# Night Landscapes: A Challenge to World Heritage Protocols

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Starlight reserves are a relatively new concept whose definition and management protocols have come about in an era when understandings of human relationships with nature are dynamic and infused with cultural meaning. Rather than assuming that pristine nature can be sealed off from human influences, World Heritage guidelines now accept that our experience of nature may be enriched by attention to the multifunctional landscape, in which a blend of aesthetic, historical, cultural, scientific and environmental elements are carefully presented to tourists.

Observatories and clear night skies are ideal sites for such an interface, and the loss of dark skies has led to new systems of audit aimed at their preservation. This study of the potential for a World Heritage Site in the Mackenzie Basin, in the South Island of New Zealand, grounds the interaction between World Heritage goals and management of land use in a place where exceptional sky quality and competing land uses challenge multiple stakeholders to rethink their concepts of landscape.

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KEY WORDS
*World Heritage Site*
*Multifunctional landscapes*
*Celestial tourism*

Appreciation of landscape and outdoor activity forms the basis of tourism in the Mackenzie Basin (see Figure 1). Not only is the landscape important in its own right, but the golden tussock frames the first glimpse of Aoraki/Mount Cook for many of the over 300,000 visitors annually to the national park and Te Wāhipounamu World Heritage Site. While the Basin delights many travelling through the area, few are present at night. This number is increasing as a night landscape of stars complements the daytime 'big skies' of the Mackenzie Basin, which is well known for its sunsets, sunrises and cloud formations (Thompson, 2011, p 162). This paper investigates how World Heritage certification might help with management of the night sky in the Basin. The World Heritage certification process encourages a holistic assessment of the landscape and requires conservation values, cultural values and development needs of local people to be addressed.

## Current dark sky quality assurance schemes

International Dark-Sky Association (IDA) reserve certification has already been awarded to the Mackenzie Basin, one of four large areas designated internationally between 2008 and 2012 to have exceptional sky quality (International Dark-Sky Association, 2012).[1] The reserve's focal point is the Mount John observatory, which has required careful shielding from local lighting since the 1980s. While the three earlier reserves are either national parks or nature reserves, the Aoraki Mackenzie Dark Sky Reserve is a multifunctional area, partly conservation estate, partly Crown land and partly private land.

The IDA reserve status has encouraged visitors (Littlewood, 2013a) and will reinforce the importance of regulations that ensure local development must not

REFLECTION

*Figure 1: Typical view of the Mackenzie Basin (Two Thumb Range) (Keith Payne).*

impact on the sky, providing a focal point for consideration by those involved in the Basin's management. Multifunctional areas like the Basin, which engage national and regional interests, are complex to manage and prone to controversy. Dark sky reserves can, however, be managed to create less conflict than other terrestrial developments (Marín et al, 2010).

The Aoraki Mackenzie Dark Sky Reserve area is listed as a 'Window to the Universe', one of five identified by Cotte and Ruggles (2010) in the International Council on Monuments and Sites (ICOMOS) and International Astronomical Union (IAU) Thematic Study on astronomical heritage, a global study on the relevance of astronomy and archaeoastronomy to world heritage. The World Heritage Committee does not yet have specific references in its 2013 *Operational Guidelines for the Implementation of the World Heritage Convention* that support the designation of heritage sites on the basis of sky quality. However, addressing the under-representation of astronomical sites on the World Heritage List has been a project of the IAU and UNESCO World Heritage Centre since 2005 (Sidorenko-Dulom, 2007).

Securing World Heritage status for an area such as the Aoraki Mackenzie Dark Sky Reserve would require establishing that many aspects of the Basin have Outstanding Universal Value (OUV).[2] Specific elements in the management regime would need to preserve not only night sky quality in the areas allocated reserve status but also the conservation, aesthetic and cultural qualities across the whole Basin.[3] It may take several years to develop criteria within the Operational Guidelines specifically for night landscapes that would help with developing management plans for such areas.

Artificial lighting has become the defining influence on the night sky. Those in metropolitan areas see as few as six stars at night, and even those in peri-urban and agricultural areas find their relationship with the sky changing because of sky glow (Cotte and Ruggles, 2010). Moreover, whether lighting is perceived positively as a spectacle, signalling progress or providing safety, or less positively as a sign of excess energy consumption and a barrier to science and biodiversity, cultural framings also influence our understanding of lighting.

New Zealand has been engaged with World Heritage processes for decades. Current landscape management is influenced by such 'meta' management regimes, including their processes for governing cultural and associative landscapes (Stephenson, 2007).[4] However, the ongoing management of a World Heritage Site remains essential to the preparation of a successful proposal by the Department of Conservation (DOC) for inclusion on New Zealand's tentative list.[5] At present, DOC prefers to wait for amendments to the *Operational Guidelines* that specify night landscape criteria before considering the addition of the Aoraki Mackenzie Dark Sky Reserve site to New Zealand's tentative list (Abbari et al, 2011).

## World Heritage operational guidelines and a starlight reserve

It is anticipated that any amendment to the *Operational Guidelines* will be modelled on the starlight concept articulated in the *Declaration in Defence of the Night Sky and the Right to Starlight* (Marín & Jafari, 2007), which provides a conceptual framework for the development of starlight reserves. This conceptual framework is entwined with the ICOMOS–IAU thematic study on astronomical heritage, which identified astronomical sites that may embody OUV (Cotte and Ruggles, 2010). The University of Canterbury has facilitated attempts to establish a World Heritage sky-oriented site in New Zealand by extending the original Mackenzie Basin case study that featured in the *Thematic Study*, as well as exploring how a case might be mounted for a World Heritage listing, given the amount of 'official' documentation available on the subject.[6]

The *Operational Guidelines* are fundamental to understanding World Heritage certification processes because they articulate precise criteria for the inscription of properties on the World Heritage List. Therefore a brief explanation of relevant concepts from the *Operational Guidelines* and how they could be interpreted for the Mackenzie Basin dark sky site follows. Authenticity and integrity are core World Heritage concepts. To be considered as exemplifying OUV, proposed sites must meet strict conditions of authenticity and/or integrity (UNESCO World Heritage Centre, 2013, pp 21–24). Authenticity relates most closely to the cultural elements of a site. It is concerned predominately with the credibility of sources that help determine the site's OUV, which must build a complete picture of the nature, specificities, meaning and history of the site's cultural heritage. Notably, different elements of a site's cultural heritage and authenticity of sources are evaluated within the cultural contexts to which they belong. For instance, past and present uses of the Mackenzie Basin site by Māori could be as important to the World Heritage application as the current scientific use of the observatory. Aoraki/Mount Cook's spiritual significance to all Ngāi Tahu is expressed through the Tōpuni status of the mountain.[7]

> The visual catchments and view shafts between the southern shores of the lakes and the mountains in the north were particularly important to Ngāi Tahu for the purpose of maintaining relationships with those places (Boffa Miskell Limited et al, 2008, p 33).

Indeed, the entire Mackenzie Basin is a significant ancestral landscape to Ngāi Tahu. Gaining and maintaining World Heritage status would require far more Māori involvement in the management of the Basin to establish the site's authenticity.

Integrity is associated with the physical manifestations of a site's cultural and natural value. Primarily, it is concerned with the 'wholeness and intactness of the natural and/or cultural heritage and its attributes' (UNESCO World Heritage Centre, 2013, p 23). For cultural sites, the property and significant features that contribute to OUV must be well preserved. In the Mackenzie Basin site, the sky would deliver both the tangible and intangible aspects (eg, cultural relationships) and must be maintained to ensure the site's OUV for future generations. Additionally, for a nomination to the World Heritage List to be successful, the site must be large enough to be representative of each natural and cultural criterion it includes as contributing to its OUV so that development outside the site does not intrude on the experience within. For dark skies, the zone must be extensive.

Included in the Mackenzie Basin site's OUV are terrestrial natural criteria, which strengthen an application for inscription on the World Heritage List based on the night sky. The criteria are mainly met by the geomorphic significance of the Mackenzie Basin, as the largest intermontane basin in New Zealand. Many of the landforms present in the Basin are the result of late Pleistocene glacial advances and retreats that occurred 13,000 to 130,000 years ago and complement landforms within Te Wāhipounamu World Heritage Site (Department of Conservation, 1989).[8]

The inland alluvial surfaces, inland dune systems, kettleholes and braided rivers of the Mackenzie Basin are globally rare ecosystems. They provide important habitat for many rare and threatened native and endemic species of flora and fauna. The northern area of the Basin, covered by the Aoraki Mackenzie Dark Sky Reserve, has been identified as the area with the greatest potential for ecological conservation (Walker, 2010). Many creatures require night to be fully themselves, to hunt and avoid being hunted; even growth can respond to inbuilt circadian rhythms (Marín & Orlando, 2009, p 8). Further research is required on the relationship between the area's threatened species and light pollution, but nocturnal and diurnal species are present.

## Managing the night landscape in the Mackenzie Basin

With tourism now competing with farming for the status of being the major economic opportunity of the Basin, management of the landscape is becoming increasingly complex. A series of overlapping plans, produced by local, regional and central government bodies, is being challenged by rapid land-use change in the south of the Basin (Environment Court of New Zealand, 2011). The night sky is already protected in the north of the Mackenzie Basin in support of scientific activities at the University of Canterbury's Mount John Observatory (Mackenzie District Council, 2004).[9] The unique aesthetic qualities of the Basin and its tourism (over 1 million visitors pass through every year) have inspired innovative night sky tourism based in Tekapo (Earth and Sky) and Mount Cook Village (Big Sky Stargazing and the Sir Edmund Hillary Alpine Centre planetarium) plus small-scale guiding without access to powerful telescopes (see Figure 2). Fraser Gunn's astro-photography gives the night sky an international web presence.[10]

DOC management plans include dark skies among the values to be protected, but the Resource Management Act 1991 makes no mention of night sky quality.[11] The regional-level landscape plan mentions the sky as an important element

*Figure 2: Astro-tourism at twilight, Mount John: Comet McNaught in 2007 (Fraser Gunn).*

of the Basin (Environment Canterbury, 2010, p 142). Regional environmental reports have relevance to sky quality, and, as with the Mackenzie District Council, regional and national organisations interact with and consult tangata whenua, who value sky quality (Abbari, 2013).[12] Non-government agencies also help private landowners with the conservation of indigenous species and monitor the planning regime (Environment Canterbury, 2010). Landowners will continue to be bound by the Lighting Ordinances of the Mackenzie District Council, but further controls in all higher-level policies produced under the Resource Management Act would need to support night sky qualities explicitly before any part of the Mackenzie Basin could attain World Heritage status.

Many planning documents address the link between landscape and tourism. Tourism is understood as being double edged: it provides resources for conservation and education about environmental needs but also has the potential to degrade the environment as use of an area increases. Celestial tourism (which includes aurorae and other sky viewing from sunsets to eclipses) has minimal impact in fragile environments. Like other sustainable tourism initiatives, considerable thought is given to managing the impact of tourism numbers and activities and promoting the educational aspects of the night sky (Weaver, 2011).

## Starlight reserves and landscape controversy

The IDA Aoraki Mackenzie Dark Sky Reserve comprises two core zones at Mount John and Mount Cook airport and a protective zone, which extends the existing Outdoor Lighting Restriction Area in the Mackenzie District Plan 2004 to the boundaries of Te Wāhipounamu World Heritage Site behind the Mount Cook airport (a total area of 4,367 square kilometres; see Figure 3). An extension of Te Wāhipounamu would probably follow the IDA boundary. The physical barrier provided by the mountains between the Basin and the east coast towns and cities is also important. The potential for light to travel suggests the World Heritage *Operational Guidelines* criteria for buffer zones would have to be amended to

protect the attributes of starlight reserves and night landscapes. To date, the application for IDA status and exploration of the potential for World Heritage status have caused little local controversy. Twizel, the largest township in the Basin, with a population of about 1,000, has recently been included in the Outdoor Lighting Restriction Area in the Mackenzie District Plan 2004. Consultation carried out by the Mackenzie District Council has received positive feedback on preserving the night sky. The lack of controversy over the value of the night sky stands in contrast with the debate over land-based conservation initiatives.

The *Canterbury Regional Landscape Study Review* identified the entire Mackenzie Basin, including the valley floor and surrounding slopes and ridgelines, as an Outstanding Natural Feature and Landscape (ONF/L) (Environment

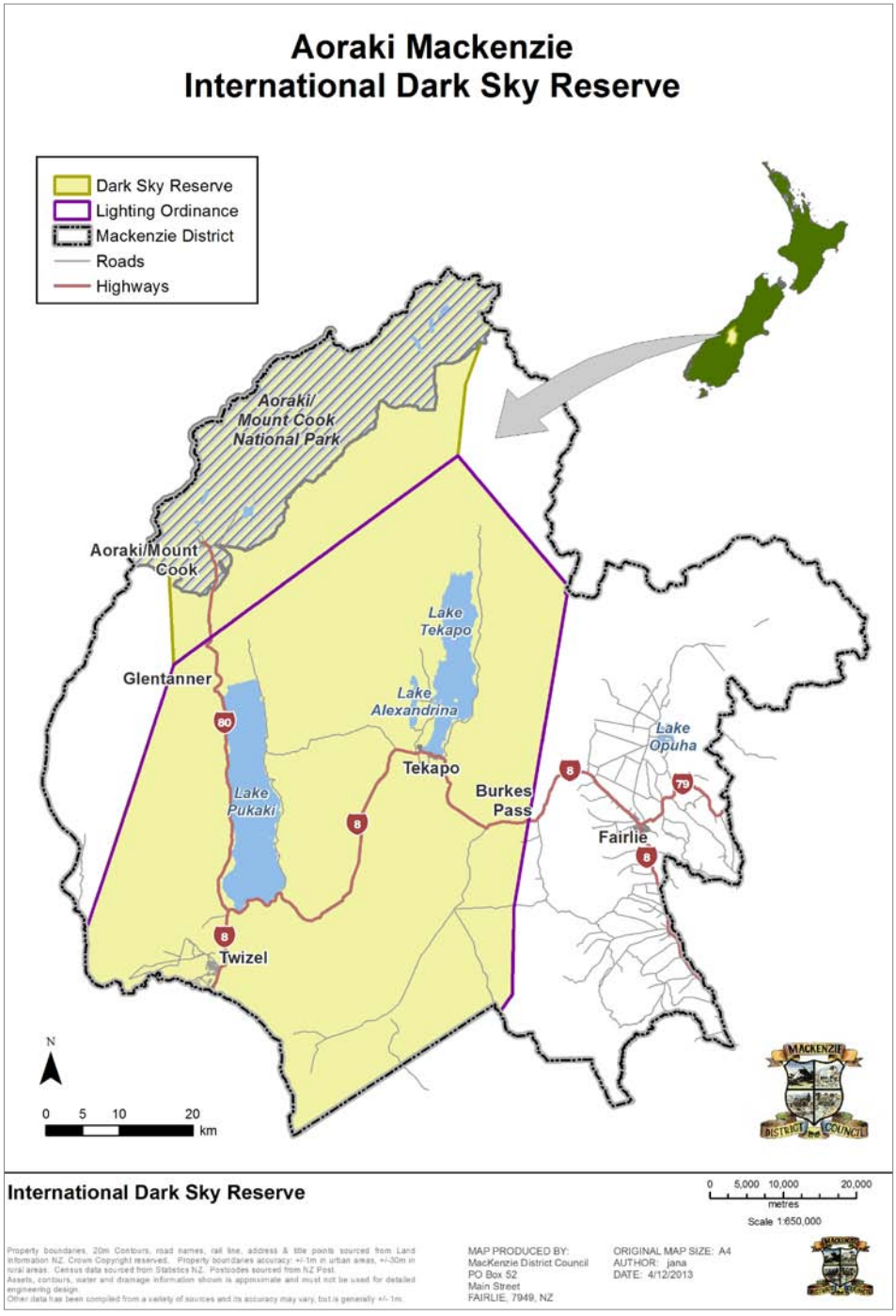


*Figure 3: Map showing the boundaries of the IDA Aoraki Mackenzie Dark Sky Reserve (Mackenzie District Council, 2013).*

Canterbury, 2010). Only a small section around and to the south of Twizel has been excluded, owing to high levels of human modification. This means the proposed starlight reserve World Heritage Site and its buffer zone fall within the designated ONF/L area. ONF/L was identified on the basis of several important landscape values, including aesthetic values such as the striking colour of lakes Tekapo and Pukaki, which form 'one of the most memorable landscapes in the country' (Environment Canterbury, 2010, p 142).

Given this ONF/L designation, management of the area should preserve the golden expansiveness of the tussock landscape, enhance the beauty and conservation values of the glacial lakes and ribbon-like braided rivers and preserve the general absence of people and human activity that enhances the area's aesthetic importance. Significantly, the night sky and its celestial bodies can be interpreted as 'superlative natural phenomena' (UNESCO World Heritage Centre, 2013, p 20). The lack of light pollution, the clarity of the night sky and the wide open vistas of the Mackenzie Basin create an area in which to view the 'exceptional natural beauty and aesthetic importance' of the night sky (UNESCO World Heritage Centre, 2013, p 20).

However, the ONF/L designation is contested. The Mackenzie District Council's Plan Change 13 sought to increase protection for the landscape values of the Basin (Mackenzie District Council, 2007). Defining a landscape as outstanding has ramifications for the application of the Resource Management Act 1991. The Mackenzie District Council's Plan Change 13 sought to increase protection for the landscape values of the Basin by recognising the ONF/L and managing development accordingly (Mackenzie District Council, 2007). However, this move was challenged by many parties, most often on the grounds that the landscape is highly modified (Collins et al, 2009). As a result of this public pressure, Plan Change 13 was altered so that the Mackenzie Basin is now defined as a distinctive and highly valued landscape with only some areas considered to be outstanding.

Arguments presented for and against defining the landscape as outstanding have been most recently revisited by the Environment Court's interim judgment in December 2011. At that time, the court called for the reinstatement of the original area as outstanding (Environment Court of New Zealand, 2011), but its final finding may not be available until 2015. If a convincing case for World Heritage Status is to be made, it will be crucial to confirm that all levels of government, from local to national, support the protection and management of landscape values deemed to contribute to the site's OUV. Judge Jon Jackson ruled an unfair burden of environmental responsibility should not be placed upon farmers, especially considering a large number of tourists and New Zealanders alike have enjoyed viewing the landscape (Environment Court of New Zealand, 2011). A mechanism for funding such protection has not been developed but could be essential for a future World Heritage application.

World Heritage requirements are consistent with a site's governance being undertaken by a network of co-managers from the public and private spheres, and with multiple sources of funding – 'a web of multiorganizational, multigovernmental, and multisectoral relationships' (Mitchell et al, 2009, p 72). Mitchell et al (2009) signal development of such webs is a long process, requiring years of negotiation, trial and adjustments. If there are indications that an

application for World Heritage status would be successful with the inclusion of the night sky, DOC, which represents the State Party, would probably spearhead formation of such governance networks and investigate diverse funding regimes. DOC is already moving in this direction with the conservation estate (Department of Conservation, 2013, p 5).

## Land management

This debate about landscape values can be understood in the context of uncertainty over the future development of the Basin. The great majority of land situated in the Aoraki Mackenzie Dark Sky Reserve is or was once held as Crown pastoral leasehold.[13] Some control over farming practices on these areas is retained through the Land Act 1948 and they are also covered by the Resource Management Act 1991. This has resulted in the general appearance of the landscape remaining relatively unchanged for the past 100 years or so (Parliamentary Commissioner for the Environment, 2009). As runholders gain private ownership of land via the tenure review process that has been available since 1998, they are free to undertake a much wider range of activities. Consequently, concerns have been raised that these activities will change the face of the Basin and affect the natural values of the land.

Changes to the Mackenzie Basin landscape over the past few decades, particularly in the south and as a result of irrigation schemes, are seen as reducing the landscape value of the Basin (Environment Court of New Zealand, 2011; Swaffield & Hughey, 2001). Change will undoubtedly continue, although the rate is contestable. Swaffield and Hughey suggest that an increasingly diverse landscape will emerge over the South Island high country as a whole and this 'provides for a greater range of adaptive strategies and thus widens the knowledge base upon which future management can draw' (2001, p 326). However, in terms of World Heritage status, the *Operational Guidelines* are clear – anything argued as contributing to the OUV of a proposed World Heritage Site must be able to be protected and sustainably managed for future generations (UNESCO World Heritage Centre, 2013, p 25). Irrigation, for example, has the potential to affect the reserve indirectly through intensification of production and associated buildings that may be lit at night. The growth of production or carbon sequestration forestry and spread of wilding pines are also a potential hindrance to viewing the full splendour of the night sky. World Heritage requirements would be best met by products such as merino wool that 'associate product with place' or conservation estate and/or farm-based outdoor recreation or cultural experiences seen as traditional in the Basin (Mitchell et al, 2009, p 76).

Measures taken to control many activities, such as limiting the development of farm bases and controlling new housing (eg, for retirees) and tourist accommodation, would have similar benefits for both day and night landscapes (see Figure 4). Attention to the sky may also be appropriate to the creation and protection of ecological corridors or networks of protected areas promoting both agricultural and wild biodiversity (Phillips, 2007). If a World Heritage listing provided new income streams through tourism or promotion of local production, these streams might help minimise the spread of introduced species, such as wilding pines and rabbits, which are current risks stretching the budgets of DOC and the Mackenzie District Council, as well as those of runholders.[14]

*Figure 4: The Mount John Village subdivision, which is lit by bollards that comply with the requirements of the observatory (Fraser Gunn).*

## Conclusion

While the individual cultural and natural elements present in the IDA Aoraki Mackenzie Dark Sky Reserve may not be enough on their own to establish the site's suitability for inclusion on the World Heritage List, the elements embody a diverse and unique cultural landscape, with the quality of the sky intimately linked to activities on the ground. Outdoor and nature-viewing activities are compatible with openness to a mood of acceptance of tranquillity and contemplation that is associated with the night sky and openness to learning about the universe (Miller, 2008). Careful lighting and the expansiveness of the landscape mean spectacular skies are accessible to everyone staying overnight in the Basin. Local enthusiasm for the IDA reserve is high.

Kirby's (1997) account of the establishment of Te Wāhipounamu World Heritage Site demonstrates how the process can raise concerns about the increase in oversight of local activities that is required. The recent controversy regarding the categorisation of the landscape and the need to resolve conflicts between tourism and other development in the daytime landscape reinforce the need to align community understandings and expectations as well as objective landscape judgements (Stephenson, 2007). Usually, the management control required for World Heritage status is achieved by obtaining national park status, but World Heritage thinking on this area is dynamic and is adapting to the needs of those such as farmers who are integral to the landscape. The night sky provides a new entrée into thinking about environmental issues in a multifunctional landscape.

## Acknowledgements

This article is part of an ongoing process of exploration of the potential for a World Heritage Site in the Mackenzie Basin, which coalesced into the formation of the Starlight Reserve Working Party in 2009, chaired by Margaret Austin. Members of the working party had been active in the area much earlier, with some attending the first and second starlight conferences, in La Palma in 2007 and Fuerteventura in 2009. The work undertaken by the authors during the 2010–11 summer and funded by the University of Canterbury is the principal source for this article. Another influence was discussion with the extensive team that worked on the application for reserve status to the International Dark-Sky Association and the IAU Extended Case Studies and Dark Sky Issues Workshop held at Mount Cook Village 14–15 June 2012. Particular acknowledgement is given to Clive Ruggles and Michel Cotte who reviewed the case studies for that workshop and to Margaret Austin and John Hearnshaw of the Starlight Reserve Working Party for their crucial role in developing the work programme. Our thanks also go to the anonymous reviewers of *Landscape Review*, although any problems in the final analysis are our responsibility alone.

### NOTES

1 The International Dark-Sky Association is a not for profit organisation whose secretariat is based in the United States. It promotes 'environmentally responsible outdoor lighting' through education, promotion of legislation, public policy and lighting standards.

2 Outstanding Universal Value signifies: 'The loss, through deterioration or disappearance, of any of these most prized assets constitutes an impoverishment of the heritage of all the peoples of the world' (UNESCO World Heritage Centre, 2008, p 2). Strasser (2002) emphasises the time taken to make changes to important definitions and processes concerning OUVs.

3 At present, the Aoraki Mount Cook National Park and several types of reserve managed by the Department of Conservation are included in the IDA area.

4 New Zealand has three World Heritage Sites and eight potential sites on its tentative list.

5 Only DOC can make an application for World Heritage List status on behalf of the State Party.

6 This employed the authors of this article in the summer of 2010–11, plus another three students in the summer of 2011–12 to help with the IDA application. The application was based on a literature review of the area (which has been extensively studied for many years) and interviews with 26 experts in DOC, the Mackenzie District Council, Environment Canterbury, Lincoln and Canterbury universities and Crown research institutes on the implications of protection of the night sky and World Heritage status (Abbari et al, 2011).

7 'The Tōpuni … is an enduring symbol of the tribe's commitment to conserving areas of high natural and historic values as well as ensuring an active role for Ngāi Tahu in the management of the area' (Department of Conservation, no date). Ngāi Tahu is the local iwi (tribe) whose members see themselves as stewards of the land. They prepare their own environmental assessments and goals and participate in the planning process (see note 11).

8 A large number of geo-preservation sites exist in the area and are listed in the Mackenzie District Council Plan (2004, Appendix One, pp 113–114). The legibility of the Basin's formative glacial processes makes these sites particularly valuable (Molloy, 2010).

9 Section 12 of the Mackenzie District Plan regulates lighting in the area covered by the IDA reserve.

10 See www.frasergunn.co.nz and www.youtube.com/user/FraserTK for time-lapse photography.

11 The Resource Management Act 1991 is New Zealand's main legislation for environmental management. Section 5 of the Act specifies local and regional governments' responsibility for the management of resources in their locality to 'promote the sustainable management of natural and physical resources'. Territorial local authorities, such as the Mackenzie District Council, administer various sections of the Act, the main instrument being a district plan, which provides guidance and standards for environmental management and inventories of heritage sites and other places needing special care.

12 Tangata whenua is the name Māori use for themselves as 'indigenous peoples of the land' with links to one or more specific localities (www.maoridictionary.co.nz).

13 This land has been leased to farmers by the Crown for pastoral grazing since the 1850s. Leases are for 33 years with a perpetual right of renewal. These large, extensively managed pastoral farms (the largest are around 20,000 hectares and the smallest around 10,000 hectares) are called runs in New Zealand and the leaseholders are called runholders.

14 As a step towards World Heritage status, the Mackenzie Sustainable Futures Trust has recently proposed that the government legislate for a stand-alone trust jointly appointed by the ministers for the Environment, Primary Industries and Māori Affairs. Under this proposal, 100,000 hectares of ecologically sensitive land could be protected through joint management agreements with landowners, the government and councils. Farmers' financial contribution to conservation would be acknowledged by providing fencing or covering other costs (Littlewood, 2013b).

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