NATURAL CHARACTER AND THE NZCPS 2010

National Workshop—
Summary of Discussion and Outcomes

CONVENED BY THE DEPARTMENT OF CONSERVATION

2 AUGUST 2011, WELLINGTON

New Zealand Government

Department of
Conservation
Te Papa Atawhai

CONTENTS

1. Attendees

Frank Boffa—Boffa Miskell

Vicky Froude—University of Waikato/Pacific Eco-Logic

Di Lucas—Lucas Associates

Stephen Brown—New Zealand Institute of Landscape Architects; also of Brown NZ Limited

Clive Anstey—Landscape architect

Rebecca Hughes—Boffa Miskell

Andrew Baxter—Department of Conservation

Clare Wooding—Local Government New Zealand

Justine Brennan—Bay of Plenty Regional Council

Dominic McCarthy—Auckland Council

Pere Hawes—Marlborough District Council

Ben Farrell—New Zealand Wind Energy Association

Michelle Pawson—Ministry of Fisheries, Aquaculture Unit

Michael Nielsen—Ministry of Fisheries, Aquaculture Unit

Paul Metcalf—Ministry for the Environment

Justin Murfitt—Northland Regional Council

Andrew Riddell—Department of Conservation

Stephen Wynne-Jones—Department of Conservation

Eleanor Jamieson—Department of Conservation

Karen Bell—Envirosolutions/Department of Conservation

Sarah McRae—Department of Conservation

Kate Brooking—Department of Conservation

Facilitator: Sarah Wilson—Down to Earth Facilitation Limited

2. Purpose of the workshop

The focus of the workshop was to discuss the methodologies used for assessment of natural character as it relates to the coastal environment under the New Zealand Coastal Policy Statement 2010 (NZCPS). The focus was on Policy 13—Preservation of natural character; and there was also discussion on Policy 15—Natural features and natural landscapes.

The proposed outcome of the workshop was to reach agreements on a methodology for undertaking assessments of natural character in the coastal environment or if a single methodology cannot be agreed, then a small number of options for methodologies.

3. Desired outcomes

The key desired outcomes sought by the workshop participants were:

- Need for consistency, simplicity, understanding, usefulness
- Clarity and agreement on criteria/methodology/definition
- Indicators/criteria of what natural character is
- A clear distinction between natural character and landscape (RMA sections 6(a) and 6(b))
- Useful guidance for implementing the NZCPS and in particular Policy 13 and the matters listed in 13(2)
- Identifying what assistance and resources regional councils and territorial authorities require
- A published outcome that records workshop discussion and agreements reached.

4. Scene setting

The New Zealand Coastal Policy Statement 2010 (NZCPS) took effect on 3 December 2010. It requires local authorities to amend all their planning documents and processes to give effect to the NZCPS provisions as soon as practicable. Local authorities, planners, landscape architects, consents officers and other practitioners have asked for support and possible guidance on how to implement the Policy Statement. In addition, some practitioners have specifically requested guidance to implement the NZCPS policies that relate to assessing and planning for Natural character (Policy 13) and Natural features and natural landscapes (Policy 15).

In their report to the Minister of Conservation, the Board of Inquiry recommended identifying known elements of natural character based on case law; as far as it felt comfortable. It noted there is always a risk with making a list that it does not cover all the relevant matters. The Board considered it essential that practitioners carry out further work to agree methodologies for assessing natural character.

The Department of Conservation (DOC) is working together with local government to prepare guidance to assist local authorities to implement the Policy Statement.

In particular, the methodologies for assessing and planning for natural character and landscape values in the coastal environment have evolved in the absence of clear definitions or guidance. Practice has evolved largely through the interpretation and application of the Section 6 RMA matters of national importance, including case law, and is understood to be nationally variable. This body of practice was also in response to the earlier NZCPS 1994.

The preparation of guidance for implementation of the NZCPS presents an opportunity for DOC, working with local authorities and practitioners, to provide coherent support. It may also be possible to get broad agreement on methodologies to support implementation of the new policies.

Implementation of the NZCPS is being overseen by a DOC/Local Government Steering Group that convened earlier in 2011. This Steering Group agreed early on to convene a workshop of experts to discuss the issues of natural character and to chart a way forward. The focus of the workshop was to discuss the methodologies used for assessment of natural character as it relates to the coastal environment under the NZCPS 2010. Participants were

chosen based on their experience and knowledge in this area—for example landscape and natural character specialists, local government, and coastal planners. It is important to note that those invited did not 'represent' any particular organisation or viewpoint, rather each person was invited as an individual who has significant experience with assessing natural character within the coastal and marine environment.

The assessment and management of natural character is a significant piece of work for local authorities who are required to amend all their planning documents and processes to give effect to the NZCPS 2010. This workshop provided an opportunity to carry out a reality check with end users: what are councils' needs regarding natural character assessment and methodologies etc?

5. Think pieces

DOC commissioned 'think pieces' from landscape architects Frank Boffa (Boffa Miskell) and Di Lucas (Lucas Associates), and Marine Technical Support Supervisor Andrew Baxter (Department of Conservation) as a platform for the workshop discussion. The think pieces are provided in Appendix 1. The following provides a brief summary of each think piece.

Frank Boffa

Frank's think piece focussed on the definition and interpretation of 'natural' and how Policies 13 and 15 might best be interpreted and applied. He explained that natural character occurs on a continuum from highly natural (pristine nature) to highly modified (urban/built development), and that there are thresholds from where the natural continuum gives way to and/or is replaced by a built continuum. Likewise there are different thresholds between indigenous natural and cultural or modified natural. Frank considers that natural character, in terms of indigenous nature, is a subset of landscape character.

Frank acknowledged that he is coming to the view that natural character is really about indigenousness/indigenous attributes; it is quite an objective thing. He feels it is easier to deal with it as indigenous nature—and maybe 'character' is the wrong word. In the NZCPS 2010 glossary it defines 'naturally rare' as 'originally rare: rare before the arrival of humans in New Zealand'. He considers that indigenous = natural, before the arrival of humans. Note: Some others at the workshop disagreed with this view and felt that natural character needs to be about more than just indigenousness.

Andrew Baxter

In his think piece, Andrew outlined the different marine ecological elements/environmental factors that help form and shape the natural character of the coast. These can be broadly grouped into biotic and abiotic features. There is considerable overlap and interaction between these various factors and it is their collective whole which helps establish the natural character of an area. Andrew considers the key integrating element of the ecological components of natural character is: natural biotic patterns—the natural distribution and abundance patterns of marine species. Biotic patterns occur vertically ('vertical' zonation offshore), and there are broad changes along the coast. Temporal changes add another dimension to biotic patterns.

Andrew then explained his involvement in the development of the 'natural character framework' for the Marlborough Sounds which describes natural character across two spatial scales (a broad scale encompassing the Sounds as a whole; and nineteen individual natural character units subdividing the Sounds at a finer spatial scale). The Marlborough

Sounds Resource Management Plan recognises that regional variability must be factored into natural character assessments.

Andrew noted that there is a lot of overlap and similar words used in different policies (e.g. Policies 11, 13 and 15). He feels the policies are interconnected with several overlapping features. As long as we acknowledge this, we can deal with it.

Many aspects of the marine environment are easily overlooked in resource management assessment and decision making processes because large parts of it are hidden beneath the waves. There is a real absence of information on marine ecology/natural character, and a lack of thinking in this area of assessment.

Di Lucas

Di's think piece explained that land-typing sets the base framework for assessing natural character in the coastal environment in every region/district (landform importance, e.g. Banks Peninsula). Onto that, we can layer physical naturalness that needs to be addressed for Policy 13 and Policy 15.

Scale is very important; areas are identified in total but we also need to window down into the detail, or aggregate up (i.e. hierarchical approach).

Natural character involves both the physical character and the perception of that character, so the degree of naturalness is context dependent. How the physical character is perceived depends on where it is. Four broad groups of values form key triggers for determining the degree of naturalness:

- Historic natural—evidence for underlying natural indigenous values and their sustainability.
- Eosystem processes—involving recovery of indigenous biodiversity
- Status quo—pastoral, tidy and productive vegetation, picturesque values
- Unobtrusive (or historic) development—replicating and subordinate to natural patterns or elements.

Di's think piece recognises the full spectrum: terrestrial and ocean, natural character and landscape. She noted that the NZCPS 2010 requires *all* landscapes to be assessed; this is a big step for clarity and direction. It would be efficient to assess both landscape and natural character physical and perceptual dimensions together in the one assessment. Di noted there is a lot of overlap because these are complex environments; we cannot separate the dimensions. There are policies that refer to specifics (e.g. Policy 11 Indigenous biological diversity), and other policies bridge/overlap these (e.g. Policy 13 Natural character and Policy 15 Landscapes).

Vicky Froude's article in Planning Quarterly

Vicky Froude's recent article[1] 'Quantitative methodology for measuring the natural character of New Zealand's terrestrial and aquatic coastal environments' was provided to the workshop participants. This article is provided in Appendix 2.

Vicky outlined the key features of the quantitative methodology (QINCCE) that she developed for measuring coastal natural character as part of her PhD research. The QINCCE (Quantitative Index for measuring the Natural Character of the Coastal Environment) methodology for measuring coastal natural character and its change provides a consistent

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[1] NZ Planning Quarterly two-part article: Part 1 June 2011; Part 2 September 2011.

framework for terrestrial and aquatic environments based on the measurement of parameters within spatial units. Actual and derived parameters are combined into three sub-indices and an overall natural character index. Additional assessment perspectives and parameters are available for detailed assessments of natural character such as might be required for a resource consent application. The methodology provides a quantitative integration of parameters measuring a very diverse range of attributes that contribute to, or detract from, natural character in both terrestrial and aquatic environments.

6. Reality check from end users

Local government attendees considered that with the introduction of the new NZCPS and other NPSs there is a strong argument for councils to do a comprehensive coastal assessment that integrates biodiversity, natural character and landscape components within their region or district.

Justine Brennan outlined the Bay of Plenty Regional Council's current situation and needs. The council released a Proposed Regional Policy Statement (RPS) two weeks before the gazettal of the NZCPS 2010; the Proposed RPS included identification of the coastal environment[2]. It now needs to give effect to the NZCPS 2010 as soon as practicable. The council is proposing to do this as a Variation rather than a Change. It is proposing to use submissions that it received and use direction from the NZCPS 2010 to inform the Variation.

The NZCPS 2010 directs us to identify areas of high and outstanding natural character, landscape values, water quality, cumulative effects, biodiversity etc. It would be useful to get a process to launch these assessments all in one go (i.e. need a process to do these assessments all together). The Bay of Plenty RPS needs to identify a series of areas for a range of needs (combined assessment). The Operative RPS is not clear in terms of identifying specific special features or areas; it is not consistent with the NZCPS 2010 and does not include any measurement of importance/significance. It relies on criteria but there is a lot of room for interpretation. The Bay of Plenty Regional Council is considering a Variation to introduce maps to the RPS which differentiate and identify areas of high and outstanding areas of natural character, natural landscapes, natural features, and biodiversity.

Marlborough District Council, Northland Regional Council, and Waikato Regional Council are in a very similar situation with their Regional Policy Statements.

In June 2011, the Marlborough District Council (MDC) initiated studies on identifying natural character. The council is drafting its RPS and has yet to decide when it will notify. Its concern is that if the methodology used in that study is different to any new methodology that emerges from this workshop, the council could be picked up for not using best practice methodology; it needs reassurance about rigour.

In October 2010, the Regional Policy Statement for Northland—Discussion Document was released. The Discussion Document was not a draft of a new RPS but it identified potential regionally significant issues and presented a range of options for dealing with them. Consultation on this document closed in December 2010. Council staff are currently working to prepare the draft new RPS.

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2   Bay of Plenty Regional Council staff report—
    http://www.boprc.govt.nz/media/102614/staff_overview_report_-_coastal_environment.pdf.

Waikato Regional Council's Proposed RPS 2010 was notified on 3 November 2010. Council staff are analysing submissions and making recommendations on the decisions requested prior to the hearings, which are expected to take place in 2012.

7. Key issues and discussion points

Section 6 of the RMA states:

> 'In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:
>
> (a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.'

When looking at natural character, we need to start with the assumption that the natural character of the coastal environment (including the coastal marine area) is something to be preserved. The action is to recognise and provide for this preservation of natural character and protection from inappropriate subdivision, use and development. It is about managing the coastal environment to preserve natural character.

Definition

∨

Identify and assess attributes including those listed in Policy 13(2)

∧

Effects of activities upon individual attributes and the implications of effects for natural character as a whole.

This discussion led the group to inquire about the definition of natural character, the assessment attributes, and evaluation of high and outstanding natural character.

Definition

A key step involves answering the question 'what is natural character?' We then need to look at 'what are the methods we can use to describe and measure it?', and 'what methods can we use to identify "high" and "outstanding" natural character?'

The group considered that Policy 13(2) is not suitable as a definition for natural character in itself. The policy allows for biophysical and experiential attributes, however the list only provides a minimum of what needs to be included. It provides the attributes but this is not an exhaustive list; it reads 'may include matters such as' therefore it is only a starting point. It was noted that the Board of Inquiry provided direction on the essential elements of natural character based on case law. The Board's list is directive but not definitive; it wanted to leave it open so that professionals can work on this further and evolve it.

As a starting point, the group looked at Frank Boffa's and Vicky Froude's definitions of natural character.

Frank Boffa's definition:

The expression of natural elements, patterns and processes in a landscape/seascape where the degree of 'naturalness' depends on:

> *i. The extent to which natural elements, patterns and processes occur, and*
>
> *ii. The nature and extent of modifications to the landscape/seascape and ecosystems,*
>
> *Where the highest level of natural character (greatest naturalness) occurs where there is least modification.*

Frank considers it would be more relevant to talk about the 'coastal character' rather than 'natural character'.

Vicky Froude's definition:

Natural character occurs along a continuum. The natural character of a 'site' at any scale is the degree to which it:

- *Is part of nature, particularly indigenous nature*
- *Is free from the effects of human constructions and non-indigenous 'biological artefacts'*
- *Exhibits fidelity to the geomorphology, hydrology and biological structure, composition and pattern of the reference conditions chosen*
- *Exhibits ecological and physical processes comparable with reference conditions.*

Human perceptions and experiences of a 'site's' natural character are a product of the 'site's' biophysical attributes, each individual's sensory acuity and a wide variety of personal and cultural filters.

Vicky explained that the definition was the first stage in developing methodology for measuring natural character change. In developing this 'first-principles' definition, Vicky reviewed literature from a wide range of disciplines to identify a set of interpretations of natural character that were then each assessed against a set of criteria developed for the New Zealand legal/policy and environmental context. She then compared this definition with a comprehensive analysis of 100 Environment Court decisions on appeals made under the Resource Management Act (RMA) (using cases that a RMA database search identified as addressing natural character). Vicky found that the definition was generally consistent with Court interpretations of natural character (noting that the Environment Court is not bound by its own decisions and so it can be inconsistent on some matters).

Vicky explained that the definition is designed to apply to land and aquatic (including marine out to the territorial sea boundary) coastal environments, and is also appropriate for freshwater environments not in the coastal environment (section 6(a) applies). The list in the definition is cumulative; you need to look at all of the bullet points. The top end of the continuum represents/reflects what there would be if humans had not arrived but natural processes had continued (i.e. measuring how natural it is).

The majority of the group felt that the definition also needs to cover 'context' because the degree of natural character responds to context. They thought that this was not covered in Vicky's definition. In Vicky's view, the incorporation of 'reference conditions' within the core definition clearly does address aspects of context.

Some considered that context and perception need to be addressed as part of a definition of natural character; rather than a context statement to the definition (i.e. it is not secondary information as Vicky's definition reads). Context can be important. For example, a pastoral environment could be rated differently depending on where it is located (e.g. coastal or inland) and the degree of modification in the regional and district context.

Vicky suggested that context is best addressed recognising that different coastal environment types have different levels of natural character remaining and this context needs to be addressed in setting thresholds (under NZCPS). She also noted that our assessments of naturalness are prone to the 'shifting baseline' syndrome where people's assessment of 'natural' is set at lower levels over time reflecting the ongoing loss of natural character in many areas.

It was argued that the way Policy 13(h) is read (because of the position of the semicolon) indicates that 'context' relates to the whole list of attributes in clause 13(2). This view was not broadly accepted by the group. Note: Further advice was sought on this after the workshop—it was clarified that 'context or setting' relates only to clause 13(2)(h), not the whole list.

The group then looked at the following definition which was developed at the Ministry for the Environment's 'Environmental Performance Indicators for Natural Character' workshop held in 2002:

> Natural Character is the term used to describe the natural elements of all coastal environments. The degree or level [of natural character] within an environment depends on:
>
> 1. The extent to which the natural elements, patterns and processes occur;
>
> 2. The nature and extent of modification to the ecosystems and landscape/seascape;
>
> 3. The highest degree of natural character (greatest naturalness) occurs where there is least modification;
>
> 4. The effect of different types of modification upon natural character varies with context and may be perceived differently by different parts of the community.

The majority of the group agreed upon this definition to use as a working basis to move forward; however it made a small editorial change to number 3 so that it reads: *'The degree of natural character is highest where there is least modification'*. The group also felt it would be helpful to include a footnote at the end of item 1 in order to list the attributes referred to in Policy 13(2). Some observed that it was interesting that the definition goes back to the one developed in 2002. Vicky noted that this definition does not include baselines or reference conditions and in her view would not be the best definition for measuring change.

Attributes

Natural elements, processes and patterns

Andrew Baxter explained that there are many factors which affect the natural character of the marine environment. These are broadly grouped into biotic and abiotic (physical) features.

- The biotic elements involved are: species and communities (building blocks for natural character), diversity and productivity (areas can be so different), biotic patterns (distribution and abundance), habitats, biological processes (predation, competition etc), and temporal changes (nothing is static, such as climatic effects). We need to consider 'why is that community there?' (e.g. what processes are affecting the community?).

- The abiotic elements involved are: natural substrates (these contribute to the natural character of an area), geology (different geological formations), environmental complexity (this is not a good measure of natural character), water quality,

and physical processes (that shape what you see on the coast). We need to build ecosystem health into our thinking.

Biotic patterns of nature (seeing what animals and plants are where), helps define natural character. Andrew considers this is a key integrating element—the natural distribution and abundance patterns of species. There are different biotic patterns, both alongshore and moving from the landward boundary of the coastal environment through to offshore. There are different zones in the marine environment and local scale complexity; we need to look at these patterns.

Natural character is not only about the iconic, special, rare things; it is also about the mundane, common areas which are equally important in defining the natural character of the coast. Regional variability also needs to be factored into any overall natural character assessment.

Connectivity with the terrestrial environment is also very important. Arguably greatest natural character values will exist where there is unbroken biological sequence from terrestrial to marine. There are Environment Court decisions recognising integration between marine and terrestrial ecology and its importance to natural character.

Perception

The role of perception in natural character is a key issue. The workshop participants discussed what is meant by perception—is it a subjective view of whether or not it is natural?

Most of the group felt that natural character assessments should reflect to some extent what value the community places on an area. Natural character may be important to a community even if it is not at the high or outstanding end of the scale. For example, a beach that is surrounded by a heavily modified environment but the community values that beach; it has a high perception of it and feels that it still has high coastal natural character. It comes down to how the community perceives their coastal natural character.

Perceptions of areas depend on scale/how we view the area. For example, when looking at a 1 km section of coast, our perception of that area will be influenced by what we can see within that limited section of the coast; however if we then widen this out to look at a 50-km section of that same piece of coast, our perception of that area will likely change due to seeing that section of coast in its broader context.

The majority of the group felt that the assessment of natural character does include people's perceptions; that perception is part of natural character and not a separate set. Vicky noted that she disagrees with this view; she considers that naturalness is independent from perception. She considers that biophysical parameters (including those that directly affect people's perception of the naturalness of an area) can be assessed qualitatively and measured quantitatively. Vicky noted that much of the NZ work on perception/preference identified groups of people in terms of their perception/preference patterns.

Some of the list in Policy 13(2) is physical and some is perceptual:

- (a), (b), (c), (d) are biophysical
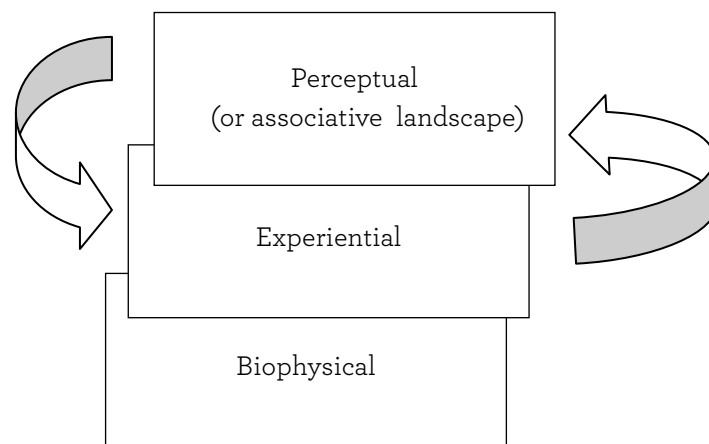- (e), (f), (g), (h) are more experiential

Policy 13(2)(h) lists experiential attributes as a matter that may be taken into account. Are they part of the natural character assessment or management process? Most of the group agreed the experiential attributes should be included and recognised in the natural character assessment.

The experience of a place is influenced by the degree of natural character. The group looked at whether natural character assessment should be dealing with experiential aspects (i.e. how people perceive the naturalness of the environment).

How you define natural character is extremely important; and where/whether perception fits in. One option could be to bring together Vicky Froude's quantitative biophysical parts, and the other perceptual elements.

Issues discussed included: Is experiential the same as perceptual? There was no agreement on these issues. The following diagram was developed by some in the group in an attempt to distinguish the contributing layers. Please note that this diagram does not represent agreement of the group, especially concerning the labels attached to the differences between 'perceptual' and 'experiential'.

Figure One: A possible distinction—natural character layers

Biophysical layer: Patterns, processes, elements. The core layer. [Policy 13(2) (a)–(d)]

Experiential layer: When you are experiencing the environment. [Policy 13(2) (e)–(g)]

Perceptual layer: Your (removed) perception of the environment and how you perceive the values of a place. [Policy 13(2) (h)–context]

Evaluation

Identifying the coastal environment

A key step in assessing and evaluating natural character is to identify the coastal environment. This is fundamental and needs to be addressed separately. Policy 1 of the NZCPS 2010 gives leads on what the coastal environment is. It would be good to get consistency on approach at a national level (this would help sort out cross-boundary issues). However, it often depends on how each region and district decides to interpret the 'coastal environment'. There needs to be a robust methodology for identifying the coastal environment which is agreed upon and endorsed.

Questions are often raised about the zone of coastal influence vs. zone of coastal dominance—which is which, and can one stand without the other? Then, having identified the coastal environment, the next question is: how are we going to avoid, remedy or mitigate activities in these areas?

The following examples were discussed by the relevant councils:

- Coromandel District Council has carried out a study to identify the coastal environment. Most was determined from topographic maps and by driving around

(direct interaction between coastal and terrestrial). It notes that variability is important.

- Marlborough District Council's study of the coastal environment entailed looking at where the coastal processes stopped. It used policy around identification, and policy around management of activities. These could easily be made into Rules. People can often agree on methodology but disagree with the lines on the map.
- Bay of Plenty Regional Council asked Boffa Miskell[3] to do some work on identifying the coastal environment (focussing on coastal dominance). A major issue arose about restricting private property rights and getting agreement on which land is in the coastal environment. The council could not get agreement from people on this (e.g. people with coastal properties did not want their land to be identified as within the coastal environment).

It is important to think about and articulate the possible implications for private land owners who find their land caught in the 'coastal environment'. Landowners are naturally inclined to resist restrictions on their activities and so will resist any provision that adds (unreasonably?) to constraints. Planning provisions and assessments to define boundaries need to evolve together.

Other councils have approached the Bay of Plenty Regional Council seeking advice on defining the 'coastal environment' (these other councils are starting from scratch). We need efficiencies in developing methodologies so different councils don't have to keep reinventing the wheel.

Mapping

The NZCPS 2010 requires that several thresholds for natural character be identified (outstanding, high). This requires appropriate GIS-mapped information. However, not all mapping can be done based on existing GIS layers; it also needs some ground-truthing. There are a range of different possible data sets, such as biophysical attributes and aerial. The issue is not just 'where you draw the lines on the map' but that you *have* drawn a line. As noted above, lines will always be controversial—the moment things go on a map, people will comment. The public need to know the impact of the lines being drawn, and it can be preferable to know the associated policies and rules.

There is a need for collaboration between those undertaking natural character assessment and planners (i.e. develop maps and policies in collaboration). It is important that landowners know what the implications of the lines are; policies and mapping need to be discussed with landowners. The management implications also need to be considered.

Ideally, natural character and other assessments would be done over a whole region or district, not just the coastal environment. Cooperation between regions and districts is also ideal. It should also be remembered that most of the coastal environment is marine intertidal and subtidal.

Comprehensive assessments that map and evaluate the significance of resources are extremely valuable to assess the effects of activities, to address matters indicated in RMA sections 6 and 7, and to achieve sustainable management.

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[3]   Boffa Miskells 'Defining the coastal environment methodology report', prepared for Bay of Plenty Regional Council, October 2010.

Scale

Scale is very important when addressing natural character; it plays an important part in the natural continuum. Areas should be identified in total, but we also need to window down into the detail (hierarchal approach). Frank Boffa considers that the continuum model can apply to all scales. An issue regarding scale is: national significance versus local significance.

When looking at 'scale' in the marine environment we need to think of variation that can occur along the whole big broad section of the coast, and patterns occurring at local scales (e.g. headlands, bays). Andrew Baxter was involved in the development of a 'natural character framework'[4] for the Marlborough Sounds. The natural character framework has been adopted as Appendix 2 of the Marlborough Sounds Resource Management Plan[5] and describes natural character across two spatial scales:

- a broad scale encompassing the Marlborough Sounds as a whole; and
- dividing the Sounds up to a finer regionally based scale.

Natural character needs to be addressed at each smaller regional area/scale rather than the broad natural character of Marlborough Sounds as a whole.

Size does matter when you are looking at natural character—given the broad biotic patterns which exist along the coast, reasonably large and representative examples of the coast need to be protected in order to preserve natural character.

Methodologies

A number of matters need to be considered when looking at methodologies, such as:

- What are we testing? (Approach using the NZCPS 2010 requirements.)
- How will they be set up?
- How will they be applied?
- How is the marine component captured and managed?
- What is the consequence of applying a different methodology?

The different approaches for assessing natural character were discussed by the group. Vicky Froude explained the QINCCE methodology. This approach measures change in a quantitative way (i.e. a clear set of parameters; robust so it is not open to 'gut feeling'). She considers that if this method is used it will provide reasonably consistent outcomes.

An alternative view—but not the only other view—is that a fair share of the assessment comes down to judgement calls. It depends on what you are measuring or assessing; as there are objective and subjective layers. Indigenousness, for example, can be measured quantitatively.

Whatever methodology is used, what needs to be identified is 'these are the results that should be coming out at the end.'

The following options were discussed by the group:

- Testing Vicky Froude's method and other methods in the same stretch of coast, or
- Using a combined/hybrid methodology (e.g. bits from Vicky Froude's methodology to measure the quantifiable parts plus qualitative assessment).

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[4] S.M. McRae, D.J. Lucas, S.P. Courtney, A.S. Baxter, R.F. Barrier, I.H. Lynn. 2004: A natural character framework for the Marlborough Sounds. *Occasional publication no. 62.* Nelson/Marlborough Conservancy, Department of Conservation, Nelson, New Zealand. 70 p.

[5] http://www.marlborough.govt.nz/Your-Council/RMA/Marlborough-Sounds-Resource-Management-Plan.aspx

Local government attendees said they would find it helpful to have one assessment approach that is efficient for all needs (e.g. landscape, natural character, biodiversity etc) and which is endorsed. Ideally, such a coastal assessment should cover the whole region/district and this assessment would inform natural character. A number of the group also considered that it would be preferable for DOC to endorse the preferred approach(es).

Some in the group suggested picking up the Marlborough District Council methodology and adapting it for use in the Bay of Plenty, i.e. persist with one methodology and refine it. The group considers it is important to develop a methodology that best suits your area; to learn from what others have done; and to get any proposed methodology peer reviewed. An issue that needs to be looked at is 'what is the consequence of applying a different methodology?'

Another possibility could be to come up with a Standard Operating Procedure (SOP) for developing/doing a methodology. The SOP could outline a series of steps and this could sit alongside a real case study.

The group recognised that the issue of a consistent natural character assessment methodology raised some important questions for discussion. The group did not come to any agreement on this matter but did agree that continuing discussions would be useful and attendees were interested to stay engaged in this process. It was agreed that it would be useful to continue this discussion at a further workshop. The group considered it would be helpful to get together a small group of those that have already prepared landscape and natural character assessments, plus experts from DOC, NZ Institute of Landscape Architects and NZ Ecological Society, to establish core elements of the assessment and provide technical input on methods as well as noting areas of difference.

Landscape assessment

Landscape assessment involves a broad assessment that covers a number of RMA/NZCPS-related components. Frank Boffa considers that natural character, in terms of indigenous, is an element of this; it drops out as a subset of this assessment. He noted that, in simple terms, it would be more appropriate and clearer if the contents of Policy 15 dealt comprehensively with the Protection of Coastal Landscape/Seascape Character (including outstanding features and landscapes), and Policy 13, as a subset of Policy 15, dealt with the Preservation of Natural Character with the focus on indigenous nature.

The following question was then asked: 'If natural character drops out of landscape assessment as a subset, how do you handle a habitat that looks fine but the ecology is damaged?' (i.e. under the landscape assessment it would look fine). Frank responded that ecologists would look at the indigenous components during the assessment and would discover this. A different example would be a habitat (e.g. mangroves) where the public perception may be low but the area has high ecological values—in this case the landscape values may rate low but the ecology values would rate high.

In practice, landscape assessment approaches are done for a specific reason and generally fall into three categories:

(1) Area/resource based assessment—to inform strategic policy, plan making

(2) Issue driven—to inform capacity/capability studies, site selection etc

(3) Project specific—to assess effects, investigate options for remedy or mitigation etc.

It is not easy to find an assessment approach that satisfies everything from the strategic planning through to project specific appraisals. Landscape assessment has to be project driven; there has to be a reason for it (i.e. what are you trying to get out of it?).

Thresholds

Matters of national importance identify parts of the environment that New Zealanders hold in particularly high regard that must be recognised and provided for, including the preservation and protection of those matters. Some areas of high natural character generally may be facing limited risks, for example some mountain tops. Other areas are more compromised, such as estuaries and wetlands, given the frequent proximity of human activity and the potential for cumulative effects. Given how much human development has focused on lowland and coastal environments, many coastal areas, wetlands and estuaries are quite modified and their indigenous character relatively compromised. Strict application of standardised thresholds risks missing some of these areas. This is a contrary outcome given the significance of these areas, as well as the importance placed on them within a region or district and/or a community.

The NZCPS 2010 is more instructive on the need to identify and assess natural character, and sets thresholds to protect outstanding natural character through the avoidance of adverse effects of activities. The RMA places a duty on preserving natural character across the board, not just the 'outstanding' parts. All areas have to be assessed; this is a big step for clarity and direction. A key question is: 'what are the important components of this area?' When looking at Policy 13, you need to know what you have got and you need to identify it. Areas that have been compromised and need restoring also need to be identified (NZCPS Policy 14). A baseline assessment of natural resources would enable a snap-shot in time of natural character.

Frank Boffa considers that natural character occurs on a continuum from: Natural (pristine) > Built (modified). Each of these sections of the continuum ranges from very low to very high. For example, in the 'Built' section of the continuum it ranges from very low modified to highly modified. We need to look at where the thresholds are on this continuum: there are thresholds between the Natural and Built sections; there are also thresholds between the low–high ranges within those sections of the continuum.

When looking at natural character, there are a range of issues to consider, such as:

1. How do you decide where things fit on the continuum?
2. How do you factor in activities that may not be permanent?
3. How does abandoned/regenerating land fit in the continuum?
4. Natural character assessment—must set thresholds.
5. Need to be clear on what 'natural' means.

The group discussed the issue of whether 'outstanding' is within the context of, or is part of, 'high' or if it is separate. The following views were expressed:

- 'Outstanding' and 'high' are not the same.
- 'Outstanding' is not a separate component, it is a sub-set of 'high' (i.e. the top end of 'high'). Outstanding is a threshold.
- Need to come up with criteria to help identify 'outstanding' natural character (a sub-set of some 'high' natural character areas).

Thresholds between the 'pristine' and 'built' sections of the continuum need to be explored, as well as where things sit on the continuum. Local government attendees asked for robust, clear criteria that can be endorsed by a suitable body.

Di Lucas's think piece notes that the entire coastal environment must be assessed in terms of natural character (Policy 13), and natural features and natural landscapes (Policy 15). Policy 13(1)(c) requires councils to identify 'at least areas of high natural character'. She notes that the 'avoid' threshold relates to 'outstanding' natural character; and that 'high' is only in relation to what you need to identify.

Conclusion

Definition

When the group looked at natural character in the context of the NZCPS 2010, the majority agreed on the following definition which is a slightly adapted version of the definition from the Ministry for the Environment's 'Environmental Performance Indicators for Natural Character' 2002 workshop, with the addition of a footnote that refers to the relevant parts in the Policy 13(2) list:

Natural character is the term used to describe the natural elements of all coastal environments. The degree or level of natural character within an environment depends on:

> *1. The extent to which the natural elements, patterns and processes[1] occur*

> *2. The nature and extent of modification to the ecosystems and landscape/seascape.*

The degree of natural character is highest where there is least modification

The effect of different types of modification upon natural character varies with context and may be perceived differently by different parts of the community.

Next steps and actions

The group agreed that it would be useful if the following next steps and actions occurred:

- DOC to commission a landscape architect to peer review Vicky Froude's QINCCE model. (Note: This action is on hold pending the outcome of the following action).

- Use current regional examples, specifically Marlborough District Council's, to examine current approaches. Initiate a discussion between DOC and Marlborough District Council on the council's approach. Marlborough District Council's work could be 'peer reviewed' by a range of other landscape architects or experts. The results of this could provide guidance to the other councils such as the Bay of Plenty and Northland in regard to their plan variations/reviews**.

  > **Note: This discussion occurred after Pere Hawes (Marlborough District Council) had left the workshop, therefore this suggested next step was not agreed on at the workshop. It has since been discussed and agreed to with Pere after the workshop.

- The majority of the group agreed it would be useful to hold another workshop to further discuss and progress work on 'Methodology'. Suggest presenting Marlborough District Council's material at that workshop and using this approach as a working example. Note: Feel it is important that other experts get engaged (e.g. ecologists) and that end-users (i.e. councils) continue to be very involved in the process.

- Include the key agreements, the report of this workshop and the three think pieces in the NZCPS implementation guidance that is being prepared for posting on the DOC website.

For further information on this project go to www.doc.govt.nz/coastalpolicy

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[1] For the purposes of interpreting the NZCPS 2010 Policy 13.2, 'elements, patterns and processes' means: biophysical, ecological, geological and geomorphological aspects; natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks; and the natural movement of water and sediment.

Appendices

Appendix 1:
Workshop think pieces 2011

a.   Frank Boffa

b.   Andrew Baxter

c.   Di Lucas

Appendix 2:
Quantitative methodology for measuring the natural character of New Zealand's terrestrial and aquatic coastal environments

Victoria Froude

Natural Character Workshop – Think Piece

Prepared by Frank Boffa

1. Introduction

1.1 As background to the Department of Conservation sponsored workshop on the NZCPS (2010), and in particular **Policy 13 – Natural Character** & **Policy 15 – Natural Features and Natural Landscapes**, three "think pieces" have been commissioned as a platform for the workshop discussion. While the primary outcome of the workshop is to gain agreement on a methodology or methodologies for natural character assessments, I consider that unless and until there is greater clarity with the definitions and the assessment attributes, there is little to be gained in adopting an assessment methodology.

1.2 Since the introduction of the RMA in 1991, the interpretation of landscape provisions, and in particular natural character and outstanding natural landscapes, has evolved in the absence of clear definitions or national guidance. As a consequence, landscape considerations have been interpreted and applied widely and inconsistently throughout different regions and districts and/or are driven by project specific outcomes, some of which are not necessarily in accordance with best current professional practice.

1.3 This paper, which focuses on the definition and interpretation of "natural" and how **Policies 13 and 15** might best be interpreted and applied, is presented as a personal opinion and does not necessarily reflect the views of all Boffa Miskell landscape planners or ecologists.

2. NZCPS 2010

2.1 In terms of natural character, natural features and landscape values **Objective 2** of the NZCPS seeks –

> *To preserve the natural character of the coastal environment and protect natural features and landscape values through:*
>
> - *Recognising the characteristics and qualities that contribute to natural character, natural features and landscape values and their location and distribution.*

2.2   In regard to the above, **Policy 13** deals with natural character and **Policy 15** deals with natural features and natural landscapes rather than landscape values as such. Landscape values *(being the importance that people and communities attach to particular landscapes and landscape attributes[1])* is covered in part in a number of items under **Policy 15 (c)** where in the context of the policy framework, the values listed would perhaps be better expressed as attributes (being *biophysical features, patterns and processes; sensory qualities; and spiritual, cultural and social associations, including both activities and meanings[2])* rather than values as such.

2.3   Notwithstanding this, while the NZCPS refers specifically to "natural" in both **Policies 13 and 15**, there is no single definition or suggestion of any difference in the meaning of natural in either policy or indeed, in general within the RMA or the NZCPS.

3. *Definition of Natural Character*

3.1   While neither the RMA or the NZCPS define 'natural' in terms of natural character, natural features and natural landscapes, the working definition that has evolved and is now widely accepted, particularly in terms of RMA s6(a) considerations, describes natural character as –

> *The expression of natural elements, patterns and processes in a landscape/seascape where the degree of 'naturalness' depends on;*
>
> i.   *The extent to which natural elements, patterns and processes occur, and*
>
> ii.   *The nature and extent of modifications to the landscape/seascape and ecosystems,*
>
> *Where the highest level of natural character (greatest naturalness) occurs where there is least modification.*

3.2   Inherent in this working definition is the proposition that natural character occurs on a continuum from highly natural (pristine nature) to highly modified (urban/built development). In general terms, the diagram below is illustrative of the natural character continuum that tends to be applied when expressing levels of naturalness.

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[1] Best Practice Note – landscape Assessment and Sustainable Management. NZILA June 2010
[2] Best Practice Note – landscape Assessment and Sustainable Management. NZILA June 2010

Natural Character Continuum

Indigenous/ Pristine	Very High	High	Moderate High	Moderate	Moderate Low	Low	Very Low	Totally Modified

3.3 In March 2011, Boffa Miskell landscape planners, ecologists and planners attended an 'in house' workshop to review aspects of the NZCPS, and in particular the meaning and application of the terms 'naturalness' and 'outstanding' in the context of natural character. At the workshop it was accepted and agreed by all participants that while **"character"** as a term or as a descriptor was not a word generally preferred or used by ecologists, the meaning of 'naturalness' that we as landscape planners and ecologists felt best represented our individual and combined professional views was that naturalness as a concept was a –

> *Measure of the degree of human modification of a landscape/seascape or ecosystem expressed in terms of;*
>
> *i. Ecological naturalness (indigenous nature)*
>
> *ii. Landscape naturalness (perception of nature)*

3.4 While ecologists tend to use words like significance rather than character (representativeness and rarity rather than outstanding), landscape planners define landscape character as being *the distinctive combination of landscape attributes that give an area its identity*[3]. Thus, while the ecological and landscape views of naturalness are complementary, they are different in so far as ecologists interpret natural character specifically in terms of indigenous attributes, whereas landscape planners tend to take a broader view that can encompass both indigenous and modified natural attributes. Accordingly the thresholds differ.

3.5 In a practical sense, while natural character occurs over a continuum, we need to acknowledge that there are thresholds from where the **natural continuum** gives way to and/or is replaced by a **built continuum**. Likewise there are different thresholds between indigenous natural and cultural or modified natural. Thus, the natural continuum needs to be more explicit and confined to the natural end of the continuum rather than attempting to include the highly modified landscapes at the built end of the continuum. Natural character in a practical sense should therefore be confined to

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[3] Best Practice Note – landscape Assessment and Sustainable Management. NZILA June 2010

a more narrow range at the indigenous nature (pristine) end of the continuum, with the built continuum taking over from the natural at a threshold where naturalness gives way to a more built/urban like character where nature is subordinate.

3.6 In this model the rural landscape, which comprises most of our threatened and vulnerable coastal and indeed inland landscapes, sits in part in both continuums. The diagram below illustrates in general terms how the two continuums expressed above relate to each other in the context of a wider landscape continuum where natural character is more appropriately seen as being a subset of landscape character.

Landscape Character Continuum
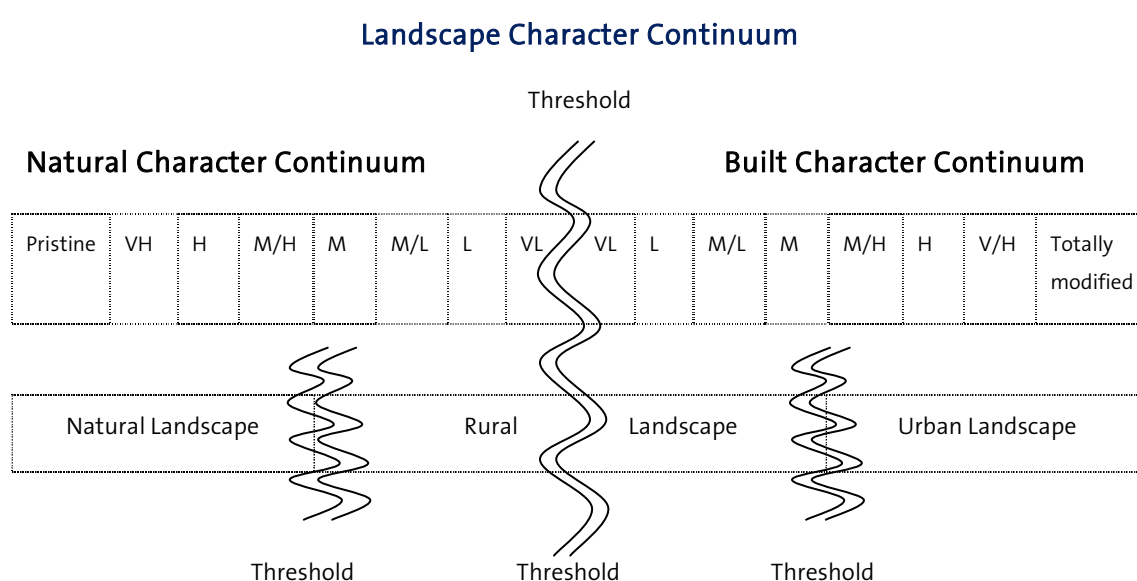
3.7 While Environment Court decisions have tended to broaden the definition of '**natural**' both in terms of natural character and outstanding natural landscapes and features, it is interesting to note that in **Policy 13 (2)** it is clearly stated that *"natural character is not the same as natural features, landscapes or amenity values."* Accordingly one could interpret this to mean that natural character and natural features and landscapes, both of which are dealt with under two separate NZCPS policies, are also different both in terms of the meaning of natural in addition to differences in individual attribute considerations. For example, **Policy 13** focuses on indigenous natural attributes while **Policy 15** includes aesthetic and cultural attributes relative to natural.
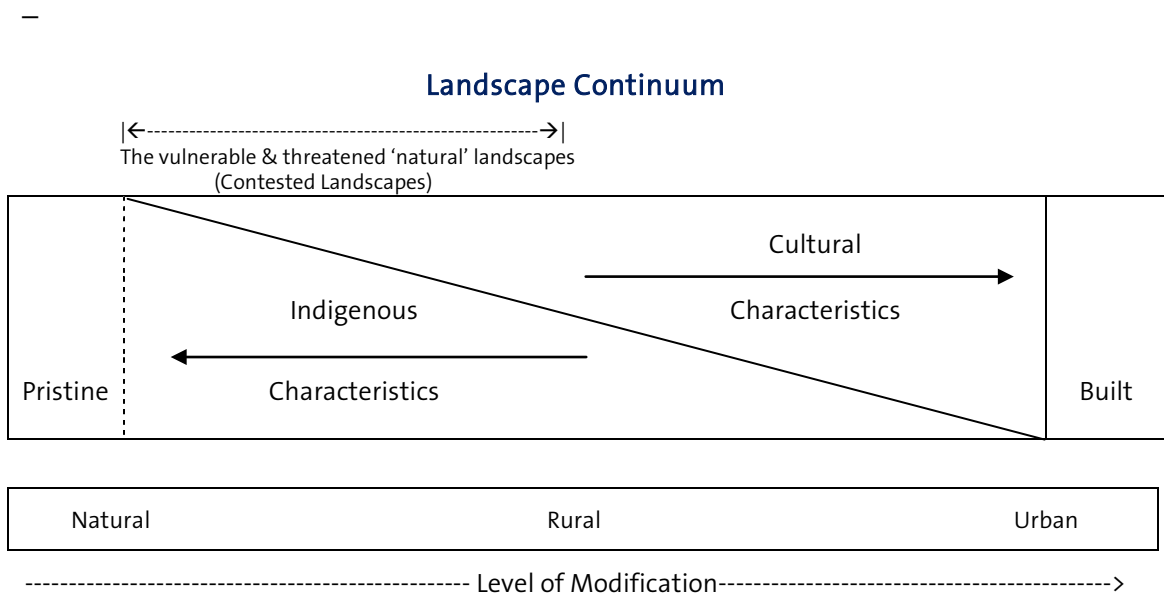
3.8   In the context of the coastal environment, perhaps **Policy 15** should be more appropriately referred to as Coastal Features and Coastal Landscapes rather than Natural Features and Natural Landscapes.

3.9   Alternatively, **Policy 13** could perhaps be titled Preservation of Indigenous Nature, with **Policy 15** being the Protection of Natural Features and Natural Landscapes, where the definition of natural includes both indigenous and modified nature (ie the perception and appearance of naturalness rather than the more specific interpretation of indigenous). Thus it seems to me that **Policy 11**, Indigenous Biological Diversity and **Policy 13**, Protection of Natural Character could be renamed and possibly combined, and that **Policy 15** be made clearer either by clarifying the definition of natural or deleting it altogether.

3.10   Taken at face value, **Policies 11, 13, 15** and their respective attributes are unclear and will no doubt lead to further debate, confusion and unsatisfactory outcomes. In line with the above, the sub-headings under each of these policies also needs to be clarified, for example those in **Policy 13 (2) c to h.**

3.11   What does this all mean and more importantly how do we develop and agree on assessment methodologies when there appears to be some confusion and conflict with regard to the interpretation and implementation of **Policies 13 and 15?**

4.   *The Landscape Continuum*

4.1   In terms of the NZCPS and indeed the RMA, all landscapes including rural working landscapes are integral to the sustainable management of our natural and physical resources, be they on the coast or inland. In this regard, I consider there tends to be an over emphasis on 'outstanding natural landscapes' and 'natural character'.

4.2   In addition, the notion of what makes one landscape better or more important than another, and therefore more worthy of preservation or protection, may have been appropriate 20 years ago. However, international best practice now tends to focus on a landscape assessment process which seeks to characterise landscapes according to what makes one landscape different or distinctive from another, and how these landscapes should best be managed be it for protection, enhancement or development. The emphasis today and into the future should be on all landscapes, and in the context of the coastal environment, all coastal landscapes relative to their distinctiveness in addition to specific areas of outstandingness or indigenous naturalness.

4.3   In this regard, I see the landscape continuum generally along the lines expressed below –

Landscape Continuum

|←--→|
The vulnerable & threatened 'natural' landscapes
(Contested Landscapes)

Pristine

Indigenous
Characteristics

Cultural
Characteristics

Built

| Natural | Rural | Urban |

--- Level of Modification--->

5. Workshop Issues

5.1   If we are to make meaningful progress I believe we must discuss and reach some consensus on the following –

i.   Clarification of the definition of 'natural' as it relates to both natural character (**Policy 13**) and outstanding natural features and outstanding natural landscapes (**Policy 15**)

ii. How the term 'natural' in the NZCPS relates to 'natural' in the RMA and more particularly how natural has been interpreted in evolving RMA case law – does this necessarily equate with best landscape practice?

iii. What are the natural character thresholds?

iv. What constitutes 'outstanding natural character' in the coastal environment – is this based on rarity, extent, condition and/or other factors?

v.   What is the threshold for determining area of outstanding natural character?

vi. How relevant to each policy are the matters listed under **Policy 13 (2)** and the matters listed under **Policy 15 (c)**?

vii. Should there be a closer link and integration between **Policy 11** and **Policy 13?**

5.2   In addition to the above, some discussion/clarification on the following would also be useful in terms of assessment approach and attributes to be considered.

- **Purpose of the assessment** – is it for policy/plan formulation or the assessment of effects relative to a specific activity or project?

- **Scale of the assessment** – is it for 200km of coastline or 200m of coastline?

- **Weighing/Prioritising assessment attributes** – how and on what basis are attributes weighted and/or prioritised?

- **Assessment of locations/positions** – relative to the consideration of attributes and factors.

- **Point in time considerations** – relative to ongoing changes in land use in the working 'natural' landscape.

6. Summary

6.1   If 'natural' in **Policies 13 and 15** are to be interpreted as covering both indigenous (pristine) and modified (cultured) nature, there clearly needs to be more consideration given to the thresholds within the natural continuum and how these are brought together. Clarification between the **Policy 13 and 15** attributes may also be required.

6.2   In simple terms, surely it would be more appropriate and clearer if the contents of **Policy 15** dealt comprehensively with the **Protection of Coastal Landscape/Seascape Character** (including outstanding features and landscapes), and **Policy 13,** as a subset of **Policy 15,** dealt with the **Preservation of Natural Character** with the focus on indigenous nature.

6.3   In conclusion, unless and until we have clear landscape definitions, directions and guidance in both the RMA and the NZCPS, there will continue to be confusion and inconsistencies in interpretations, methodologies and outcomes.

Frank Boffa

July 27, 2011

Marine Ecological Components of Natural Character

A think-piece for:

Natural Character Assessment Workshop
2 August 2011
Wellington

Andrew Baxter
Department of Conservation
Nelson/Marlborough Conservancy

I have been asked to present a "think-piece" on natural character as it relates to the Coastal Environment under the NZCPS 2010. Given that I am a marine ecologist, I will address natural character from a marine ecological perspective.

I have 28 years experience in coastal/marine management, specialising in marine ecology and marine mammal management. During this time I have presented evidence on marine ecological values and the natural character of the coast at various Environment Court and Council hearings. Much of the material below has been extracted from or adapted from this evidence.

Natural Character of the Coast
As an ecologist, I recognise several environmental factors which help shape the natural character of the coast. Many of these elements are inter-related; it is their collective whole which helps form the ecological component of natural character. Furthermore, many of these features are visible and, therefore, will be part of both the above water and subsurface "landscapes".

These environmental factors can be broadly grouped into biotic and abiotic features. The groupings are largely for convenience only; there is considerable interaction both within and between the groupings.

Biotic features
Species and communities:
The actual species that are found in an area obviously help establish its natural character; however, it is often their particular community association (i.e. how the species interact and combine together to establish a community) that gives an area its distinctiveness.

Diversity and productivity:
Marine communities can vary from the simple, with relatively low species diversity, to the rich and complex with corresponding high species diversity. Productivity can similarly vary from location to location. However, neither species diversity nor productivity *per se* should be used as a measure of natural character. A land desert might have very low diversity of species and low productivity compared to a tropical rain forest, but that does not mean the desert has comparatively low natural character. The two ecosystems are completely different and cannot be compared so simply. The same applies in the subtidal marine environment. For example, rocky reefs are more complex and can support a higher diversity of species than some sediment dominated habitats, however, this does not mean that rocky areas have higher natural character than soft bottom communities; they are merely different. While reef areas are very important, soft bottom communities can be equally important in forming the natural character of an area.

Biotic Patterns:
By biotic patterns I mean the distribution and abundance patterns formed by species, communities and habitats (see below). These spatial patterns include the biotic zones which change down the shore and with increasing depth. They also include the patterns which manifest themselves along the coast; for example, the differences between enclosed sheltered bays, current swept outer shores and exposed rocky headlands and reefs.

Habitats:
The habitat available will have a strong influence on what species/communities will be present. Species themselves may create habitat for other species (e.g. bryozoans, polychaete tubeworm mounds, seaweeds), though normally abiotic features are the most crucial (see below).

Biological processes
Biological processes (e.g. predation, competition, reproduction/recruitment, natural movement patterns) have a major influence on community structure, and species distribution and abundance patterns.

The interaction between species through predation and competition help shape the biotic patterns seen on the coast; this is particularly evident in the vertical zonation patterns observed in the intertidal zone.

Dispersal/recruitment patterns and natural movement of species also have a large influence on biotic patterns. Species move around to a greater or lesser extent, from the dispersal of spores, gametes, eggs and larvae, to the daily and seasonal movements of motile species including fish and marine mammals. Some dolphin and whale migrations can span hundreds to thousands of kilometres.

Temporal changes
Ecological systems are never static. Short-term and longer term changes (seasonal, annual and longer) mean that species, communities and the biotic

patterns they form will be constantly changing over time within the realms of natural variability.

Abiotic features
Natural substrates:
While some species can provide habitat for others, natural substrates literally provide the foundation (i.e. habitat; see above) for most benthic species and communities. Natural substrate composition and the natural distribution of substrates are, therefore, crucial elements in shaping natural character.

Geology:
Geology can have a major bearing on habitats, species and communities. Different rock or sediment types can create different habitat form; for example, compare the complexity of limestone reefs with the relatively simple reef formation of mudstone or granite. Similarly, estuaries along a granite coastline (e.g. the Abel Tasman National Park) are very different to those from other shores.

Environmental complexity:
The marine environment can vary from the very homogeneous (i.e. uniform) to the very heterogeneous (i.e. complex). Complexity is determined by the interplay of numerous factors such as geology, substrates/habitat and various physical processes (see below). Normally species diversity increases with environmental complexity and consequently environmental complexity is a major factor in shaping natural character.

Water quality:
Water quality has an obvious and direct bearing on natural character, influencing habitats and the health of species and communities.

Physical processes:
Physical processes include such factors as:
- tidal change;
- currents;
- salinity changes;
- temperature gradients;
- sedimentation patterns;
- wave action; and
- turbidity/water clarity/light penetration.

All of these will have a direct bearing on species and communities, the biotic patterns they form, and consequently the natural character of the coast. The processes themselves may also be visible features of the coast (e.g. wave action, tidal change, currents, and water clarity/turbidity).

The importance of natural biotic patterns in describing natural character
The preceding discussion has highlighted many of the important bio-physical elements which help form and shape the natural character of the coastal

marine environment. As noted earlier, there is considerable overlap and interaction between these various factors and it is their collective whole which helps establish the natural character of an area. Nevertheless, one factor stands out in my view as a key integrating element of the ecological components of natural character: natural biotic patterns – the natural distribution and abundance patterns of marine species. These patterns are the product of both the physical and biological world. Most, if not all, of the other environmental factors help mould the natural biotic patterns which are observed in the marine environment.

Biotic patterns manifest themselves in all directions in three-dimensional space. There is a "vertical" zonation offshore into deeper water; i.e. from intertidal beaches and reefs, down to offshore reefs and soft sediments (gravel, sand and mud). There are broad changes along the coast in response to differences in variables such as exposure, substrate composition, tidal and current patterns, salinity changes and temperature. At a smaller scale, local features such as headlands, bays, reef systems, estuaries, offshore algal beds and biogenic reefs (e.g. bryozoan and horse mussel beds) all add diversity and complexity.

All these patterns combine to create a three dimensional ecological *picture* of the marine environment. On top of this, temporal changes (i.e. changes over time) will add a fourth dimension to biotic patterns.

In my view, preservation of the natural character of the coast must recognise and provide for the protection of the broad scale variation in community structure and function that occur along the coast, as well as the patterns which can be observed at a more local scale both vertically and along the shore, while recognising the temporal changes that occur naturally within ecological systems.

A Natural Character Framework for the Marlborough Sounds
Over the mid-1990s I was part of a multi-disciplinary team that developed a "natural character framework" for the Marlborough Sounds (McRae *et al* 2004[1]). This work was co-ordinated by the Nelson/ Marlborough Conservancy of the Department of Conservation in association with Lucas Associates and Landcare Research New Zealand Ltd.

The natural character framework has been adopted as Appendix 2 of the Marlborough Sounds Resource Management Plan and describes natural character across two spatial scales:
• A broad scale encompassing the Marlborough Sounds as a whole; and
• Nineteen individual natural character units (11 terrestrial and 8 marine) subdividing the Sounds at a finer spatial scale (Appendix 1).

[1] McRae, S. M.; Lucas D. J.; Courtney S. P.; Baxter A. S.; Barrier R. F.; Lynn, I. H. 2004: A natural character framework for the Marlborough Sounds. Department of Conservation, Nelson/Marlborough Conservancy, Occasional Publication No. 62. 70pp.

These spatial scales recognise the national importance of the Marlborough Sounds as a whole. The Sounds are a distinctive part of New Zealand's coastal/marine environment. They also recognise the variability that occurs at a regional scale, and therefore the importance of factoring in this regional variability into any natural character assessments within the Sounds.

The marine environment of the Marlborough Sounds is influenced greatly by the Sound's strategic location separating the warmer and more sheltered waters of Tasman Bay from the colder and more exposed waters of Cook Strait. The north-eastern and south-eastern outer coasts are very exposed, whereas much of the Sounds are distinguished by their relatively sheltered conditions owing to their convoluted form.

The Sounds' marine environment is shaped by a number of broad interrelated environmental gradients which traverse the length and breadth of the Sounds including:
- wave exposure;
- tidal influence (currents, tidal height and water exchange);
- turbidity and sedimentation;
- temperature;
- salinity;
- natural substrates; and
- depth.

These elements in various combinations create a diverse range of natural ecosystems in the wider Marlborough Sounds. Cobble/boulder and bedrock shores tend to dominate the intertidal and shallow subtidal zones, with muddy sediments offshore. Coarser sediments can occur in shallow wave-worked areas or places with strong currents. This much generalised pattern is broken up in places by features such as offshore rocky reefs and stacks, biogenic reefs, some sand and pebble beaches and estuaries.

The broad differences in physical and biological diversity formed the basis for the division of the marine environment of the Sounds into eight marine natural character areas, which were broadly divided into:
- Mainly exposed (two areas); and
- Mainly sheltered (six areas).

A recent report on ecologically significant marine sites in the Marlborough Sounds identified seven marine biogeographic zones in the Sounds (Davidson *et al* in press[2]). These biogeographic zones align closely to the natural character units referred to above apart from some boundary differences in the vicinity of D'Urville Island and all of Pelorus Sound being included within the one unit rather than two (inner and mid Pelorus Sound).

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[2] Davidson R. J.; Duffy C.; Gaze P.; Baxter, A.; Courtney S.; DuFresne S.; Grose R.; Hamill P.; Richards L.A. *In Press*: Ecologically significant marine sites in Marlborough, New Zealand. Co-ordinated by Davidson Environmental Limited for Marlborough District Council and Department of Conservation.

Natural character Policy 1.8 in Chapter 2 of the Marlborough Sounds Resource Management Plan: states: *"To recognise that preservation of the intactness of the individual land and marine natural character management areas and the overall natural character of the freshwater, marine and terrestrial environments identified in Appendix Two is necessary to preserve the natural character of the Marlborough Sounds as a whole"*. Appendix Two of the Plan goes on to say: "*Each natural character area contributes to the overall natural character of the Marlborough Sounds area. Sustainability of the characteristics of individual natural character areas is therefore important in sustaining the overall natural character of the Marlborough Sounds.*"

The Sounds plan therefore recognises that regional variability is critical when assessing and preserving natural character overall. Favouring one natural character area at the expense of another may lead to a net overall decline in the natural character of the Marlborough Sounds as a whole.

Concluding comments

Preservation of the natural character of the coast must recognise and provide for more than just the special and iconic features of a region which many people tend to focus on (i.e. headlands, offshore stacks and islands, rocky reefs, biogenic reefs, tidal passages, etc). Representative, typical and mundane – these are also important in defining the natural character of the coast. Regional variability is also crucial and needs to be factored into any overall natural character assessment (e.g. through the recognition of distinct natural character areas).

Biotic patterns are an integrating element of natural character which I believe are a key factor in terms of preserving the natural character of the coastal marine environment. Biotic patterns manifest themselves over local as well as broad geographic scales depending on environmental complexity and the influence of broad environmental gradients (offshore and along shore).

Given the broad biotic patterns which exist along the coast, the preservation of natural character can only be realistically achieved if reasonably large and representative examples of the coast are protected. The alternative of protecting small sections of the coast scattered and interspersed between areas of development will not protect the broad biotic patterns which exist. Continuity over distance – along shore and offshore – is in my view a crucial element here.

Continuity with neighbouring freshwater and terrestrial environments adds another important part to the picture. Arguably greatest natural character values will exist where there is an unbroken biological sequence from ridge tops to sea floor, especially where this occurs along a large section of coast. However, simply because the terrestrial environment might be degraded (wholly or in parts) does not mean the adjoining marine environment does not retain important natural character values, especially in areas where along-shore biotic patterns are still relatively intact over a long distance.

Many of the biotic and abiotic features I have described in this paper are literally hidden beneath the waves. Unnoticed, they are easily forgotten or ignored. Certainly underwater seascapes don't seem to feature in traditional landscape assessments.
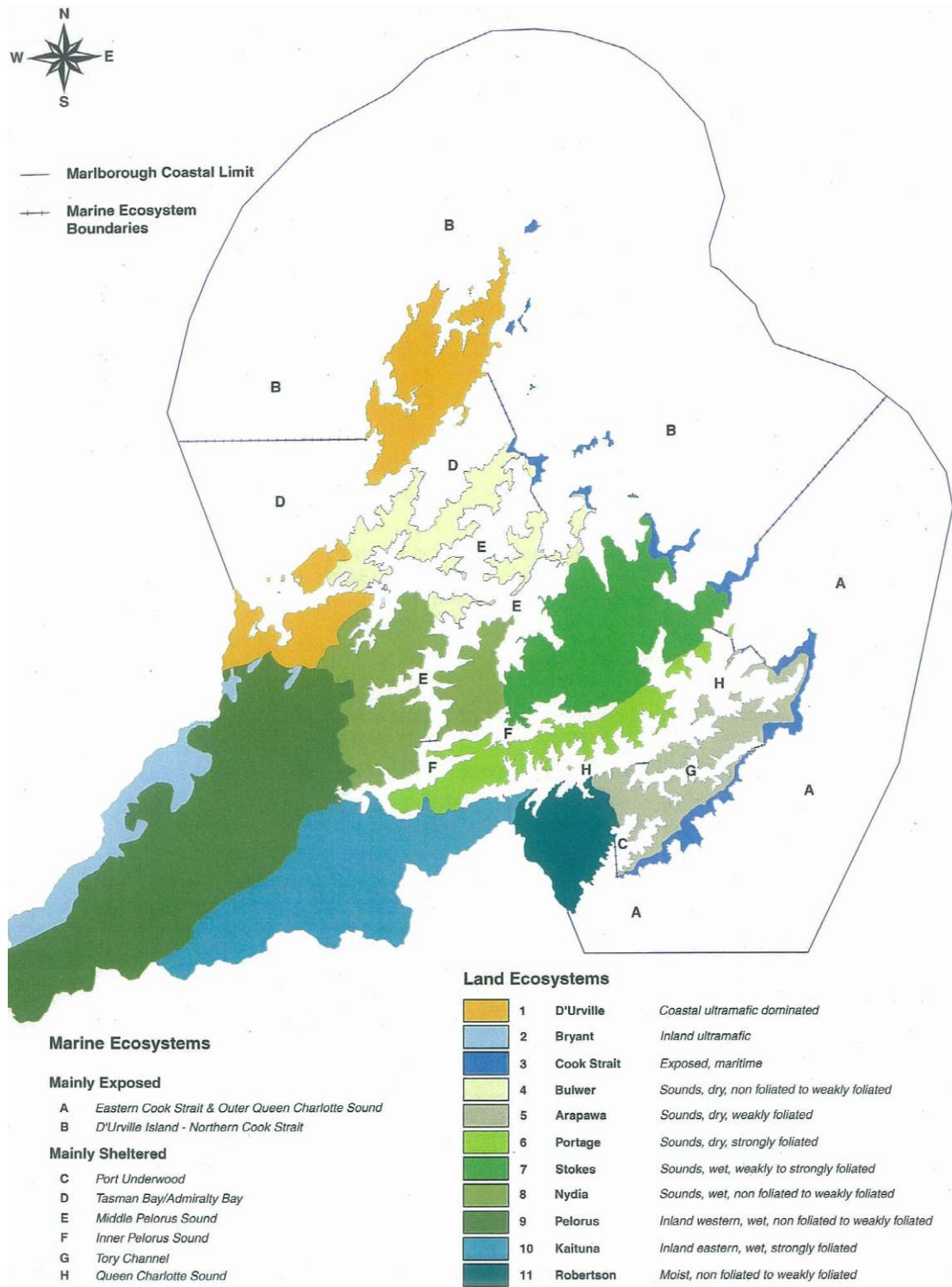
Our knowledge about the subtidal environment is also limited by the difficulties in surveying and assessing the underwater world. Marine surveys are often blinkered snapshots of reality, meaning the full picture has to be extrapolated from scattered pieces of information. However, recent advances in remote surveying techniques (e.g. side scan and multi-beam sonar, towed video, drop cameras) mean much broader surveys are able to be undertaken. These techniques provide the best opportunity to paint a broader and more precise picture of the underwater environment which is essential if the natural character of the marine environment is to be better understood.

Andrew Baxter
27 July 2011

APPENDIX 1
Land and Marine Ecosystems in the Marlborough Sounds
From: McRae *et al* 2004: A natural character framework for the Marlborough Sounds. Department of Conservation, Nelson/Marlborough Conservancy, Occasional Publication No 62.

— Marlborough Coastal Limit
┼┼┼ Marine Ecosystem Boundaries

Marine Ecosystems

Mainly Exposed

A   Eastern Cook Strait & Outer Queen Charlotte Sound
B   D'Urville Island - Northern Cook Strait

Mainly Sheltered

C   Port Underwood
D   Tasman Bay/Admiralty Bay
E   Middle Pelorus Sound
F   Inner Pelorus Sound
G   Tory Channel
H   Queen Charlotte Sound

Land Ecosystems

	1	D'Urville	Coastal ultramafic dominated
	2	Bryant	Inland ultramafic
	3	Cook Strait	Exposed, maritime
	4	Bulwer	Sounds, dry, non foliated to weakly foliated
	5	Arapawa	Sounds, dry, weakly foliated
	6	Portage	Sounds, dry, strongly foliated
	7	Stokes	Sounds, wet, weakly to strongly foliated
	8	Nydia	Sounds, wet, non foliated to weakly foliated
	9	Pelorus	Inland western, wet, non foliated to weakly foliated
	10	Kaituna	Inland eastern, wet, strongly foliated
	11	Robertson	Moist, non foliated to weakly foliated

Implementing NZCPS 2010[1]   re Natural Character, Features and Landscapes

This country is largely defined by its coasts. Our islands have been variously sculpted by coastal processes through time. For the size of the land area, the coastline is very extensive.[2] All regions of Aotearoa New Zealand have substantial lengths of coastline. Therefore each regional (or unitary) council has to address and apply the NZCPS 2010 in the application and review of policies and plans, and in consideration of resource consent applications.

Most districts also have considerable lengths of coast. Few districts have no coast, but many of these have extensive lakes, 'inland seas' – e.g. Queenstown Lakes, Mackenzie, Taupo and Rotorua Districts – where application of the natural character protection methods can be guided by the NZCPS, as can ONFL[3] protection methods. For each of these Districts belong in a region having to apply the NZCPS to the coastal environments of other districts in their rohe, so a planning framework will be available to address natural character, natural features and natural landscapes.

Whilst NZCPS 2010 Policies 13 (natural character) and 15 (natural features and natural landscapes) are specifically for management of the coastal environment, their methods provide guidance for wider application for addressing natural character, natural landscapes and natural features across entire regions and districts (see at Appendix 1).

A. What is Analysed & Evaluated

SEAWARD - SEASCAPE

Natural character, natural features and natural landscapes all involve both terrestrial and aquatic areas. They all address both the land and the sea. "Landscape" does not stop at the coastal edge but includes the CMA, the coastal marine area. Many existing landscape studies have not addressed the sea. NZCPS Policy 15 makes this requirement explicit by "including seascapes", and I interpret this as allowing for above-water as well as subsurface dimensions to be addressed. I have at times included sub-surface assessments in my natural character and landscape assessments.

LANDWARD - DEFINING THE COASTAL ENVIRONMENT

The extent of the coastal environment needs to be decided for application of the NZCPS. As physiographic studies have shown, the coastal environment inland of MHWS[4] varies in extent, varying between kilometres and some hundreds of metres in width.

The collection of islands that form Aotearoa NZ could, at the very broad scale, be considered as entirely coastal environment. However, for day to day implementation, a practical and pragmatic selection of scale or scales is necessary to contribute to sustainable management.

Experience around the country has shown that no simple spatial formula is appropriate for coastal environment delineation. For example a distance from MHWS, a contour, or, visibility from inshore waters, are each inadequate as the sole measure. However these measures may all contribute to pragmatic delineations in particular places, such as those lacking landform containment. The guidance from the report accompanying the 1994 NZCPS resulted in a rule of thumb that the coastal environment extends inland to the first ridgeline: the ridgeline that contains the coastal environment.

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[1] NZCPS = New Zealand Coastal Policy Statement 2010, which came into effect in December 2010
[2] e.g. New Zealand has a longer coastline than mainland USA.
[3] ONFL = outstanding natural features and landscapes (RMA s. 6 (b))
[4] MHWS = Mean High Water Springs

Toward MHWS coastal processes are more evidently dominant. The watersheds to coastal catchments can be useful physical and perceptual inland delineators. Such catchment delineation should be accompanied by data on the distribution of coastal influences, particularly hydrological and ecological influences.

The coastal environment has sometimes been usefully addressed to include both a "*coastal dominance zone*" and a more inland "*coastal influence zone*". Similarly, based on indicator plant species, a Coastal Zone and a Semi-Coastal Zone can be identified, mapped and modelled. The role of landform in defining the coastal environment is thus demonstrated. As delineated for Bay of Plenty (W. B. Shaw 1988), where there are not confining ridges the Coastal Zone extends 1 km inland and the Semi-Coastal Zone may extend some 20 km inland (Appendix 2 A - B)[5].

To spatially define the coastal environment, it is useful to utilise land typing as the base mapping and modelling for identification of the extent of coastal influences, and on which to delineate ridgelines and catchments.

Note that "land" and "landscape" are addressed separately below, being overlapping but not equivalent resources.

LANDSCAPE ASSESSMENT

"Landscape" is a large subset of the environment.[6] Coastal landscapes are a large subset of the coastal environment. Landscapes assist in defining the coastal environment. The coastal environment may be considered to spatially equate to the coastal landscape, containing varying areas of physical, perceptual and associative coastal influence. For "landscape" involves both natural and physical resources as well as factors relating to participants' perceptions of the resources. Landscape is a link between individual (natural and physical) resources and the environment as a whole, as well as peoples' attitudes to those resources as affected by social, economic, aesthetic and cultural conditions.

Landscape is understood to encompass dimensions of physical environment (ones we are generally able to describe and measure) as well as the '*social, economic, aesthetic and cultural conditions*' through which we are conditioned to perceive and experience it.[7] As well as the visual expression of the various landscape processes identified, '*the human experience is a factor to take into account*'[8] and this is clarified in Policy 15.

Everyone's landscape is somewhat different as the experience of a particular landscape depends on the characteristics of the observer.[9] People have different world views. People's experience, education and role affect what they perceive, what they value, and, thus what they consider of greater or lesser appropriateness.[10]

The complexity does not mean that landscape is too hard to be addressed: there is substantial common ground within the profession, within communities, together with guidance from research,

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[5] *A Framework for Monitoring Ecological Integrity in the Bay of Plenty Region.* Lucas Associates. with Ian Lynn, Landcare Research & Wildland Consultants. 1998. page 12
[6] WESI v QLDC C180/99 paragraphs 45-6.
[7] Claire Findlay 2004 "*Protecting the Landscape*" Chapter 20 in Handbook of Environmental Law, RFBPS Wellington.
[8] *Campbell & Ors v Southland District Council* W114/94.
[9] Kenneth H. Craik. 1986. Psychological Reflections on Landscape. Ch. 4. "Landscape Meanings and Values" eds. E.C. Penning-Rowsell; D. Lowenthal. London: Allen & Unwin.
[10] Diane Lucas 1988 *Assessing Landscape Experience - techniques for the high country.* MLA research project, Lincoln College. page 30

practice and case law. Policy 15 (c) clarifies the more holistic approach needed to be taken to address landscapes.

COMPREHENSIVE LANDSCAPE ANALYSIS

Recognising international trends and local professional guidance, Policy 15 (c) requires that natural features and natural landscapes of the coastal environment be identified and assessed by land typing, soil characterisation and landscape characterisation. That is, the **entire coastal environment is to be assessed**.

Previously many landscape studies have not involved landscape characterisation of the entire coastal environment, but have only addressed areas assessed to be outstanding. Now the entire coastal environment is to be analysed comprehensively – based on the 'modified Pigeon Bay factors' landscape assessment approach (Appendix 3). The factors are listed in Policy 15 **(c)** (i), (iii), (iv), (vi), (vii), (viii – with expanded explanation) and (ix) in addition to some other physical and perceptual factors re (ii) water, (v) vegetation, and (x) wild and scenic values. Together these factors clearly address **physical, perceptual and associative dimensions**.

No longer can there be merely visual effects assessments, for the visual is only part of the landscape. Nor can there be just identification of outstanding bits of landscapes. **For the first time in a statutory document with nationwide implications, the NZCPS formalises the basis for landscape assessment in terms of the comprehensiveness required in assessments for councils' policies and plans, and for resource consents, within the coastal environment.**

PHYSICAL CHARACTER

S.6(a) and the NZCPS require protection of natural "**character**", and, "**characterisation"** is a method required for protecting natural features and landscapes as per Policy 15. Physical or tangible dimensions of "character" contribute to natural character, to natural features and to natural landscapes. The physical character can be described and measured as to its degree of naturalness. Quantitative and qualitative assessment of the physical naturalness of an area at any scale may be undertaken.

However, the physical character is only part of what constitutes natural character. It is also only part of what constitutes natural features and landscapes. Assessment methodologies addressing only the physical character in terms of the degree of naturalness are therefore useful, but alone they are not adequate. Alone, the physical or tangible dimensions of naturalness are not adequate for assessment of natural character, natural features or natural landscapes.

PERCEPTUAL & ASSOCIATIVE CHARACTER

"Natural character" involves both the **physical character** of an area AND the **perception** of that character. "**Natural landscape"** involves the **physical character** of an area, the **perception** of that character AND the **associations** with that area. So too does "**natural feature"**. Whilst natural character, natural feature and natural landscape have all been addressed as matters of national importance for 20 years, NZCPS 2010 Policies 13 (2) and 15 (c) very usefully clarifies this distinction. Natural character is shown to address different but overlapping resources from those of natural features and natural landscapes. The **associative** dimensions of cultural, spiritual, historic and heritage are addressed within natural features and natural landscapes, but are not dimensions of natural character.

B. How to Structure Analyses

Characterisation

The need to address characterisation in evaluating natural 'character' is implicit for Policy 13. Also 'land characterisation' and 'landscape characterisation' are both explicitly referenced through Policy 15. Land typing is defined "*as the basis for land characterisation*". Landscape characterisation is also defined in the NZCPS Glossary to utilise the land typing base. Thus whilst land and landscape characterisation share common ground, **care is needed to distinguish land from landscape** in any analysis.

To assess the **state of natural character**, a bio-physical base framework is necessary that can address the coastal environment at broad scale or down to small sectors of the coast, and through time. A nested hierarchy is, therefore, appropriate that allows people to window down, or aggregate up, depending on the scale of interest. It is considered crucial that the approach is able to be applied, interpreted and monitored at the detail scale (Appendices 5 – 6).

The usefulness of the base should not be vulnerable to land use change, as has happened with methods based on land use and land cover. With changes such as afforestation or clearance, such methods failed as they became suddenly outdated. The geomorphological basis to land typing is thus more useful (Appendix 4).

Field tested in New Zealand for two decades, variously referred to as land types / land systems / ecosystems, the land typing method continues to demonstrate a means to provide a basis for nationally consistent land and landscape characterisation that is applicable at a range of scales and for a range of purposes, and is robust through time. To date various regions, districts, areas and locations have been addressed, but not the whole. The geomorphic-based timeless characterisation framework provides an appropriate base on which to layer current landcover information to enable both natural character and landscape assessments to be undertaken.

The land typing approach using mapping, description, charting and 3-D modelling enables planning at broad mapping scales to recognise localised values, as has been demonstrated in various studies. Thus even at the broad 1:250,000 mapping scale, because of identification of landform components through 3-D modelling and charting, very small land units can be recognised (Appendix 5 A – B).

Landscape Characterisation

Use of a land type framework provides the basis, the first information layer, for more or less holistic landscape assessments to be undertaken. For various purposes and at various scales, catchments, landscape units, character and/or identity areas, they can be identified across and within the various landscape types. These can be based on landform, but can also respond to the overlay of vegetation and land use patterns.

Whilst a variety of landscape and visual assessments have been undertaken since the 1991 RMA enactment, a land typing basis would provide a framework onto which any of these can be overlain. Thus at a national or regional scale, volcanic country, for example, is easily distinguishable from sedimentary ranges through their particular natural and physical characteristics. At a district or local scale, the bedrock hills and headlands are easily distinguishable from the gravel plains and dunelands due to their differing natural and physical characteristics.

The landscape profession in NZ has repeatedly sought development of a national landscape characterisation approach. As used for the Landscape Map of England (Appendix 7), landscape characterisation undertaken to overlay on a land type framework for the length of the coastal

environment will assist in providing a consistent factual and language foundation in Aotearoa NZ. The scientifically delineated and described land types form the basis over which land cover, land use and association information is then draped to identify landscape character. Landscape characterisation based on land typing as now is required will assist in seeking to address the diversity of landscape and natural character that occurs through the coastal lands.

As defined in the NZPS 2010 Glossary, "*Landscape characterisation*": "*Utilises the land typing base and overlay with land cover, land use and associations affecting or affected by coastal processes.*" To achieve adequate management for all landscapes, it is essential that an overall landscape character framework be developed, and that would appropriately be underpinned by land typing

CHARACTERISATION of LAND & SEA

Assessing the physical character of an area in terms of its naturalness must address not merely what exists but how it exists in space and time. That is, the **spatial patterning** and the temporal patterning, the **processes,** which occur, must be taken into account. This means that mere measuring of how much of certain types of landcover occur, is not adequate.

Land typing, as land systems, provides a method of making sense of natural patterns, processes and elements at all scales, from broad to detailed. It provides a timeless method to make sense of the patterning of land form, the patterning that underlies any and every place, wild, rural or urban. Land typing is not a mere mapping of types of country at a fixed scale, as has occurred in some assessments. It involves a spatial and temporal nested hierarchy analysis to address natural patterns, processes and elements.

From use in practice through the life of the RMA for addressing the basis to the character of lands and waters, land typing has now been usefully formalised as the basis for assessment in NZCPS Policy 15 (c). As defined in the NZCPS Glossary, Land typing "*describes land types which form the basis over which land cover, land use and association information are addressed as the basis for land characterisation.*" It appropriately provides a timeless base framework for implementation of both Policies 13 and 15. If not already available, a land type framework can first be undertaken for a region or district's coastal environment at a broad scale with windowing in where and as required to address attributes, values and issues.

To assess the state of natural character, a bio-physical base framework is necessary that can address the coastal environment at broad scale, from whole regions down to small sectors of the coast within a district. A nested hierarchy is therefore appropriate as it is considered crucial that the approach is able to be applied, interpreted and monitored at the detail scale.

Because of the fundamental importance of context, of iconic places, of people's perceptions, and of very site specific land-water inter-play, limiting an approach to aggregations of data at broader scales is not seen as adequate for addressing the natural character of the coast.

A substantial input of lithology, landform and landform component, and, exposure data, and, the influence of dominant offshore circulation patterns, is needed. As in our Akaroa Harbour study (2000), a coastal landform typology will be necessary. Again, their perceived naturalness and significance will depend on their context.

The land typing framework can thus underpin the methods to address Policy 13 (natural character) and Policy 15 (natural features and natural landscapes) as described in the previous section.

To view examples of coastal land typing at various scales, see excerpts at http://lucas-associates.co.nz/resources/coastal-land-types/coastal-land-types-of-new-zealand/

C. How to Evaluate the Resources

In accordance with practice and case law, and now shown by the new policies, natural character analysis must be in relation to the context. This is both a bio-physical and a socio-cultural context. Whilst the biota and substrate of a site may be assessed somewhat in isolation in terms of identifying what exists, and its condition, the relationship of a site to surrounding lands, waters and peoples must be part of any assessment. Therefore, an objective assessment scale, for measuring the degree of naturalness on any coast, is not achievable.

PERCEPTION STUDIES

To address how communities value natural character, natural landscapes and natural features, it is not adequate to undertake preference testing using placeless photos. To address perception is to address a place so that what is known and understood of the place is factored in. The research by Swaffield and Fairweather, with Q-sort testing of photographs by the public, has frequently been misused in coastal landscape and natural character assessments.

PERCEIVED NATURALNESS

As natural character involves both the physical character and the perception of that character, the degree of naturalness is context dependent. How the physical character is perceived depends on where it is. Therefore there can be no formulaic measurement of natural character as a consistent nationwide approach.

Prior to this policy, to address the "natural" dimensions for consideration under section 6(a) or (b), "naturalness" has been identified to be expressed through:
- relatively unmodified and legible physical landform and relief;
- vegetation (especially native vegetation) and other ecological patterns;
- the presence and extent of water (rivers, sea); and,
- the landscape being uncluttered by structures and/or obvious human influence.

(Long Bay Okura Great Park Society v North Shore City Council A078/2008 para.135)

This practitioner and case law interpretation and the new policy allow for recognition that there is a diversity of world views in our society. The naturalness of the coast for various people differs markedly depending on their experience, knowledge, association and role. Any monitoring programme that purports to monitor "natural character" has to recognise the varied perceptions. For assessing naturalness in terms of S.6(a), 4 broad groups of values form key triggers for determining the degree of naturalness:

- historic natural - evidence for underlying natural indigenous values, and their sustainability.

- ecosystem processes - involving recovery of indigenous biodiversity.

- status quo - pastoral, tidy and productive vegetation, picturesque values.

- unobtrusive (or historic) development - replicating and subordinate to natural patterns or elements.

From the direction provided in the NZCPS, these should be recognised hierarchically. That is, that remnant nature has greatest protection, and the significance of the remnant be recognised, particularly with regard to representativeness, rarity and community significance. Thus a natural science assessment alone is not adequate.

Many people will respond to more than one of the value sets noted above. Knowledge will often affect their perception. Knowledge of the scientific significance of a remnant, or the significance of processes in what may superficially appear rather scruffy, will often change people from a negative to a positive view. Thus I consider increasing knowledge of natural values to be a crucial mechanism in achieving the protection required by the act and by policy. Therefore it is very important that techniques to identify the state and change in natural character are people friendly, not in technical, numeric, coded or other less than accessible language.

THRESHOLDS

RMA s.6a sets no threshold. The natural character of the coastal environment is to be preserved. However in studies such as those by Stephen Brown for Whangarei and Coromandel (2008), "outstanding" and "significant or high" "natural character areas" have been assessed in recent years, and such recognition was recommended for the NZCPS. He suggested "Outstanding Natural Character Areas" as those parts that 'tick most of the criteria boxes" being:

- *Abiotic factors (essentially landform);*
- *Vegetation type (native / endemic to exotic)*
- *Vegetation cover & patterns*
- *Land Uses / Activities: Buildings & Structures (their presence / absence)*
- *Seascapes & Water Areas, and,*
- *Natural processes.*

    Plus "more experiential values, related to the perception of the likes of 'wildness', 'wilderness' and 'remoteness'.

In response the NZCPS now requires areas of "**high** natural character" be identified, and adverse effects on areas of "**outstanding** natural character" be avoided. (Policy 13 (1) (a)). Stephen Brown had sought a High Natural Character Area threshold, where the boxes are ticked, which are not pristine but "*still have value*". He recognised that such values are often about context, in adjoining areas of coastal settlement or other modification. That is both the physical and the perceptual dimensions of naturalness must both be addressed.

Policy 13 (1) (c) requires councils to identify "*at least areas of high natural character*" by mapping or otherwise. That is, rather than a full mapping exercise, the types of natural character could be identified for a district or region that would be considered high natural character in terms of their physical character. The natural character value could thus be usefully modelled in part. Land typing provides a useful model framework for addressing the physical dimensions of naturalness, which would be efficient for addressing extensive wild and rural coastlines. However to address the perceptual aspects of naturalness would also require place-based assessments.

Due to the context-dependence of the degree of natural character, areas of high naturalness may have low indigenousness. Practice has shown that extensive pasture may have "*high natural character*" in some coastal environments but moderate or low natural character in others. Thus no formulaic approach is appropriate for application across NZ. A nationally-set fixed scale for addressing perceived naturalness would not be appropriate.

As shown in ONL studies, it is not necessary to "tick" or to be exceptional in each criterion to reach the threshold for outstanding natural character, outstanding natural features or landscapes. To have high values in one or more factors may trip the outstanding threshold.

Also, an area need not be publicly visible to have high or outstanding natural character, or, to be an ONFL.

SCALE

Assessing natural character as required by Policy 13 (c) and natural features and landscapes as required by Policy 15 (c) can be undertaken at a range of scales. As has previously been recognised by practitioners and variously supported in case law, some grand coastal landforms, such as the whole of Banks Peninsula, of Marlborough Sounds, of Golden Bay and of Coromandel Peninsula, have each been identified as an outstanding natural landscape or feature (ONFL) in total. Within each, assessments have been undertaken at a finer scale that identify at a local scale ONFL within these coastal landforms.

As is recognised in other multi-scale assessments, such as for ecology and heritage, if a landscape is outstanding at any scale, then it is a matter of national importance. Outstandingness is recognised at all scales. A range of scales is also appropriate in considering the thresholds set in Policy 15 (a) regarding avoiding adverse effects on outstanding natural features and outstanding natural landscapes. In the Boffa Miskell Banks Peninsula Study (2007), a Banks Peninsula-wide assessment was undertaken, plus a catchment assessment and a local feature assessment.

Also, a range of scales is appropriate for consideration of Policy 13 (1) (a) for avoiding adverse effects on areas with outstanding natural character. It is not adequate to assess coastal landscapes on a catchment basis alone, as these under-value the promontories that define the perceptual and associative values. The headlands and ridges miss being addressed as local features in their own right if they are addressed only as the watershed to several catchments.

D. Addressing Adverse Effects

Effects on the natural character of the coastal environment can result from activities within or inland of the coastal environment. These effects may be on the physical character, such as through changes in the quality or quantity of water being discharged into the coastal environment. Or the effect may be on the perception of the naturalness through activities beyond – such as large structures or works inland that are experienced from within or in association with the coast so as to change the perception of the naturalness of that coastal environment (Appendix 8).

NZCPS 2010 formalises approaches developed in professional practice over the last two decades, which have been variously endorsed in case law, and usefully extends from these to assist assessment and implementation. Planners, councils, landscape architects and others previously sought clarification of appropriate methodologies to minimise wasted effort and enable consistency in assessment and implementation to apply s.6 (a) and s.6 (b) as matters of national importance. This has now been provided by the NZCPS. Whilst the NZCPS addresses only the coastal environment, the guidance provided in Policies 13 and 15 regarding assessing natural character, natural features and landscapes form a basis for such assessment throughout Aotearoa New Zealand.

Di Lucas

Registered FNZILA landscape architect

Policy 13.   Preservation of Natural Character

> *(1) To preserve the natural character of the coastal environment and to protect it from inappropriate subdivision, use and development:*
>
>> *(a) avoid adverse effects of activities on natural character in areas of the coastal environment with outstanding natural character[11]; and*
>> *(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on natural character in all other areas of the coastal environment;*
>
>> *including by:*
>
>> *(c) assessing the natural character of the coastal environment of the region or district, by mapping or otherwise identifying at least areas of high natural; character; and*
>> *(d) Ensuring that regional policy statements, and plans, identify areas where preserving natural character requires objectives, policies and rules, and include those provisions.*
>
> *(2) Recognise that natural character is not the same as natural features and landscapes or amenity values and may include matters such as:*
>
>> *(a) natural elements, processes and patterns;*
>>
>> *(b) biophysical, ecological, geological and geomorphological aspects;*
>>
>> *(c) natural landforms such as headlands, peninsulas, cliffs, dunes,*
>>
>> *wetlands, reefs ,freshwater springs and surf breaks;*
>>
>> *(d) the natural movement of water and sediment;*
>>
>> *(e) the natural darkness of the night sky;*
>>
>> *(f) places or areas that are wild or scenic;*
>>
>> *(g) a range of natural character from pristine to modified; and*
>>
>> *(h) experiential attributes, including the sounds and smell of the sea;*
>>
>> *and their context or setting.*

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[11] outstanding natural character = ONC

***Policy 15.   Natural features and natural landscapes***

To protect the natural features and natural landscapes (including seascapes) of the coastal environment from inappropriate subdivision, use, and development:

a. *avoid adverse effects of activities on outstanding natural features and outstanding natural landscapes in the coastal environment; and*

b. *avoid significant adverse effects and avoid, remedy, or mitigate other adverse effects of activities on other natural features and natural landscapes in the coastal environment;*

including by:

c. *identifying and assessing the natural features and natural landscapes of the coastal environment of the region or district, at minimum by land typing, soil characterisation and landscape characterisation and having regard to:*
    i. *natural science factors, including geological, topographical, ecological and dynamic components;*
    ii. *the presence of water including in seas, lakes, rivers and streams;*
    iii. *legibility or expressiveness – how obviously the feature or landscape demonstrates its formative processes;*
    iv. *aesthetic values including memorability and naturalness;*
    v. *vegetation (native and exotic);*
    vi. *transient values, including presence of wildlife or other values at certain times of the day or year;*
    vii. *whether the values are shared and recognised;*
    viii. *cultural and spiritual values for tangata whenua, identified by working, as far as practicable, in accordance with tikanga Māori; including their expression as cultural landscapes and features;*
    ix. *historical and heritage associations; and*
    x. *wild or scenic value;*

d. *ensuring that regional policy statements, and plans, map or otherwise identify areas where protection of natural features and natural landscapes requires objectives, policies and rules; and*

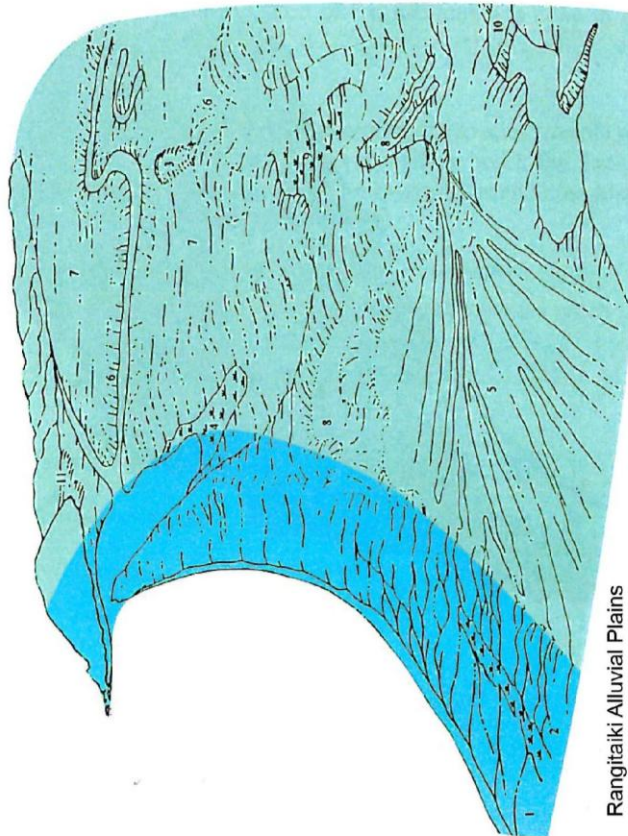e. *including the objectives, policies and rules required b (d) in plans.*

Bio-Climatic Zones

Coastal (C)
Semi-Coastal (SC)
Lowland (L)
Sub-montane (SM)
Montane (M)
Sub-alpine (SA)
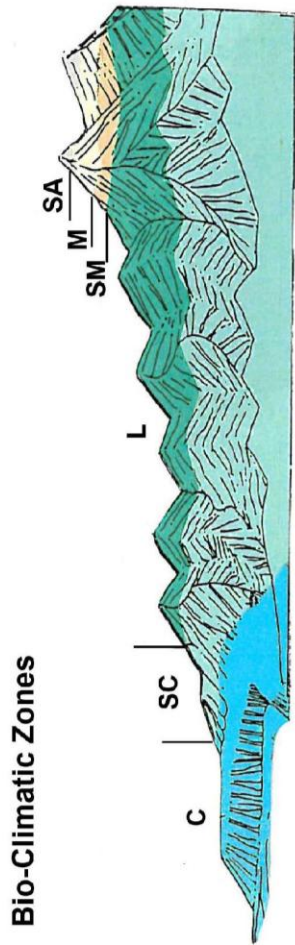
Indicative Bio-climatic Zones
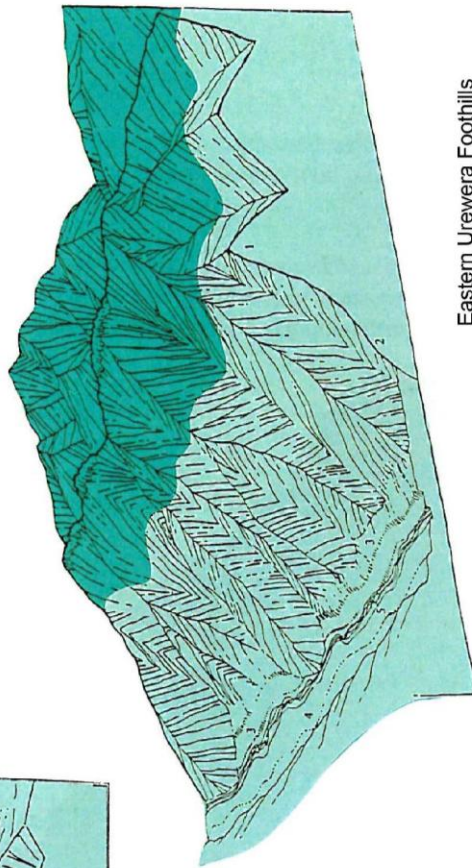
Eastern Urewera Foothills
Land System/Ecosystem

North Eastern Coastal Strip
Land System/Ecosystem

Rangitaiki Alluvial Plains
Land System/Ecosystem

Source: Lucas Associates with Ian Lynn, Landcare Research & Wildland Consultants 1998
A Framework for Monitoring Ecological Integrity in the Bay of Plenty Region

Bay of Plenty Region
Bio-climatic Zones

Scale 1:1 000 000 (1cm - 10km)

TAURANGA

ROTORUA

WHAKATANE

Legend
- Coastal
- Semicoastal
- Lowland
- Submontane
- Montane
- Subalpine

— Environment B · O · P Regional Boundary
— Regional Catchment Boundary

Source: Lucas Associates with Ian Lynn, Landcare Research & Wildland Consultants 1998
A Framework for Monitoring Ecological Integrity in the Bay of Plenty Region

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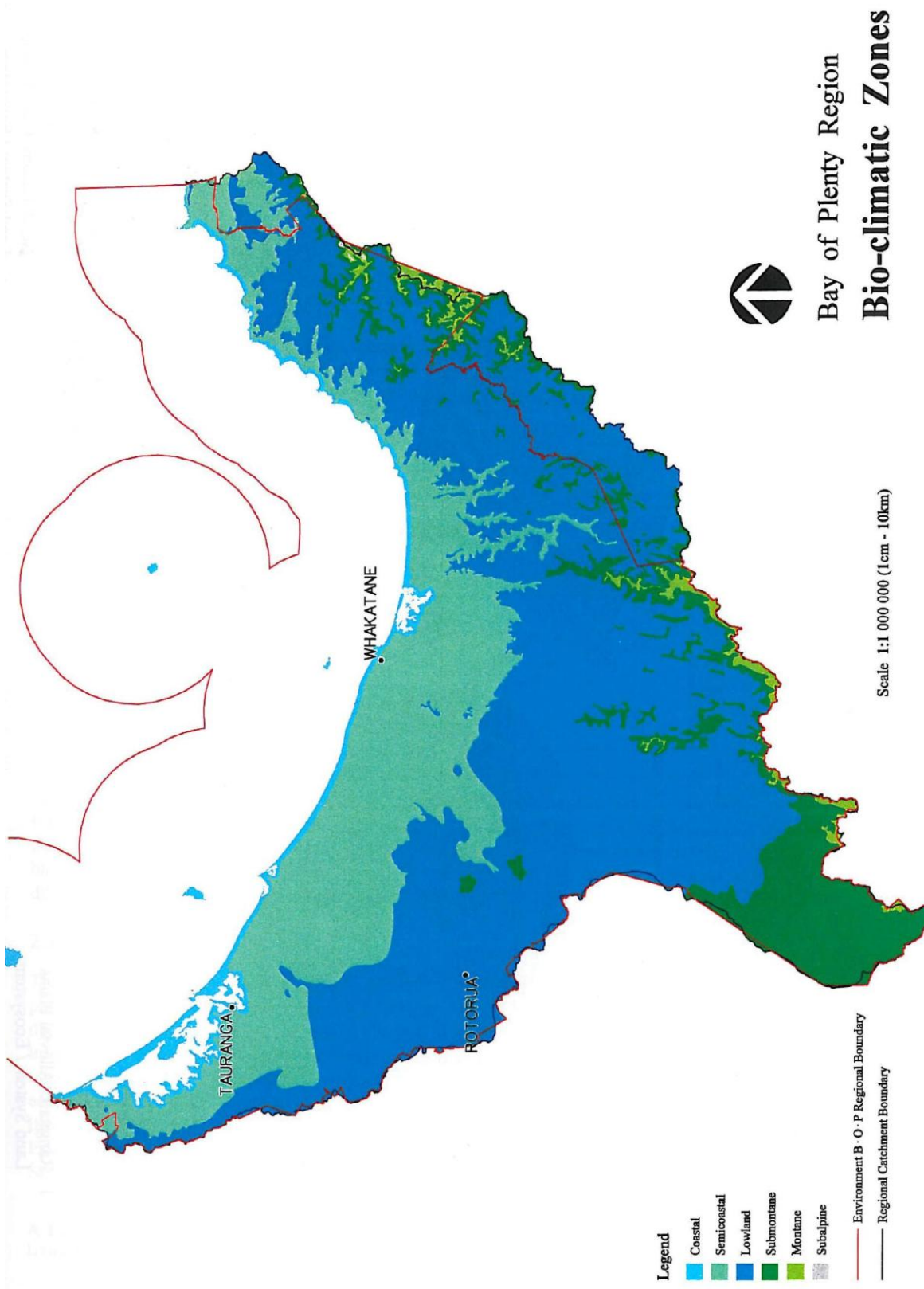
APPENDIX 3   'PIGEON BAY FACTOR' ORIGIN

Just two years after the enactment of the RMA, Boffa Miskell and Lucas Associates together developed a suite of landscape assessment criteria for interpretation of section 6(b), and undertook a rapid assessment of the Canterbury Region in 1993 to identify regionally outstanding and significant landscapes. I then interpreted these criteria for a district scale assessment in 1995. The landscape criteria developed were:

In the context of the Region/District, for identification as "outstanding", a landscape would need to have exceptional characteristics or values with regard to at least one of these criteria:

NATURAL SCIENCE - Natural features and landscapes of at least region/district importance for reasons of the rarity or representativeness of their particular landform and landcover. A natural feature may be a landscape feature or an element/component of the landscape. Under s. 6(b), geology and soils are elements of particular focus, as flora and fauna values are also considered elsewhere in the Act.

LEGIBILITY - The landscape (or natural feature) of region/district significance should clearly express past natural and/or cultural processes. Some may have strong historical connotations and a distinctive sense of place.

TRANSIENT - The natural feature or landscape of regional/district significance providing predictable or regular experience of dimensions of nature other than landform or landcover e.g. concentrations of wildlife.

AESTHETIC - Landscapes (and natural features where applicable) that are of high aesthetic value determined on how memorable they are, on their naturalness, on their composition (coherence) and on other important aesthetic factors.

SHARED & RECOGNISED - There should be a substantial measure of agreement between professional and public opinion as to the value of natural features and landscapes, for example as reflected through writings and paintings or through favourite locations to cite or visit. The presence of existing protected sites is also likely to reflect shared and recognised values.

TANGATA WHENUA - The natural feature or landscape identified as having particular regional/district importance to tangata whenua.

I quoted these criteria in my landscape assessment for an Environment Court hearing.[12]   In that decision the Court referred to them as the 'Pigeon Bay criteria' and introduced them with slight modification to the Queenstown Lakes District Plan.[13]   Historic associations were added.   Also, ecological factors were added to the natural science criterion, as 'double counting' of values under section 6(b) and (c) was identified as not being an issue.   The Court stated that "*this list is not frozen – it may be improved with further use and understanding*".

With minor modification, this list was included in Policy 32 of the Proposed NZCPS. A considerable number of Council, power company, professional and NGO submissions supported this list of landscape criteria. These assessment factors based on our 1993 study, widely (but not totally) supported in practice and decisions since, are now formalised in NZCPS 2010 Policy 15.

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[12] *Pigeon Bay Aquaculture v. Canterbury Regional Council* C32/99.
[13] *WESI v QLDC* C180/99 paragraph 80

APPENDIX 3   Land Typing[14]

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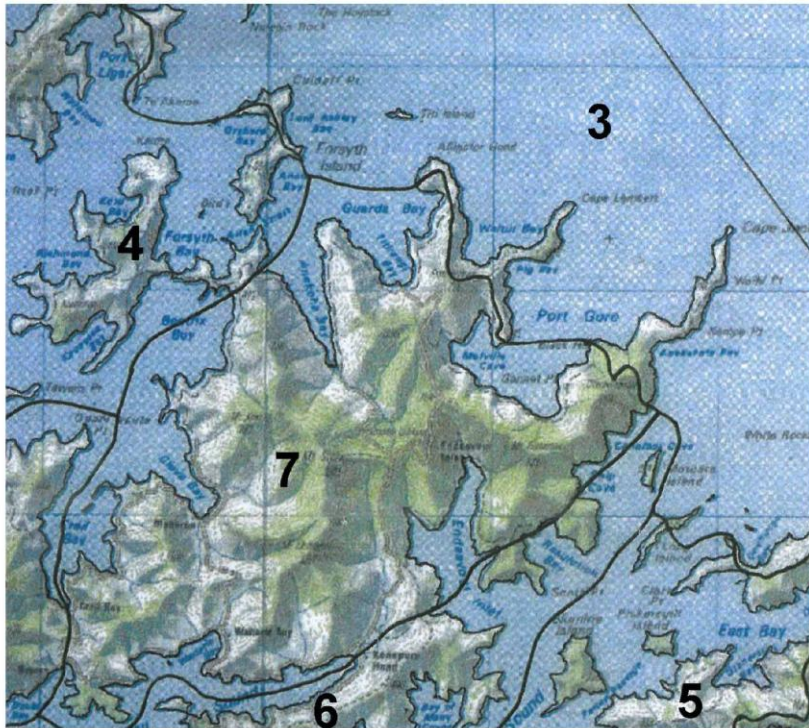
See graphic examples at a range of scales at http://www.lucas-associates.co.nz/resources/

& http://lucas-associates.co.nz/resources/coastal-land-types/coastal-land-types-of-new-zealand/

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[14] NZCPS 2010 Glossary page 27. *Land Typing – Describes land types which form the basis over which land cover, land use and association information are addressed as the basis for land characterisation.*
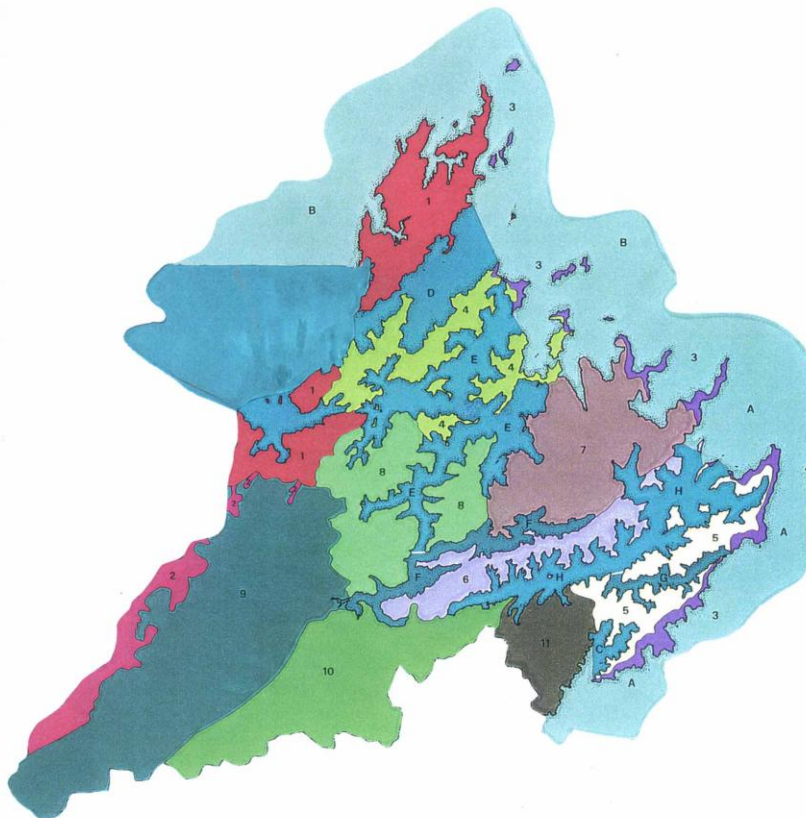
Excerpt - Marlborough Sounds Landtypes

Source - Ian Lynn , Landcare Research, 1997

Key

3   Cook Strait
7   Stokes
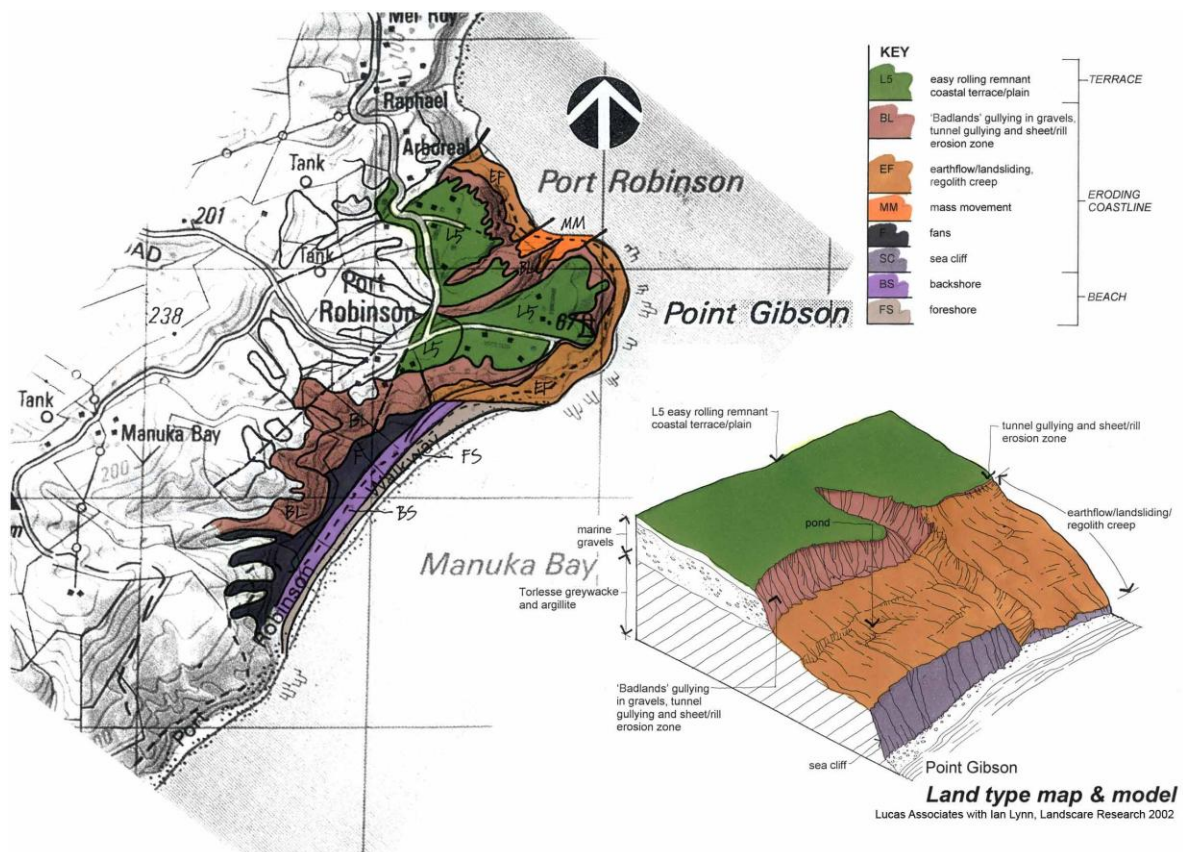
Lucas Associates   www.lucas-associates.co.nz   August 2011

LAND TYPE **7**
STOKES
sounds, wet, weakly to
strongly foliated
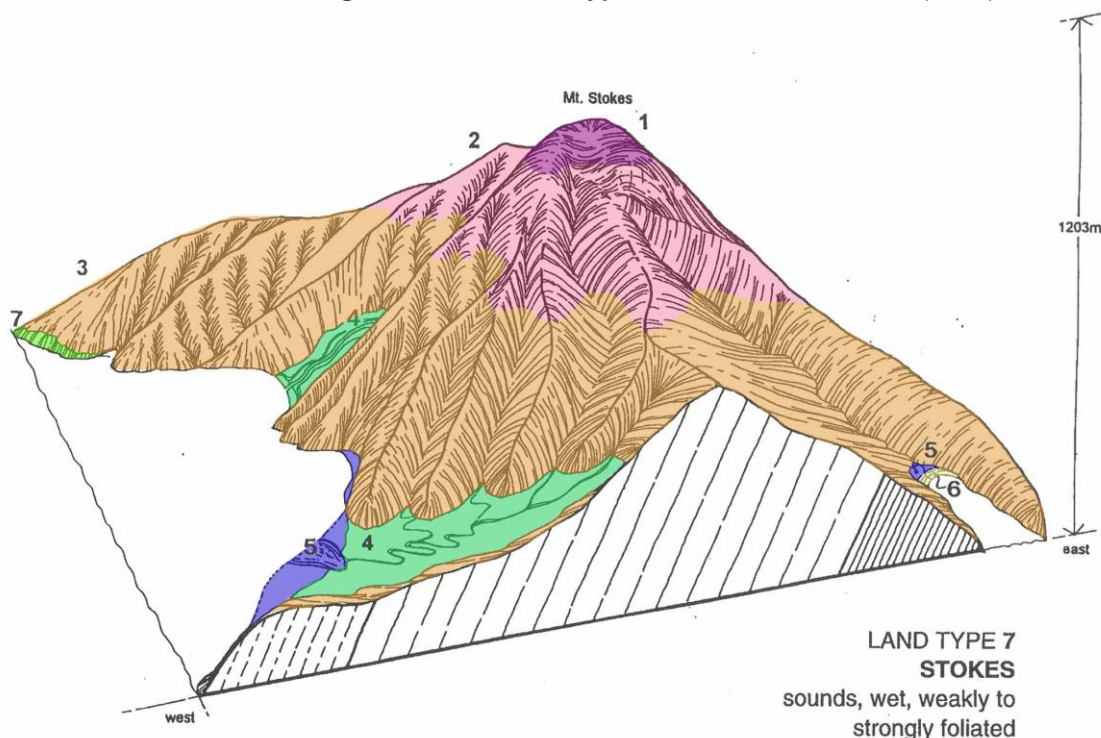
	landform component	geological formation	elevation m	remnant native vegetation		present land use	potential land use	land use impacts
1.	strongly rolling to moderately steep broad mountain summits and upland ridge crests	siliceous, foliated t.z. 11A to t.z. 111A schist of the Marlborough Schist	1000 – 1203	silver beech, tussock grasslands, herbfields, and cushion bog above 1100 m		conservation land, protected native forest, recreation	conservation land, recreation	recreation, tracking, buildings etc.
2.	steep to very steep upper hill and mountain slopes	siliceous, foliated t.z. 11A to t.z. 111A schist of the Marlborough Schist	600-1100	red beech-kāmahi forest, with some rimu, tawa, Hall's tōtara, silver beech above 700 m		conservation land, protected native forest, semi extensive grazing, recreation	conservation land, extensive grazing, recreation	recreation, tracking, buildings etc.
3.	moderately steep to steep lower hill slopes	siliceous, foliated t.z. 11A to t.z. 111A schist of the Marlborough Schist	0-600	hard beech-kāmahi forest, with some rimu, tawa, hīnau, and kohekohe; reverted scrubland with mānuka - kānuka scrub and bracken fern with regenerating broadleaves		conservation land, semi extensive grazing, exotic forestry, recreation	conservation land, semi intensive grazing, exotic forestry, recreation	increase in exotic pasture and weed species, exotic forest, tracking, fencing, recreation
4.	undulating terraces, floodplains, fans and associated wetlands and deltas [P27/980050, 970098]	recent alluvium from predominantly schistose rocks	0-20	podocarp-broadleaved forest, kahikatea, rimu, mataī, miro		intensive grazing	intensive grazing, feed cropping, intensive cropping	intensified land use, drainage, windbreaks, subdivision
5.	minor prograding inlet heads and fans, eg [P26/980110, 030165]	recent alluvium from predominantly schistose rocks, minor swamp deposits	0-20	podocarp-broadleaved forest, kahikatea, rimu, mataī, miro		intensive grazing	intensive grazing, feed cropping, intensive cropping	intensified land use, drainage, windbreaks, subdivision
6.	beach ridges and dunes, eg [P26/056202]	recent marine sand and gravel	0-20	Spinifix, dune slack, rushes, sedges, low scrub		extensive grazing, conservation land, wildlife habitat	extensive grazing, conservation land, wildlife habitat	loss of native and increase in exotic species, recreational impacts
7.	minor steep to precipitous eroding sea cliffs	siliceous, foliated t.z. 11A to t.z. 111A schist o f the Marlborough Schist	0-100	sparse shrub-herbfield, flax		conservation land, protected native forest-scrub, wildlife habitat	conservation land, protected native forest- scrub, wildlife habitat	habitat destruction, fire, wild animal grazing - goats

KEY
L5   easy rolling remnant
     coastal terrace/plain
BL   'Badlands' gullying in gravels,
     tunnel gullying and sheet/rill
     erosion zone
EF   earthflow/landsliding,
     regolith creep
MM   mass movement
F   fans
SC   sea cliff
BS   backshore
FS   foreshore

Point Gibson
Land types
overlaying high level aerial oblique (April 1991)

Lucas Associates with Ian Lynn, Landscare Research 2002

KEY

L5	easy rolling remnant coastal terrace/plain	*TERRACE*
BL	'Badlands' gullying in gravels, tunnel gullying and sheet/rill erosion zone	
EF	earthflow/landsliding, regolith creep	*ERODING COASTLINE*
MM	mass movement	
F	fans	
SC	sea cliff	
BS	backshore	*BEACH*
FS	foreshore	

L5 easy rolling remnant
coastal terrace/plain

tunnel gullying and sheet/rill
erosion zone

earthflow/landsliding/
regolith creep

pond

marine
gravels

Torlesse greywacke
and argillite

'Badlands' gullying
in gravels, tunnel
gullying and sheet/rill
erosion zone

sea cliff

Point Gibson

Land type map & model
Lucas Associates with Ian Lynn, Landscare Research 2002

APPENDIX 7

When UK landscape architecture Professor Carys Swanwick was on sabbatical at Lincoln University, she and Professor Swaffield issued an opinion piece, which included the following excerpt:

> *"The UK has historically used a similar approach to current practice in NZ, focusing upon identification and designation of 'outstanding' or 'special' landscapes. In recent years however there has been a significant shift towards understanding the distinctive character of all landscapes, with emphasis on what makes them different from each other, rather than better or worse, or more or less important. This allows planning strategies to be devised that address the needs and opportunities of different landscapes, from conservation of valued features in some areas, to restoration of landscape systems or even creating new landscape structures in other areas.*
>
> *In the UK, central government advice documents have established a more consistent approach, and there is now an accepted framework of character assessment. Although there is still debate about what strategies are appropriate in different areas, conflicts over basic principles have largely disappeared.*
>
> *While the circumstances are inevitably different, New Zealand could also benefit from an approach that pays more attention to understanding what makes <u>all</u> of our landscapes distinctive, rather than just attempting to 'red line' certain areas. The results of these types of 'character' assessment could inform councils, communities and landowners about how landscapes are changing and where development would best be undertaken, what factors it should take into account, as well as indicating where development will be less appropriate. This is hardly revolutionary and indeed some consultants are already moving to such an approach. But a much broader consensus is needed among communities, landowners, council planners and landscape specialists about possible ways forward, if we are to move beyond the current atmosphere of conflict."*

'*Recognising and managing landscape values'*, Simon Swaffield and Carys Swanwick, Lincoln University, 26 May 2006
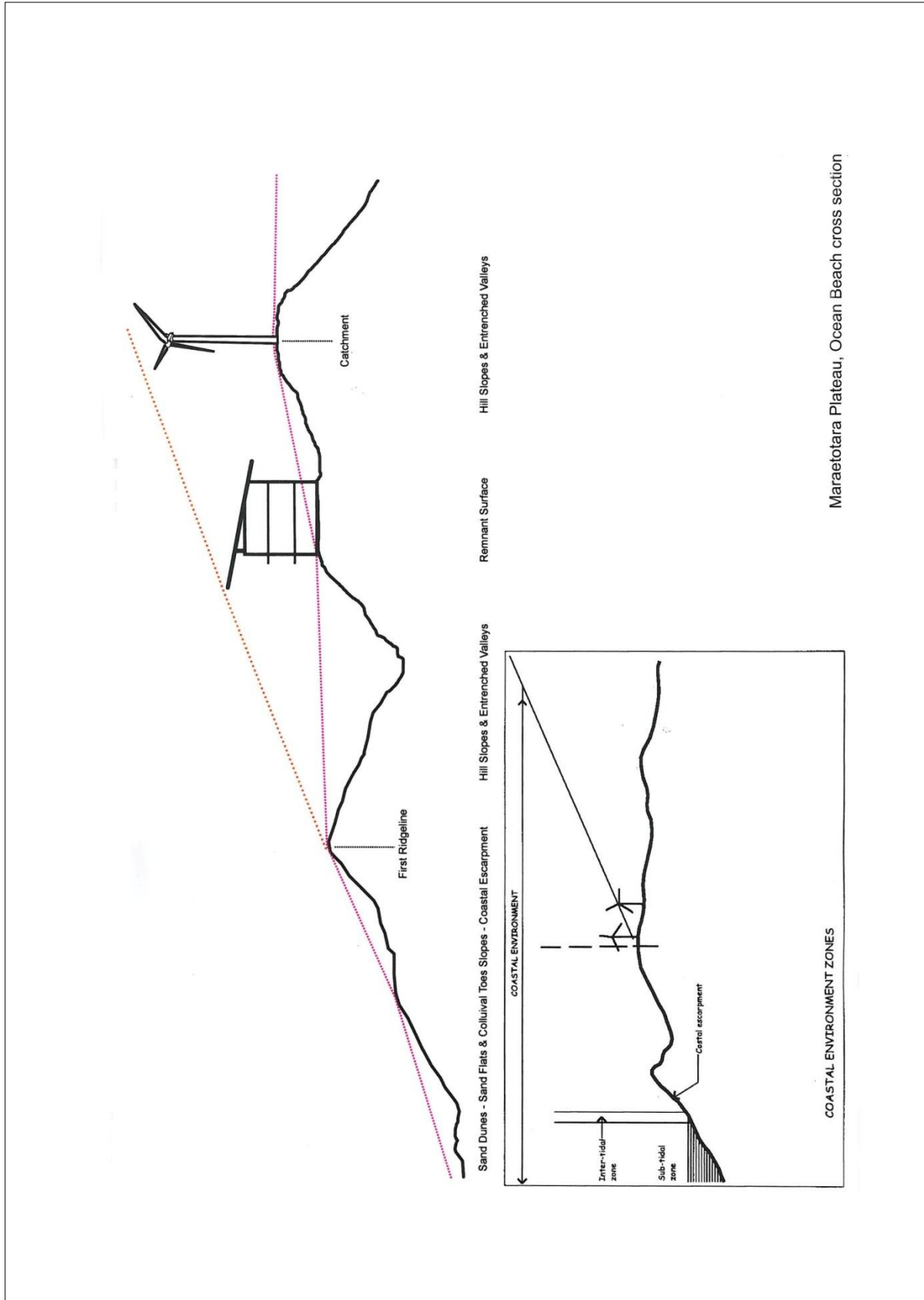
Maraetotara Plateau, Ocean Beach cross section

Catchment

Hill Slopes & Entrenched Valleys

Remnant Surface

First Ridgeline

Hill Slopes & Entrenched Valleys

Sand Dunes - Sand Flats & Colluvial Toes Slopes - Coastal Escarpment

COASTAL ENVIRONMENT

Coastal escarpment

Inter-tidal zone

Sub-tidal zone

COASTAL ENVIRONMENT ZONES

Quantitative Methodology for measuring the Natural Character of New Zealand's Terrestrial and Aquatic Coastal Environments

Victoria Froude [1]

[1] Pacific Eco-Logic Ltd, Deeming Road, RD1 Russell 0272 vfroude@slingshot.co.nz

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Introduction

New Zealand has a long-standing statutory policy goal to preserve the natural character of the coastal environment, riparian and various freshwater environments, and to protect those environments from unnecessary/inappropriate subdivision, use and development. This policy was developed in the early 1970's as part of the response by the then government to widespread public concern about the rapid rate of coastal and lake-margin development. It has been one of the matters of national importance in planning/development control legislation since 1973 (now section 6(a) of the Resource Management Act 1991), and one of the three purposes of the Reserves Act 1977 (section 3(c)) since 1977.

The preservation and restoration of natural character is an important component of the 2010 New Zealand Coastal Policy Statement. Policy 13 requires that the natural character of the coastal environment be preserved by avoiding adverse effects on areas of coast with outstanding natural character; avoiding significant adverse effects on natural character, and avoiding, remedying and mitigating adverse effects on natural character for all other parts of the coastal environment. Methods for doing this are to include assessing natural character of the coastal environment of the region or district by mapping or otherwise identifying at least areas of high natural character. Policy 14 requires that restoration or rehabilitation of the natural character of the coastal environment be promoted using a variety of mechanisms, including identifying areas and opportunities for restoration.

Since the adoption of the natural character policy goal coastal natural character has been degraded by terrestrial and aquatic developments; invasive alien species; accelerated sedimentation/ smothering of aquatic ecosystems caused by land-based human activities; land-use intensification; and harvesting of fish and other aquatic life. Climate changes, consequential higher sea levels and more frequent violent storm events and storm surges have the potential to further reduce natural character, especially where the human response is to use/ increase hard protection works. In some locations coastal natural character has improved by: retirement of some marginal farming lands; ecological restoration activities; and the establishment of no-take marine reserves and some coastal margin and estuarine reserves.

The purpose of this two-part article is to summarise key features of the quantitative methodology (QINCCE) I developed for measuring coastal natural character as part of my PhD research at the International Global Change Centre at the University of Waikato. In Part One I address the definition of natural character and requirements for methodology that measures it. Part Two will describe QINCCE (*Quantitative Index for measuring the Natural Character of the Coastal Environment*) methodology and applications for the methodology.

Defining natural character

The first step in methodology development was to define natural character. A paper published in the *New Zealand Journal of Ecology* (Froude et al. 2010) analyses literature from a wide variety of disciplines to distil a set of interpretations and perspectives of natural character/ environmental naturalness. These interpretations were assessed against criteria addressing New Zealand's environmental, legal and policy context. No interpretation addressed all criteria and so several of the "best-matched" interpretations were combined and refined to develop a comprehensive definition that fully addressed all the criteria as follows:
"Natural character occurs along a continuum. The natural character of a "site" at any scale is the degree to which it:

- *is part of nature, particularly indigenous nature*
- *is free from the effects of human constructions and non-indigenous "biological artefacts"*
- *exhibits fidelity to the geomorphology, hydrology and biological structure, composition and pattern of the reference conditions chosen*
- *exhibits ecological and physical processes comparable with reference conditions*

Human perceptions and experiences of a "site's" natural character are a product of the "site's" biophysical attributes, each individual's sensory acuity and a wide variety of personal and cultural filters."

I then compared this definition with an analysis of the collective interpretations of natural character distilled from 100 Court decisions on appeals made under the Resource Management Act. The comparison showed that the comprehensive definition of natural character was generally consistent with Court interpretations of natural character. It is, therefore appropriate to use the comprehensive definition to underpin methodology for measuring the natural character of the coastal environment. I have prepared a paper describing this case law analysis and comparison and will be submitting that to an environmental management journal.

Developing the QINCCE methodology

My analysis of existing approaches for assessing natural character showed that no existing approaches:

- applied to all the different types of New Zealand terrestrial and aquatic coastal environments
- addressed all relevant components of natural character (as in Froude et al. (2010)
- provided quantitative methodology for measuring the current level and changes in overall coastal natural character, and its individual components
- provided scientifically robust methodology that could be used at a variety of scales and for a wide variety of purposes

A wide variety of sources were used to develop criteria (Table 2) for assessing potential new methodologies for measuring natural character and its change. These criteria are addressed by the QINCCE methodology.

Table 2: Criteria against which potential methodologies for measuring natural character and its change are assessed

Criterion category	Criteria for methodology for measuring and reporting natural character and its change
Comprehensive	Address all components of the definition of natural character in Froude et al. (2010) and elements in New Zealand Coastal Policy Statement policy 13
	Address terrestrial, freshwater and marine coastal environments
	Provide for a variety of circumstances including broad scale and detailed assessments
	Address the spatial pattern of natural character variation
Consistent	Use a consistent methodology framework across land-water boundaries and natural character discontinuities
	Developed within a consistent analytical framework
Flexible	Able to be used for a variety of purposes at a wide range of scales
Quantifiable	Quantitative measurements and/or categorical scoring are used to facilitate measurement of change
Sensitive	Able to distinguish between human induced change and natural disturbance
	Responsive to environmental change
	Clearly distinguishes different levels of natural character
Robust	Soundly based and well designed
	Well tested analysis and reporting framework
Practical	The data collection phase can be implemented by trained personnel but there is not a requirement for high level specialist knowledge
Transparency	The components that contribute to a natural character 'score' are available for examination and other uses
Predictive capacity	Able to predict how score would change in response to environmental change
Results understandable	Reporting addresses spatial pattern of natural character variation
	Reporting uses indices or equivalent to simplify communication of complex information

The QINCCE methodology uses the same framework for all categories of terrestrial and aquatic coastal environments. Part Two will describe key aspects of the QINCCE methodology and potential applications.

References

Froude VA, Rennie HG, Bornman JF 2010 The nature of natural: defining natural character for the New Zealand context. *New Zealand Journal of Ecology* 34(3): 332-341 http://www.newzealandecology.org/nzje/new_issues/NZJEcol34_3_332.pdf

Froude, VA, 2011 Quantitative methodology for measuring the natural character of New Zealand's coastal environments. A thesis submitted in fulfilment of the requirements of the degree of Doctor of Philosophy. University of Waikato. 349p.

PART TWO: To be published in *Planning Quarterly* September 2011

Introduction

This is the second part of a two-part article summarising key features of the quantitative methodology I developed for measuring coastal natural character as part of my PhD research at the International Global Change Centre at the University of Waikato. In Part One I addressed the definition of natural character and requirements for methodology that measures it. In this part I describe the QINCCE (Quantitative Index for measuring the Natural Character of the Coastal Environment) methodology and applications.

The QINCCE methodology uses the same framework for all categories of terrestrial and aquatic coastal environments. It can be applied at a variety of scales and for a variety of purposes. The core methodology uses units depicted in plan-view. For each unit a set of core parameters are measured or calculated and combined into three indices which are further combined into a natural character index. Additional assessment perspectives and parameters are available for detailed assessments of natural character such as might be required for a resource consent application.

Depicting spatial patterns of natural character

Given the flexibility provided by GIS tools and the amount of data involved in most assessments, an early decision was that the methodology for measuring natural character and its change should use GIS technology. Natural character is too complex a concept for automatic computer classification. Accordingly, units with relatively homogeneous levels of natural character are depicted manually on aerial images or marine charts and subsequently digitised as polygons with geo-referencing. The average size of units in an assessment depends on the heterogeneity of natural character present in the area being assessed as well as the scale selected for assessing natural character. Each geo-referenced unit is electronically linked to a database containing that unit's parameter information.

The levels of natural character within each unit are relatively homogeneous as this improves the sensitivity of the method for detecting natural character change. Unit boundaries are determined after an assessment of factors that most directly affect current natural character levels in different types of terrestrial and aquatic coastal environment. When natural character assessments are made at broad (less-detailed) scales, the units may contain more natural character variation.

Detailed assessments (e.g. resource consent applications) in terrestrial and intertidal coastal environments can use the oblique *Viewpoints* measuring system as well as the plan-view

based methodology. From each selected vantage-point a grid is used to define an oblique *Viewpoint* "unit" for which the core parameters (with minor amendments) are assessed.

Using indicators and parameters

Natural character is a complex concept. Like other complex concepts (e.g. biodiversity) it is best assessed using a carefully selected set of indicators (and associated parameters) that can track changes in the main environmental components that comprise the natural character of an environment.

The Pressure-State-Response model has been widely used for developing and reporting indicators (e.g. OECD 1993; Ministry for the Environment 2010). It is based on the concept of causality. *Pressures* (resulting from human activities) change the *State/Condition* of the environment. Society's *Response* to these changes through policies and actions forms a feedback loop to the pressures. The high level/aggregated indicator, *Amount of natural character*, is a state/condition indicator. Specific indicators selected for the QINCCE methodology are state/condition indicators wherever possible. In situations where it is not practical to collect data about potential state indicators, surrogate pressure indicators are used instead.

The comprehensive definition of natural character (Froude et al. 2010) discussed in Part One of this article provided the framework for selecting indicators and associated parameters. Some parameters are directly measured (e.g. *% cover that is natural area/natural surface*) while others are derived or calculated (e.g. *Score for progress towards present-potential cover*). Descriptions of special-purpose terms are in Box 1.

Categorical scoring is used for those parameters where direct numerical measurement is not possible (e.g. *building and structure colour naturalness score*, *score for progress towards present-potential cover*). The second of those parameters is derived from two assessments: the current cover and the *present-potential cover*. The relationship between the current cover and the *present-potential cover* is assessed using a 100 point categorical system (in practice usually only 20 categories are used) based on a log-growth curve. The assessment of building and structure height uses a similar system.

For each broad class of coastal environment there is a *core* set of parameters (Table 3) that are used to calculate the primary natural character indices. These parameters are based where possible on underlying measured data (e.g. % cover). Those parameters using categorical data (e.g. score between 0 and 1) are supported by comprehensive scoring tables.

Detailed assessments (e.g. for resource consent applications) can use additional *Tier-Two* indicators/ parameters and sub-indices (e.g. sound and light naturalness index). These additional indicators (selected as appropriate for the environment type) address native cover, status of indicator species that represent the state of naturalness; alien pest-plant cover, water clarity, water quality, non-natural sounds and artificial light.

Using indices to aggregate New Zealand natural character data

The reporting of assessment and monitoring outcomes for a complex concept like natural character requires the aggregation of data from diverse parameters. An effective way to do this is to use an index or set of indices. Benefits of indices are that they can: combine complex information about a range of parameters into a simple system that can be understood by the public and decision-makers; provide a way to integrate information about different types of parameters; and be used to identify or set thresholds or standards. None of the many existing New Zealand and international indices I reviewed would satisfactorily report natural character and its change, especially not in the New Zealand context.

Accordingly I developed a set of new indices for reporting natural character. The core QINCCE methodology uses three sub-indices for each unit (ecological naturalness index; hydrological and geomorphological naturalness index; freedom from buildings and structures index). These sub-indices are multiplied together to give the natural character index for the unit. Table 3 lists the indicators and core parameters arranged by sub-index. For many units a subset of core parameters is assessed because only some categories of cover are present and human-mediated hydrological and geomorphological changes are limited.

Table 3: QINCCE methodology: core indicators and parameters arranged by sub-index

Ecological naturalness index (ENI)

Indicator	Parameter(s)
Natural area, natural surface and biological artefact area cover*	• % cover natural area/100 • % cover natural surface/100 • % cover biological artefact area/100
Impact of alien mammals on native flora and fauna (terrestrial & freshwater)	Score representing the relative impact of/ freedom from alien mammal (terrestrial)/fish (freshwater) species on native flora and fauna for natural areas; natural surfaces; biological artefact areas
Level of protection/ naturalness mobile biota (marine)	Score representing the level of freedom/protection from human harvesting pressure for natural areas; biological-artefact-areas
Progress to present-potential-cover*	Score for *progress to present-potential cover* for natural areas; natural surfaces; biological-artefact-areas

Hydrological and geomorphological naturalness index (HGNI)
HGNI=1-HGIS (Hydrological and Geomorphological Impact Score)

Indicator	Parameter(s)
Hydrological and geomorphic impacts	• Score representing the magnitude of each human-mediated change to the hydrology and/or geomorphology compared to the "*present-potential natural state* • % area affected by each human-mediated hydrological and/or geomorphological change

Freedom from buildings and structures index (FBSI)
FBSI=1-BSIS (Buildings and Structures Impact Score)

Indicator	Parameters
Building, structure, paved or surfaced cover	• % cover/100 buildings • % cover/100 structures • % cover paved, surfaced areas/100
Building & structure height/volume	• Score for maximum height (terrestrial or intertidal) of buildings; structures; paved • Score for structure volume (subtidal)
Building colour naturalness & reflectivity (terrestrial & intertidal)	• Score for colour naturalness of buildings; structures; paved • Score for reflectivity of buildings; structures; paved
Alien cover on structures (subtidal)	• Score representing the level of alien cover on structures only

*Descriptions of special purpose terms are in Box 1.

Calculating natural character indices

The "score" for each core parameter is standardised to lie between 0 and 1. For each of the three main sub-indices the relevant core parameter scores are combined using multiplication except where the parameters are measuring attributes that are clearly independent. The independent parameters in each index are the directly measured percentage cover assessments adjusted to give scores between 0 and 1. The three sub-indices for each unit are multiplied to give an overall index of natural character that also lies between 0 and 1. This can be multiplied by 100 to give a more easily understood "percent natural". Natural character formulae have been developed for terrestrial, intertidal and underwater (sea/lake bed and water column) coastal environments. The formula for an optional water-surface overlay uses a weighting that doubles the impact of buildings and structures.

Parameter measurement protocols and index formulae were refined using extensive field testing and a comprehensive validation exercise. In the validation exercise, natural character perception scores from 113 relatively informed participants (half from councils) were compared with objective assessments using the QINCCE *Viewpoint* methodology.

Figure 1 shows the application of the methodology with unit boundaries and natural character scores depicted as an overlay on detailed aerial imagery. For regional or sub-regional scale assessments lower resolution imagery would be used and the density of units would be less.

Figure 1: Application of the QINCCE methodology using high resolution aerial imagery

Potential applications for QINCCE methodology

While the overall purpose of the QINCCE methodology is to measure natural character and its change, the methodology has been designed to address a range of management applications of particular significance to the New Zealand context including:

- Calculating natural character indices for units at a sub-district, district and region wide scale (so allowing councils to map the level of natural character of the coastal environment)
- Comparing changes in natural character over time across different types of coastal environment
- Forecasting natural character change for a development or restoration project, enabling better quantification of offsets for mitigation if appropriate.

Conclusion

The QINCCE methodology for measuring coastal natural character and its change provides a consistent framework for terrestrial and aquatic environments based on the measurement of parameters within spatial units. Actual and derived parameters are combined into three sub-indices and an overall natural character index. Additional parameters and indices are available for detailed assessments such as those required for resource consent applications. The methodology has been most thoroughly developed and trialled for terrestrial and estuarine intertidal environments.

While QINCCE methodology has been developed in Northland Region the methodology framework and parameters apply nationally. The methodology is relatively unusual internationally because it provides a quantitative integration of parameters measuring a very diverse range of attributes that contribute to, or detract from, natural character in both terrestrial and aquatic environments.

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