small coastal settlements behind Fisherman's and Putney's Beaches and a rural homestead.

On Great Keppel Island, the study area comprises approximately 1100 hectares *(ha)*. However assessment of scenic values associated with both the study area and the whole of Great Keppel Island also includes consideration of the sandy beaches, rocky foreshores and bays below High Water Mark (HWM), which contribute significantly to landscape, seascape and Island character. Accordingly, references to the study area and the Island in this report include the adjacent intertidal zone.

This study aims to:

- identify the landscape values of the study area in the context of Great Keppel Island and the Keppel Island Group, and their contribution to World Heritage aesthetic values of the GBRWHA,

- describe and map visual sensitivity as constraints and opportunities for development, as an input to site planning and design;
- assess the likely visual impacts of the proposed development; and
- recommend mitigation measures where appropriate.

2. METHODOLOGY

2.1 Literature Review

The ToR (section 3.2.2.1) requires a literature review of accepted methodologies for the assessment of scenic amenity and evaluation and classification of landscape character. Section 3 below also includes review of published material on the World Heritage aesthetic values of the GBRWHA generally, as the basis for assessment of the contribution made by Great Keppel Island.

2.2 Description of Scenic and Iconic Values

Section 3.2.2.1 of the ToR (Scenic Amenity) requires the following description of environmental values:

- Description of the existing scenic and landscape values of Great Keppel Island and the surrounding area;
- Identification of the geographic and landscape features, panoramas and views valued by the community, with reference to those values protected through legislation including world heritage protection;
- Identification of major view corridors, viewshed sectors and focal points, landmarks and other features that contribute to the amenity of the area;
- Description of local area character and surrounds, including landcover, landform and landuse;
- Description of the visual absorption capacity (VAC) of the Island and identification of scenic constraints/opportunities.

Section 3.2.3 of the ToR (Iconic Values) also requires description of relevant iconic values and protected planning provisions (3.2.3.1) under the *Iconic Queensland Places Act 2008*, the Livingstone Shire Planning Scheme 2005 Zoning Map, the Great Keppel Island Code and Structure Map PSM 5. The Livingstone iconic place includes "The Keppels" which are listed as Z42 on the Zoning Map and described as *"(iv) The Keppel Group of Islands that form an integral feature of the natural inshore seascape"*.

Great Keppel Island and surrounding waters are within the Great Barrier Reef World Heritage Area (WHA), requiring assessment as a matter of National Environmental Significance under the *Environmental Protection and Biodiversity Conservation (EPBC) Act.* Assessment of World Heritage scenic values and impacts requires consideration of the original 1981 nomination as a place of "outstanding universal value" under all four of the "Natural Heritage" criteria (N),

including "aesthetics and natural beauty". The nomination acknowledged the GBR *"… to be an area of great natural beauty and wonde*r" and included under N(iii) " ….. *containing unique, rare and superlative natural phenomena, formations and features and areas of exceptional natural beauty"* the following: "*The Great Barrier Reef provides some of the most spectacular scenery on earth and is of exceptional natural beauty*. The World Heritage Values include:

- *the vast extent of the reef and Island ecosystems which produces an unparalleled aerial vista;*
- *Islands ranging from towering forested continental Island complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays;*
- *coastal and adjacent Islands with mangrove systems of exceptional beauty;*
- *the rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs;*
- *the abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs;*
- *spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies; and*
- *migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish.*

Many of the above occur on or around Great Keppel Island, and provide a check-list for initial evaluation of World Heritage values. However while the overall criterion of "outstanding universal value" applies to GBR as a World Heritage Area, this does not mean that each of the above components and features must be of 'outstanding universal value' in order to contribute to the overall WH values. The framework for assessment of aesthetic values and visual impacts in this report has been that the GBR is of World Heritage aesthetic value because it has some superlative scenic phenomena which are unique and unparalleled, and these are supported by a rich variety of other highly attractive features which contribute to the scenery, but which on their own may not be unique or superlative.

The above features and characteristics were assessed initially by desktop review of air photos and topographic data, plus a tourist map (*Carl Svendsen's Guide Map of Great Keppel Island* 2009), with features shown and named on **Figure 1**. Where significant landscape features do not appear to have an existing place name, provisional names were assigned as place references. Digital contour data were also analysed in GIS (Vertical Mapper) to prepare draft maps of visibility from offshore viewpoints, divided into four compass point sectors (also shown in **Figure 1**). These were then field checked during a 2-day inspection in February 2011 by two landscape architects experienced in visual assessment, during which the landscape values and sensitivity were recorded from both Island and offshore viewpoints.

As discussed in the Literature review (Section 3), the approach taken to landscape assessment has been by physical description and expert evaluation, rather than by a scenic preference study. While scenic preference techniques are reported to have greater validity in predicting community

consensus on scenic amenity, they do not as yet provide a basis for visual impact assessment of proposed development projects. In the case of Great Keppel Island, many of the key landscape and aesthetic values are already well-established and documented as World Heritage values and iconic place values, so a comprehensive scenic preference analysis (which in effect would 'start from scratch') is not considered appropriate. Nonetheless, scenic preference studies, such as the South East Queensland Scenic Amenity Methodology, support the emphasis given in this report to the high value accorded to 'naturalness' of those parts of Great Keppel Island perceived by the local community to be undisturbed and undeveloped.

The landscape values associated with Great Keppel Island and surrounding area include scenic amenity, character, sensitivity, iconic seascape and contribution to World Heritage aesthetic values. While specific landform elements and features contribute to these values, and may be captured in photographs, landscapes are more holistic. Landscape beauty is seen and appreciated within broad settings, observed while enjoying or moving through a viewshed. Accordingly, the main viewsheds of Great Keppel Island have been mapped and form the basis for assessment of relative naturalness (absence of visible built form) as a constraints and opportunities framework for project planning and design, and for impact assessment.

2.3 Visibility and Sensitivity

As a preliminary stage of assessment, visual constraints and opportunities were identified and mapped as an important input to project planning and design, and in particular those parts of Great Keppel Island which are sensitive to or tolerant of landscape change as a result of their relative visibility.

In an area of iconic and World Heritage values, and especially on an Island with only a small node of visible development at present, a primary issue in visual impact assessment of further proposed development is its visibility. While there are other factors to be taken into consideration, they are secondary to the visibility of new built form, earthworks and landform alteration as seen from external viewpoints and lookouts. Where these are visible, a range of measures need to be considered (such as form and design) in order to achieve compatibility and character integration, and reduce impacts on scenic amenity. However where development is largely screened from external view, their visibility will be localised and there will be fewer visual impacts. Accordingly, Great Keppel Island has been modelled and mapped for visibility and sensitivity, the former by terrain analysis of seen areas (using the GIS software 'Vertical Mapper'), and the latter by Visual Absorption Capacity (VAC).

2.4 Visual Constraints and Mitigation Measures

Section 3.2.2.2 of the ToR requires consideration of proposed mitigation measures. For the Great Keppel Island Revitalisation project, the approach to reducing potential visual impacts has been firstly through site-sensitive (constraints-based) planning to avoid or minimise disturbance of areas of landscape sensitivity, and subsequently through retention of screening vegetation,

revegetation and landscape planting and design controls on built form (such as height, scale, bulk, colours, roof form and reflectivity).

Management objectives for mitigation of lighting (section 3.2.4 of the ToR) are also considered in this context.

2.5 Potential Impacts

Sections 3.2.2.2, 3.2.3.2 and 3.2.4 of the ToR require assessment of potential impacts as follows:

- Description of the potential impacts/benefits on visual/landscape character associated with the proposed development;
- Assessment of changes in visibility/landscape character from existing and future sensitive receptors (see below), based on viewshed mapping and photomontage simulations;
- Description and assessment of the potential impacts of the project on the relevant iconic values, including dominant landscape features, forested ridgelines, rocky outcrops and foreshore areas, future visitor's enjoyment of the Island's natural character, the existing airstrip operations, etc;
- Potential impacts of night lighting (including increased traffic) on fauna and residents at all stages, from construction to occupation.

The approach to impact assessment in this report is dominated by issues relating to the visibility of built form and earthworks, and their relationship to skylines, sensitive features and existing nodes of development and disturbance. In general, visible built form and disturbance will have high visual impacts on parts of Great Keppel Island which are currently perceived by external observers as undeveloped, and low visual impacts where they are screened from view, as seen from ground and sea level, or are visually integrated with an existing node of development.

It is also a general premise that views enjoyed by large numbers of people (eg. ferry and boating routes), and views of people seeking particular scenic experiences (eg. national park campers and bush walkers), are more sensitive to visible change in the landscape than (for example) views from cargo vessels using commercial shipping channels, and accordingly these viewpoints are regarded as 'sensitive receptors'. Existing residences behind Fisherman's and Putney Beaches, and 'First Lookout' on the main ridge are also considered to be sensitive receptors (see Figure 1), but not the existing abandoned resort. Viewpoints which are likely to be well-used following development, such as the proposed marina, are also considered as 'future receptors',
Visibility from the air is also considered, especially in relation to World Heritage values, although it is to some extent unavoidable that development will be highly visible from planes. The appearance of proposed development as seen from viewpoints on the Island is also taken into consideration, but the impacts on existing residents and businesses (who enjoy the Island's scenery pre-development) are distinguished from those associated with scenic opportunities created by the development *per se* (such as resort guests, golfers and marina users).

The approach taken to visual impact assessment in this report places only minor emphasis on viewing distance, because most of the landscape values associated with Great Keppel Island (and potentially at risk from inappropriate development) are mid-ground and background views. Few of the World Heritage, iconic and perceived naturalness values are associated with foreground views, and at this viewing distance the visibility of built form is generally amenable to design integration, screening and other mitigation measures. It is also relevant that visual impacts such as landscape scarring, reflective roofs and night-time lighting can detract from landscape values when seen across water, even at long distances where they may form only a very small proportion of the field of view. However viewing distance has some relevance to visual impact assessment with respect to vegetation density, which usually provides greater screening capacity when seen at a distance, whereas built form may be visible through the trees when seen at closer distance.

In addition to considerations of visibility, visual impact assessment is also based on the features and attributes which are documented and/or protected by legislation, such as the World Heritage and iconic values.

3. LITERATURE REVIEW (TOR SECTION 3.2.2.1)

3.1 Approaches to Landscape Evaluation

3.1.1 Competing Paradigms

Scenic quality has been studied over the past 40 years in order to develop explanatory theories of human landscape preferences, as reviewed by Chenoweth EPLA *et al* (1997), SEQ Regional Amenity Study (2004-2005)[1] and Lothian (2009). Although landscape appreciation is subjective, these studies have provided systematic approaches to measurement and prediction of what constitutes and changes scenic quality. For non-urban landscapes, a range of landscape assessment paradigms (or analysis typologies) have been used and published, which may be broadly categorised as either formal inventories (usually by experts) or approaches that rely to varying degrees on public responses and perceptions (psycho-physical, cognitive or experiential paradigms and scenic preference studies). In general, physical descriptions mainly involve expert assessments using standardised criteria, while phenomenological or psycho-physical approaches mainly or partly involve evaluation by observers or the wider community. Lothian (2009) describes this dichotomy as the 'physical paradigm' (beauty is an intrinsic quality of the landscape) and the 'preference paradigm' (beauty lies in the eye of the beholder), and suggests that this fundamental distinction prevents the merging of the two approaches. He further considers that, while physical studies are more widely used (mainly due to practical considerations of feasibility), they have failed to develop a credible or repeatable method. Although physical (expert) evaluation can be significantly improved by using criteria based on public perception studies, scenic preference studies (using photographs as scenery surrogates are increasingly proving more reliable (Lothian 2009).

[1] South East Queensland Regional Scenic Amenity Study (2004) *Interim Scenic Amenity Maps and Guidelines to Protect High Scenic Amenity in SEQ*

3.1.2 Physical / Expert Evaluation

In Australia, broadscale analysis and assessment of scenic landscape values from the 1970s through to the 1990s generally adopted and adapted the physical / expert model of the US Visual Management System (VMS) (U.S. Department of Agriculture, Forest Service 1974, updated as the Scenic Management System 1995). The VMS/SMS approach combined Visual Prominence and relative Scenic Quality, the latter based on criteria derived from formal aesthetics (line, form and composition) and from research into aesthetic preferences. Broad topographic units were rated, assuming that scenic quality increases with:

- naturalness;
- presence of water and land-water edges;
- uniqueness in land and water features;
- relative topographic relief and ruggedness;
- vegetation diversity and landscape variety generally; and
- patchwork effects in agricultural landscapes and edge diversity in forests.

Similar approaches continue to be used as procedural standards and guidelines in Western Australia[2] and elsewhere.

These US-derived approaches differ from those in Britain, where the established procedures include formal aesthetic criteria (form and composition) together with other components as assessed by landscape experts, but the evaluations are more descriptive and related to character and contribution to scenic quality, and less reliant on standardised categories and relative values. Guidelines for field survey categorise the landscape in general "Landscape Types" (such as Flat/Undulating Wooded Farmland, Marshland Fringe etc.) and as place-specific "Landscape Character Areas" described in terms of local distinctiveness, landform and geology, land cover and ecology, archaeology and history, built environment and cultural associations. Within each Landscape Character Area, "Local Landscape Types" are identified through field assessment of:

- landcover (mainly vegetation)
- dominant elements (mainly built form and water features)
- landform
- aesthetic factors
- condition
- ability to accommodate change
- most appropriate management

[2] WA Planning Commission and Dept for Planning & Infrastructure (2007) *Visual landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design*

3.1.3 Preference-based / Experiential Evaluation

The scenic preferences study undertaken in South East Queensland[3] are the most extensive yet undertaken in Australia, and have been combined with GIS terrain mapping to provide a repeatable broadscale assessment of "scenic amenity" (Visual Exposure X Scenic Preferences). The South East Queensland Regional Scenic Amenity Study "*identified characteristics of views that influenced scenic preferences and based on this, maps of highly preferred scenery were prepared. The scenic preferences were combined with maps of visibility to map scenic amenity on a 1 – 10 scale*" (Lothian 2009). This methodology is now adopted as the SEQ Regional Plan Guideline 8, and is particularly suited to broadscale mapping to assist land use planning. Although Preston's Scenic Assessment Methodology has been criticised for its reliance on visual exposure (Lothian 2009), the restricted photo-based 'framing' of expansive landscape settings, its unsuitability for urban places and the limited range of landscape attributes[4], it has been a major advance in developing a repeatable approach to scenic quality as perceived by the community. Scenic amenity data currently map specific parameters rather than holistic landscape values, but may in the future provide a consistent base for adding extra layers such as landscape character, cultural values and sensitivity to change. The latter is commonly mapped at present as Visual Absorption Capability (VAC)

3.1.4 Evaluation for Visual Impact Assessment

Notwithstanding the above, the slow progress towards a generally-accepted method for broadscale evaluation of landscape quality has had only limited applicability for site-specific or project-related visual impact assessment. There is no single method which balances the 'objective' attributes of the seen landscape and the 'subjective' appreciation of scenic quality, for planning, impact assessment and development control.

While scenic amenity and landscape quality mapping has proven valuable for planning purposes in non-urban areas, they have been less successful in predicting the impacts of proposed developments and associated landscape changes. In general, maps indicating areas of high scenic quality and landscape values (such as the SEQ Scenic Amenity mapping) are appropriately used as 'flags' or triggers for more detailed impact assessment, and the latter uses different approaches and 'tools', taking into account other factors.

Techniques and terminology adopted in visual impact assessment vary widely between expert practitioners (Humphreys Reynolds Perkins Dent Is 2003-05, SKM Hummock Hill Island EIS 2010, URS Naturelink Cableway EIA 1998), but generally include some or all of the following:

(a) Description of existing landscape values, opportunities and constraints:

- Existing maps or documents indicating scenic quality, scenic routes, heritage and cultural / social values, tourism assets, landscape features and iconic or 'special' places, as verified or amended by site-specific assessment;

[3] South East Queensland regional Scenic Amenity Study (2005) *What's in a View? Vols 1, 2 and 3*
[4] AILA (Qld) *2009 Position Paper on SEQ Scenic Amenity & the Scenic Amenity Guideline 8*

- Description of the site and its landscape context, including physical attributes (landform, features and land use), landscape character, remoteness / wilderness values, regional/local image elements and current/future development pattern; and
- Landscape sensitivity to or tolerance of development, disturbance and change (eg Visual Absorption Capacity).

(b) Predicted appearance of the proposed development in its local context, presented as accurately and objectively as possible:

- Viewshed (or *intervisibility*) mapping, viewlines and cross-sections to show parts of the landscape, observer positions, lookouts and 'receptors' likely be within view of proposed development, either modelled from topographic data only, or field-checked and modified to take into account local view screening;
- Graphic representation (eg. models of built form massing, photomontages, sketches, fly-though models etc) showing what the proposed development will look like, including (where appropriate) its appearance on completion and after a reasonable period of growth of planted vegetation;
- Shadow diagrams and other modelling, sight lines and calculations to address specific impacts such as privacy, access to sunlight etc.

(c) Response to constraints and mitigation measures

- Assessment of project design responses to community concerns, landscape constraints and scenic values;
- Visual integration, design controls, screening and other impact mitigation measures.

(d) Compliance or conflict with statutory requirements, planning intentions and documented values:

- Compliance with policies and regional / strategic planning intent;
- Assessment against performance requirements such as codes, building heights, bulk and scale etc.

(e) Community and stakeholder consultation regarding social and cultural values associated with the landscape, potential visual impacts, concerns and proposed mitigation measures; and

(f) Expert opinions eg.

- Consistency with existing or emerging character and other developments approved or likely in the surrounding area;
- Acceptability or otherwise of the proposal, notwithstanding the likely changes to landscape appearance and values.

3.2 Coastal Zone Landscape Evaluation

(a) Trial Visual Evaluation Procedure: Brouwer & Chenoweth 1994

Analysis and assessment of scenic landscape values in Queensland's coastal zone in the 1990s adapted the physical / expert model of the VMS/SMS approach of combining visual prominence with ratings for scenic quality. Five 'Scenic Quality Indicators' (landform, waterform, landcover, naturalness and built form) were used by Brouwer & Chenoweth (1994) for a trial application in coastal parts of the Whitsunday Shire.

(b) A View of the Coast: EDAW Australia 1996

A systematic overview of landscape values along the entire Queensland coastline used similar scenic quality indicators. The coastline was classified and divided into landscape types and scenic quality indicators (landform, landcover, water and the land/water interface) categorised eg as steep and rugged coastal landforms, and naturalness and diversity in landcover. Categories for the land/water interface included fringing reefs, rocky headlands and sweeping beaches. These were subsequently rated as:

- High Scenic Quality: areas which have scenic qualities that are highly outstanding and distinctive or unique state-wide, national or international aesthetic value;
- Moderate Scenic Quality: areas with some scenic qualities somewhat distinctive with regional or state-wide aesthetic values; and
- Low Scenic Quality: areas with scenic qualities commonly occurring elsewhere along the coast; having some regional or local aesthetic values.

The Keppel Islands (a 'Major Island Group' landscape type) were rated Very High scenic quality and landscape integrity, given their "high degree of intactness" and uniqueness, at both regional and State-wide levels (see 4.8 below).

(c) Coastal Landscape Assessment Methodology: Chenoweth EPLA et al 1997

The scenic quality indicators used in the above studies were subsequently validated or amended through calibrated field assessments and community focus groups, for the Coastal Landscape Assessment Methodology in an intensive study of four coastal regions in Queensland (*Coastal Landscapes of Queensland* - Chenoweth EPLA *et al* 1997), using detailed 5-point scale ratings (Very High to Low) for the following six scenic quality indicators:

- Naturalness - the proportion and integrity of the landscape in apparently undeveloped natural condition;
- Vegetation and Wildlife - diversity and contrast of the vegetative land cover and associated fauna (if present);
- Landform - diversity and contrast (height, slope, pattern features) of the topography;
- Water and Shoreline - diversity and contrast of the shoreline, and the presence, extent and character of water forms;
- Pattern - focal points, diversity, harmony, rhythm and juxtaposition of elements; and

- Built Form and Activity - the contribution of built elements and cultural landscape modifications, and associated human activity.

The mapped landscape units in this 1997 study were "Landscape Settings", on the premise that coastal landscapes are viewed by visitors and residents as a series of scenes within viewsheds such as valleys and bays, and these settings frame their experiences and activities. The descriptive framework combined some of the features of the US and British approaches. Within each Setting various 'Land Types' (foothills, wetlands, headlands, settlement patterns, ranges, peaks etc) were described and rated for landscape integrity and sensitivity, taking into account significant view corridors, viewing distances (foreground, midground, background) and Visual Absorption Capacity (the capacity of the landscape to 'hide' development).

This Coastal Landscape Assessment Methodology provided several layers of assessment of Landscape Settings, each using a 5-point scale as follows:

- Composite Scenic Quality (rated Very High to Low) based on the ratings of each of the six indicators, weighted to reflect the importance of water and shoreline. Very High and High ratings implied regional significance, which may include exceptionally scenic places of State, national or international significance;.
- Sensitivity (Very Sensitive to Extremely Tolerant);
- Scenic Integrity (All Integral to Degraded);
- Contribution to regional identity (Strong or Distinctive to Weak);
- Scenic Significance (Very High, High, Moderately High, Moderate or Local), taking into account contribution to identity and integrity and sensitivity

(d) Livingstone Shire: Chenoweth EPLA et al 2003

The four coastal regions evaluated in 1997 did not include Great Keppel Island and the Keppel Group of Islands. They were also excluded from a later landscape evaluation study of the Capricorn Coast mainland (Chenoweth EPLA 2003). However the 2003 study informed the declared iconic values of the mainland parts of the Central Capricorn Coast (see 4.4 below), to which the Keppel Group of Islands has subsequently and appropriately been added.

(e) Dent Island EIS: Chenoweth EPLA and Humphreys Reynolds Perkins 2003

Assessment of visual impacts of a golf course on Dent Island in the Whitsundays (Chenoweth EPLA and Humphreys Reynolds Perkins 2003 and 2005, for Hamilton Island Enterprises) adopted the 1997 Coastal Landscape Assessment Methodology, combined with an analysis of World Heritage aesthetic values. The 2003 Dent Island assessment included viewshed analysis, Landscape Settings, Landscape Sensitivity and Visual Absorption Capacity of various land types, and scenic quality ratings. Dent Island had been previously assessed as part of a trial landscape evaluation procedure in the Whitsunday Region by Brouwer and Chenoweth (1993), and the 2003 Dent Island EIS verified the earlier broadscale assessment with more detailed studies. In this case, the relatively simple topography of a single central Island ridge parallel to

the mainland and Whitsunday Passage divided Dent Island into two viewsheds, and one of the main visual impact constraints on development planning was location and height of built form so that the skyline remained free of development as seen from either side.

(f) Magnetic Island: Wilson Morrison & Ptnrs (1990) and Kenchington & Hegerl (2005)

A study of Magnetic Island by Wilson Morrison and Partners in 1990 (Appendix 5 of GHD: Magnetic Island Management Plan, for Townsville City Council) is cited by Kenchington and Hegerl (2005) as part of the assessment of World Heritage values (see 3.3 below). The 1990 study was a systematic landscape quality assessment based on qualitative criteria for rating relative quality as seen from particular locations, mapping Magnetic Island in five categories of Landscape Quality: Distinctive, Very High, High and Medium plus an uncategorised central area.

Kenchington and Hegerl also cited visitor surveys as a resource for identifying the social and contemporary cultural values of Magnetic Island *viz.* the "*relaxed, peaceful tranquil atmosphere*" and "*natural beauty*" as the most appealing aspects of the Island.

3.3 World Heritage Aesthetic Values

(a) Great Barrier Reef World Heritage nomination

The Great Barrier Reef (GBR) is a World Heritage Area because it is of "*outstanding universal value*", and has been listed on all four natural heritage criteria, including aesthetics and natural beauty. As acknowledged in the original World Heritage citation, the GBR provides some of the most spectacular scenery on earth and is of exceptional natural beauty; and meets Selection Criterion (vii) of the Operational Guidelines for the Implementation of the World Heritage Convention*: "to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance"*.

For the GBRWHA, the relevant values are[5]:

"*The Great Barrier Reef provides some of the most spectacular scenery on earth and is of exceptional natural beauty. The World Heritage values include*

1. *the vast extent of the reef and Island systems which produces an unparalleled aerial vista;*
2. *Islands ranging from towering forested continental Islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays;*
3. *coastal and adjacent Islands with mangrove systems of exceptional beauty;*
4. *the rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs;*
5. *the abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs;*

[5] (www.environment.gov.au/heritage/places/world/great-barrier-reef/values.html) August 2011

6. *spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies; and*
7. *migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish."*

Values numbered 2, 3 and 4 above are particularly applicable to Great Keppel Island, although the aerial vista over the Keppel Group of Islands is also relevant.

The subjective aesthetic values of World Heritage Areas have proven difficult to define at the same level of precision as applies to the more 'scientific' and cultural WH values. There has been little research into the marine and coastal aesthetics of the GBRWHA, as noted in Lucas *et al* (1997) and Kenchington and Hegerl (2005). .

(b) Lucas et al (1997)

The Wold Heritage values of the GBRWHA were clarified by Lucas *et al* in 1997, in order to provide a basis for guiding management decisions. The authors noted that "*attributes that satisfy criterion (iii)*[6] *are difficult to measure*" and relate more to a social construct than some physical or biological phenomenon. The 'Natural Heritage' aesthetic values of the GBRWHA were reviewed and assessed by the authors, referring to the scenic quality criteria developed by Brouwer & Chenoweth (1994) and EDAW Australia (1996). While noting that that these studies were largely restricted to visual amenity and scenic quality of just the terrestrial components, and commenting that " *…little work had been completed which allows the full range of aesthetic values which relate to the GBRWHA to be identified*", Lucas *et al* list the phenomena of high scenic quality and aesthetic importance as including:

- expansive water views;
- the contrast and diversity of the land water interface;
- movement and diversity in the water, particularly at its edge; and
- diversity due to coastal form.

Lucas *et al* also concluded that aesthetic significance included community held perceptions and 'existence value', as well as the scenic and iconic values associated with the GBRWHA.

(c) Kenchington & Hegerl (2005)

The authors assessed WH values and attributes of Magnetic Island and surrounding waters, including aesthetic values. They recognised that, while aesthetic perception is personal and subjective, they are related to other social and cultural values and are also strongly linked with natural qualities, such that "*the outstanding universal value of the Island derives from a combination of these qualities*". Their "Word Heritage Scorecard" rated 'expressions' of the four natural criteria as:

- Unique values – only expressed on Magnetic Island;
- Regionally Important Values – where Magnetic Island contains a highly significant expression or the majority of expressions in the GBRWHA; and

[6] Natural Criterion (iii) has subsequently been re-numbered as Criterion (vii).

- Values for which Magnetic Island is a minor component of total expressions in the GBRWHA.

Magnetic Island was rated as "Unique" (*a value expressed uniquely on Magnetic Island*) for Criterion (iii) "*contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance"* (Note that the wording of Criterion (iii) has since changed). The reasons for their assessment were that "*The Island has mountainous terrain and a shoreline with a rich variety of landscapes and seascapes of exceptional beauty*".

Furthermore, because Magnetic Island is readily accessible by an urban population, it provides opportunities for presentation of WH values which are not available elsewhere in the GBRWHA. "*… its accessibility makes it a key place for presentation, appreciation and enjoyment of values that, although widespread, are effectively inaccessible to most people*". The authors consider that WH qualities and values, even those which are relatively common, are significant where they occur in combination and are accessible. This "*obligation of "presentation" can mean that widespread values are particularly important in accessible areas*" (Kenchington and Hegerl 2005).

This 2005 assessment of Magnetic Island is relevant to the WH values of Great Keppel Island in that:

- It considers combinations of scenic qualities associated with Island landscapes, shoreline and seascape features, each of which may be widespread and not necessarily of outstanding universal value (and which do not include aerial vistas over patterns of reefs and lagoons), but which in combination 'express' WH values; and
- It considers that the accessibility of such combinations is important in the 'presentation' of such values to the public.

4. DESCRIPTION OF ENVIRONMENTAL VALUES (TOR 3.2.2.1)

4.1 Local and Regional Context

Great Keppel Island is one of the largest and highest of the 18 Islands that comprise the Keppel Group of Islands, located approximately 12 km offshore from Yeppoon across Keppel Bay. All are continental Islands, representing a continuation of the coastal hills and low ranges along the mainland. Nearby smaller Islands are Humpy and Halfway Islands to the south, and Middle, Miall and North Keppel Islands, the last of which is approximately 10 km to the north. These are tropical Islands, just north the Tropic of Capricorn, and have characteristic white sandy beaches, clear blue waters, rocky headlands and distinctive coral fringing reefs. All the Keppel Group of Island are within the Great Barrier Reef World Heritage Area and surrounded by Great Barrier Reef Marine Park (Mackay / Capricorn Management Area). All the Islands, apart from Great Keppel Island, are also National Parks.

In the southern part of the Great Barrier Reef, the outer reef is farthest from the mainland, separated by Capricorn Channel. The outer reef and Swain Reef is 120 - 250 km from the inshore Islands (the Keppel Group, Curtis Island, the Capricorn Group and the Bunker Group), although there are a number of closer coral cays, reefs and shoals. The closest reef flats are approximately 80 km from Great Keppel Island.

The Islands and adjacent mainland are within the local government area of Rockhampton Region, with a coastal zone comprising flat plains punctuated by steep volcanic outcrops, and dominated by the background Berserker Ranges. The stretch of coastline between Farnborough in the north and Keppel Sands in the south is known as the 'Capricorn Coast', an attractive 35 km long stretch of headlands, hills, and beaches approximately 40 km north and east of Rockhampton. It includes the towns of Yeppoon and Emu Park, the artificial boat harbour at Rosslyn Bay, and smaller towns of Kinka Beach, Lammermoor Beach, Cooee Bay and Bangee, as well as associated rural and forested hinterland. Among the many landscape attributes of the Capricorn Coast is the view across Keppel Bay to Great Keppel Island, Humpy and Middle Islands, which contributes significantly to the region's character.

In the wider context of the GBR, Great Keppel Island is one of 599 continental Islands within the GBRWHA, but only 25 are larger than 1,000 ha (Kenchington & Hegerl 2005). With a mountain peak at 174 m, it is relatively high in local context but there are many taller mountains on northern continental Islands.

4.2 Description and Landscape Inventory

4.2.1 Geomorphology and Features

Great Keppel Island is a relatively mountainous Island, with several high ridges dominated by Mt Wyndham and "Bald Rock Peak" (see **Figure 1** and **Plate 1**), and many smaller spur ridges and headlands which separate the Island into a number of valley catchments both hydrologically and visually. The main central valley is associated with Blackall Creek draining to Leeke's Estuary (**Plate 2**). These ridges generally meet the shoreline at rocky headlands (**Plate 3**), and these (plus a sandy spit at the western end – **Plate 4**) separate the coastal strip into a series of bays and beaches around the perimeter of the Island (**Plate 5**). The nearby adjacent Islands also form part of the geomorphology which influences landscape values, in particular the ocean passage between Putney Beach and Middle Island.

Major headlands include Monkey Point, Bald Rock Point, "Red Beach Point" and Big Peninsula (**Plate 6**), with smaller points at Little Peninsula, Creek Rocks and Putney Point (**Plate 3**). Two of the valleys are drained by creeks – Blackall Creek in the centre, and the smaller Putney Creek on the west coast (**Plate 7**). The valleys and beaches are of varying sizes and orientations to the prevailing winds and tides, and the headlands and ridges vary in their height, slope, ruggedness and extent of exposed rock, creating a diverse landscape. Leeke's Estuary, the northern sand hills (**Plates 6** and **8**) and areas of vegetated old dunes add to the geomorphic diversity. Similarly, the Island's bays vary from small steep-sided coves exposed constantly to waves, to wide shelving sandy beaches (such as the sheltered Fisherman's Beach **Plate 9**, Leeke's, Putney and Long Beaches, and the more exposed Wreck Beach) and shallow fringing reef lagoons, the latter best exemplified by Clam Bay. Smaller beaches and bays include Butterfish Bay and "Secret Beach" in the north (**Plate 10**), Svendsen's Beach and Second Beach separated by Middle Rocks, "Little Wreck Beach" and Wyndham Cove (**Plate 11**). Views from the shoreline and lookouts also include small adjacent Islands of Halfway, Humpy and Middle Islands (**Plate 3**), inshore rocks such as Bald Rock and Hannah Rock, Sykes, Half Tide and Passage Rocks, and also Chocolate Rocks and Middle Rocks which occur on beaches.

The landform over most of the Island has not been changed or disturbed significantly by past grazing activities and development, with the exception of the area shaped and levelled for the airstrip (**Plate 12**) and resort. This has caused changes to the surrounding drainage pattern, affecting Putney Creek and removing an area of swamp which reportedly existed behind Fisherman's Beach.

In overview, the Island's geomorphology and size create a diverse and attractive landscape, with a combination of steep mountains and forested ranges, windswept craggy peaks and rocky headlands, secluded valleys and bays, sweeping beaches and small coves with inshore rocks and reefs, and the northern sand dunes. This range of scenery is not uncommon along sections of tropical coastline where the mountains are close to the sea, but on islands there is additional diversity associated with the perimeter shoreline and exposure to wind and sea in all directions, and the scenic diversity is particularly high in the context of other Great Barrier Reef Islands.

4.2.2 Land Cover

Apart from the developed areas (**Plate 13**), most of the Island supports natural vegetation, notwithstanding past disturbance associated with grazing, as described in the *Flora and Fauna Technical Report* (Chenoweth EPLA 2011). The natural vegetation ranges in form from wind-stunted dense low forms to sheltered forests, exposed woodland and swamps adding significantly to the variety in landscape pattern. In general, vegetation types broadly correspond to variations in geology, landform, drainage and exposure. The broad dominant habitat types are described in Figure 18 of the *Flora and Fauna Technical Report* summarised as:

- Tidal/estuary – with mangrove communities dominating the intertidal zone (**Plate 14**)
- Sclerophyll association with Paperbarks – *Eucalyptus, Corymbia* and *Melaleuca* spp. (**Plate 15**)
- Sclerophyll association with Wattles – *Eucalyptus, Corymbia* and *Acacia* spp. (**Plate 16**)
- Headland and windsheared vegetation (**Plate 17**)
- Steep wind-buffeted grass slopes (**Plate 18**)
- Beachfront or land/water interface vegetation (**Plate 19**);
- Cleared areas – airstrip, grasslands or dam (**Plate 20**);
- Littoral Rainforest – patches in several areas

Some of the land previously cleared for grazing has now returned to regrowth and natural forest, although several areas are infested with weeds (**Plate 21**).

The mangrove communities and the patches of littoral rainforest (a threatened ecological community) are not usually found on smaller Islands, and are accordingly not common in the context of the Great Barrier Reef.

Of relevance to this report, the heights of natural vegetation range from 1 to 4 m in wind-sheared areas and 5 to 15 m elsewhere. The areas mapped as cleared or disturbed in the *Flora and Fauna Technical Report* include a band of coconut palms and other planted vegetation along Fisherman's Beach foreshore to 14 m height (**Plate 22**). These vegetation heights have been added to terrain modelling (**Figures 2A to 2D**) in order to assess likely screening capacity for built form and other development impacts.

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4.2.3 Land Use and Built Form

Great Keppel Island has a long history of Aboriginal use, following which the land use has been mainly grazing on marginally-suitable land, plus offshore fishing and associated beach-related settlement. The developed area now occupies a relatively small node associated with the former resort and airstrip, the sheltered areas behind Fisherman's and Putney Beaches, and an existing rural homestead, and the reminder of the Island is occupied by natural vegetation apart from a few areas still cleared for grazing (**Plate 23**). Throughout the Island, examples of areas of land clearing for grazing and agriculture can be seen, plus evidence of farm buildings, some of which

remain (such as the Great Keppel Island Homestead **Plate 24**) and the Shearing Shed) behind Leeke's Beach.

The Island has long been used as a holiday destination for mainland residents of the Rockhampton region, and leisure uses increased when the Great Keppel Resort and airstrip were developed behind Fisherman's Beach in the 1960's, then redeveloped in the 1970's with additional villa units on the hillside. The resort is now closed but the buildings remain as a reminder of the Island's heyday as a popular tourist and day-trip destination, although the area now appears overgrown and unkempt (**Plate 25**). Despite closure of the resort, some tourist and backpacker use continues, with low-cost accommodation available at several venues such as Keppel haven (**Plate 26).**

Current residential use is concentrated in the south-western corner of the Island, plus a rural dwelling in the northern part of the Island (**Plate 27**). Built form at Fisherman's Beach comprises mainly detached single-storey or two-storey dwellings, and some of the latter incorporate a ground level commercial premise. The buildings are relatively modest in scale and construction, and the settlement has overall a low-key and casual beachside character, but set back from the beach and foredune. The single storey buildings are effectively screened from the beach and from offshore, and the two-storey buildings are partly screened by the foredune and associated vegetation (**Plate 21**).

The old resort buildings set back behind Fisherman's Beach dominate the southern end of Fisherman's Beach. The old hotel is visible behind the Fishermans' Beach foreshore, although considerably 'softened' by mature Fig trees. The most visually prominent buildings are the most recently constructed villas which are terraced down the hillslopes adjacent to the airstrip (**Plate 28**). Their pale colouring and reflective tin roofs are visible from offshore and from the mainland, although they too are softened by landscape trees which have now grown to maturity.

Apart from roads in the resort and settlement area, the road and vehicle track network is limited, with a single main track over the western end of the Mt Wyndham Range ridge connecting the developed areas with Leeke's Beach and north to Svendsen's homestead.

4.2.4 Character

As indicated above, the landscape of Great Keppel Island is particularly varied, due to the landform, shoreline and vegetation diversity, and the difference between sheltered and exposed areas. All parts contribute to its overall character of a large and diverse tropical mountain island with minor low key development and casual lifestyle. This diversity comprises a number of recognisable landscape character areas:

- The settlement node of Fisherman's Beach/Putney Beach low-key village, plus the 'faded glory' of Great Keppel resort and airstrip, with the associated beaches, sand spit and views outwards to sheltered waters, nearby islands and sunsets;

- Sandy beaches, bays and intervening rocky headlands, remote from the development node, varying in size from wide bays with gently curving beaches to smaller coves with steep rocky sides and headlands, most of them with other Islands or rocks visible offshore;
- Swamps and inlets, either estuarine mangrove and salt pan areas of Leeke's Estuary and Putney's Creek, or freshwater wet areas with *Melaleuca* forest and/or other wetland vegetation;
- Valley floors and lowland areas, with natural bushland or areas cleared for grazing, drained by ephemeral streams;
- Low hills and lower slopes or foothills, generally with natural bushland;
- Forested mountains, upper hillslopes and ridgelines with rugged appearance, offering panoramic views of headlands and bays, as well as surrounding waters and nearby Islands;
- Wind-swept bluffs and steep exposed slopes with natural grassland and stunted vegetation; and
- The northern sand dunes.

All the above contribute to the character of Great Keppel Island, but there is an additional intangible but important amenity factor which may be termed its 'island-ness'. As seen from across Keppel Bay, Great Keppel Island is a single mountain-like landform on the horizon, close enough to the mainland to be accessible but far enough away to be alluring and appear 'natural'. Also, it is large enough to offer a wide variety of scenery and activity opportunities, but small enough to be perceived as a discrete island. This distinctive combination of accessibility and remoteness, together with the rich variety of landscape and seascape scenery, makes Great Keppel Island a special place. It is distinctly different from the mainland, and offers the opportunity to 'escape' to an Island.

Great Keppel Island is also a significant element in the Capricorn Coast 'sense of place', and is particularly special to residents of these communities and Rockhampton. Part of its attractiveness and difference from the mainland is its 'perceived naturalness'. Despite its history of grazing and the presence of a resort, settlement and airstrip, it has a predominantly undeveloped natural appearance as seen from a distance, apart from the visible hillside villas.

This 'Island escape' quality of Great Keppel Island, its 'perceived naturalness' and the "*relaxed, peaceful tranquil atmosphere*" described by Kenchington & Hegerl (2005) for Magnetic Island, are examples of aesthetic qualities which are broader than just the scenic attributes, which Lucas *et al* (1997) consider as contributing to GBRWHA values.

4.3 Scenic Quality

(a) Previous Studies

The broadscale landscape qualities of the Great Keppel Island area were mapped in 1996 as part of a Queensland-wide scale study[7], which divided the Capricorn Coast into three "Coastal Landscapes", including:

18. Keppel Bay / Yeppoon
19. Keppel Islands
20. Corio Bay

The Keppel Islands group including Great Keppel Island (as distinct from Keppel Bay/Yeppoon) were characterised as:

> 7.19. Major Island Group: *'Major Island Group: well used for recreation/tourism. These uses are mostly absorbed due to the limited extent of development and the high degree of landform relief on the Island'.*

The 1996 study identified that the steep coastal ranges characterised the landform of this group of Islands, with more distinctive features including '*Ruggedness of landform*', '*Rocky outcrops, headlands and embankments*'.

(b) Landscape Settings and Scenic Quality Ratings

In order to apply the six scenic quality indicators used in coastal landscapes studies in 1994, 1996 and 1997 (see 3.2 above), the Island is divided by its landform into four main viewsheds (**Figure 1**). As shown in Figure 1, these differ somewhat from the external view sectors used for visibility analysis, because the viewshed mountain ranges are not aligned with the main angles of external view. The four main viewsheds have been further subdivided internally into a number of simple legible Landscape Settings.

"Settings" are visual sub-catchments as viewed by visitors and residents as a series of scenes, and which frame their coastal experiences and activities. Accordingly, coastal landscapes associated with the western viewshed (around the resort and settlement) are subdivided into a number of smaller settings, whereas the more remote and less visited parts of the Island comprise larger settings. The settings and their Scenic Quality ratings are as follows:

Table 1: Landscape Settings and Scenic Quality

Main Viewshed	Landscape Settings	Scenic Quality
Western	▪ Putney Beach	High
	▪ Fisherman's Beach	High
	▪ Resort, Airstrip and Settlement	Moderate*
	▪ Monkey Beach – Morris Lookout	Very High
	▪ Long Beach – Mt Wyndham	Very High

[7] EDAW Australia (1996) *A View of the Coast*

South-eastern	▪ Clam Bay – Wyndham Cove ▪ Red Beach	Very High Very High
Eastern	▪ Wreck Bay ▪ Buttterfish Bay, Sandhills and Big Peninsula	Very High Very High
Central	▪ Svendsens Beach ▪ Leeke's Beach, creek mouth and secluded valley ▪ Central Valley and tidal wetlands	Very High Very High High

* The extent of natural bushland and the vegetated mountain range behind the development node offset the parts of this setting which have a low or moderately low scenic quality.
NOTE: Scenic quality of a setting relates to the attributes within that setting, not to the quality of views outwards to other areas or waters.

In overview, all settings with a shoreline interface and no visible development (or at most a single rural homestead) have very high scenic quality, and are of regional and State-wide significance, and also contribute to World Heritage values.

Internally, the large central valley and associated tidal wetlands (with no ocean shoreline interface) are not considered to be of World Heritage level of significance for scenic quality[8], except inasmuch as they contribute (when visible) to aesthetic diversity. They are nevertheless rated high scenic quality for their landform and vegetation diversity and lack of visible development, apart from old rural buildings and cleared grazing paddock, which in context add to an attractive landscape pattern.

The only area with a lower (moderate) scenic quality rating is the internal part of the western viewshed, with the airstrip, resort and settlement.

4.4 Iconic Places Values (TOR section 3.2.3.1)

The Central Capricorn Coast is an iconic place under the *Iconic Queensland Places Act 2008* (*IQP Act*), and includes the Keppel Group of Islands. The purpose of the IQP Act is "*to protect places with characteristics or qualities in their natural or built environment that reflect or contribute in a substantial way to Queensland's character*." Although most of the declared iconic values for the Central Capricorn Coast apply to the mainland, they also include "*the Keppel Group of Islands that form an integral feature of the natural inshore seascape*". Accordingly, the main contribution of Great Keppel Island to the iconic place is considered to be those parts visible from the mainland and Keppel Bay ie. the mountainous landform on the horizon and the western viewshed, including the existing development node, which reflect or contribute to the character of the Capricorn Coast

Provisions of the *IQP Act* and the Livingstone Shire Planning Scheme which apply to Great Keppel Island are summarised in Section 5.5.

[8] The Leeke's Estuary wetland may however have other World Heritage values associated with (eg.) bird populations.

4.5 World Heritage Values

As acknowledged in the original World Heritage citation, the Great Barrier Reef (GBR) provides some of the most spectacular scenery on earth and is of exceptional natural beauty; and meets World Heritage Criterion (vii): "*to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance*". As listed in Section 3.2(f), the listed aesthetic values of the GBR of relevance to continental Islands include:

- *the vast extent of the reef and Island systems which produces an unparalleled aerial vista;*
- *Islands ranging from towering forested continental Islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays;*
- *coastal and adjacent Islands with mangrove systems of exceptional beauty;*
- *the rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs.*

The contribution of Great Keppel Island to World Heritage aesthetic values has been broadly identified as:

- Views to Great Keppel Island and its mountains, headlands and beaches as seen from the water, mainland and other Islands;
- Views from Great Keppel Island to surrounding waters, headlands and islands, as seen from elevated viewpoints (in which case the views often include the internal valleys and natural vegetation of the Island) or from the beaches;
- Views over the Keppel Group of Islands and fringing reefs as seen from the air; and
- Accessible combinations of landscapes and seascapes, similar to the "Unique" values (a value uniquely expressed on the Island) attributed to Magnetic Island by Kenchington & Hegerl 2005

In terms of the aesthetic attributes of the Great Barrier Reef described by Lucas *et al* (1997), Great Keppel Island offers:

(a) expansive water views as seen from any of the peaks, ridges and headlands wherever the vegetation height and density allows such views;

(b) contrast and diversity of the land water interface, ranging from steep rocky headlands and rocky coves to gently shelving sand beaches and tidal wetlands, and especially where these elements are visually juxtaposed;

(c) movement and diversity at the water's edge, in that the various beaches and headlands face all points of the compass around the Island and through the passage, with the shorelines exposed to or sheltered from wind in all directions. There is always some part of the Island where waves crash against the shore, and other areas with relatively calm water;

(d) diversity of coastal form, ranging from the large mountainous landform of Great Keppel Island *per se* to the smaller adjacent islands, rocks and fringing reefs around the Island. Within the Island, the diversity includes tidal wetlands and sand dunes;

(e) "existence value": Inasmuch as the concept can be considered an aesthetic value or applied to any particular Island within the GBR, it has some relevance to the 'iconic value' of Great Keppel Island in its Capricorn Coast context, in that the Island is perceived as natural and a remote 'escape' from the mainland.

On their own, each of the above (and each of the various landscape character elements on Great Keppel Island) may not be of 'outstanding universal value', and similar features of equal or higher scenic quality can be seen elsewhere within the GBRWHA and on the mainland. However in combination they present a 'package' of landscape values which is not common on a single island in the southern part of the GBRWHA, and as such they contribute to and extend the scenic diversity.

However those elements and features which are visible from external sea level viewpoints and from elevated lookouts, and those which are not well represented elsewhere in the GBRWHA, make a greater contribution to scenic diversity. Similarly, viewsheds and settings which are perceived as natural, with no visible development or disturbance, contribute more to World Heritage aesthetic values than does the existing settlement node in the western part of the Island.

With respect to "*the vast extent of the reef and Island systems which produces an unparalleled aerial vista…*", the unique and exceptionally beautiful patterns of reefs, lagoons and coral cays, with waters of varying depths and shades of azure blue, can be seen only from the air, and their vast extent can be seen only on the Great Barrier Reef. It is this aerial vista which can truly be described as being of outstanding universal aesthetic value, and such views are not associated with Great Keppel Island, apart from the small Clam Bay fringing reef. As described above in 2.5, distinctive aerial views of reef flats can be seen some 80 km to the east, and the main outer reef is 120 – 250 km away across Capricorn Channel, and these are too far away to be visible in any aerial view of Great Keppel Island.

However the Keppel Group of islands is very attractive as seen from the air, and aerial views include the fringing reef in Clam Bay, which at low tide on calm sunlit days provides an example of coral patterns. The Keppel Group provides the most southerly examples of Island fringing reefs in the GBRWHA (DeVantier L. in Lucas *et al* 1997), so Great Keppel Island provides an accessible opportunity for such views. Accordingly, Great Keppel Island and other islands in the group make an important contribution to the vast extent of the GBR system as seen from the air, notwithstanding that aerial views of the Island reveal the node of development, airstrip and patches of rural land use.

Overall, the natural scenery of Great Keppel Island and surrounding Islands and waters exhibit many of the World Heritage aesthetic values of the GBRWHA, and its variety of internal and shoreline landforms and seascapes extend and contribute to World Heritage values. Importantly, these attributes are close to the mainland, readily accessible by air and sea, and available to

residents and tourists based at an existing node of development. As noted by Kenchington & Hegerl (2005) for Magnetic Island, accessibility allows the 'presentation' obligation of World Heritage Area management to be met.

5. SENSITIVITY AND CONSTRAINTS

5.1 Lookouts, Viewpoints and Sensitive Receptors

(a) Views Outwards

First Lookout on the main ridge of Great Keppel Island (**Figure 1**) offers views outwards in two directions, although both are becoming somewhat obscured by regrowth wattles and trees:

- north-west over the settlement to Middle and Miall Islands (**Plate 4**), with the mainland in the far distance;
- north-east over Leeke's Beach and Estuary, offering a view over tidal wetlands which is not common in the context of Great Barrier Reef Islands. There is an identifiable view corridor from this lookout, over the wetlands and beach but not extending to the central valley, and this has influenced the mapping of Visual Absorption Capacity (**Figure 3**).

The hillside resort villas (**Plate 28**) and Morris Lookout (**Figure 1**) also offer views outwards over the developed areas to Middle and Miall Islands and including the mainland.

These are the only viewpoints with view corridors which may require specific consideration for protection or enhancement. Other panoramic views outwards from elevated positions are available from a number of ridges accessible to bushwalkers, wherever vegetation height and density allow.

Views from vantage points accessible to bushwalkers include:

- From the Clam Bay escarpment across the fringing reef to Halfway and Humpy Islands, with the mainland in the distance, although this view is also part obscured by vegetation (**Plate 29**) and the attractive reef patterns are seen only at low tide in calm sunlit conditions;
- From "Bald Rock Peak" and Point, panoramic views are available of the eastern coastline to Wreck Bay and Big Peninsula (**Plate 30**)

All beaches offer attractive views to the associated bays and headlands (**Plate 3**), and the western beaches (especially Putney Beach) are popular vantage points for watching the tropical sunsets (**Plate 31**).

(b) Views Inwards

There are multiple mainland and offshore places which offer views to mountain peaks, rocky headlands or other scenic features. These are best assessed from sequences of viewpoints, for example as the tourist ferry approaches or leaves the Island, rather than as individual viewpoints and view corridors. These external viewpoints have been analysed in Section 5 below and **Figures 2A** to **2D**.

(c) Sensitive Receptors

The existing residences at Fisherman's Beach and Putney Beach, the tourist ferry route and the main ridge lookout, are considered to be sensitive receptors in terms of visual sensitivity, but not the abandoned resort. Existing walking tracks across the island and along beaches are addressed separately below in (d).

Some of the main landscape features of the Island, such as the forested mountain ridges and rocky headlands, are visible from the ferry route but not from the residential areas, which are generally screened from these features by surrounding vegetation. Views of the distinctive features of the Great Keppel Island landscape, as seen from most residences, are mainly of the adjacent beach and bay. Views from the mainland are not particularly sensitive because of the long distance of views (Yeppoon 20 km and Emu Park 20 km), but nevertheless they are important considerations because of the potential for insensitive built form in elevated positions to be seen across water, as exemplified by the existing hillside villas. Similarly, views from the North Keppel Island walking track and lookout (approximately 85 m elevation) are over a distance of approximately 11 km to the northwest. North Keppel Island is not considered to be a sensitive receptor, given that the walking track and lookout are unlikely to be used at night time, when development-related lighting may be discernible at this distance.

In this context, it is also worthwhile to note that existing views from sensitive receptors or beaches do not include the central valley, which is seen mainly from the air when flying into or out from the airstrip; nor the Putney Creek wetlands which are not visible from the beach, roadway or from the lookout. It should also be noted that no views include coral reefs or the unique GBR patterns of reefs and lagoons and which are only visible from the air, although bushwalkers can sometimes see attractive patterns of fringing coral from "Bald Rock Peak" and the Clam Bay escarpment. The airstrip *per se* is not visible from sea level views, but the associated 'notch' in the landform is visible from offshore in the south-west sector (**Plate 32**).

The Great Keppel Island Resort Revitalisation Plan will also provide opportunities for future receptors, with new views and view corridors such as from the proposed Marina over Putney Beach to Mt Wyndham, and this has been recognised in visual impact mitigation measures (**Section 6**).

(d) Walking Tracks

The existing walking tracks and fire trails on Great Keppel Island have a combined length of approximately 40 km (including 8 km casual walking opportunities along beaches), including a network of paths associated with the existing resort and residential precincts (see Figure 7). The remainder offer opportunities for appreciating natural scenery with little or no visible built form at present. Some sections of this trail network are through forest or other screening vegetation with no expansive views outwards, while other sections are along ridge-tops or headlands, some of which are through grassland or low wind-pruned vegetation, offering panoramic views of the island's coastline, forested hills and valleys, and surrounding waters.

5.2 Visibility and External View Sectors

Because Great Keppel Island is within the Great Barrier Reef World Heritage Area, and also because its 'iconic values' (see 4.4 above) are associated with visibility from the mainland across Keppel Bay, preliminary evaluation of visual amenity constraints (as an input to Project design) included an assessment of visibility from the bay and ocean.

Views towards the Island were divided into four equal 'external view sectors' for analysis of visibility as seen from the tourist ferry route and mainland. As shown in **Figure 1,** these are not the same as the main Island viewsheds, and do not represent meaningful boundaries on the Island *per se*. Each external view sector has been analysed and presented separately in **Figures 2A** to **2D**, because the number and frequency of observers and their scenic expectations differ between sectors. Views from the mainland and ferry route (including the existing development node) are seen by more people and by the majority of tourists and visitors, and affect the 'iconic values', whereas views towards more remote parts of the Island are available to fewer people on a regular basis, but those observers have a greater expectation of undisturbed naturalness.

Viewshed Analysis using Digital Terrain Modelling (DTM) has modelled intervisibility from a number of points along the ferry route and representative sample points on the mainland and offshore around the Island were rated from high to low visibility (red/blue/yellow on **Figures 2A** to **2D**) or screened from view (grey), according to the proportion of points from which the landform is likely to be visible in each sector. Modelling has taken into account the viewpoint location, elevation, topography and existing average vegetation heights in each mapped vegetation type on the Island (see *Flora and Fauna Technical Report*).

Due to the Island's topographic 'frame', each external view sector reveals different parts and proportions of the landform as being highly or moderately visible, as shown in **Figures 2 A** to **2D**. All views from a distance include the mountain tops and upper slopes as 'highly visible', and at mid-range viewing distance the headlands, steep seaward hillslopes and adjacent Islands become visible, then the beaches come into sight at closer distances. Views from the west-north west sector (including an angle of distant views from North Keppel Island) potentially include most of the central valley but existing vegetation screens most of this valley visibility.

(a) West/northwest sector (Figure 2A)

The main ferry route from Rosslyn Bay approaches from the west- towards Fisherman's Beach, and boating traffic through the passage to North Keppel Island also offers views from this sector. From the ferry, Great Keppel Island is seen in a sequence of views at varying distances, all of which show the western (developed) side of the Island and the visual dominance of Mt Wyndham and the forested main range, plus the adjacent smaller Islands as context. Most viewpoints do not reveal the shoreline beaches and the passage (until they come into view at closer distances), and the resort hillside villas are visually prominent to varying degrees depending on sunlight angle (**Plate 33**).

Fisherman's Beach and its palm-lined foreshore are apparent at close viewing distance, with some buildings and infrastructure visible between and above the trees (**Plate 22**). Putney and

Leeke's Beach are also within this sector, as are all the existing settlement and resort areas, including all sensitive receptors (5.1c above). Most of the central Blackall Creek valley, including the 1920s "Great Keppel Island Homestead", the shearing shed and grazing areas, are also included although these are mainly screened from external view by topography and vegetation.

(b) North/north-east sector (Figure 2B)

This includes Big Peninsula, Wreck Beach and Butterfish Bay. The 'Northern Range' and the Butterfish-Bald Rock Range dominate the landform. This sector is also visible only from boats, and is almost entirely undeveloped apart from the Svendsen's homestead.

(c) East/south-east sector (Figure 2C)

Views towards Great Keppel Island from the east and south-east are available only from boats, and include 'South-east Point', Bald Rock Point, Halfway and Humpy Islands. The coastline is rugged and the landform is visually dominated by 'Bald Rock Peak' and its mountain range, with few tall trees apparent because the exposed ridges, slopes and headlands are covered with wind-swept shrubs and grassland. This sector includes Clam Bay, Red Beach and Little Wreck Beach, but the remainder of the coastline slopes steeply to the shore. The viewshed is completely natural with no visible evidence of development.

(d) South/South-west sector (Figure 2D)

Views towards Great Keppel Island from the south-west, including from the mainland areas of Emu Park and Keppel Sands, are dominated by Mt Wyndham and Monkey Point, plus Humpy Island and 'South-east Point'. Half Way Island and Long Beach are apparent only at relatively close viewing distance. This side of the Island appears undeveloped, although the resort hillside villas can be glimpsed behind 'Resort Point' from some angles of view.

(e) Views from other Islands

Great Keppel Island is visible from other neighbouring Islands, including Halfway, Humpy, Middle and Miall Islands, as well as Islands closer to the mainland (Pelican, Wedge, Divided, Peak and Girt Islands). Apart from North Keppel Island, these Islands have not been considered as receptors or considered in the viewshed modelling (except inasmuch as they screen Great Keppel Island from some view angles), because they have limited or no public viewing opportunities such as campgrounds, facilities and public lookouts, or are oriented away from Great Keppel Island.

5.3 Viewsheds

Also as shown in **Figure 1**, the Island comprises four distinct visual catchments, corresponding to the viewsheds formed by the main mountain ranges and headlands. For convenience (and because the term catchments more commonly refers to drainage patterns), these are referred to and mapped as the western, south-eastern, eastern and central viewsheds. These are further subdivided into Landscape Settings in **Table 1** (4.3b).

(a) Western Viewshed

This viewshed extends from 'Wyndham Point' to 'Putney Point' and defined by the Mt Wyndham Range, this includes the existing settlement node and airstrip, the well-used shorelines of Fisherman's and Putney Beaches as well as Long Beach and Monkey Point. This includes the main landscape settings (Table 1) for recreational and residential activity and appreciation of Great Keppel Island. The southern part of this viewshed, behind Long Beach, currently appears undeveloped and undisturbed, although the landform has a clear 'notch' corresponding to the southern end of the existing airstrip (**Plate 32**).

(b) South-eastern Viewshed

This visual catchment extends from 'Wyndham Point' to Bald Rock Point, bounded by a line between Mt Wyndham and 'Bald Rock Peak' corresponding to an escarpment behind Clam Bay. Although this escarpment is in places poorly defined, it marks the southern edge of the Blackall Creek central valley, and the. skyline as seen from Clam Bay and offshore to the south and south-east. It is currently free of visible development and disturbance.

(c) Eastern Viewshed

The relatively remote and exposed eastern viewshed extends from Bald Rock Point to Butterfish Bay and Little Peninsula, including Big Peninsula and the 'Northern Range'. The skyline viewshed is formed by the Butterfish – Bald Rock mountain range, and this visual catchment is also free of visible development.

(d) Central Viewshed

The two main mountain ranges enclose the valley of Blackall Creek, draining to the Leeke's Creek Estuary and forming a relatively large central valley which extends south-east almost to Clam Bay. This viewshed is seen in part from adjacent hills and ridges through a gap in the forest cover, for example at the main Island lookout and roadway, but is otherwise not exposed to view except along the shoreline edge at Leeke's Beach. Apart from the 1920s homestead, the shearing shed and patches cleared for grazing, it is natural in appearance although parts comprise regrowth of previously-cleared areas.

(e) Implications

The eastern and south-eastern viewsheds are currently free of visible signs of development and disturbance, and the Long Beach end of the western viewshed has only minor evidence of past landform alteration for the airstrip. As seen from the waters surrounding the Island, and

especially from three of the four external view sectors shown in **Figure 1**, these undisturbed viewsheds and their rugged 'wild' appearance contribute significantly to the 'perceived naturalness' of Great Keppel Island.

5.4 Visual Absorption Capacity and sensitivity

Visual Absorption Capacity (VAC) is the ability of landform and vegetation to visually absorb built form and earthworks scarring, and is an important indicator (together with visual exposure) of landscape sensitivity to change. A simple matrix of vegetation density (3 categories) and slope (3 or 4 categories) provides a simple classification of VAC into five ratings (Very High to Very Low), where VAC is inversely related to sensitivity eg. a steep grassy hillside has a Very Low VAC, and if also exposed to view it will be highly sensitive to the visual impacts of development.

For Great Keppel Island, where some wind-pruned vegetation is dense but short, the vegetation screening categories have been adapted for a threshold value of 3m in Table 2. The VAC categories have also been modified to rate open sandy beaches as Very Low VAC because, although are flat, they are exposed to views over water and have no landform or vegeatation screening capacity.

Slopes and vegetation types on Great Keppel Island were modelled to determine VAC **(Figure 3)**, indicating the capacity to visually absorb built form. The results include:

- relatively flat to gently sloping areas in the central valley and behind Fishermans's and Putney Beaches have high VAC, are visually tolerant and capable of accommodating built form;
- The western viewshed, between Long Beach and Putney Beach (including the airstrip) has variable VAC, with patches of high sensitivity interspersed with areas which are more tolerant of development.
- the exposed headlands, beaches, major ridgelines and associated upper and mid slopes low and very low VAC (highly sensitive to change) ie. any built form will be visible. The beaches are flat, but still rated low VAC for their relative exposure (see **Figure 3**);
- On the eastern, south-eastern and north-eastern parts of the Island, much of the area has low VAC (steep and exposed slopes with stunted vegetation) and the extent of higher VAC land is limited and/or fragmented land, but these areas are not proposed for any development.

Table 2: Visual Absorption Capacity: Great Keppel Island

Visual Absorption Capacity for built form		VEGETATION SCREENING POTENTIAL		
		Tall dense vegetation	**Semi-dense or low-medium height vegetation**	**Open, sparse or low vegetation**
		Rainforest	**Open eucalypt / Acacia forest, woodland and dense mangroves >3m tall**	**Beaches*, Bare areas, Grassland, Scattered trees and stunted vegetation <3m tall**
SLOPE	**FLAT** <1:10	**1 VERY HIGH**	**2 HIGH**	**2 HIGH**
	GENTLE 1:10 to 1:5	**2 HIGH**	**3 MODERATE**	**3 MODERATE**
	MODERATE: 1:5 to 1:3	**2 HIGH**	**3 MODERATE**	**4 LOW**
	STEEP: >1:3	**3 MODERATE**	**4 LOW**	**5 VERY LOW**

* Open sandy beaches are rated "Very Low" VAC, notwithstanding that they flat landforms

5.5 Visual Amenity Constraints

As an input to project development planning, the information from **Figures 2A** to **2D** (viewshed modelling) and **Figure 3** (Visual Absorption Capacity) has been combined in **Figure 4** to show the visual constraints applicable to various parts of Great Keppel Island, in five categories described in Table 3 together with a summary of their landscape values.

Table 3: Visual Amenity Constraints

Constraint Category	Description	Areas, Viewsheds & View Sectors (Figure 1)	Scenic Amenity and Landscape Character Values
1: Priority Viewsheds	**Coastal landscape settings with completely natural appearance, with no visible evidence of development or disturbance, as seen from any external viewpoint or or internal lookout.**	Eastern (E) and South-Eastern (SE) Viewsheds, defined by high ridge of the Butterfish-Bald Rock Range and the Clam Bay Escarpment, including high ridges, steep upper slopes, dunes, beaches, headlands and secluded beaches.	Significant contribution to perception of Great Keppel Island as a natural and undisturbed Island; and to World Heritage Values as adding to scenic diversity and part of its "*rich variety of landscapes and seascapes*"
2: Highly Constrained	**Landmarks and other visually prominent places and areas visible from multiple offshore viewpoints in two or more external view sectors (Figure 1), or from beaches.**	Ridgeline peaks and steep upper slopes on the Butterfish-Bald Rock Range, the Putney-Mt. Wyndham Range, Monkey Range and all headlands visible from two or more external sectors, plus all Island beaches not in Category 1.	These areas form the topographic frame, skylines and viewsheds which are the basis for landscape settings, and are highly valued for creating a distinctive sense of place; and (in the case of beaches) form the land-sea interface and define the coastal and tropical Island experience.
3: Sensitive	**Lower vegetated slopes**	Foothill areas of the Island	The overall image and

Constraint Category	Description	Areas, Viewsheds & View Sectors (Figure 1)	Scenic Amenity and Landscape Character Values
	and other areas which are visible as seen from one external view sector, or have high visibility locally on the Island (eg lookouts) or are moderately visible from two or more external view sectors	ranges and lower slopes exposed to external (offshore) views, plus areas at lower elevation exposed to view through gaps in the screening vegetation;	perception of Great Keppel Island as largely undeveloped, with buildings and landform alteration confined to discrete nodes, relies upon the broad matrix of vegetated hillslopes visible from offshore and the mainland.
4: Limited Visibility	**Areas visible from several external viewpoints in one sector or from a limited number of external viewpoints in two or more sectors (Figure 1), or from elevated lookouts on roadways.**	Gently sloping valleys in the Central Viewshed (ie. the Blackall-Leeke's Valley area) and the Western Viewshed (either side of the airstrip) between the hills and set back from the foreshore;	These areas form most of the bushland in valleys seen mainly as masses of vegetation (treetops) occupying the valleys, screening and buffering the existing tracks and small areas of clearing or disturbance from external views. There is generally good visual absorption capacity, in that minor buildings 'embedded' in these bushland areas can be readily screened from external view.
5: Semi-secluded	**Areas predominately screened by topography and existing vegetation from external view sectors and from elevated lookouts on roadways, although they may be visible from walking trails and from the air;**	Mainly in the central Blackall-Leeke's Valley, in side valleys 'tucked' into the eastern and western foothills, and also screened from the south by the Clam Bay escarpment, by Halfway and Humpy Islands. The existing airstrip also falls into this category, although of course it is highly visible from the air. Other small semi-secluded patches are a low-lying area along Putney Creek and steep hillslopes south of Mt Wyndham.	Although these semi-secluded areas may have wilderness values, in terms of scenic amenity they contribute little to the attractiveness or World Heritage Values of Great Keppel Island.

5.6 Planning Provisions (ToR section 3.2.3.1)

The Planning Scheme of the former Livingstone Shire includes (s 3.22) a *Great Keppel Island Code* with overall outcomes as:

(i) *Development comprises low-intensity resort facilities, camping accommodation including associated works and is:*

(A) located in accordance with the precincts illustrated on PSM-5 – Great Keppel Island Structure Map, and

(B) integrated with the natural environment facilitating visitor's enjoyment of the Island's natural character, and

(C) well designed, sensitive to climatic conditions and provides for the protection of dominant landscape features, including forested ridgelines, rocky outcrops and foreshore areas.

(ii) Development does not adversely impact on:
(A) the operation of the existing airstrip at Fisherman's Beach; or
(B) the western aquifer; or
(C) erosion prone areas.

(iii) Development is provided with physical infrastructure commensurate with the scale and density of development.

The accompanying *Structure Plan Map PSM5* shows "Accommodation and Associated Facilities" development concentrated behind Fisherman's Beach around the existing resort and airstrip, plus a smaller node behind the sand spit and Putney Beach corresponding to the existing settlement, separated from the main node by a small strip of "Village Commercial" development. The remainder of the Island is shown as "Conservation".

Special Management Areas also apply to Great Keppel Island under the Planning Scheme. Most of the Island is mapped as Erosion Prone or Steep Land on *Overlay Map 02A*, the Leeke's Estuary is mapped as a Wetland on *Overlay Map 03A/1* and the low-lying western areas are subject to Storm Tide Hazard on *Overlay Map 05A*. The potential for Acid Sulfate Soils is also flagged for parts of the Island below 5m AHD on *Overlay Map 08B*. The Special Management Areas *Overlay Map 09,* showing areas of landscape sensitivity, is limited to the mainland and does not include Great Keppel Island.

Under the *IQP Act*, Rockhampton Regional Council must submit to the Minister a report evaluating impacts on iconic values, if it intends to make or amend structure plans or other planning and policy instruments (*protected planning provisions*) for Great Keppel Island. However proposed developments in an iconic place are determined by a development assessment panel appointed by the Minister, unless the panel elects to refer the application to Council. Whether the application is assessed by the panel or Council, or referred to the Minister for a recommendation (in the case of master plan applications), the overriding criterion is whether or not the iconic values (see Section 4.4) are protected.

6. VISUAL IMPACT MITIGATION (TOR SECTION 3.2.2.2)

6.1 Site Planning Response to Constraints and Opportunities

6.1.1 Visual Constraint Categories

The constraints-based approach to planning and design of the Great Keppel Island Resort Revitalisation Plan has taken into consideration the visual amenity constraints mapped in **Figure 4** and Table 3 above. The implications for project planning and design of these mapped constraint categories are summarised in Table 4 below.

Table 4: Planning and Management Recommendations

Constraint Category	Recommendations
1: Priority Viewsheds	No visible disturbance or development; no lights, no cleared gaps on ridgelines, any disturbance should maintain a wooded skyline; any necessary infrastructure, earthworks and maintenance tracks should be screened.
2: Highly Constrained	(a) Terrestrial: Built form should be screened from external view or visually subordinate to the natural topography and vegetation. Lighting to be localised, subdued and downward-directed, with glare fully screened from mid-distance and long distance views, except as glimpses ('twinkling') through vegetation. Similarly, earthworks should (on completion) be subordinate to the natural landscape and/or visually integrated so as to appear compatible with the natural landform and vegetation, with a wooded skyline. (b) Marine Services Precinct: Built form and lighting (and moored boats) will unavoidably be visible, but should be responsive to the setting and similar in height to the backdrop landform of Putney Ridge, with no buildings visible above its skyline as seen from Leeke's Beach.
3: Sensitive	Built form should be visually integrated, largely below the height of existing tree canopies and overall visually subordinate to the natural landscape, although in localised areas there can be a local balance between development and the natural landscape. Similarly earthworks (when complete and rehabilitated) and lighting should be integrated and subordinate to natural landscape as seen from mid and long distance. Reflective solar panels on roofs should be located in positions and at angles where they will not be visually intrusive with respect to lookouts or external view sectors.
4: Limited Visibility	Bands of vegetation should be retained to screen built form and earthworks from external views along sector sightlines and adopt height limits (ie. below tree height) and design controls (especially roof form, colour and reflectivity) to integrate built form as seen from internal elevated lookouts.
5: Semi-secluded	These areas have high visual absorption capacity and tolerance to built form, clearing and earthworks, and are appropriate locations for infrastructure and built form which may be bulky or not capable of reduction to below tree canopy height.

Areas mapped as Category 1 and 2 are constraints on the location of new built form and major earthworks, whereas Categories 4 and 5 areas represent opportunities for built form development afforded by the landform, viewshed boundaries and Visual Absorption Capacity. Areas mapped as Category 3 (Sensitive) have both visual constraints and opportunities for low density site-sensitive development.

6.1.2 Iterative Planning Process

Together with the ecological constraints mapped and discussed in the accompanying *Flora and Fauna Technical Report*, and the physical landform and hydrology of the Island, the visual constraints and opportunities have largely determined the location, scale and form of the proposed precincts. A previous (2009) under the *Environmental Protection and Biodiversity Conservation Act* referral[9] by GKI Resort for Great Keppel Island had been refused by the Minister for Environment, Heritage and the Arts, and the Great Keppel Island Resort Revitalisation Plan represents a revised proposal with a smaller footprint based on the island's natural constraints and capacity.

The process of constraint-based planning has been relatively standard, comprising:

- Preliminary assessment, categorisation and mapping of constraints and opportunities;
- 'First cut' matching of various Project components and their area, access and amenity requirements to the available opportunity areas;
- Identification of potential conflicts and constraint management approaches ie. whether the 'first cut' precinct allocations should change, or whether 'soft' constraints (such as buffer widths or vegetation screening height) could be reduced through management;
- A back-and-forth design process which iteratively related the constraints, opportunities and land area requirements for each precinct and Project component.

The constraints-based project planning and design process has been largely iterative, although there have been some 'givens' such as:

(a) the existing Fisherman's Beach node of resort, airstrip and settlement are designated in Planning Scheme Map PSM5 for future development, and will be the focus of redevelopment and new built form;

(b) a marina and longer airstrip are essential requirements for project feasibility, and have specific site selection criteria. The most suitable site for a marina is at Putney Point, and the most suitable place for a longer runway (which cannot be accommodated on the existing airstrip site) is along the western base of the main ridge;

(c) airstrip relocation will make available a large flat area, largely screened from external view and suitable for development;

(d) a golf course and associated villas are required on suitable terrain in the central valley, linked by a new road to the Fisherman's Beach Resort precinct; and

(e) a large proportion of the subject land (in the northern and eastern parts of the Island) will be retained in their natural condition for environmental purposes.

[9] Humphreys Reynolds Perkins (August 2009) "Great Keppel Island Resort Revitalisation Plan" referral to Department of the Environment, Water, Heritage and the Arts (DEWHA), on behalf of Great Keppel Island Resort Pty ltd

The WATG Revitalisation Plan and Great Keppel Island Resort Revitalisation Plan: Plan of Development are the outcomes of the above process. Most of the development will be located in areas mapped as Visual Constraints Category 4 or 5, with the exception of the proposed marina which cannot be 'hidden' in the landform. However, to arrive at this final proposal, there have been a number of changes to the '1st cut' allocation of precincts, as discussed below in 6.2.2.

6.2 Proposed Development

6.2.1 Precinct and Maximum Building Height

As shown on Map 1 – Precinct Plan and Map 2 – Development Parameters Plan in the Great Keppel Island Resort Revitalisation Plan - Plan of Development, the Project includes the following main components, with their locations, extent and height of built form correlated with visual constraints as follows:

Table 5: Precincts and Maximum Building Heights

Precinct and *Maximum Building Height*	Viewshed and Setting (**Note 1**)	VAC & Visual Constraint Category (**Note 4**)
Clam Bay Resort Precinct Golf Course & Eco-tourism Villas *(maximum building height: 2 storeys)*	Viewsheds: Central (southern part) Setting: Central Valley & Tidal Wetlands (approximately half) (**Note 2**)	VAC: High & Medium Mainly Constraint 4: Limited Visibility
Fisherman's Beach Resort Precinct (South) Eco-tourism Villas *(maximum building height: 2 storeys)*	Viewshed: Western Setting: Resort, Airstrip & Settlement	VAC: High & Medium, some Low on hillslopes Mainly Constraint 4: Limited Visibility and Constraint 5: Semi-secluded; Patches of Constraint 3: Sensitive behind Long Beach
Fisherman's Beach Resort Precinct (Central) Eco-tourism Villas & Apartments Former Airstrip Area *(maximum building height: 3 storeys)*	Viewshed: Western Setting: Resort, Airstrip & Settlement	VAC: Mainly Low, plus a hill (Very Low) Mainly Constraint 3: Sensitive and Constraint 4: Limited Visibility
Fisherman's Beach Resort Precinct (Runway) New Runway & Terminal	Viewshed: Western Setting: Resort, Airstrip & Settlement	VAC: High & Medium, some Low on a hill (to be removed) Mainly Constraint 4: Limited Visibility and Constraint 3: Sensitive behind Putney Beach
Fisherman's Beach Resort Precinct (West) Hotel (maximum building height: *3 storeys)*	Viewshed: Western Setting: Resort, Airstrip & Settlement	VAC: High Constraint 4: Limited Visibility
Fisherman's Beach Resort Precinct (East) Base of ridge: Runway Villas & Staff Accommodation (maximum building height: 3 storeys)	Viewshed: Western Setting: Resort, Airstrip & Settlement	VAC: High Constraint 4: Limited Visibility

Precinct and *Maximum Building Height*	Viewshed and Setting (**Note 1**)	VAC & Visual Constraint Category (**Note 4**)
Marine Services Precinct Marina Shops & Tourism Apartments Putney Beach (*maximum building height: 3 storeys*)	Viewshed: Western Setting: Putney	VAC: Medium (on Point) and Very Low (Beach & Passage) Constraint 2: Highly Constrained
Environmental Protection Precinct	Viewsheds: Eastern, and parts of South-eastern and Central (**Note 3**) Settings: Red Beach, Wreck Bay, Butterfish Bay – Sandhills - Big Peninsula, Clam Bay-Wyndham Cove (**Note 2**) and approximately half of Central Valley & Tidal Wetlands	VAC: Mainly Very Low Mainly Constraint 1: Priority Viewshed and Constraint 2: Highly Constrained

Note 1: See Figure 1 and Table 1

Note 2: The Clam Bay Precinct extends to the coastline of Clam Bay, including a strip of the South-eastern Viewshed and the Clam Bay – Wyndham Cove Setting

Note 3: The Environmental Protection Area occupies the northern, eastern and south-eastern parts of the island, but also 'wraps' around the Clam Bay Precinct to include Leeke's Estuary and "Wyndham Point"

Note 4: See Figures 3 & 4

In summary, the proposed development is concentrated in areas of low visual constraints and high or medium VAC, with all built form in the western viewshed and in the southern part of the central viewshed, avoiding the upper hillslopes and highly visible areas, apart from several exceptions discussed in 6.2.3 below. The revitalisation will take advantage of the topographic 'bowl' in the central valley and the hidden valley of the existing airstrip. This pattern of development will leave the headlands, forested mountains, the eastern and south-eastern viewsheds, and the northern part of the central viewshed, free of built form, as at present. In particular, the large environmental protection area will ensure that a significant proportion of the island, and especially its land-sea interface around the shoreline, maintains its natural character.

6.2.2 Changes in Response to Visual Constraints

The final precinct plan and development proposals have progressed through a number of changes to the '1st cut' allocation of precincts, including:

1. Building heights will be limited to three storey apartments and hotel (Fisherman's Beach Resort and Marine Services Precincts) or two storey detached ecotourism villas (including the Clam Bay Precinct and golf course), capable of being screened or integrated by retention of extensive forested areas between precincts, retention of trees between buildings and by landscaping;

2. An area initially proposed for the development of villas above Wyndham Point, with panoramic views across Keppel Bay, has been removed from the Priority Viewshed area (**Figure 4**), the proposed Clam Bay Precinct buildings are now restricted to the 'Limited

Visibility' areas. Although the golf course greens and fairways will extend into the Priority Viewshed, they will be below the vegetation canopy;

3. Development in the central valley is located and buffered to protect both the Leeke's Creek Estuary ecosystem and the visible forested hillslopes around the valley. The latter will ensure that views from offshore are towards a predominantly natural valley, and that built form does not intrude upon 'natural' views northwards from First Lookout;

4. The road across the Mt Wyndham Ridge, linking the Fisherman's Beach Resort and Clam Bay Resort Precincts, has been located and aligned so as to avoid any visual scarring and impacts on views from offshore or from First Lookout;

5. A water supply borefield (with overhead power supply), initially proposed for the northern dunes, is no longer part of the required infrastructure, hence the Big Peninsula area can remain undisturbed;

6. Design of the new airstrip has undergone several iterations, and is now proposed as a gently sloping strip, to minimise the extent of earthworks cut behind Long Beach and fill embankment behind Putney Beach;

Townhouses initially planned for the Marina breakwaters have been deleted to ensure buildings are associated only with shoreline and the seaward profile is low and relatively unobtrusive, and the Marine Services Precinct built form will be limited in height to three storeys, equivalent to or below the height of the Putney Point landform, such that it will be screened from Leeke's Beach (see **Figure 6**);

7. Three-storey staff accommodation is located at the base of the Mt Wyndham Range, in an pocket of High VAC part-screened by a ridge spur; and

8. Development is set back from Fisherman's Beach in order to maintain a vegetated foreshore, with the proposed three-storey hotel and apartments (and villas on the hillside) visible above the tree canopy as seen from offshore, but not visually dominating the landscape.

The effectiveness of some of the above measures are illustrated in aerial oblique artist's impressions (**Appendix A**), indicating the location, coastline setbacks and scale of built form and golf course in relation to landform, and the extent of integration achieveable through landscaping.

6.2.3 Areas Requiring Impact Mitigation

As summarised above, the Project is concentrated in areas with relatively few visual constraints. However there are several exceptions which will require particular visual impact mitigation measures as detailed below in 6.3:

(a) The proposed **Marina** and associated buildings to 3 storeys will be in a highly visible location with respect to Putney Beach and the Passage, and will be unavoidably a brightly lit and busy node. However development in this precinct will occupy only a small proportion of the Island's coastline, it will affect a relatively limited Landscape Setting (see **Figure 1**) and a restricted offshore viewshed (see **Figure 6**), and:
   a. All buildings will be on the shore, not on the breakwaters, and building height will be below the elevation of Putney Point hence will be screened from Leeke's Beach;
   b. the height of built form will be consistent with height of yacht masts, and
   c. the visual impression of the combined marina breakwaters, moored boats, shops and apartments will be a long curving cluster of built forms of moderate height fitting into a corner of the bay, rather than a 'straight line' group of tall buildings (see 6.3.2 below).

(b) The **hill behind Fisherman's Beach** occupied by the existing resort villas, which is visible externally and has a low VAC, and which is proposed for new 2-storey Eco-tourism villas, within the development node encouraged by Planning Scheme Map PSM5;

(c) **Earthworks for the new runway**, which will remove an existing hill and re-shape part of a ridge to create aircraft safety clearance zones, and create an earth embankment behind Putney Beach. However the ridge saddle to be re-shaped is less visible (Category 3: Sensitive) than the remainder of the Mt Wyndham Range, and the 11.5 ha (approximately) of proposed earthworks is a relatively minor part of the Western Viewshed;

(d) The **golf course facility** building, in an elevated Category 3 (Sensitive) position with medium VAC, and the **south-eastern group of Clam Bay ecotourism villas** which are potentially visible from southern offshore viewpoints; and

(e) The proposed **3-storey buildings** (hotel and apartments) within the existing development node are mainly located in areas of high VAC and low visual constraints. They are also part of the former resort and settlement node, and in an area in which development is encouraged by Planning Scheme Map PSM5. Nevertheless they are likely to be visible above the heights of tree canopies as seen from offshore and other viewpoints, hence sensitive design and landscape integrations are appropriate.

The above components of the Project require particular visual mitigation measures, but they are exceptions. The 3-storey components represent a total of approximately only 20 ha in four separate precincts, the marina is only a small proportion of the Island's coastline, and the new enlarged runway will only be visible to external observers as a landscaped earthen embankment at its northern end.

6.3 Visual Impact Mitigation Measures

6.3.1 New Airstrip Runway

The new runway will require removal of a small (RL 65 approximately) hill which is currently visible from a very limited arc of offshore viewpoints (Constraint Category 3: Sensitive) and has a Low VAC. No impact mitigation measures are proposed for this hill, for reasons addressed in 7.1(a) below.

Lateral clearance zones for aircraft take-off and landing safety will also require earthworks to re-shape part of the adjacent hillslope and cut part of the ridge of the Mt Wyndham Range, although as explained above the cuttings will affect areas of generally limited visibility and medium VAC, and will not be seen from sensitive receptors nor will it affect the skyline as seen from any existing viewpoint. Visual impact mitigation measures are:

- The earthworks will not result in a simple uniform batter slope, but will be shaped to create surface variation with a more natural appearance;
- The exposed hillside will be promptly revegetated with appropriate native shrubs to 3 m height, in order to maintain the required lateral clearance zones;
- Similarly the fill embankment at the northern end, behind Putney Beach, will be revegetated with native shrubs of appropriate mature height, while still allowing for clearance zones; and
- Revegetation will be designed as irregular patches for additional visual diversity.

6.3.2 Marine Services Precinct

As indicated in 6.2.3 above, the height, bulk and alignment of the 2 – 3 storey buildings (shops, research centre and apartments) will create a built form complex which is overall longer than high, and will give the visual impression of being curved and 'tucked' into a corner of the bay. Building heights will be similar to or lower than the Putney Point skyline as seen from a distance. This visual integration will be facilitated by:

- Screening by Putney Point, Sand Spit and Middle Island, which restrict the visibility of the marina and associated buildings from offshore waters, as shown in **Figure 6**;
- Variation in building alignment, with some in a staggered line parallel to Putney Beach and some similarly staggered parallel to Putney Point, such that only part of the complex will be visible from within the Putney Beach Landscape Setting;
- Variation in height, scale and groupings of buildings, which in addition to their staggered front setbacks from the marina edge, will appear as an informal, busy and attractive complex;

- Articulated facades and balconies on the three storey apartments, deep overhangs to shade large picture windows, variation in their front alignment and some minor variation in the horizontal line of flat roof-tops, to further avoid the appearance of a wall of uniform built form;
- Generally subdued colours and tones to enhance visual integration with the headland and forested mountain backdrop; and
- Narrow vertical elements (eg. waterfront & street lighting, flagpoles) to reinforce the verticality of yacht masts and break up the appearance of buildings behind.

6.3.3 Golf Course and Clubhouse Facility

The golf course proposed for the Clam Bay Resort Precinct will be developed over approximately 70 ha in the southern part of the central valley viewshed. The golf course will be 1 to 2.5 km inland from the shoreline of Leeke's Beach and at elevations of 12 to 65 m. At these distances and this elevation, retained native vegetation along the foreshore and in the wetland buffer will screen all the golf course from the beach and all parts of the golf course below 65 m elevation from offshore viewpoints.

In parts of the golf course above 30 m elevation, the land is gently sloping (1 - 5%) and no extensive earthworks are required to re-shape the landform. Consequently, bands of trees can be retained such that the golf course greens and fairways can be screened from external view. The location of the golf course, set well back from the Leeke's Estuary wetlands, will not intrude upon views from First Lookout. Similarly the southern-most greens and fairway, and associated vegetation clearing, will be screened from views in the south (eg from Keppel Bay and Emu Park) by the dense windswept vegetation along the Clam Bay escarpment.

Specific visual impact mitigation measures for the golf course are:

- Clearing and earthworks for greens and fairways will be restricted to land of less than 5% slope and will not affect the hillslopes on either side of the central valley ;

- Bands of trees at least 5 m wide will be retained across the golf course approximately perpendicular to external lines of sight, such that the external views will not include swathes of visible lawn or grassed fairways. An appropriate guideline formula to restrict the swathe of cleared grassy areas visible above tree canopies is:
    - Maximum width of cleared area between bands of trees = T/S + 20 m

      where T is average tree height and S is the land slope (eg. 20% has an S value of 0.2)

  Using this approach, the maximum clearing between trees of average height of 14m would be 160 m wide on a 10% slope, and 90 m wide on a 20% (1 in 5) slope. With bands of trees at this spacing, even a single row of tree canopies will screen or soften the appearance of cleared fairways and golf course greens, allowing for visible patches to be restricted to narrow 20m strips;

- Fairways will be integrated with adjacent native vegetation on foothills and watercourse buffers by informal edges of local native plant species; and

- The seaward edges of fairways behind Clam Bay will be landscaped to avoid parts of the golf course being visible from the south, including vegetated mounds if and where necessary.

In addition to the above mitigation measures for the golf course, the proposed Facilities building (clubhouse) will be a single structure on a visibly sensitive hillside overlooking the golf course, and although it will be seen from most viewpoints in the context of the Mt Wyndham backdrop, it may be visible on the skyline as seen from the adjacent golf course fairway and villas.

Mitigation measures for the clubhouse building include:

- A built form which is fitted into the hill with a flat or low profile skillion roof, and which is wider and longer than it is high as seen from any direction, rather than sitting above or dominating the landscape;
- The second storey will be set back from the southern (seaward) side to reduce its apparent bulk as seen from this direction and to allow terrace planter boxes;
- Because of its wind-swept location, it is unlikely that planted vegetation will screen a two-storey building, but nevertheless hardy native trees will be planted close to the building on the seaward side to take advantage of the protection afforded by the structure;
- Articulated facades and balconies, deep overhangs to shade large picture windows, and
- Generally dark subdued colours and tones to enhance visual integration with the hilltop location and surrounding wind-swept vegetation.

6.3.4 Ecotourism Villas

The two-storey ecotourism villas in the southern part of the Clam Bay Resort Precinct will potentially be visible only from the north-west, where sight-lines from offshore extend into the central valley. The proposed villas will be 1 to 2.8 km inland from the shoreline of Leeke's Beach and at elevations ranging from 20 to over 100 m on hillsides. At these distances and this elevation, retained native vegetation along the foreshore and in the wetland buffer will screen all villas from the beach, but as seen from offshore there is potential for villas on the distant skyline (the Clam Bay escarpment) and the valley side foothills to be visible.

Similarly, some hillside two-storey ecotourism villas behind Long Beach (Fisherman's Beach Resort Precinct) will potentially be visible from offshore in Keppel Bay, although most will be screened by the height of existing trees behind the beach foredune.

Building height and design controls, plus retention of some existing trees in selected locations, and additional screen planting of trees, are required to visually integrate the villas into their landscape settings on the side foothills of the valleys.

The 2-storey built form of the proposed eco-tourism villas in these more sensitive locations will be spaced at relatively low densities (typically 170 m^2 building envelopes on 1000 m^2 allotments), with sufficient intervening space between buildings to allow for retention of some existing trees and landscape planting of additional trees.

Specific visual impact mitigation measures for the Clam Bay Resort and Fisherman's Beach Resort (South) Precinct ecotourism villas and associated roads are:

- Building height (roof ridge line) restricted to 8.5 m above ground;
- Variation in roof form and pitch, but generally divided into two or more sections at different angles, each with pitch of less than 30 degrees;
- Articulated facades and balconies, deep overhangs to shade large picture windows,
- Generally dark subdued colours and tones, especially of upper stories, and pale dull roofs (not reflective white or silver). to enhance visual integration with island vegetation;
- Height restrictions on retaining walls in visible locations, such that the maximum height of any one 'step' is 2 m and the maximum height overall is 5 m, with planted terrace beds at least 1.5 m wide on each bench and at least 0.5 m wide at the base;
- Street trees planted on both sides of each roadway (or one side and in the median), at average spacing of no greater than 10m, specified and maintained so as to achieve 5 m height within 5 years;
- Bands of retained trees (supplemented by screen planting), adopting a similar guideline formula to that suggested above for bands of trees in the golf course ie.
    - Maximum width of building areas between bands of trees = (T-4m)/S
      where T is average tree height and S is the land slope (eg. 20% has an S value of 0.2)

Using this approach, 100 m wide groups of two-storey villas on a 10% slope, with bands of trees of average 14 m height separating each group of villas, would have their lower storeys completely screened and their upper storeys part-screened by a combination of retained and planted trees.

The eco-tourism villas proposed for other parts of the Fisherman's Beach Resort Precinct have less potential for visual impacts, and are consistent with the Planning Scheme. All will be set well back from the beach and screened by foreshore vegetation, and many will be further screened by locations in the existing airstrip valley. However a group of villas will be redeveloped on the hill behind Fisherman's Beach, the site of the existing visually intrusive resort villas. For these villas, most of the above mitigation measures relating to building design will also be appropriate, but on these steeper slopes the following will apply:

- Roofs will be flatter, with maximum pitches of 20 degrees, and darker and less reflective in colour;
- Buildings will be partly suspended or cantilevered to extend out from the hillside (rather than 'tucked' into the landform), in order to minimise earthworks and tree removal, with a maximum above ground height limit of 4 m (upslope) and 10 m (downslope) and a visual impression of no more than 3 levels; and

- Planter boxes, alcoves for tall growing palms or similar, or other opportunities for integrating landscape and built form as seen from Keppel Bay and viewpoints downslope.

6.3.5 Hotel and Apartments

As with the Fisherman's Beach Resort Precinct eco-tourism villas above, the proposed 3-storey hotel and apartments are consistent with Planning Scheme intentions in PSM5, they will be set well back from the beach and will be screened by foreshore vegetation. However they will be visible above the tree canopies (and against a backdrop of the forested Mt Wyndham Range) as seen from Keppel Bay, and will be sensitively designed to reinforce the impression of visual integration through:

- Tropical and sub-tropical design features in the buildings and landscape, to reinforce the sense of place and relaxed resort theme, rather than a metropolitan urban character;
- Buildings which comprise small legible units with an indoor/outdoor integration, but which overall appear as an integrated built form which is non-bulky, longer than it is tall, and relates visually to its setting at the base of a forested ridge backdrop;
- Articulated facades and balconies, deep overhangs to shade large picture windows and flat or low pitched roofs with some variation in the horizontal line of roof-tops, to avoid any impressions of a wall of uniform built form; and
- Generally subdued colours and tones to enhance visual integration with the Resort surrounding vegetation and the forested mountain backdrop.

6.3.6 Roof Forms and Reflectivity

The above design guidelines for the built form of the Marine Services, Clam Bay Resort and Fisherman's Beach Resort Precincts include roof forms. In general, smaller two-storey buildings (such as the ecotourism villas) will have pitched roofs, whereas larger and more visually exposed buildings will have flatter roofs which can be integrated lower in the landform. Roof colours will be generally subdued and non-reflective, with darker roof colours for the hillside eco-tourism villas behind Fisherman's Beach.

The visual impression of built form integrated with the landform and landscape will be reinforced by variation in roof angles and colours, such that no external line of sight is exposed to simultaneous sunlight reflections from multiple roofs all at the same angle and pitch.

This design principle will also apply to the solar panels proposed to be fitted to most roofs, and in most cases they will be fastened flush with pitched roofs for greater cyclone resistance. Where installed on flat roofs visually sensitive locations (eg. the golf course facilities building), the solar panels on angled brackets will be set back so they are unobtrusive.

Solar panels are dark in tone but are reflective, and if all installed at the same angle and pitch there is a risk that certain sun elevations will cause multiple 'flash' reflections from buildings in each precinct. This potential will be reduced by retaining trees between the villas (as per 6.3.4

above) and by varying the angle of roof sections and their solar panels, while keeping the pitch of solar panels within the recommended solar orientation range for the Rockhampton – Capricorn region.

Accordingly, the mitigation measure is:

- Reflective solar panels on roofs will be located in positions and at angles where they will not be visually intrusive with respect to lookouts, sensitive receptors or external view sectors; and
- Tree retention on the seaward side of buildings with roof-mounted solar panels, where the tree canopies will soften long-distance views of the panel but not cast shade on the panels.

6.3.7 Roads and Infrastructure

The potential for roads and associated cuttings to create visual scarring is limited because there is only one new road connection across the Mt Wyndham Range between the Fisherman's Beach Resort and Clam Bay Resort Precincts. There will be no linear swathes of clearing up forested slopes or across skyline ridges for overhead powerline or telephone connections, but it is likely that the existing mobile phone tower behind Fisherman's Beach will require relocation to a ridgeline, or duplication in the Clam Bay Resort Precinct.

Visual impact mitigation will be achieved by:

- Road alignment will avoid linear hillside scarring perpendicular to contours and within view of sensitive receptors and external viewpoints;
- Road cuttings on hillsides in areas of Low or Very Low VAC will minimise vegetation clearing and earthworks footprint by dark-coloured retaining walls with planted terraces, soil nailing or gabion supports, instead of vegetated cut batters; and
- During construction, the area of bare earth exposed at any one time, and the period of exposure, will be minimised.

6.3.8 Walking Tracks

As indicated in 5.1(d) above, the existing network of walking tracks comprises approximately 40 km, excluding beaches. In the relatively undisturbed parts of the island, away from the existing resort and residential areas, the network includes tracks through natural bushland, and a minor proportion of these tracks offer expansive outwards views from ridges and hilltops, depending on vegetation heights (see **Figure 7**). There is potential for sections of the trail network with views over the central Blackall Creek valley to be affected by the proposed development. Where ridgeline and hilltop walking tracks are not screened by vegetation, parts of the golf course and eco-tourism villas of the Clam Bay Resort Precinct may be visible. Mitigation of any such impacts is discussed below.

It is likely that future bushwalkers (following development) will be mainly visitors accommodated within the resort facilities, with corresponding expectation that their walking

experience will include views over resort facilities. Nevertheless the intention is to ensure that the walking track network offers opportunities to interact with nature.

The Great Keppel Island Resort Revitalisation Plan includes a planned program of trail upgrades, integrated with trailheads and bushfire management, to ensure that bushwalking remains an important part of the Great Keppel Island experience. This will include walks of various grades, lengths and degrees of self-reliance and 'remoteness', including loop trails which take in the Island's attractions. Conceptually, the proposed walking track strategy includes four trail zones as outlined in **Figure 7**:

Trail Zone A: "Resort Walking" where well-signposted and interpretive trails may be through natural and landscaped areas, but views of built form and resort facilities will be part of the setting:

A1: in and around Fisherman's Beach Resort Precinct, Putney Beach and the Marine Services Precinct; and

A2: in and around the Clam Bay Resort Precinct.

Trail Zone B: Mid-Island Trails through natural areas accessible from resort accommodation, where longer trails (half-day to full-day, with sign-posts) offer natural bush, wetland, creek, mountain and beach experiences, and the visible landscape will be almost entirely natural with little or no views of built form:

B1: Leeke's Beach, Estuary and the Mt Wyndham Range, and.

B2: Long Beach, Monkey Beach, Morris Lookout and Monkey Point; and

Trail Zone C: North-eastern Island Trails through natural areas, comprising longer and more self-reliant tracks along the main Bald Rock to Butterfish Bay Range, also offering natural bush, wetland, creek, mountain and beach experiences, where the visible landscape will be almost entirely natural with little or no views of built form.

Trail Zone D: Remote access only, no constructed walking trails apart from tracks for conservation management and bushfire management with no views of built form.

Visual impact reduction and integration will be assisted in each Zone by:

Trail Zone A

In Zone A1, views from trails and paths will be changed as a result of the proposal, but the walking experience will remain a combination of walkways, beaches and easy tracks with a combination of natural and resort landscape scenery (**Figure 7**). In A2 the walking experience through the Clam Bay Resort Precinct will include golf course fairways and landscaped resort villa precincts as well as patches and strips of natural vegetation. It is noted that, following development, most users of the walking trail network are likely be resort or marina visitors, with corresponding expectation that their walking experience will include views over such facilities, especially in Zone A1. Nevertheless, the intention is to ensure that trails also offer opportunities to interact with nature. Mitigation measures

will be implemented to minimize visual impacts and integrate built form with the landscape, including:

- Walking track routes through and alongside natural and rehabilitated vegetation;
- Appropriate vegetation screening to walking tracks, where required;
- Building heights generally below tree canopies; and
- Built form to complement the natural landscape with appropriate bulk, scale, building materials and colours.

Trail Zones B & C

The visual impacts in Zones B and C will be minimal, with existing vegetation providing significant screening particularly along the main ridgeline in Zone C, as shown in ***Section A*** on **Figure 7**. There may be opportunistic glimpses of development where vegetation has died or thinned out, and it may be necessary to supplement the screening capacity of existing vegetation with additional planting of local native shrubs or trees, where feasible. This will form part of the proposed ongoing management and long-term maintenance regime.

Trail Zone D

There will be no visual impacts in Zone D.

In summary, some of the walking tracks are in the existing resort and residential parts of the Island, where the walking experience includes some visible built form, and will continue to do so. In other parts of the Island, the existing walking tracks offer natural bushland and coastal experiences with little or no visible built form. Without any mitigation measures, it is possible that short sections of these trails (eg. ridgeline tracks through grassland or stunted vegetation) could be visually affected by the proposed development, in that existing natural views may change to include some built form and/or golf course. However these impacts are confined to relatively short track sections in Trail Zones B & C, and some of these potential views may be capable of mitigation through supplementary screen planting. The walking experience and visible landscape around Great Keppel Island will remain predominantly natural.

6.3.9 Lighting (TOR 3.2.4)

The above mitigation measures for screening, softening and visual integration of built form and roofs will also reduce the night-time impacts of lighting. However there will be parts of the Fisherman's Beach Resort Precinct where the buildings may be quite well screened by day, but more apparent at night as bright lights seen through the trees. This will not apply to the Marine Services Precinct, where the development will be unscreened and visibly apparent by day and night (including a restricted offshore viewshed as shown in **Figure 6**); nor in the Clam Bay Resort Precinct where the external viewpoints are so distant that the buildings will be equally screened or equally visible by day and night.

The Marine Services Precinct will represent, when constructed and operational, a significant change from the existing 'dark night' condition to a small harbour with navigation lights visible from Great Barrier Reef Marine Park waters to the west and World Heritage islands, and to a brightly lit node as seen from Putney Beach and the ferry route. While the marina *per se* is below the horizon as seen from the mainland, there is potential for the associated 3-storey buildings and night-time glow to be seen from across Keppel Bay.

Navigation lights marking the Marina entrance are essential, widespread and expected in Great Barrier Reef waters, and are not considered to be inconsistent with GBR World Heritage aesthetic values. No mitigation measures are proposed for navigation lights *per se*. The associated bright lights of the proposed Marine Services Precinct will also have a direction-finding and place-marking function for boating, but bright glare visible across large areas of ocean could detract from GBR World Heritage aesthetic values. The location of the marina at Putney Beach, with screening by Putney Point, Sand Spit and Middle Island, will restrict the offshore viewshed as indicated in **Figure 6**.

Visual impact reduction and integration will be assisted by:

- Maximum use will be made of bollard lighting for night-time safety and direction finding, with taller mast lighting used only where necessary;
- Lighting in the Fisherman's Beach Resort and Clam Bay Resort Precincts, including lighting of the interconnecting road, will be downward-directed with minimal glare spillage, with no flood-lighting of trees or external walls above the surrounding vegetation screening height;
- Lighting of rooms associated with decks and large picture windows (if any) in the hillside eco-tourism villas will be fitted with dimmers and timers;
- Design of Marina lighting to be below the height of the Putney Point ridge, and (apart from Marina entry lights) inside a line drawn between Putney Point and the trees on the Sand Spit; and
- Lighting in the Marine Services Precinct will be downward-directed, with glare restricted to local parts of Putney Beach and the passage, with minimal glare apparent from Leeke's Beach and Chocolate Rocks

NOTE: this restriction of glare to the Putney Beach area is also appropriate for reducing the impacts of lighting on marine turtles.

7. VISUAL IMPACTS

7.1 Modelling and Photomontages

The likely appearance of the Great Keppel Island Resort Revitalisation Project, as seen from five offshore viewpoints has been modelled in **Figure 5 B** to **5F**, with a key map as **Figure 5A** (Viewpoints # 1 – 5). These represent three of the four 'external view sectors' and three of the four major viewsheds mapped in Figure 1, the exception being the eastern viewshed which will remain free of visible development.

For each of the five viewpoints modelled, four images (1-4) are presented in **Figure 5**:

- a photograph taken in February 2011 from a boat or from the ferry (***1****: Original Photo*);
- a digital terrain model prepared in MapInfo using a similar 'camera position' based only on topography with no vegetation, and with built form inserted (***3****: 3D model- terrain + built forms*),
- a photomontage based on the photograph with built forms located in position as indicated in the 3D model (***2****: Photomontage*);
- a digital terrain model with built form, but also with the existing vegetation shown indicatively at average vegetation heights (from the Flora and Fauna Technical Report) (***4****: 3D model- terrain + built forms + existing vegetation*)

It should be noted that, at this early stage of the Project design process when no built form has been subject to architectural design, the built form shown in **Figure 5** is represented as simple two or three storey blocks, and is also illustrated as artist's impressions in **Appendix A**. It should also be noted that the screening effects of vegetation are shown only with respect to existing retained vegetation ie. without additional landscape planting, in order to identify development elements which require such screening. Key issues arising from this modelling are:

(a) Views from Keppel Bay

As shown in **Figure 5E** (view from offshore Wyndham Cove) and **5F** (view from offshore Long Beach), no built form or part of the golf course will be visible from these viewpoints, because the constraints-based approach to project planning and design has ensured that these viewsheds remain undisturbed. A small hill, currently visible from bay viewpoints (eg **Figure 5F**), will be removed for runway construction but will not be visible in the post-construction landscape. Runway clearance zone earthworks will also be screened from view by a bend in the Mt Wyndham Range.

Figure 5D (view from Clam Bay) indicates that a small group of eco-tourism villas in the southern central valley, on the foothills of the 'Bald Rock Peak', are potentially visible above the stunted vegetation of the Clam Bay escarpment. This area is Low VAC (Figure 3) but categorised as "Limited Visibility" because it is screened by topography as seen from most viewpoints. Nevertheless the potential visibility of these villas as seen from part of Clam Bay indicates that site-specific mitigation measures are appropriate here, including retention and

planting of trees in bands as detailed in 6.3.4 above. Screening is feasible for two-storey villas on this site because it is relatively protected from wind and the existing vegetation is not stunted. The photomontage modelling in **Figure 5D** has taken into account tree retention and screen planting within groups of villas.

(b) Views from the ferry route and offshore Fisherman's Beach

The visibility of built form as modelled in **Figure 5B** (view from offshore Fisherman's Beach) indicates that buildings in this precinct will be visible from offshore and the ferry route, but the built form will be relatively long and low, below the local tree canopy height and below the forested hill skyline behind, apart from the villas on the existing resort villa hillside. The model indicates that the visible built form will be attractively integrated into its beach setting by foreshore trees, and additional visual integration will be achieved by intensive tropical landscaping proposed for spaces between resort buildings and eco-tourism villas.

The villas proposed for the existing airstrip land will be screened by topography, as will the new runway and the pocket of runway villas on its northern side and three storey staff accommodation apartments and will be completely screened by topography.

Although not modelled in **Figure 5B**, existing residences (sensitive receptors) behind the Sand Spit will not be visually affected, because the generally flat landform and existing trees will screen them from view.

(c) Views from offshore Leeke's Beach

All development in the central valley will be completely screened by foreshore and lowland trees from the shoreline on Leeke's Beach. However as shown in **Figure 5C**, offshore views across Leeke's Beach potentially include distant villas at the southern end and side slopes of the central valley, and along the skyline of the Clam Bay Escarpment, where the natural terrain rises to elevations above the lowland trees retained along the foreshore and in the wetland buffer area. However additional tree retention and screen planting in the golf course and between the buildings, as detailed in 6.3.3 and 6.3.4 above, will mitigate these potential impacts by screening and integration. The photomontage modelling in **Figure 5B** takes these mitigation measures into account, such that only the tops of villas are seen from offshore and the distant skyline will have a wooded appearance.

7.2 World Heritage Values

As discussed in 4.6 above, the World Heritage aesthetic values which are expressed on Great Keppel Island comprise a diversity of attractive features associated with its natural landscapes, shoreline and seascapes. Together these contribute to the scenic diversity of the GBRWHA, and their proximity to the mainland, accessibility and lookout opportunities provides a unique combination in the southern part of the GBR.

Likely visual impacts on these values, taking into account the proposed mitigation measures, are summarised in Table 6:

Table 6: Visual Impacts on World Heritage aesthetic values:

Scenic Features and Values	Likely Impacts (Post-Mitigation)
Views to Great Keppel Island from offshore	**(a)** from Keppel Bay and ferry route: The proposed Marine Services precinct will be visible from parts of the ferry route (see (f) below), although screened from most of Keppel Bay. There will also be some additional visual impact of proposed new buildings in the existing Fisherman's Beach former resort area, with parts of the 3-storey hotel visible between and above foreshore trees, and sensitively-designed hillside 2-storey villas replacing the existing visually intrusive resort villas. **(b)** from the south: the currently undisturbed natural viewsheds will continue to have no visible built form, apart from some Clam Bay Resort Precinct hillside villas which may be visible between retained trees as seen from a restricted arc of view, and then only until screening vegetation takes effect; **(c)** from the east: the currently undisturbed natural viewsheds will continue to have no visible built form; **(d)** from the north: the viewshed is predominantly natural and undisturbed (apart from Svenden's homestead) and will have no additional visible built form; **(e)** from the north-west (across Leeke's Beach): the central valley currently appears undeveloped, notwithstanding past rural uses, and the viewshed will be changed by the development of a golf course (screened from offshore views) and by some villas and associated lighting visible at the far end of the valley and on the distant skyline, although these will be part-screened and integrated by bands of tree retention and planting; **(f)** from the Passage and Middle/Miall Island: views to Putney Beach and Putney Point will be significantly changed by development of the marina and associated buildings up to 3 storeys, and also by marina complex lighting, although visual impacts will affect a relatively small landscape setting confined by the Putney Point landform and Sand Spit trees.
Expansive views from Great Keppel Island peaks and ridges over GBRWHA waters and adjacent islands	No visual impacts – the view north from First Lookout over Leeke's Beach and estuary to Creek Rocks (Figure 1) will remain unchanged, the view south from First Lookout and the view from Morris Lookout will continue to include some of the existing settlement houses and part of an airstrip, and most of the ridges and peaks will continue to offer opportunities for expansive views outwards over the Great Keppel Island shoreline, bay, islands and GBRWHA waters with no visible built form.
Contrast and diversity of shoreline and water's edge	Visual impacts will be limited to the marina site (a small proportion of the Island's coastline), plus some minor increase in built form visible from Fisherman's Beach. Other development will be set well back and screened from the shore at Putney Beach, Leeke's Beach, Long Beach and Clam Bay, and all other isolated bays, coves, headlands and

Scenic Features and Values	Likely Impacts (Post-Mitigation)
	beaches will remain in their existing pristine condition.
Diversity of coastal form including mountains, headlands, sand dunes, mangroves, beaches and fringing reefs	Very little of the Island's landform will be altered. Visual impacts will be limited to removal of a small hill and re-shaping of part of a hillside, needed for the new runway and clearance zones. The hill to be removed is visible from only a limited arc of view from offshore Putney Beach, and while earthworks during the construction phase will be seen, there will be no permanent impact after it is removed, apart from the absence of a minor landform feature. With respect to the clearance zone re-shaping, the hillside is not in a visually prominent location and the disturbed areas will be formed and revegetated for visual integration. The Island peaks, ridges, headlands, mangrove, sand dunes and fringing reefs will remain unaffected. The inter-precinct road will require clearing and earthworks, but the temporary visual scarring will not be visible from First Lookout, from offshore or from sensitive receptors.
Aerial vista over island and reef systems	The Project will have moderate visual impacts, in that views from the air will reveal a more extensive area of buildings and golf course than at present. However the aerial vista will also reveal the large proportion of Great Keppel Island maintained in natural condition, the pattern of islands in the Keppel Group, and (under suitable weather conditions) the fringing reef in Clam Bay.
Unique accessible combinations of landscape, shoreline and seascape, as an opportunity for 'presentation' of WH values	Development will have a net positive impacts on this 'aesthetic' value, in that the unique combination of natural scenic features of the GBRWHA within close proximity to the mainland will become even more accessible and 'presentable' to the public with expansion of resort accommodation and day trip opportunities, and development of a marina, longer runway and the golf course.
'Existence Value' as a relatively undisturbed island.	Inasmuch as this can be regarded as an 'aesthetic' value, development will have a minor impact on the 'perceived naturalness' of Great Keppel Island, in that part of the central valley will be developed as a golf course and associated eco-tourism villas (see 7.4 below), and management of walking trails through natural areas will include supplementary planting to screen views over the Clam Bay Resort Precinct where possible.

Although the Island's natural vegetation contributes to World Heritage biodiversity values, it contributes to World Heritage aesthetic values mainly where particularly diverse and attractive vegetation communities are visible from external viewpoints. The forest communities, areas of regrowth and cleared grazing land in the southern parts central valley, do not *per se* contribute significantly to the aesthetic values listed for the GBRWHA. Consequently their partial clearing

for development of the Clam Bay Resort Precinct is not considered to be a visual impact on World Heritage values.

In summary, the Project will have little impact on World Heritage aesthetic values, and these limited impacts will be mainly associated with a discrete node of shoreline development at the Marina and to a lesser extent with some golf course villas visible at the far end of the central valley. These visual impacts will be restricted to relatively confined arcs of view, because the Island landform offers opportunities for 'visual absorption' in the central valley between two ridges, and opportunities for a marina 'tucked' behind Putney Point. There will also be visual impacts associated with the Fisherman's Beach Resort Precinct, an existing development node within the GBRWHA.

The above minor visual impacts will be offset by enhanced accessibility and World Heritage values presentation opportunities afforded by the accessibility of Great Keppel Island.

7.3 Planning Scheme and Iconic Values

As detailed in 4.4 above, the Iconic Places values of Great Keppel Island relate to the naturalness of the Keppel Group of islands as part of the inshore seascape ie. as seen from the Capricorn Coast mainland across Keppel Bay. Given that the Marine Services and Clam Bay Resort Precincts are screened from view from this direction, the Iconic Places values relate mainly to the Fisherman's Beach Precinct. This is already a node of development, with the existing hillside resort villas visible from the bay and mainland as a group of visible pale roofs.

Accordingly, the Great Keppel Island Resort Revitalisation Plan will have little or no additional visual impact on the values of the Keppel Group of islands as an Iconic Place under the *IQP Act*.

The applicable Planning Scheme includes a Great Keppel Island Code and accompanying Structure Plan Map PSM5, as discussed in 5.5 above. While the proposed development will occupy a footprint more extensive than envisaged in PSM5, it will nonetheless be "…*integrated with the natural environment facilitating visitor's enjoyment of the Island's natural character"* as intended by the Code (s 3.22 (i) (B)). The development will be consistent with s.3.22(i)(C): "*well designed, sensitive to climatic conditions and provides for the protection of dominant landscape features, including forested ridgelines, rocky outcrops and foreshore areas.*" All the dominant forested ridges will remain free of development, and will remain as natural skylines.

7.4 Character and Scenic Project Quality

The Project will not change the natural features and elements listed in 4.2.3 above as contributing to the character of Great Keppel Island, except for the Marine Services Precinct at Putney Point which will change significantly. The existing character of the developed areas will change with relocation of the airstrip, the demolition of the abandoned Great Keppel Resort, and the new hotel, apartment and villa development. The Fisherman's Beach Resort Precinct will no

longer be 'low-key', but will have a more modern, better designed and more 'upmarket' character. In this context, it should be noted that the Great Keppel Resort in its heyday was not considered to be 'low key' but as a very active leisure playground, so the proposed change in this Precinct will be a return to (and improvement on) its former character.

There will also be significant changes to the internal character of the central valley with development of the golf course and villas in the Clam Bay Resort Precinct, but these changes will not be readily apparent to most visitors. As indicated in 6.3.8 above, existing walking tracks are extensive and most are through vegetation which screens views to the central valley. However regular track management will include supplementary native planting to further minimise opportunities for views of the golf course and villas.

While the character of these areas will change, they represent in total only 5% (approximately) of Great Keppel Island. The existing natural character of most of the Island and its shoreline will remain unchanged, apart from conservation management in the Environmental Protection Precinct.

Importantly, the Landscape Settings rated as Very High scenic quality in Table 1 (4.3b above) will remain unchanged, ensuring that the landscape values of character and scenic quality will be maintained. The 'perceived naturalness' of Great Keppel Island will change, in that the development footprint will now extend into the central valley Clam Bay Resort Precinct, and the airstrip relocation will re-shape the valley at the base of Mt Wyndham Range. Although these visual impacts will be largely hidden from outside view, and will be well-integrated into their landscape settings, there will be awareness that the development node has been extended into previously undeveloped parts of the island, and this will change perceptions about its character.

However this 'spread' of proposed development across three separate areas separated by bushland and forested hills will provide some protection for the current small scale character of the existing settlement, and will avoid the impression of urban development.

7.5 Lighting Impacts

Lights from the Fisherman's Beach Resort Precinct, including the hillside eco-tourism villas, will be visible from Keppel Bay and the mainland over a distance of 12 – 20 km. Providing the lights are seen as a distant 'twinkling' rather than a bright glare, they will be consistent with the existing character and degree of development of Great Keppel Island as seen from the bay and mainland, and to that extent are consistent with the 'Iconic Places' values of the Keppel Group of islands.

Distant lights associated with the eco-tourism villas in the Clam Bay Resort Precinct will also be visible from offshore, and under clear conditions are likely to be seen from the North Keppel Island lookout, although it is unlikely to be accessed at night.

The main lighting impacts will be associated with the Marine Services Precinct, and even with the mitigation measures outlined in 6.3.6 above, this area will be a brightly lit node of night-time activity. The visual impacts on the Island will be largely confined to the immediate setting of Putney Beach and the passage. However the passage is not an anchorage and Middle/Miall Islands are uninhabited and unused, so few people apart from Great Keppel Island residents and visitors will be affected. The sensitive receptor residences likely to be within view of the marina lights are those behind Putney Beach, rather than the houses behind Fisherman's Beach which will be largely screened. As seen from offshore, the Marine Services Precinct lighting will be visible over an arc of waters to the west, as indicated in **Figure 6.**

The potential for lighting of the airstrip, marina and resort, combination, to cause a night-time glow equivalent to a small town, is difficult to evaluate. However this potential is considered unlikely because of the lack of urban streets and major intersections, mast street lighting, vehicle lights, shopping centres or industry, and because ridges and headlands separate the three Precincts.

7.6 Impact Risk Assessment

The above analysis of potential visual impacts requires a risk assessment approach in order to appreciate their likelihood and consequences. For example, there is a low likelihood that the combined level of lighting will cause a night-time glow, which could have moderate consequences for Island character; whereas there is a higher likelihood (but with lower consequences) that tree planting will fail to screen some built form in wind-exposed settings. However in the broader context of other potential environmental impacts, the visual impacts assessed in this section have relatively few serious consequences.

A risk assessment of potential visual impacts for each phase of the project (Design, Construction and Operation) has been undertaken and is described below, with reference to a standard risk assessment matrix (Table 7).

Table 7: Visual Impact Risk Assessment

RISK MATRIX	**CONSEQUENCES**				
PROBABILITY	Catastrophic Irreversible Permanent (5)	Major Long Term (4)	Moderate Medium Term (3)	Minor Short Term Manageable (2)	Insignificant Manageable (1)
Almost Certain (5)	(25) Extreme	(20) Extreme	(15) High	(10) Medium	(5) Medium
Likely (4)	(20) Extreme	(16) High	(12) High	(8) Medium	(4) Low
Possible (3)	(15) High	(12) High	(9) Medium	(6) Medium	(3) Low
Unlikely (2)	(10) Medium	(8) Medium	(6) Medium	(4) Low	(2) Low
Rare (1)	(5) Medium	(4) Low	(3) Low	(2) Low	(1) Low

Adopting this framework with respect to potential impacts on World heritage values and other values associated with the Island, the risks of significant visual impacts have been assessed in Table 8, indicating the likely risks with and without mitigation measures A1 to F3 above.

Table 8: Visual Impact Risk Assessment – with and without mitigation

Phase*			Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Mitigation Measures A – F (See 3.2.2 above)
D	C	O				
●	●	●	Visual intrusion on coastline and World Heritage waters by marina construction, built form, lighting and boating use	High (16)	Medium (8)	A1 – A9 (Design phase)
●	●		Noticeable changes to landform for new airstrip	Medium (8)	Low (4)	B1 – B2 (Design & Construction phases)
●	●	●	Visual intrusion on Keppel Bay by hillside eco-tourism villas in Fisherman's Beach Resort Precinct	Medium (10)[#]	Low (2)[#]	C6 – C9 and D1 – D3 (Design & Construction phases)
●	●	●	Visual intrusion on Keppel Bay by 3-storey Hotel visible above Fisherman's Beach tree canopies	Medium (8)	Low (4)	C6 – C9 and E1 (Design & Construction phases)
●	●	●	Visual intrusion on World Heritage waters, by villas, clubhouse, solar panels and lights visible through trees and on distant skyline, behind Clam Bay and Long Beach.	Medium (8)	Low (4)	C1 – C4, C6 - C10 (Design & Construction phases)
●	●		Change in island character as seen from World Heritage waters, associated with visible parts of golf course	Medium (8)	Low (3)	C1 – C4, C6 - C10 (Design & Construction phases)
		●	Change in island bushland character because some ridge-line sections of bushwalking tracks will be within view of Clam Bay Resort Precinct and golf course	Medium (8)	Low (3)	C5 (Operational phase)
●	●		Visual scarring of a hillside associated with road across ridge	Medium (10)	Low (3)	F1 – F3 (Design & Construction phases)
●		●	Night time 'small town' glow of lighting	Medium (6)	Low (2)	See 3.2.4
●		●	General perception of over-development and character change	Medium (6)	Low (4)	See 3.2.3

* Design, Construction & Operational phases

[#] Balanced by beneficial visual impact associated with removal of existing visually-intrusive hillside villas

In overview, many of the potential risks of significant visual impact have been addressed in the planning and design phase. The natural landform of Great Keppel Island allows the Project to be split into three separate precincts, each with visual impacts confined by ridges and headlands. The Great Keppel Island Resort Revitalisation Plan will continue to focus on the existing resort node at Fisherman's Beach, which is already a developed and non-natural area. Most of the development areas will require little re-shaping of the natural landform (apart from the marina and airstrip), native vegetation will be retained between and through the precincts, natural forested skylines will be retained and the built form will be modest and largely below the local

tree canopy levels. Low density development of this nature has a generally low risk of causing significant visual impacts.

8. SUMMARY AND CONCLUSIONS

Great Keppel Island is the largest island in the Keppel Group of islands, relatively close to the Capricorn Coast mainland, and part of an Iconic Queensland Place. It is also part of the Great Barrier Reef World Heritage Area (GBRWHA) and contributes to its aesthetic values, notably due to its diversity of scenic landform, shoreline and seascape features, but also because of its accessibility. Part of the existing character of Great Keppel Island is the perception that it is largely natural. Low key and relatively undeveloped, although the existing Fisherman's Beach node of development includes a settlement, airstrip and the Great Keppel Resort (currently closed), and parts of the Island were and continue to be grazed.

The proposed Great Keppel Island Resort Revitalisation Plan (including a marina, longer airstrip and a golf course) has been planned and designed around the constraints and opportunities identified through site investigations, including the visual assessments reported herein. These include the mapping of viewsheds and visibility, which indicated that a high proportion of Great Keppel Island showed no visible built form as seen from offshore, contributing to its World Heritage and iconic values as well as character and perceived naturalness. On the other hand, the central valley of Blackall Creek is semi-secluded and visible from only a narrow arc of views. These constraints and opportunities have, together with others, partly determined the division of proposed development into three distinct precincts – Fisherman's Beach Resort, Marine Services and Clam Bay Resort. The intention to create an island resort and villa environment which is integrated within it natural setting has also dictated the proposed built form, which will be mainly two-storey villas plus three-storey hotel and apartments. Apart from the marina and associated shops, research centre and apartments, which will be 'un-screenable' in their coastal location, all built form is potentially capable of being below tree height.

As seen from external viewpoints, almost all the elements and features which contribute to significant aesthetic values will remain unaffected by development ie. those which make up:

- the diversity of landscapes and seascapes (World Heritage values),
- the view from across Keppel Bay (iconic values),
- the view from First Lookout and
- the perceived naturalness of the island.

The main exceptions will be:
(a) the marina and associated buildings at Putney Point, although these will occupy only a small proportion of the island coastline and will be visible only within the Passage and from within the Putney Beach setting; and

(b) earthworks for the relocated airstrip which will involve some re-shaping of hillside over approximately 11.5 ha, although this will be visible from only few viewpoints and will be revegetated to integrate with the natural landscape.

As a result of the constraints-based approach to planning and a range of design and mitigation measures for integrating the separate precincts into their landscape settings, the visual impacts of the proposed development are considered minor and acceptable. The proposed development, will cause visible changes to only a small proportion of the Island, it will not detract overall from its natural scenery, and provides an opportunity to present Great Barrier Reef World Heritage values to the public at an accessible location.

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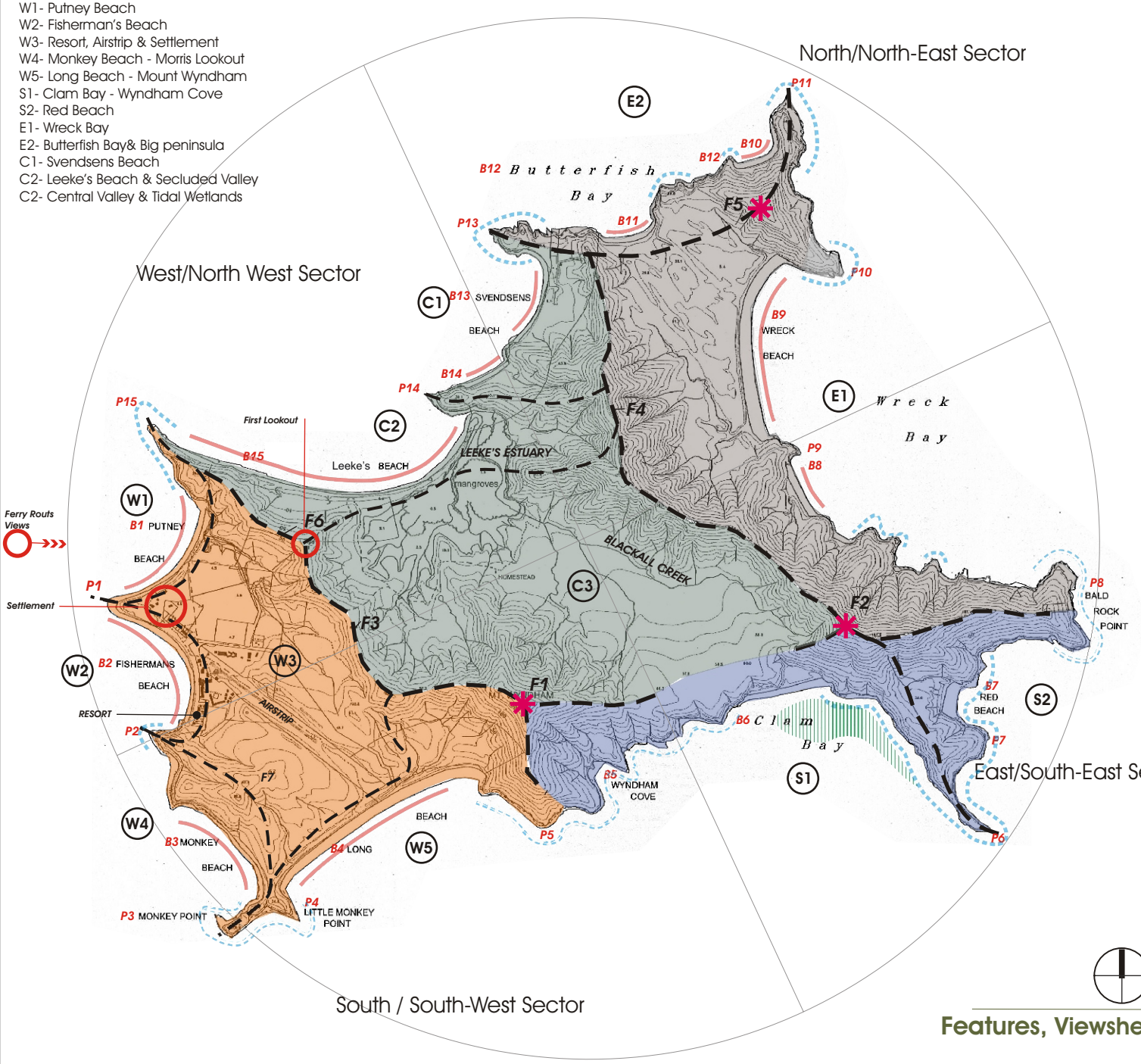
Figures

Landscape Settings
W1- Putney Beach
W2- Fisherman's Beach
W3- Resort, Airstrip & Settlement
W4- Monkey Beach - Morris Lookout
W5- Long Beach - Mount Wyndham
S1- Clam Bay - Wyndham Cove
S2- Red Beach
E1- Wreck Bay
E2- Butterfish Bay& Big peninsula
C1- Svendsens Beach
C2- Leeke's Beach & Secluded Valley
C2- Central Valley & Tidal Wetlands



Legend

- Major ridgelines & Viewsheds
- External Viewshed sectors (for visibility analysis)
- E — Eastern Viewshed - incorporating the Northern Range, the North Dunes and Butterfish to Bald Rock Range
- SE — South-Eastern Viewshed - incorporating the Mt Wyndham Range and Clam Bay Escarpment
- W — Western Viewshed - incorporating Putney and Monkey catchment areas
- C — Central Viewshed - incorporating Leeke's Valley and the Blackall catchment

Landscape Features

Points / Headlands
P1 - Sand Spit
P2 - Resort Point
P3 - Monkey Point
P4 - Little Monkey Point
P5 - Wyndham Point
P6 - South East Point
P7 - Red Beach Point
P8 - Bald Rock Point
P9 - Little Wreck Point
P10- Wreck Point
P11- Big Peninsula
P12- Butterfish Point
P13- Little Peninsula
P14- Creek Rocks
P15- Putney Point

Beaches/Coves
B1 - Putney Beach
B2 - Fisherman's Beach
B3 - Monkey Beach
B4 - Long Beach
B5 - Wyndham Cove
B6 - Calm Bay
B7 - Red Beach
B8 - Little Wreck Beach
B9 - Wreck Beach
B10- Secret Beach
B11- Big Sandhill Beach
B12- Butterfish Bay
B13- Svendsens Beach
B14- Second Beach
B15- Leeke's Beach

- Fringing Reef
- Rocky Points
- Sandy Beaches
- Mountain Peaks
- Sensitive Receptors

Elevated Features (Mountains Ranges, Lookouts)
F1- Mount Wyndham
F2 - Bald Rock Peaks
P3 - Mount Wyndham Range
F4 - Butterfish to Bald Rock Range
F5 - Northern Range
F6 - First Lookout
F7 - Morris Lookout

Great Keppel Island
Visual Assessment

FIGURE 1
Features, Viewsheds and External View Sectors
March 2011

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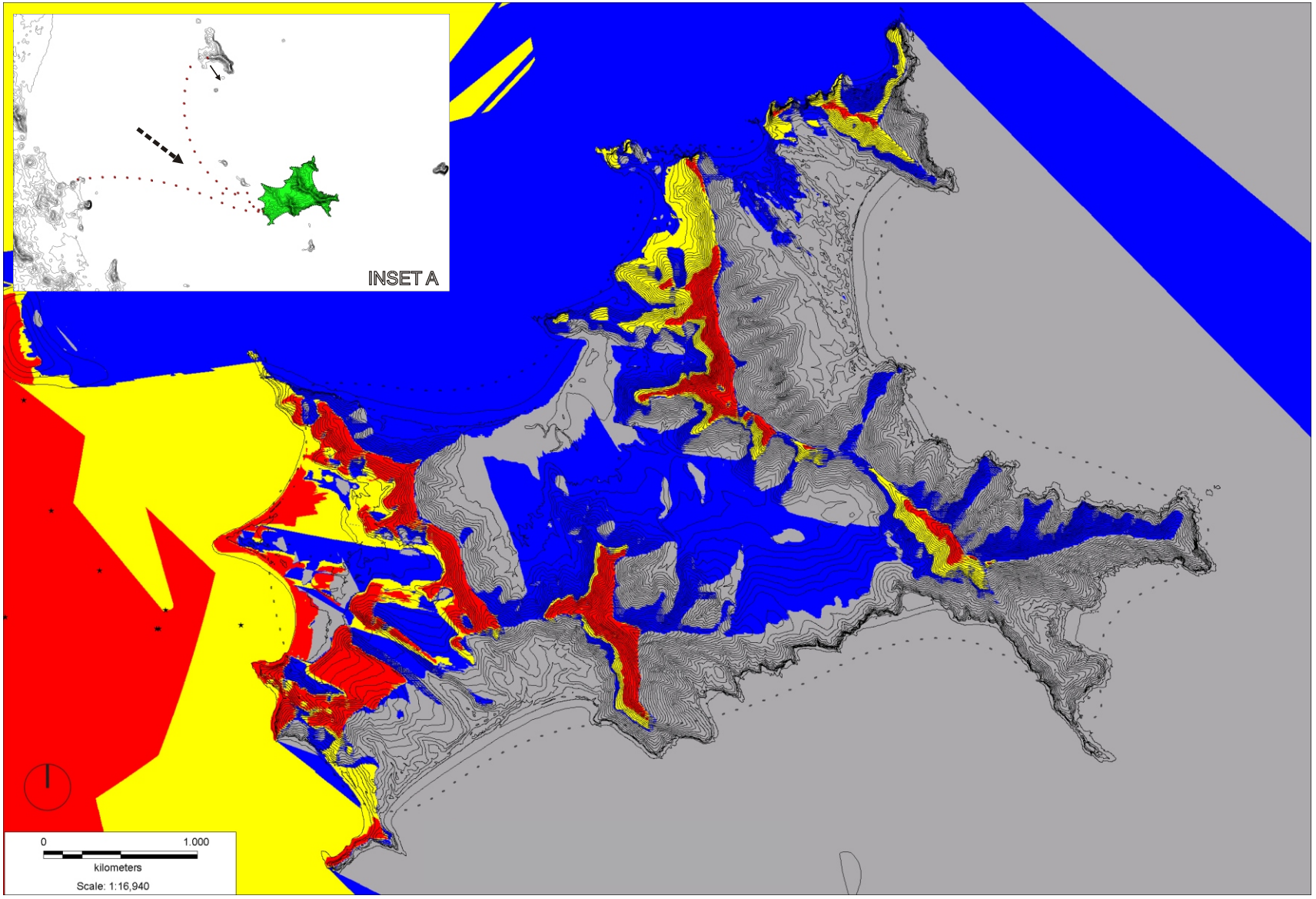
E-mail: mail@chenoweth.com.au



LEGEND

- Not Visible
- Highest Visible
- Moderate Visible
- Least Visible

*Classified viewshed analysis from multiple viewpoints in this sector

* DTM with vegetation heights

* Refer Inset A for viewpoint locations and view direction

Great Keppel Island
Visual Assessment

FIGURE 2 A

Viewsheds from West / North West View Sector

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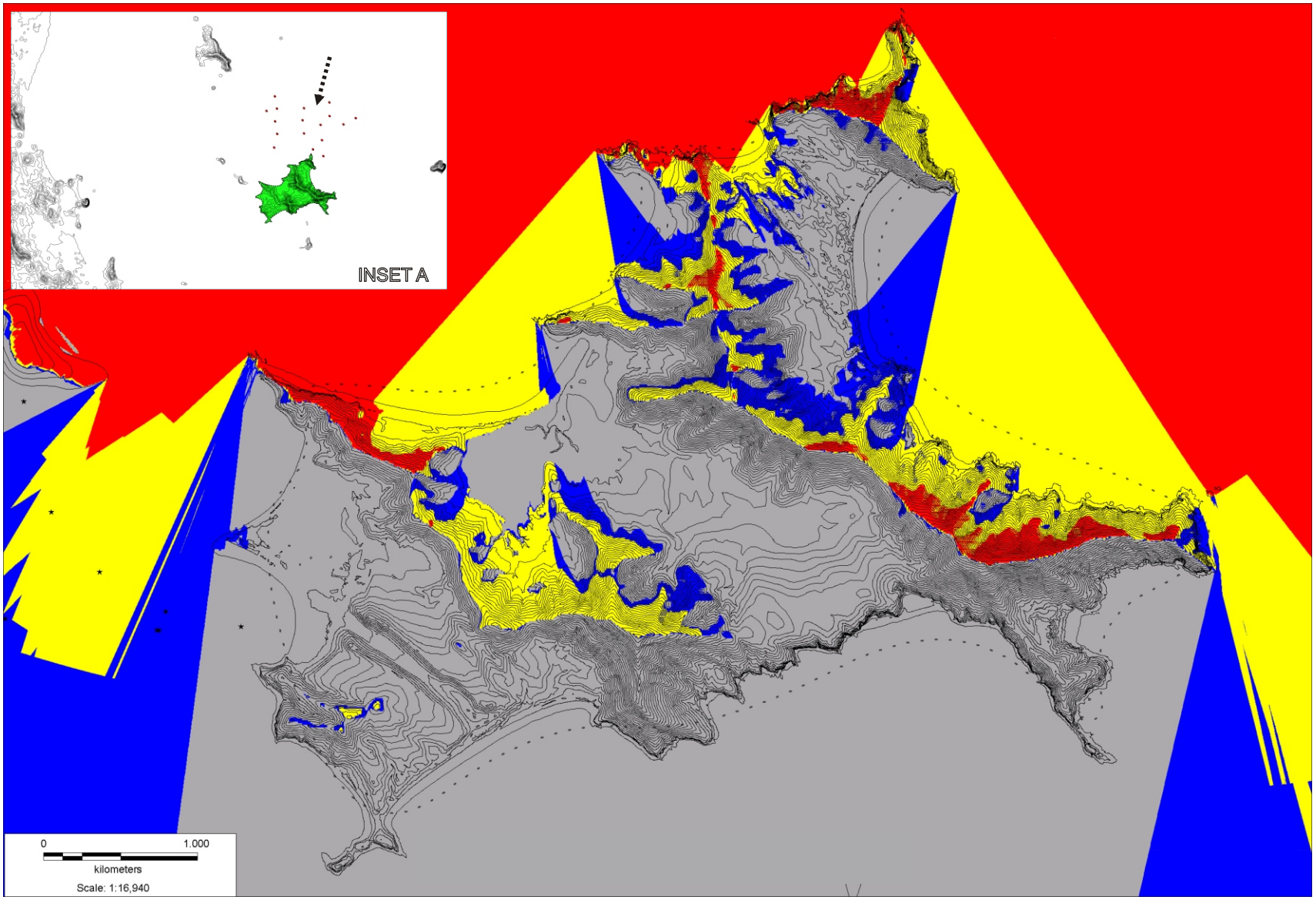

LEGEND

- Not Visible
- Highest Visible
- Moderate Visible
- Least Visible

* Classified viewshed analysis from multiple viewpoints in this sector

* DTM with vegetation heights

* Refer Inset A for viewpoint locations and view direction

Great Keppel Island
Visual Assessment

FIGURE 2 B

Viewshed from North / North East View Sector

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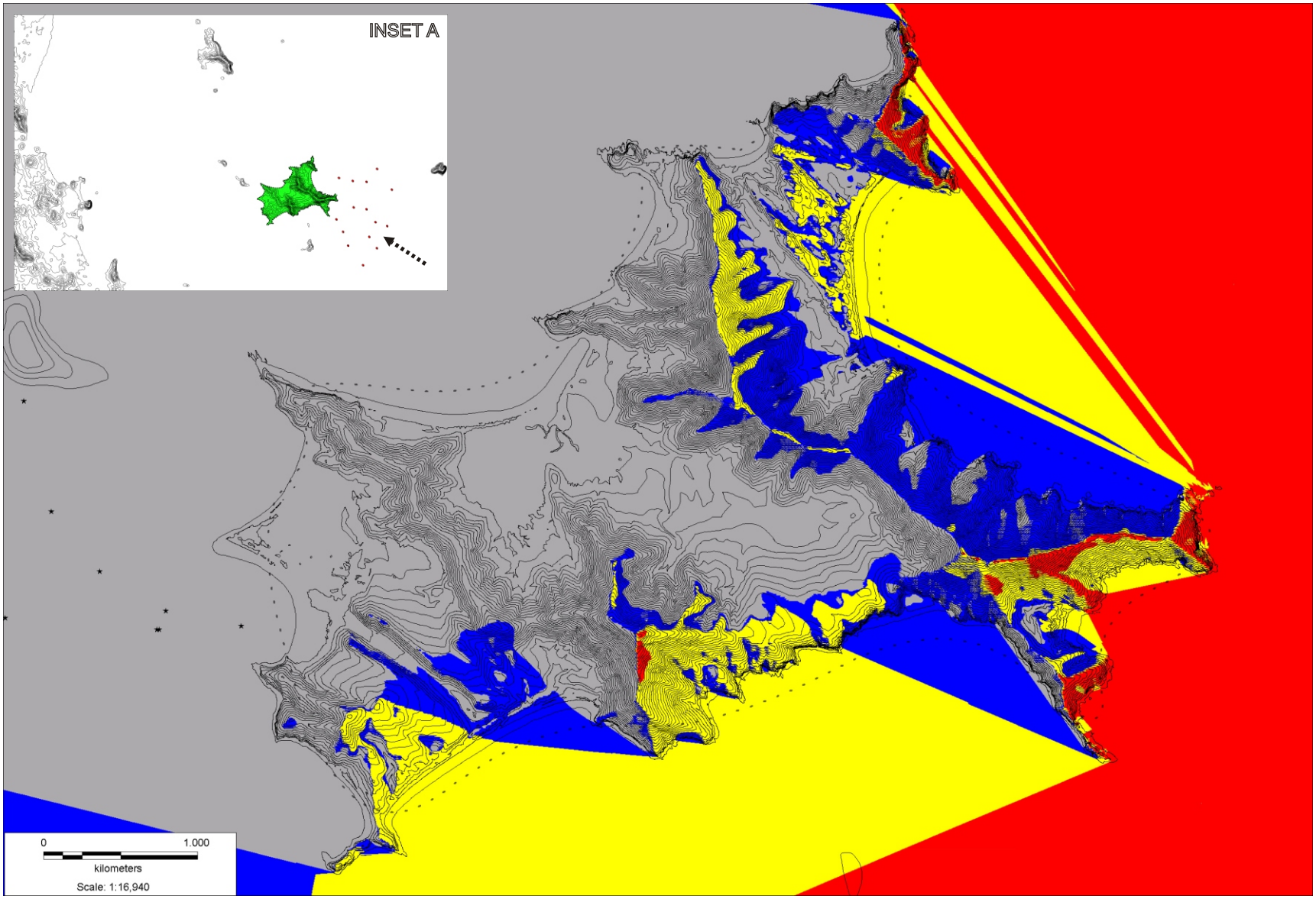

LEGEND

- Not Visible
- Highest Visible
- Moderate Visible
- Least Visible

* Classified viewshed analysis from multiple viewpoints in this sector

* DTM with vegetation heights

* Refer Inset A for viewpoint locations and view direction

Great Keppel Island
Visual Assessment

FIGURE 2C

Viewshed from East / South East View Sectors

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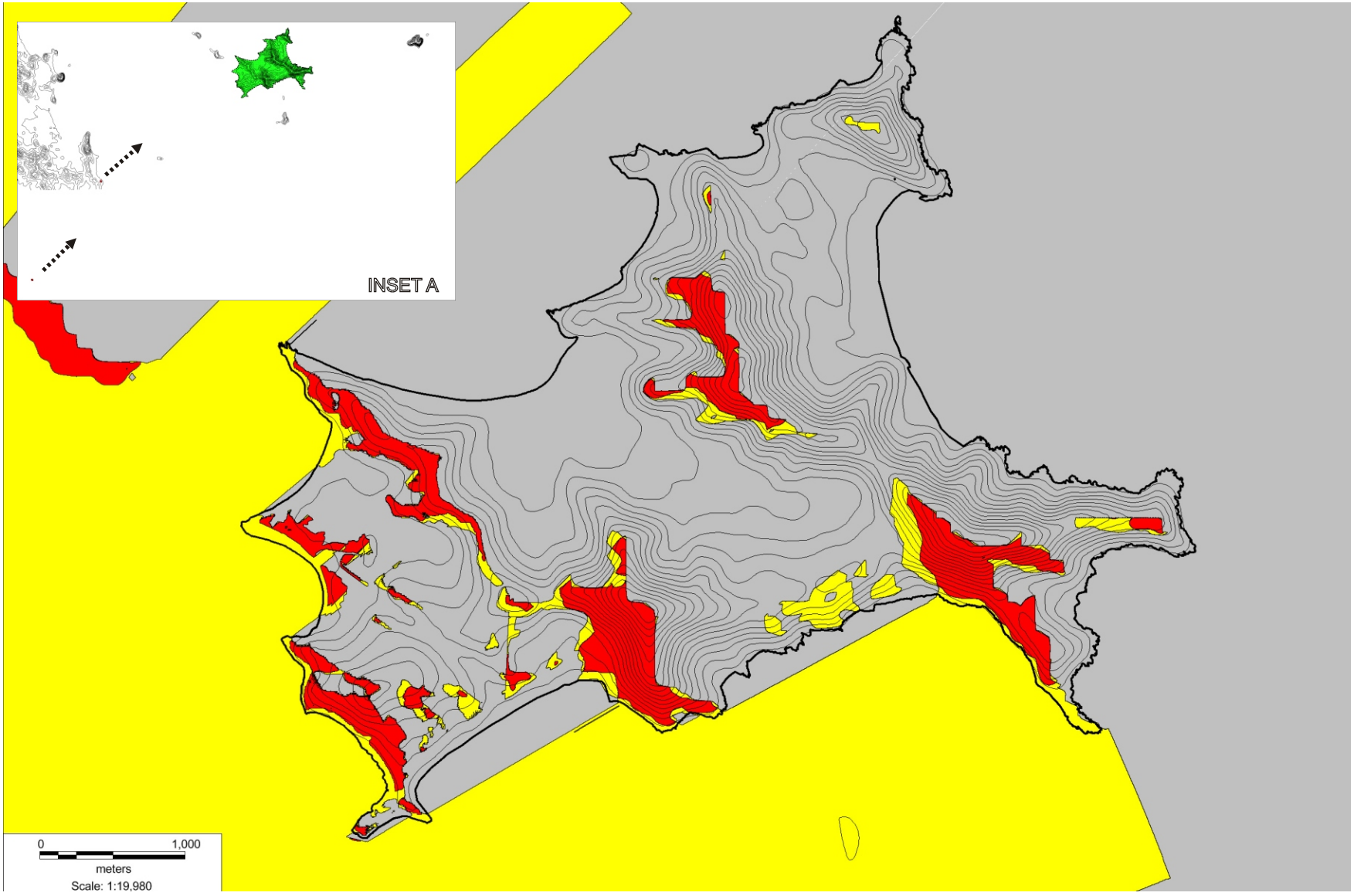

LEGEND

- Not Visible
- Highest Visible
- Moderate Visible

* Classified viewshed analysis from Emu Park & Keppel Sands Mainlands

* DTM with vegetation heights

* Refer Inset A for viewpoint locations and view direction

Great Keppel Island
Visual Assessment

FIGURE 2 D

Viewshed from South / South West View Sectors

March 2011

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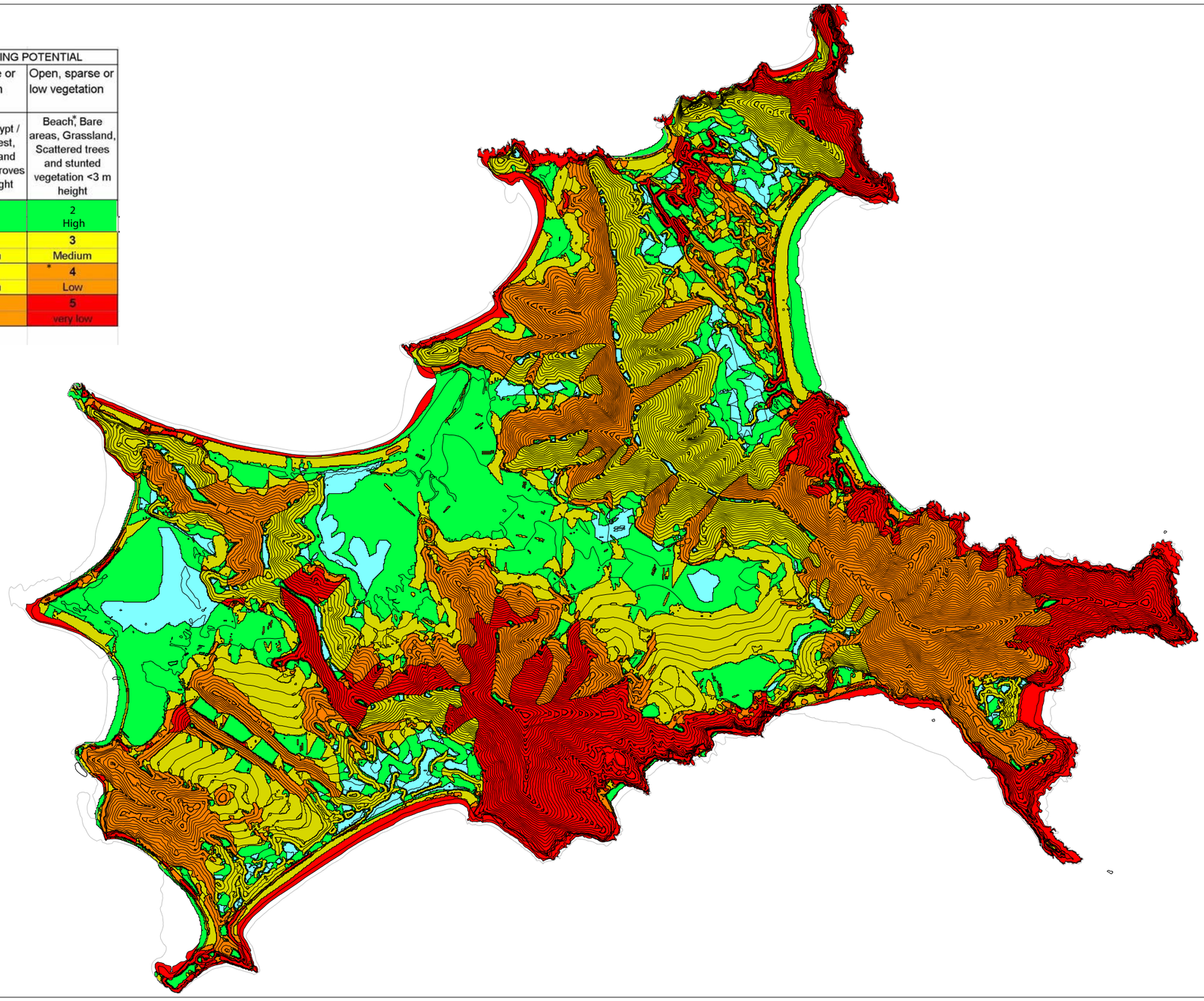
E-mail: mail@chenoweth.com.au

		VEGETATION SCREENING POTENTIAL		
		Tall Dense vegetation	Semi-dense or low-medium vegetation	Open, sparse or low vegetation
		Rainforest	Open eucalypt / Acacia forest, woodland and dense mangroves to 3 m height	Beach*, Bare areas, Grassland, Scattered trees and stunted vegetation <3 m height
SLOPES	**FLAT**	1	2	2
	< 1:10	Very High	High	High
	GENTLE	2	3	3
	1:10 TO 1:5	High	Medium	Medium
	MODERATE	2	3	* 4
	1:5 TO 1:3	High	Medium	Low
	STEEP	3	4	5
	>1:3	Medium	Low	very low

Visual Absorption Capability Matrix

* See report



Legend

- 1: Very High V.A.C
- 2: High V.A.C
- 3: Medium V.A.C
- 4: Low V.A.C
- 5: Very Low V.A.C

N

0 1 2

kilometres

GREAT KEPPEL ISLAND
VISUAL IMPACT PROPOSAL

Visual Absorption Capacity

FIGURE 3

CHENOWETH
ENVIRONMENTAL PLANNING
& LANDSCAPE ARCHITECTURE

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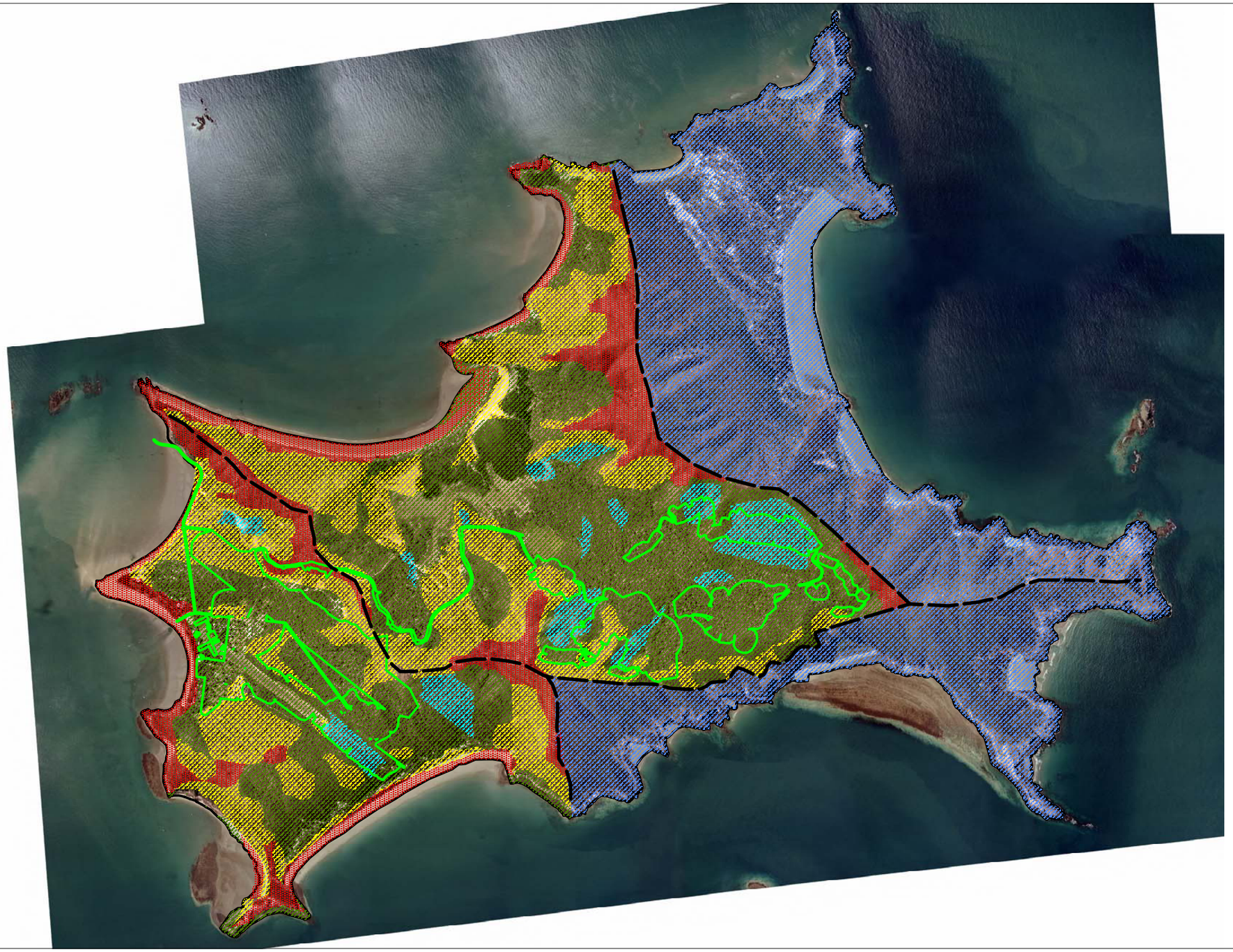

LEGEND*

- Category 1 - Priority Viewsheds
- Category 2 - Highly Constrained
- Category 3 - Sensitive
- Category 4 - Limited Visibility
- Category 5 - Semi-secluded
- Viewshed
- Development Footprint

N

0 1 2

kilometres

GKI Visual Impact Study

Visual Constraints

FIGURE 4

CHENOWETH
ENVIRONMENTAL PLANNING & LANDSCAPE ARCHITECTURE

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Date: 29/03/11
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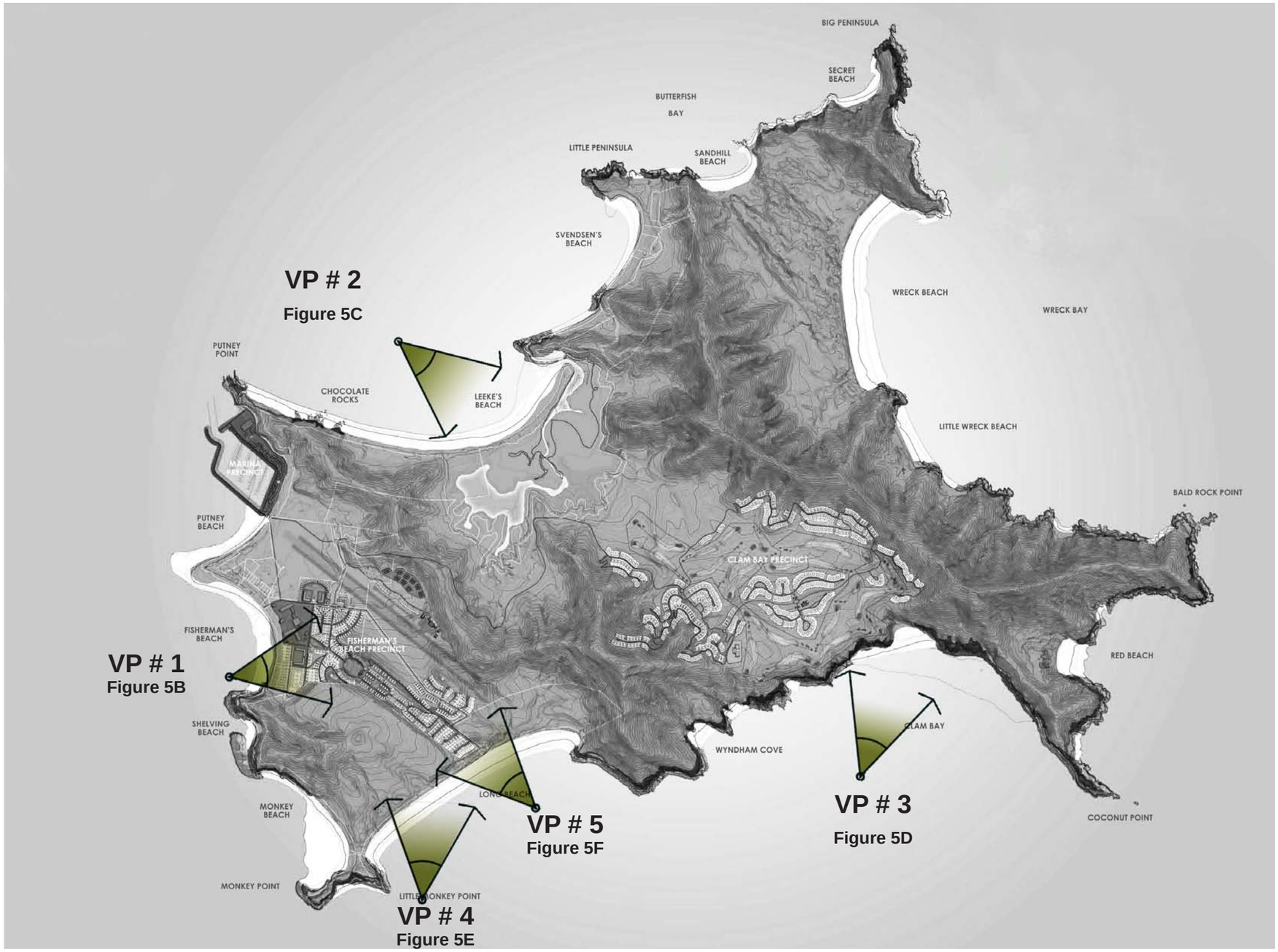
* See accompanying text regarding areas, values and recommendations for each category



Great Keppel Island
Visual Assessment

FIGURE 5 A

PHOTOMONTAGE VIEWPOINTS

CHENOWETH
ENVIRONMENTAL PLANNING & LANDSCAPE ARCHITECTURE

JOB 11CH001, AT, 16.08.2011

1: Original Photo

2: 3D Model (Terrain + Visible and hidden Builtforms + Existing Vegetation)

3: Photomontage + Mitigation Measures

4: Zoom View

Great Keppel Island
Visual Assessment

FIGURE 5B

Photomontage & model from Viewpoint 1

CHENOWETH
ENVIRONMENTAL PLANNING
& LANDSCAPE ARCHITECTURE

JOB 11CH001, AT, 16.08.2011

1: Original Photo

4: 3D Model (Terrain + Visible and hidden + Builtforms +Existing Vegetation)

3: Photomontage + Mitigation Measures

4: Zoom View

Great Keppel Island
Visual Assessment

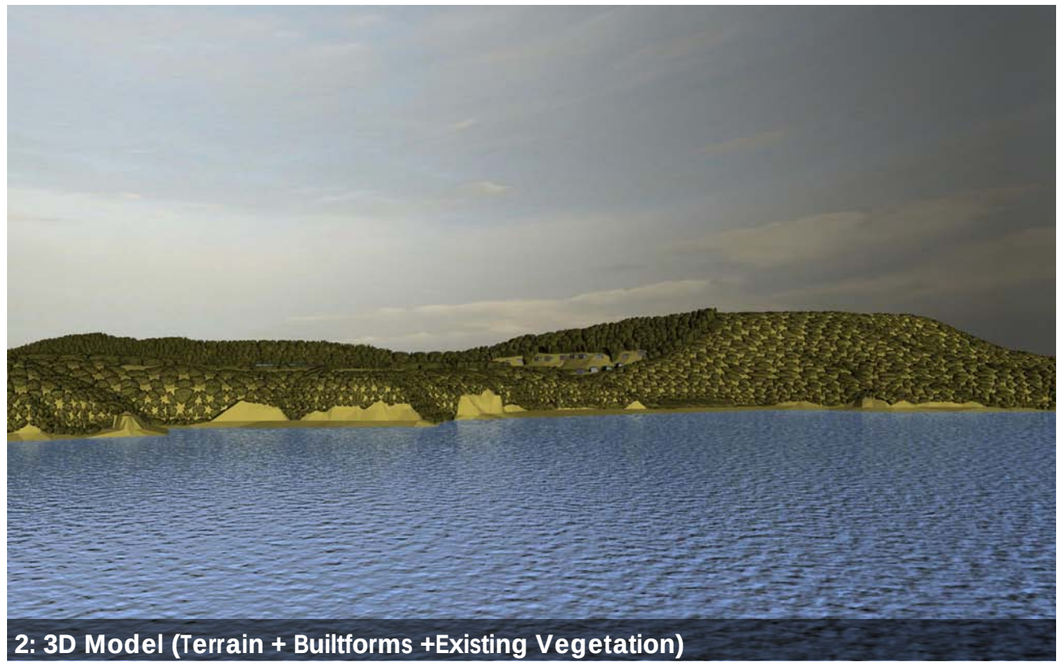
FIGURE 5C

Photomontage & model from Viewpoint 2

CHENOWETH
ENVIRONMENTAL PLANNING
& LANDSCAPE ARCHITECTURE

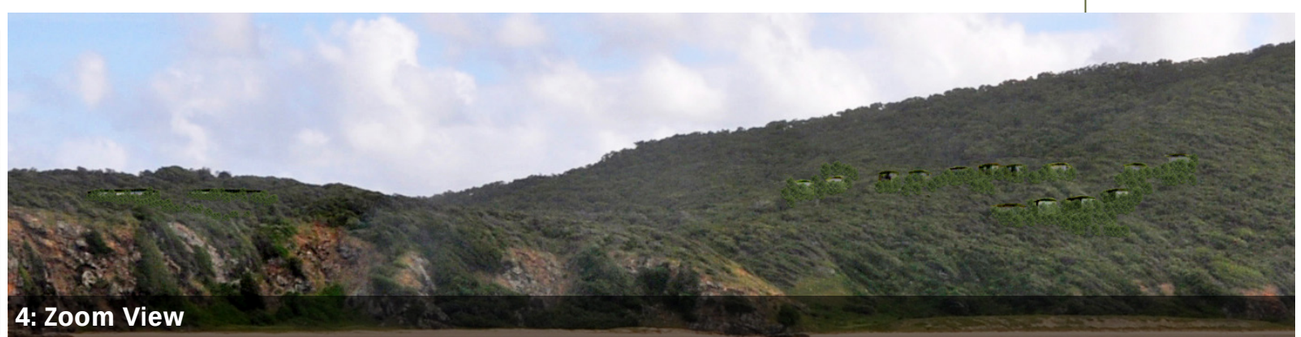
JOB 11CH001, AT, 16.08.2011

1: Original Photo



2: 3D Model (Terrain + Builtforms +Existing Vegetation)

3: Photomontage + Mitigation Measures



4: Zoom View

Great Keppel Island
Visual Assessment

FIGURE 5D

Photomontage & model from Viewpoint 3

CHENOWETH
ENVIRONMENTAL PLANNING
& LANDSCAPE ARCHITECTURE

JOB 11CH001, AT, 16.08.2011

1: Original Photo

2: 3D Model (Terrain + Builtforms +Existing Vegetation)

3: Photomontage - no visible builtform

Great Keppel Island
Visual Assessment

FIGURE 5E

Photomontage & model from Viewpoint 4

CHENOWETH
ENVIRONMENTAL PLANNING
& LANDSCAPE ARCHITECTURE

JOB 11CH001, AT, 16.08.2011

1: Original Photo

2: 3D Model (Terrain + Visible and hidden Builtforms+Vegetation)

3: Photomontage + Mitigation Measures

4: Zoom View

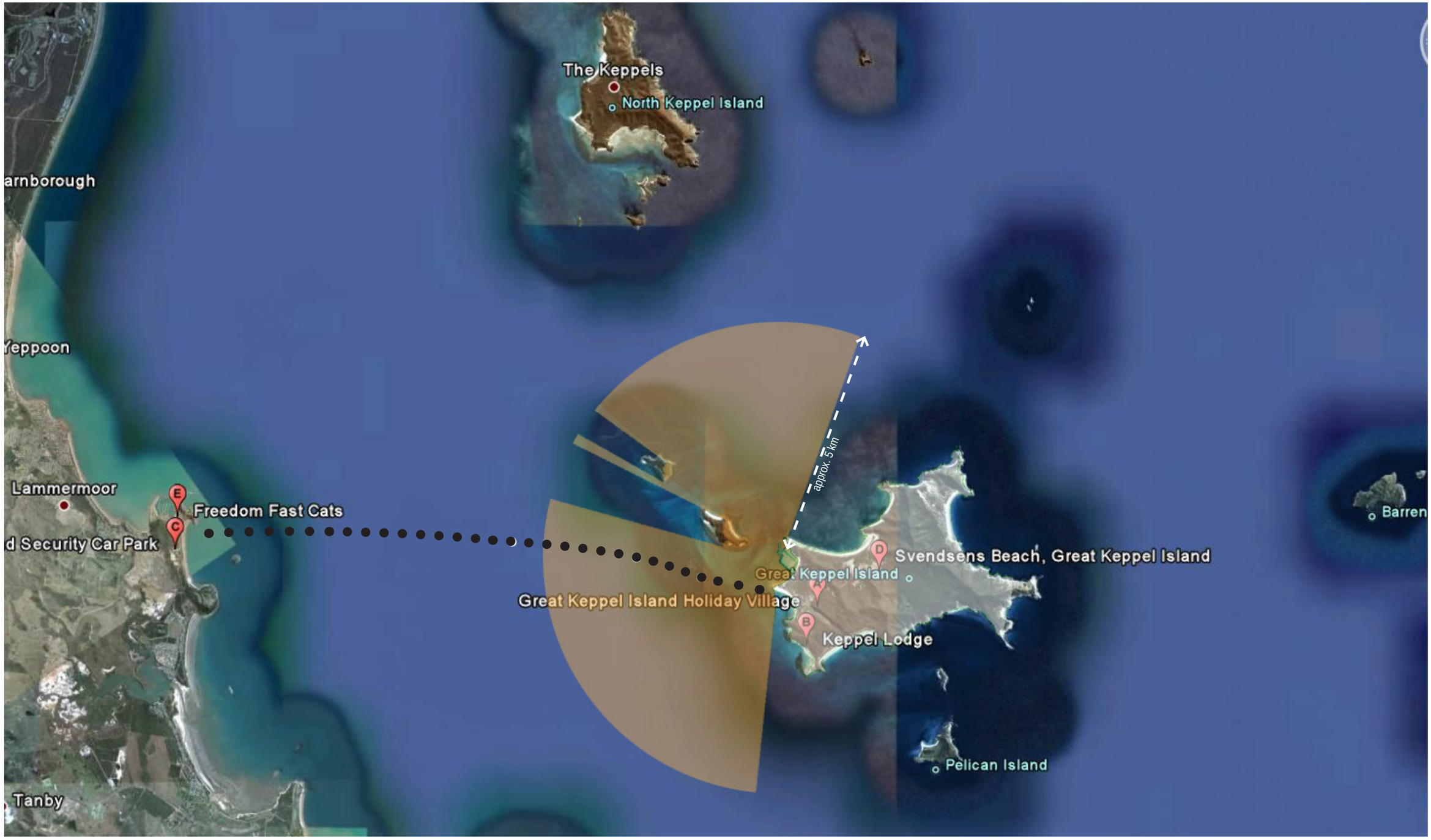
Great Keppel Island
Visual Assessment

FIGURE 5F

Photomontage & model from Viewpoint 5

CHENOWETH
ENVIRONMENTAL PLANNING
& LANDSCAPE ARCHITECTURE

JOB 11CH001, AT, 16.08.2011



Source: Google Earth 2010

Visible area

Ferry Route

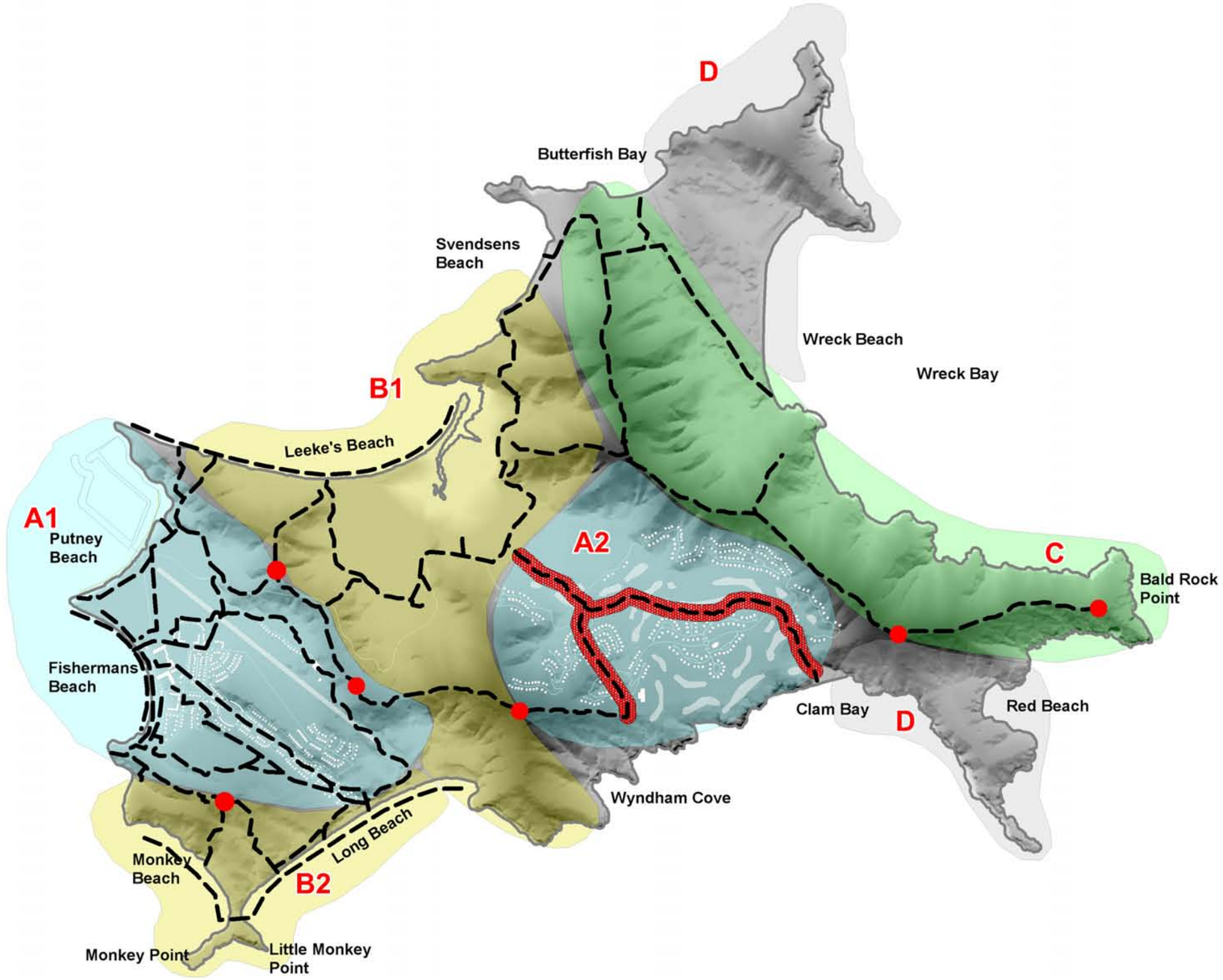
Great Keppel Island
Visual Assessment

FIGURE 6

Potential Viewshed of Proposed Marina Breakwater & 3 Storey Building

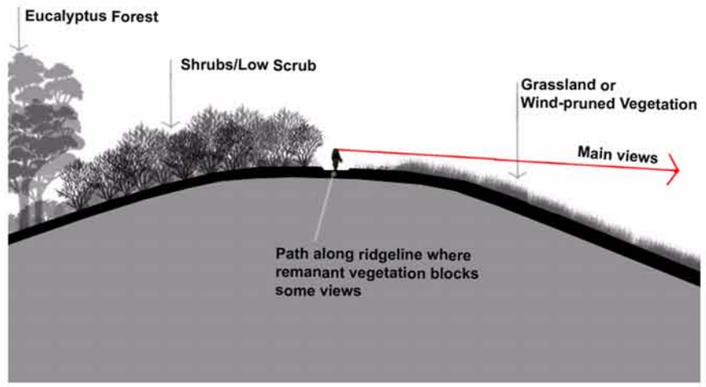
CHENOWETH
ENVIRONMENTAL PLANNING & LANDSCAPE ARCHITECTURE

JOB 11CH001, AT, 02.11.2011



Total Existing Trails: 40 km

Note : Walking Trail Strategy requires integration with Bushfire Management Plan.



Indicative Section - Trail along ridgeline

LEGEND

- Resort Walking Zone A1 & A2
- Mid Island Zone B1 & B2
- North Eastern Island Tracks Zone C
- Remote Access Walks - Zone D (no constructed walking trails)
- Existing Tracks to be relocated as part of Clam Bay Resort Precinct Planning
- Great Keppel Island Existing Tracks & Popular Walking Beaches
- Lookout

N

0 0.5 1

kilometres

Great Keppel Island EIS
Visual Assessment Technical Report

Walking Track Strategy

FIGURE 7

CHENOWETH
ENVIRONMENTAL PLANNING & LANDSCAPE ARCHITECTURE

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11CH001 Dwn: AT/AN

Plates

Plate 1 - Great Keppel Island from the air, showing mountainous landform, with several high ridges dominated by Mt Wyndham and "Bald Rock Peak" (Middle Island at lower right)

Plate 2 - Main Central Valley as seen from Leeke's Estuary

Plate 3 - Rocky headlands of "Passage Point" with Middle Island and Miall Island in background

Plate 4 - View from existing resort hillside villas looking west, with sandy spit at the western end

Plate 5 - Sweeping beaches along the northern coastline

Plate 6 - Big Peninsula and "Northern Range" showing areas of sand dunes between the hills

Plate 7 - Putney Creek

Plate 8 - Sand hills behind Big Sandhills Beach

Plate 9 - Fisherman's Beach

Plate 10 - The secluded 'Secret Beach' along the northern coastline

Plate 11 - Wyndham Cove

Plate 12 - Existing airstrip, looking west

Plate 13 - Western end of GKI over Putney Beach, "Passage Point", and Sandy Spit showing existing extent of development

Plate 14 - Leeke's estuary with mangrove communities

Plate 15 - Vegetation adjacent Putney Creek

Plate 16 - Taller eucalypts in Central Valley

Plate 17 - Headland and windsheared vegetation, on southern slopes of Mt Wyndham

Plate 18 - Wind-buffeted grass slopes along the Lighthouse Track looking towards Wreck Beach

Plate 19 - Leeke's Beach with foreshore Beach She-oaks

Plate 20 - Grassland grazing area in Central Valley, near old homestead

Plate 21- Regrowth and weed infestation, Central Valley

Plate 22 - Fisherman's Beach, showing foreshore Coconut Palms and other screening vegetation in front of resort

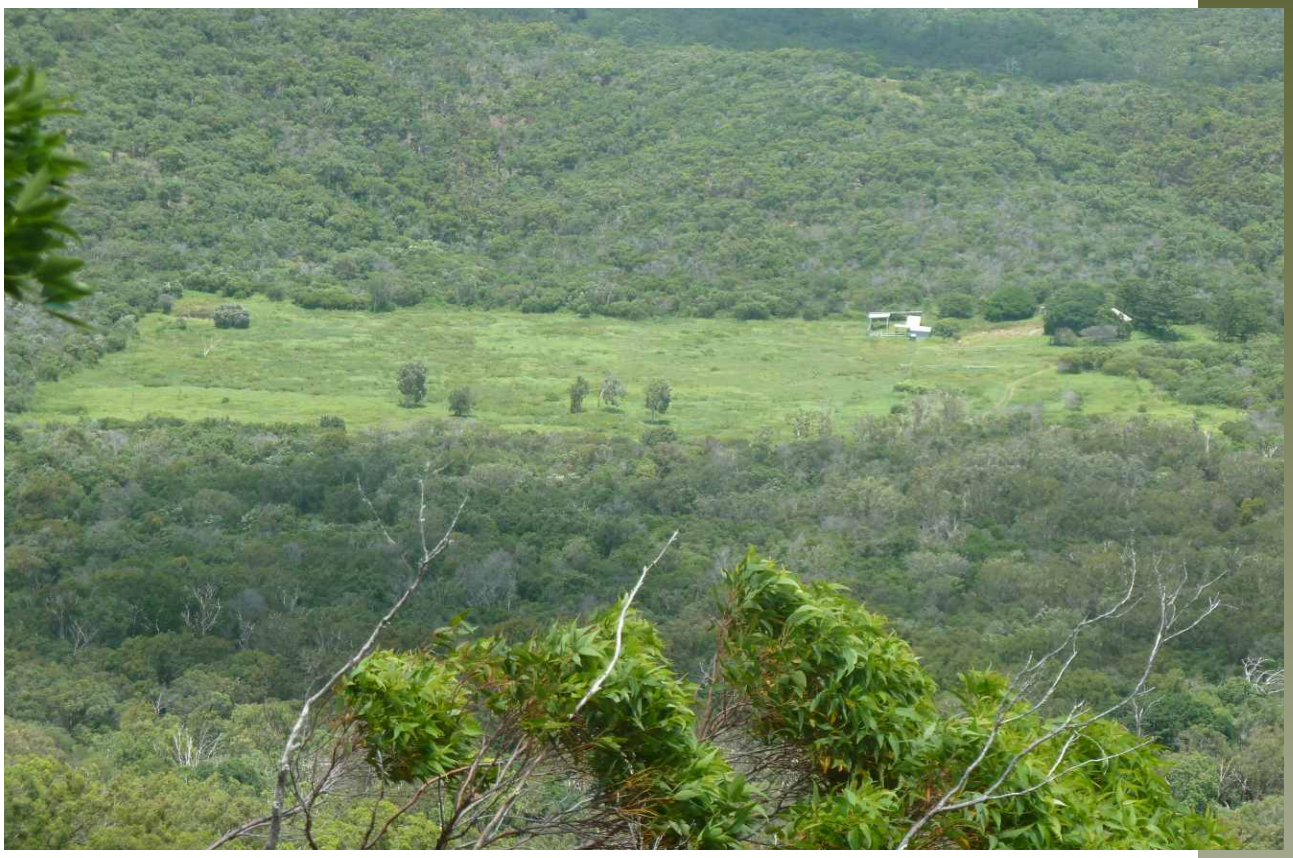

Plate 23 - Existing grazed areas in the central valley

Plate 24 - Great Keppel Island Homestead (built 1922-24)

Plate 25 - Abandoned Great Keppel Resort buildings

Plate 26 - Existing accommodation on the Island - Keppel Haven

Plate 27 - Svendsen's homestead behind Little Peninsula

Plate 28 - Hillside villas of the old resort viewed from Fisherman's Beach

Plate 29 - View west from the Clam Bay escarpment taking in Halfway and Humpy Islands

Plate 30 - Panoramic views from Bald Rock peak of the eastern coastline to Wreck Bay and Big Peninsula, with North Keppel Island on the horizon

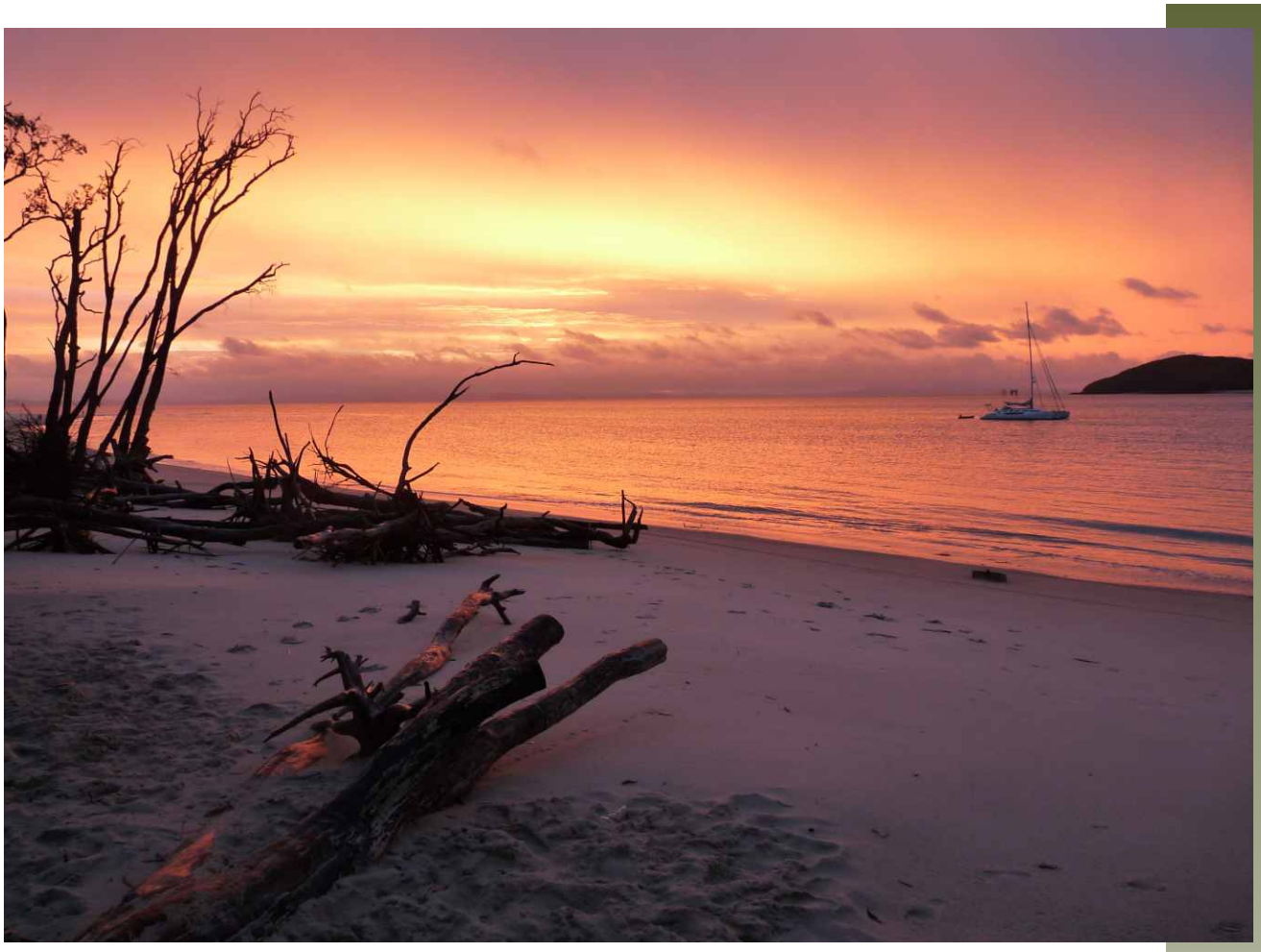

Plate 31 - Sunset view from Putney Beach

Plate 32 - Landform 'notch' corresponding to existing airstrip, as viewed from the south seas

Plate 33 - Existing resort hillside villas as viewed from offshore Fisherman's Beach

APPENDIX

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Artist Impressions (WATG)