

4. Lighting Inventory and Lightscape Management Plan

4.1 Overview

A broad review of the existing regulations relevant to Great Barrier Island's application for Dark Sky Sanctuary status was undertaken and it was established that around 60% of the area of the island is completely protected as it is either DOC estate or Council Reserve land as summarised in section 5.2 below detailed in Appendix 2.

Although the island operates from an extremely dark baseline due to its off-the-grid nature, a comprehensive lighting inventory was undertaken and the complete inventory is recorded in Attachment 4 and is discussed in section 5.3 below. Only 5 potentially significant sites were identified through this exercise and they are also discussed in section 5.3 below while detailed information on them and the plan to manage them is provided in Attachment 3.

Only a handful of marginal lighting issues were observed during the two sky quality surveys and the lighting inventory exercise. Of the potentially significant 5 sites identified, 3 have already committed to working within the guidelines set by the Local Board (see Letter of Support from two of them) and one is part of Department of Conservation's working site. The Department is also committed to dark skies (see Letter of Support) and the remaining site is a local club which rarely uses outdoor lighting after 10:00pm. As we believe there are approximately 500 built-on sites on the Island, 49% of which are only occupied on a seasonal basis, compliance with IDA standards is conservatively estimated to be 90% or higher.

Although no practical problems currently exist, the Local Board is committed to working towards achieving total compliance with IDA standards by extending voluntary curfews within a year and encouraging owners to upgrade and review lighting fixtures. Further, as detailed in section 5.4 below and in Attachment 5, it has adopted both IDA and internal guidelines and recommendations so that a binding policy will be in place as the currently operational Hauraki Gulf District Plan is absorbed into the Auckland Unitary Plan over the coming 3 years.

Although there are no plans in place to provide traditional network mains power supply to the island as it is seen to be cost prohibitive (see Letter from Vector), improved solar panel and new battery technology is viewed as a potential long-term risk to preserving the island's dark skies. Achieving International Dark-Sky Sanctuary status would provide the motivation and impetus for the Auckland Council to incorporate lighting policies in line with IDA guidelines, and give weight to the Local Board's request that IDA guidelines and international best practice be incorporated into the Unitary Plan as it applies to the Island.

The Local Board has established a formal structure for on-going review and monitoring through an Advisory Group convened by the Board's Chairperson.

In summary, the Great Barrier Island already meets the IDA requirement of >90% and is committed to achieving total compliance by putting in place a binding policy incorporating IDA standards or higher and a programme of ongoing monitoring both through the lighting compliance rating system and by checking for compliance.

4.2 Regulation for Dark Sky protection

4.2.1 Plans, Rules and Compliance

New Zealand has one of the most environmentally proactive planning regimes in the world. The Resource Management Act (RMA) provides the framework for environmental management of New Zealand through District and Regional Plans developed by local Councils. Dark Sky protection for Great Barrier Island falls under the planning regime of Auckland Council, the country's largest local government body. Councils are required to take into account several layers of national policy guidelines, environmental protection rules, amenity values rules, coastal protection rules, and map overlays protecting outstanding natural landscapes.

4.2.2 Current Situation-Hauraki Gulf District Plan

Great Barrier Island is currently under the Hauraki Gulf District Plan (Operative 2013). The relevant clause in this plan is:

"The use of artificial lighting producing an illuminance up to but not exceeding 150 lux, measured at any point on the site containing the light source, in a horizontal or vertical plane at ground level or at the exterior of any building within or adjacent to the site on which the lighting is placed, is a permitted activity."

Several sections of higher level planning documents refer to goals and policies for protecting the quality of the night sky. However, the above statement is the applicable rule. Lighting outside that standard is a discretionary activity and the Council can impose a wide range of restrictions.

Our assessment is that this clause does not completely meet the minimum standards of the IDA. However, the practical effect of this is virtually nil. There is virtually no outdoor lighting on the Island. This is demonstrated in the lighting inventory. While the rule does not yet adequately cover the dark sky requirements, the actual lighting, both indoor and outdoor, is well within the IDA guidelines for preserving the dark sky environment. Existing national policy statements and planning guidelines provide sufficient high-level legal support to enable the Council to readily incorporate dark sky protection as a critical factor at district plan level.

4.2.3 Transitional Phase.

The Hauraki Gulf Plan will be absorbed into the wider Auckland Unitary Plan in the next few years. The development of the lighting component for the Great Barrier Precinct within this plan is a priority for the Great Barrier Local Board and the strategic planners within Auckland Council. Until these sections are fully incorporated, the transition strategy is to encourage all landowners and residents of Great Barrier to adopt best practices. With the establishment of the Dark Sky Sanctuary on the Island, the Board will formally recommend that any landowner applying for a resource consent for a development on the Island will be given documentation regarding the Island's sanctuary status, the transitional guidelines, and recommended fixtures. The Local Board will actively promote the need to ensure the Island's dark sky qualities are preserved.

4.2.4 Unitary Plan

The Unitary Plan for the rest of Auckland is already operative and has more specific guidelines and rules for protecting the night sky and relevant amenity values within the wider city. With the endorsement of the Dark Sky Sanctuary Status for Great Barrier Island, Auckland Council will in principle adopt the minimum standards outlined in the IDA documentation for inclusion in the Unitary Plan section for the island. The Council will also review international and New Zealand best practice and applicable New Zealand law in preparing the necessary legal sections of the plan.

4.2.5 Governance and Compliance

Compliance is the responsibility of Auckland Council under both the existing Hauraki Gulf Plan and the Unitary Plan. The Council has a robust process of dealing with planning and compliance. Encouragement and education will be the main means of gaining acceptance in the transition phase, but the Council has a full range of legal resources from abatement orders to actions before the Environment Court to ensure compliance. The Board has indicated its commitment to the principles of preserving our dark skies in the Unitary Plan.

4.2.6 Great Barrier Island Local Board Formal Governance and Monitoring

The Great Barrier Island Local Board met on 21 March 2017 to finalise its application and give formal expression to its intentions of creating a Dark Sky Sanctuary on the Island. The meeting considered reports from the Dark Sky team, Auckland Council's planning team (Planning Advice for Aotea Great Barrier Island Dark Sky Application Application), national planning guidelines and policy statements, the Outstanding Natural Landscape Overlay documentation, transitional guidelines draft documentation (Draft Guidelines for Outdoor Lighting) and (IDA Outdoor Lighting Basics). The Board formally endorsed the application and the lighting standards and fixture suggestions outlined in the IDA Guidelines for Dark Sky Sanctuary Status, the IDA Outdoor Lighting Basics information hand-out, and the transitional guidelines discussion document. It has committed to a public education programme, and has formally established a monitoring and advisory group for the Dark Sky Sanctuary. The detailed documents are provided as attachment 6.

4.2.7 In Summary

In summary of the current regulatory situation: around 60% of the area of the island is completely protected as it is either DOC estate or Council Reserve land. The road reserve is protected as it is under the Council's jurisdiction and there are no plans for installing any road lighting whatsoever. With transition to the Unitary Plan, Aotea Great Barrier's compliance will at a minimum achieve and normally exceed IDA guidelines.

4.3 Lighting Inventory

Great Barrier Island approaches the light planning issue from an extremely dark baseline. During the In-depth Night Sky Brightness Survey, after 11:00pm on 31 October, 2016 only 4 sites were showing lights that were noticeable from a dark sky perspective. Subsequently, it was resolved that 2 of these were

temporary mast-head lights from visiting yachts. Additional assessments were done by undertaking a full lighting inventory and assessments show that 5 sites had a lighting impact which warranted discussions with property owners. These sites are:

- a) The Currach Irish Bar, Tryphena;
- b) Tipi & Bob's, Tryphena;
- c) Great Barrier Social Club, Tryphena;
- d) Great Barrier Sports and Social Club, Claris;
- e) Department of Conservation Storage Yard, Okiwi.

Since this survey, the Great Barrier astronomy enthusiasts group has had informal discussions with all but one of the owners of the above properties (as DOC is already committed a separate discussion was not necessary). Full details on the current situation and management proposals to make the properties compliant are detailed in Attachment 3, Lighting Inventory Significant Sites. The Lighting Inventory of currently non-compliant sites has been assessed as limited to 5. It has not been possible to take consistent light readings from these properties as usually outdoor lights are turned-off after around 11:00pm each night. In other words, there is a voluntary curfew operating with these sites due to the desire to conserve power in the off-the-grid environment

Although there is provision for emergency lighting at each of the wharves on the Island at Port Fitzroy, Whangaparapara and Tryphena, these require generators to be brought to the wharves for the occasion, and none has been used over the last 10 years. The airfields are not lit, and apart from the DOC yard there is no lighting on other publicly owned buildings throughout the Island.

We have prepared a separate lighting management/monitoring inventory (Attachment 4) for a wider purpose. The Lighting Inventory consists of sites where the level of public/private use and fixture types warrant proactive monitoring, although none of these sites had outdoor lighting at the times readings were being taken.

Lighting on the Island is limited by de facto curfews imposed by the need to generate independent power. At this stage, outdoor lighting is not really an issue.

Large blocks of private land have limited development potential or rights. The settlement areas consist of smaller titles, but no practical problems exist in any of these areas as off-the-grid power is precious and expensive. As we believe there are approximately 500 built-on sites on the Island, 49% of which are only occupied on a seasonal basis, compliance with IDA standards is conservatively estimated to be 90% or higher.

Lighting inventories have been prepared (Attachment 4) and Attachment 3 lists those properties where active discussions were required. Site specific management plans are also detailed in Appendix 3. Sites identified in Attachment 4 will be proactively covered as part of a medium-term monitoring and management strategy. There is now a comprehensive inventory of sites which have been identified as those that would benefit from monitoring to achieve the goals of 100% compliance by the time the regulatory document, the Unitary Plan, is formally adopted, an estimated timeframe of 3 years.

4.4 Lightscape Management Plan

Basically, the Island has almost no systemic or regular outdoor lighting. The basis of the Lightscape Management Plan is less on correcting problems, but more on ensuring problems don't get started. On this basis, the Island is comfortable with setting a high standard for 'dark sky goals'. Broadly, the Local Board has set a pre-curfew target for lighting assessments at property boundaries of <0.05 lux for reserve and public land outside the settlement areas, <0.1lux for private land areas outside the settlement areas, and <1.5 lux within the settlement areas of Tryphena, Claris, Okupu, Okiwi, Port Fitzroy, Motairehe, and Kawa. Across the entire Island the Local Board has set a colour temperature range of 2400K to 3000K, with adequate shielding and shading, and a reasonable commitment to a curfew plan. The Board's guidelines for inclusion in the Unitary Plan include the special purpose lighting fixture standard requiring shading and shielding for any light >500 initial lumens, in addition to the general lux and colour temperature standards set above. These have now been formally documented and passed as a Local Board Resolution (see Attachment 5)

4.4.1 Goals of the Lighting Management Plan

Given the extremely low baseline, the over-riding goal is to maintain the current situation for future generations. The targets stated above actually represent the current situation. Night-time curfews are a fact of life on the Island. Power is not wasted on outdoor lighting. The over-riding goals are to maintain the existing low-light standard across the Island, encourage residents to upgrade fixtures over time, and actively manage light control measures in the future. We propose the following steps:

a) Existing Light Sources

The Board and Advisory Group have already begun discussions with owners of the 5 non-compliant sites. These are analysed in more detail in Attachment 3. To date 3 owners have indicated a willingness to make appropriate alterations to their outdoor lighting subject to safety and legal restraints. One site is the Department of Conservation's work site, and no problem is anticipated in making appropriate changes, and the other is a club rarely uses outdoor lighting after about 10:00pm.

b) Adoption of IDA specifications and best practice measures in the proposed Unitary Plan Revision

Lighting requirements and restrictions are best dealt with under the District and Unitary Plans. The Great Barrier Local Board is currently working with the city's planning department to ensure that appropriate planning rules are included in the new planning Unitary Plan documentation. As the city is at the preparation stage of developing the Unitary Plan provisions for Great Barrier Island now is the perfect time to establish the IDA protocols as an integral part of the planning regime for the Island.

c) Private lighting and Retrofitting lighting

No other significant private lighting pollution was observed either during the lighting inventory on any of the sky quality data collection dates. Most private power on the Island is generated through the use of solar systems with large storage batteries. A very small number of people use wind generation systems as a complementary system. Back-up generators are used, but the cost of such systems ensures they are only used when absolutely necessary. Thus no-one wastes power and a de facto lighting curfew applies from around 10:00 give or take an hour. Consequently, the Board believes an educational and promotional

approach is all that will be required to increase awareness of the IDA goals and requirements. Over the coming years the Board will adopt the following strategies:

- i. School and public information booklets.
- li Dark Sky book.
- iii. Inclusion in the annual Off the Grid expo.
- iv. Inclusion of DSS material in DOC publicity and information packs.
- v. Barrier Bulletin articles.
- vi. Auckland Council and the Department of Conservation will be asked to formally establish the minimum IDA guidelines as a requirement on all public land. This will establish coverage of the regulations for 56% of the surveyed titles. In addition, this will establish the regime for all road reserves and coastal reserve areas.
- vii Information leaflet to existing landowners and to landowners who apply for resource consents for building and lighting projects. Under the Unitary Plan for the Island, the Board will propose that outdoor lighting requires a specific consent and be classified as a discretionary activity. Under the current plan, all landowners will be notified of the Island's sanctuary status and encouraged to meet or exceed the minimum requirements set out in the IDA guidelines. Updated sample sheets of approved lighting will be made available through the Council's planning consent process.
- viii. Site warranties and special purpose areas

For the transition period before the adoption of the revised Unitary Plan, the Local Board will propose that owners of sites which fall outside the IDA parameters or which have special use requirements (eg. Recreation, security, safety, etc.) be asked to obtain planning advice and warranties which will include curfews and agreed limitations on the nature of the lighting fixtures and their use.

d) Risk Identification

The Island faces few current risks to its dark sky status. Private outdoor lighting is barely noticeable and the little that does occur is widely scattered through the Island and not concentrated. Public lighting is non-existent, and will be controlled through Council and DOC policies. However, the Board will adopt a precautionary approach to risk management. It sees the following issues as warranting particular focus: possible intensification of development in settlement areas; private buildings on the larger sites outside the settlement areas, and technological change.

- i. Intensification of settlements

Only 5 or 6 building consents are issued in a normal year, and most of these are for holiday homes in the settlement areas and currently have no effect on the light generated from the areas on normal evenings after about 11:00.

Until the Unitary Plan is operative for the Island, landowners will be advised that the Island is a Dark Sky Sanctuary and encouraged to adopt the minimum standards as laid out in the IDA guidelines and the

board's guidelines. The Council's planners will be asked to adopt a precautionary approach in advising landowners of lighting that is acceptable on the Island. Under the Unitary Plan, outdoor lighting will be proposed as a discretionary activity (the highest threshold for allowing activities where the Council can impose a wide range of restrictions on a consent), and the IDA guidelines, or other best-practice as determined by NZ's environment planning regime, will be adopted.

ii. Private development outside settlements

Most private titles outside of settlement areas consist of very large blocks of land with minimal development rights. Subdivision is very difficult on large blocks outside the settlements. As above, owners will be encouraged to adopt the IDA standards, and a discretionary regime will be included in the revised Unitary Plan.

iii. Technological Changes

This is the only potential source of concern for this project over the long-term and is one of the major reasons for the application for Dark Sky Sanctuary Status. Solar panel technology and new battery technology are improving all the time and may completely change the economics of small-scale power production and use. Restrictions on outdoor light use will be included in the Unitary Plan and the high standard of "discretionary activity" applied to all significant outdoor lighting. Until the adoption of the Unitary Plan the Council's planners are asked to adopt a precautionary approach following the regional best practice guidelines for protection of amenity values, night sky and landscape values, and protection from light spill and its effect on adjacent and adjoining properties. Landowners will be encouraged to help preserve the Island's unique character.

e. **Colour temperature**

This issue will require careful management. Technological changes in lighting and lighting fixtures mean that landowners will need advice and that the issue of colour temperature will need to be highlighted in Council brochures and information sheets. The Island's reliance on solar generated power makes us enthusiastic early-adopters of power saving technology. Information will stress the advantages of restricting lights to the 2400K to 3000K range which aligns with the commercially available "soft or warm white" lights.

Achieving International Dark-Sky Sanctuary status would provide the motivation and impetus for the Auckland Council to incorporate lighting policies in line with IDA guidelines, and give weight to the Local Board's request that IDA guidelines and international best practice be incorporated into the Unitary Plan as it applies to the Island.