Before Independent Hearings Commissioners
appointed by the Northland Regional Council

under: the Resource Management Act 1991

in the matter of: an application by Meridian Energy Limited for resource consents for earthworks, associated stormwater diversion and discharges and vegetation clearance for the construction of a solar farm at Ruakākā, Northland (APP.045356.01.01)

between: **Meridian Energy Limited**
Applicant

and: **Northland Regional Council**
Consent Authority

Statement of Evidence of Stephen Fuller (Ecology - wetland restoration)

Dated: 19 July 2024

Reference: J Appleyard (jo.appleyard@chapmantripp.com)
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STATEMENT OF EVIDENCE OF STEPHEN FULLER

INTRODUCTION

1 My full name is Stephen Andrew Fuller.

2 I am a Senior Ecologist and Partner at Boffa Miskell Limited (*Boffa Miskell*).

3 I hold a Bachelor of Science in Zoology and Botany, and a Diploma of Applied Science in Ecology from Victoria University of Wellington.

4 I am a Fellow of the Environment Institute of Australia and New Zealand and a Certified Environmental Practitioner.

5 My professional memberships include:

5.1 The Environment Institute of Australia and New Zealand;

5.2 The Wellington Botanical Society.

6 I have worked as a botanist and general ecologist for over 40 years, including employment with the Department of Lands and Survey, and Botany Division DSIR, where I conducted biological surveys of scenic reserves in the lower and central North Island. From 1992 to 1997 I ran my own ecological consultancy. From 1997 to 2002 I was the project manager responsible for the design and development of the Karori Wildlife Sanctuary (Zealandia). In November 2002 I joined Boffa Miskell.

7 I work primarily in the area of ecological impact assessment, project shaping (constraints mapping and iterative design), assessing ecological value and significance, determination of offsetting requirements, identification of mitigation sites, the preparation of management plans, construction observation, establishing post construction monitoring, and assisting with design changes and upgrades over time. My work covers a range of fields, including the mapping and description of terrestrial and wetland flora and fauna, freshwater habitat descriptions, monitoring, and avifauna studies. I have carried out assessments throughout New Zealand.

8 I have a thorough understanding of wetland ecology, identification, delineation, values and assessment. This has included two inventories for the Wellington Region:

8.1 In 1992 I was commissioned to produce a comprehensive report on wetlands in the Wellington Region for Greater Wellington Regional Council[1] (*GWRC*) with recommendations

[1] Fuller, S. A. (1993). Wetlands in the Wellington Region (Wellington Regional Council Policy and Planning Department Report WRC/PP-G-93/16). Wellington Regional Council.

for changes to policies and protections for the region's wetlands.

8.2 In 2011 I was again commissioned by GWRC to produce an updated inventory of wetlands within the region and provide an assessment of each wetland's ecological values.[2]

9 My work in the design and implementation of ecological restoration is particularly relevant to this evidence. Examples of relevant experience include:

9.1 Since joining Boffa Miskell I have designed constructed wetlands at a number of rural-residential subdivisions on the Kapiti coast which occur in similar sand/peat substrates to those present at the Proposal sites.

9.2 I have also provided advice to landowners whose wetlands have failed due to poor design, leading to eutrophication and stagnation, weed infestations, odours and the proliferation of insect pests. This advice included preparation of a guidance document for those thinking of constructing a pond/wetland, highlighting the pitfalls and issues that need to be addressed[3].

9.3 The largest and most complex wetland construction project I have been involved in was for the MacKays to Peka Peka Expressway (*M2PP*). For this project we constructed 21.5 ha of wetland and 14 ha of associated riparian margin along this new alignment. I will discuss this project later in my evidence.

CODE OF CONDUCT

10 Whilst this is a Council hearing, I acknowledge that I have read and agree to comply with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023. My qualifications as an expert are set out above. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

[2] Boffa Miskell Ltd. 2011: Desktop delineation and assessment of significance of wetlands of the wellington region methodology & results. Prepared for Greater Wellington Regional Council. November 2011. 50p.

[3] Greater Wellington Regional Council 2005: "So you're thinking about a pond...", A guide to the design, management and consent requirements for landowners. GW/RP-G-05/185

SCOPE OF EVIDENCE

11 I have been asked by Meridian Energy Limited (*MEL*) to provide evidence specifically in relation to ecological (or wetland) restoration as it relates to MEL's Ruakākā solar farm project (the *Proposal*).

12 I have not been involved in the development of the Proposal to date however, I visited the Site on 19 June 2024 to view the wetland habitat to be removed, the wetland habitat sites to be restored and enhanced, and the wetland offset site.

13 My evidence considers my on-site observations in relation to other wetland restoration and construction work that I have been involved in in similar environments in the lower North Island.

14 Specifically, my evidence will cover:

14.1 key factors for successful wetland restoration;

14.2 examples of successful wetland restoration; and

14.3 my opinion on the wetland restoration that is proposed as part of the Proposal.

15 Other ecological matters will be covered by other Boffa Miskell experts, including **Dr Sarah Flynn**, **Ms Tanya Cook**, and **Dr Lee Shapiro**.

16 I note that I have read the evidence of the other Boffa Miskell experts, Dr Sarah Flynn, Ms Tanya Cook and Dr Lee Shapiro and will not repeat their discussions. I have also read the relevant sections of the Section 42A report.

SUMMARY OF EVIDENCE

17 My evidence relates specifically to the ability to restore, enhance, and construct wetlands that will meet offsetting objectives for the Proposal.

18 I have considered the proposed offsetting, which involves the restoration, enhancement and construction of wetlands, in light of my experience developing similar wetlands in the lower North island.

19 I also highlight that there is a long history of wetland restoration, enhancement and construction in New Zealand, supported by several national organisations which have advocated for this work since the 1970s and which have produced guidance to assist in design and ongoing management.

20 In addition to community, local and central government projects to restore and enhance wetlands, many wetlands have also been

developed by ecological practitioners as mitigation or offsetting for the effects of an activity such as roading and subdivision. Furthermore, many of these restoration projects have been conducted along the coastlines of New Zealand in similar sand and peat soils.

21 With good design and implementation, and ongoing management, I am confident that the enhancement works proposed in Site 1B/1C and the construction of new wetlands proposed in Sites 1 and 3 can achieve the stated objectives.

22 I do not believe that doubts presented in the Ecological Review included with the Section 42A report are founded based on my knowledge and experience of wetland restoration work.

INTRODUCTION TO WETLAND CONSTRUCTION AND RESTORATION

23 By way of an introduction to this topic, the construction and restoration of wetlands in New Zealand has a long history and there are many examples of successful wetland restoration and wetland construction projects that have resulted in significant biodiversity gains.

24 One of the earliest proponents of wetland construction was Ducks Unlimited NZ (*DU*), founded in 1974. Over the past 50 years DU has assisted landowners across the country to construct ponds and wetlands. Many were initially built to improve habitat for duck hunting, but DU shifted its focus some years ago and now uses the knowledge gained to support wetland restoration and construction projects for the purpose of biodiversity gain.

25 Another key player has been the National Wetland Trust formed in 1999. This Trust has made significant contribution to advocacy, education and research into wetland restoration, including its bi-yearly Wetland Restoration Symposia which I have presented at.

26 The Department of Conservation has also been involved in wetland restoration and enhancement projects since its formation, with the Arawai Kākāriki Wetland Restoration Programme launched in 2007 its current flagship wetland conservation and science programme.

27 In addition a range of guidance has been produced on the development of stormwater management devices which are based on ecological principles. This guidance provides relevant information for wetland construction and management with a focus on water quality. Examples are the stormwater treatment standards of Waka Kotahi (2010), and the Auckland Council's various guidelines for Stormwater Management (e.g. Landscape and Ecology Values in Stormwater 2011).

28 Finally, ecological practitioners, such as myself, have been applying the learnings from these groups, and from our own investigations, for several decades. This has typically involved restoring degraded wetlands and constructing new wetlands as offsets for developments at a range of scales from significant infrastructure projects to smaller subdivisions.

29 Overall, I consider that the wetland restoration proposed at this site is fully covered by learnings and experience of the last 50 years. It does not require unique solutions, nor are the methods that will be used unproven or uncertain. Good design is essential and there is ample guidance to achieve that.

WHAT IS BEING PROPOSED

30 In summary, and as detailed in the evidence of **Dr Flynn** and **Dr Shapiro**, I understand the effects management component of this Proposal is to carry out:

30.1 Recreation, restoration and enhancement of 9.31 ha of existing highly modified and degraded dune swale wetland and open water habitats within Sites 1B and 1C. This will involve protecting and restoring 2.05 ha of open water habitat and extension of this wetland to the east creating a further 7.05 ha of wetland.

30.2 Recreation of 11.73 ha of wetland habitat in improved pasture within Site 3. There are no remains of historical wetlands at this site. The proposed offset wetland will therefore be fully constructed.

31 The objectives of this work are to ensure there is no loss of extent of natural inland wetlands, and to provide specific habitat for two species, the Australasian bittern and dabchick, noting that the habitats that will be developed for these species will also benefit a wide range of other flora and fauna.

DEFINITIONS

32 For the purpose of my evidence I will use the following broad classifications for types of restoration being proposed at this site:

32.1 **Wetland Restoration:** returning an existing degraded wetland to as close to its original form as possible with little or minimal hard engineering. Relies on the natural landforms and hydrology to have been largely retained. It may simply require management of exotic plants and revegetation of habitats where indigenous plants have been lost, but may also require management of water levels. Typically wetland restoration requires some parts of the original wetland to have been retained to inform the design and act as a core.

32.2 **Wetland enhancement:** for the purpose of this Proposal means expanding and modifying an existing wetland where natural landforms and hydrology have been highly modified but where some of the wetland has been retained. It may require physical works to improve water retention, provide a range of hydrological conditions necessary to restore the original diversity of habitats, and the reintroduction of species lost to past land uses.

32.3 **Wetland construction:** for the purpose of this Proposal this means the construction of a wetland on a site where none currently exists but may once have been present. For these projects the hydrology must be understood to ensure the excavations interact appropriately with ground water and surface water features. I note **Dr Flynn** and **Dr Shapiro** refer to this part of the Proposal as "wetland recreation", these terms are interchangeable.

KEY FACTORS FOR SUCCESSFUL WETLAND RESTORATION

33 There are a number of key requirements for the successful enhancement and construction of wetlands which will all apply to this site. They include:

33.1 A clear articulation of the objectives. For example is biodiversity the prime goal, or do other goals need to be accommodated (e.g. flood offset storage, stormwater treatment, amenity).

33.2 An understanding of the current hydrology of the site, seasonal variability of ground water and surface water, inflow volumes and sources, including:

(a) Sources of water that will be recharging the wetland, rainwater, groundwater, stream, etc.

(b) Consideration of the likelihood of salt water intrusion and appropriate species selection.

33.3 An understanding of the likely water quality and nutrient inputs that the wetland will experience once formed, such as:

(a) Dairy farms, horticulture, agriculture.

(b) Urban stormwater.

(c) Treated sewerage.

33.4 Knowledge of existing flora and fauna, both native and exotic.

33.5 An understanding of the wetland form that you are seeking to restore, saltmarsh, swamp, fen, etc, and in particular the required proportions of:

(a) Permanent open water.

(b) Permanently flooded rush and reedlands.

(c) Areas with a consistently high watertable.

(d) Seasonally flooded areas.

(e) Riparian margins.

33.6 An understanding of the substrates to be used where wetlands are constructed; sands, peats, imported topsoils, and any nutrient deficiencies.

33.7 An understanding of the plant communities appropriate to the site, and which are most likely to thrive in the constructed habitats, for example:

(a) Sedge or raupo swamp.

(b) Saltmarsh.

(c) Swamp forest.

(d) Manuka fen, etc.

33.8 If the objectives require provision of specific habitats for the return of key species of plant, fish, invertebrate or bird, creation of those habitats will drive wetland design. For example:

(a) Breeding habitat for specific species.

(b) Deep water for submerged aquatic plants and divers.

(c) Shallows for dabblers and waders.

(d) Saturated soils for swamp forest.

(e) Wooded margins for nesting (shags, heron) and for shade.

33.9 An understanding of potential invasive weeds at the site and likely ongoing management requirements.

34 Once this information is gathered it will inform the design process. The design process must involve the project ecologist, hydrologist, and if excavation is required, the project engineer.

35 Construction monitoring by the ecologist is required to pick up any issues early, ensure existing vegetation is protected, carry out any salvage of plants and fauna (e.g. fish).

36 Installation of piezometers to monitor ground water fluctuations should occur in advance of construction to establish the seasonality of groundwater, and monitoring of groundwater changes should continue through construction and post construction to inform any fine tuning of groundwater and surface water. I understand that piezometers have been recently installed at the site to commence this data gathering.

37 Conditions of consent need to allow for a period of adaptive management following construction to ensure the built form meets the design objective. This may require minor changes to hydrology and planting.

38 In almost all wetland restoration, enhancement and construction projects I have worked on, the watertable has been reduced historically through drainage, as it has at this site. While there may be some ability to influence groundwater levels, typically they cannot be returned to original levels without also increasing the risk of flooding outside the restoration site. This is a limitation that needs factored into the design.

EXAMPLES OF SUCCESSFUL WETLAND RESTORATION

39 By way of examples, I will present results from two sites with images attached (**Attachments 1 and 2**). They are:

MACKAYS TO PEKA PEKA EXPRESSWAY (M2PP)

40 I was the lead project ecologist for M2PP. This included undertaking the effects assessment, consenting, mitigation design, three years of construction observation, and four years of post-construction success monitoring.

41 This project resulted in the construction of five large wetlands with a combined area 21.5 ha of wetland, and 14 ha of riparian margin as follows:

41.1 Riparian margin - treed habitat / buffering / nesting / groundwater.

41.2 Ephemeral wetland – seasonally saturated, summer dry.

41.3 Persistent wetland – groundwater at or near surface, seasonally inundated.

41.4 Permanent water; 0mm – 600mm.

41.5 Permanent water; >600mm.

42 The wetlands were formed in a peat/sand substrate as can be seen in the attached images. It involved extensive earthworks. Recovery following planting was very rapid as is typical for these types of wetlands.

43 For example the first wetland shown was completed and planted in November 2016, largely vegetated by April 2017, and by late 2017 we started seeing natural colonisation of wetland plants that had not been in our planting mixes.

44 I would note that the wetland area totals do not include the extensive areas of vegetation swales and stormwater treatment ponds, which also provide ecological benefit.

45 See **Attachment 1**.

RUAKĀKĀ STORMWATER PONDS

46 An excellent example of what can be achieved within the local area are the stormwater treatment ponds already present at Ruakākā adjacent to Site 3. I visited the large pond and have seen the concept design for it.

47 While the effective functioning as a stormwater pond was the primary objective, the designers have applied ecological principles which have led to areas of dense rush and reed lands, shallows, and deep open water.

48 While I was on site, I observed a bittern at this pond, which I consider indicates a successful recreation of habitat. If the pond had been designed solely for biodiversity purposes that habitat could have been expanded further.

49 See **Attachment 2**.

RESPONSE TO SECTION 42A REPORT

50 The Ecological Review by Mr Jack Warden included as Appendix A to the Section 42A report presents a range of matters. I will focus on those that relate to the ability to restore, enhance and construct wetlands to meet the mitigation and offset objectives of this Proposal.

51 Firstly, in Section 3.5 'Proposed wetland offset' (Page 22, final para and Page 23, 1st para) it states:

> *In my assessment, the biodiversity offset model presents overly optimistic assumptions regarding the proposed wetland offset area, which assumes high ecological value without adequately addressing uncertainties in restoration outcomes or the lag time between wetland loss on Site 1 and the creation of a new artificial wetland*

habitat on Site 3 that provides suitable habitat for a variety of the affected species on Site 1. (Page 23, 1st para)

52 In terms of the specific matters raised in this paragraph:

"without adequately addressing uncertainties in restoration outcomes"

52.1 For the types of dune swale wetlands and ponds with swamp margins that MEL is seeking to recreate, I see no uncertainty in outcome. The plant species needed to restore these wetlands have known tolerances and their position within a hydrological transition are known. Multiple planting treatments can be developed to cover all potential moisture regimes. Furthermore, given the highly degraded, heavily grazed, and largely exotic habitat within Site 1, constructing and enhancing habitats can, in my opinion, easily provide better habitat for existing fauna than those habitats which will be lost, and will at the same time provide secure habitats for colonisation by species not currently present.

"or the lag time between wetland loss on Site 1 and the creation of a new artificial wetland habitat on Site 3 "

52.2 In my experience the lag time to go from an excavated surface to a fully vegetated wetland habitat is 12 months, or at the most two spring seasons. Once planted vegetation has established, there will be continued improvement for several years as new species re-colonise the site and the wetland communities become more 'natural'. I understand that subject to suitable plant availability, wetland restoration at Site 1 will follow the solar infrastructure works in the first earthworks season, and at Site 3 will occur in the following year, with the objective that the bulk of offsetting outcomes are met within 3 years of the commencement of earthworks (bulk planting), and all supplementary planting will fully meet the offsetting outcomes within 5 years. If these timeframes are met, I do not believe there will be a significant time lag such that the offset will be unsuccessful.

"that provides suitable habitat for a variety of the affected species on Site 1."

52.3 Any fauna species known to occur at Site 1 are currently utilising wetland habitats which are highly modified, contain little or no indigenous vegetation, are degraded due to drainage, and are subject to ongoing disturbance by stock. They are in my view marginal habitats. Based on my experience, I believe that once constructed and planted, Site 3 will rapidly (12 months) establish a range of safe and

stable wholly indigenous habitats not currently available to wetland species present in Site 1.

19 July 2024

Stephen Andrew Fuller

ATTACHMENT 1

Mackays to Peka Peka Expressway

From "Fuller 2018: Wetland Construction on the SH1 Realignment, Kapiti Expressway. Prepared for the National Wetland Restoration Symposium, 2018".

Constructed Wetlands
Four Examples

Site 1. Raumati Wetland & OSA (Offset Storage Area)

4.8 ha

Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz Boffa Miskell


Photo - April 2016
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell

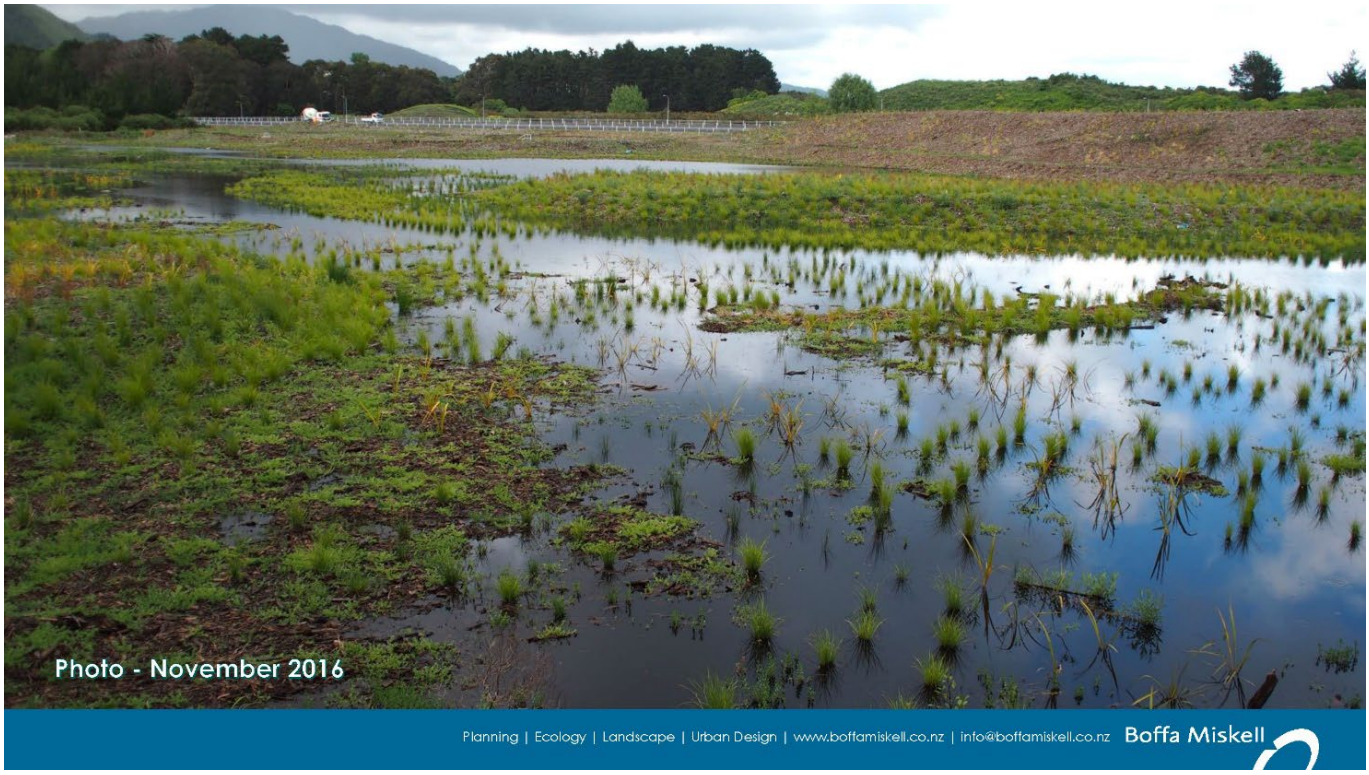
Photo - November 2016
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell


Photo 10 Apr 2017
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell

Site 2. Drain 7 and OSA 2A & 3
11ha

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Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz Boffa Miskell


Photo - July 2016
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell


Photo - November 2016
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell

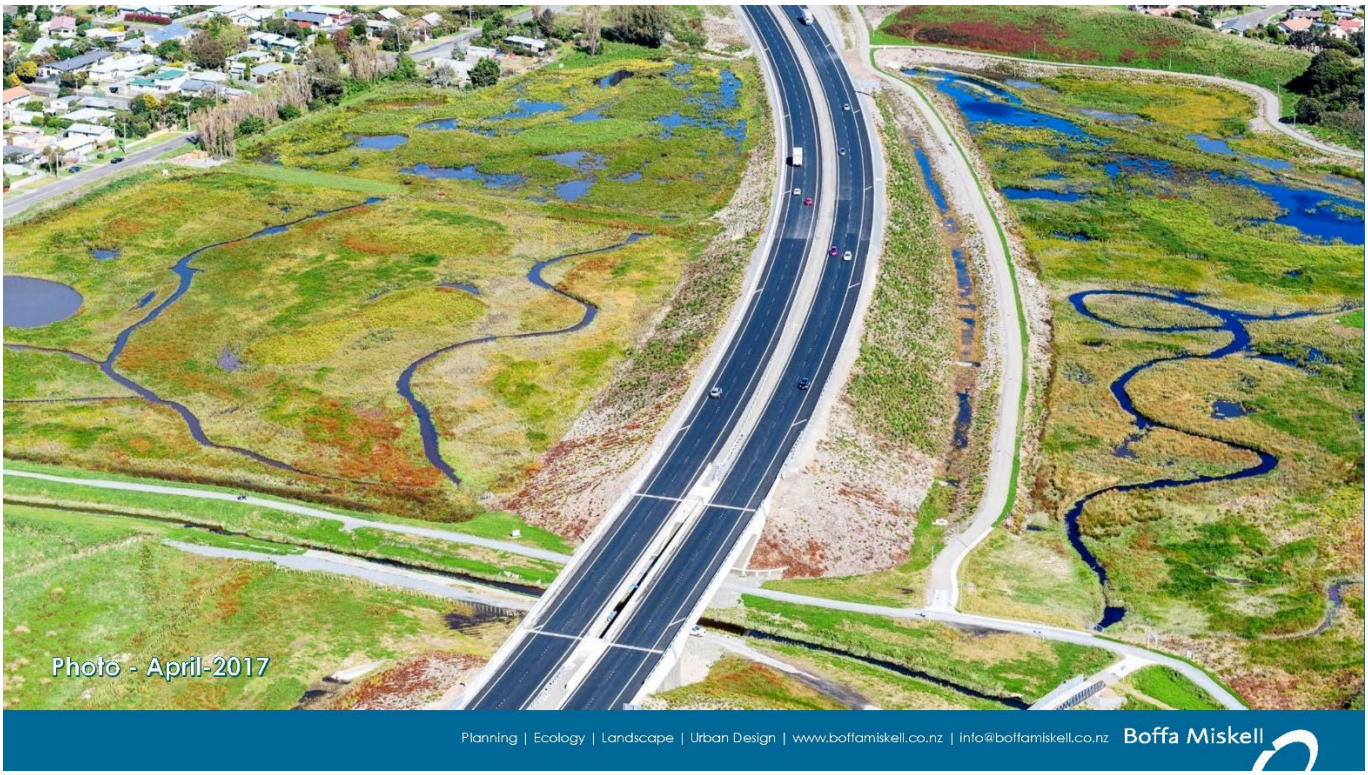
Photo - April-2017
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell

Site 3. Otaihanga Trident
6.7 ha

Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz Boffa Miskell


Photo - April 2016
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell

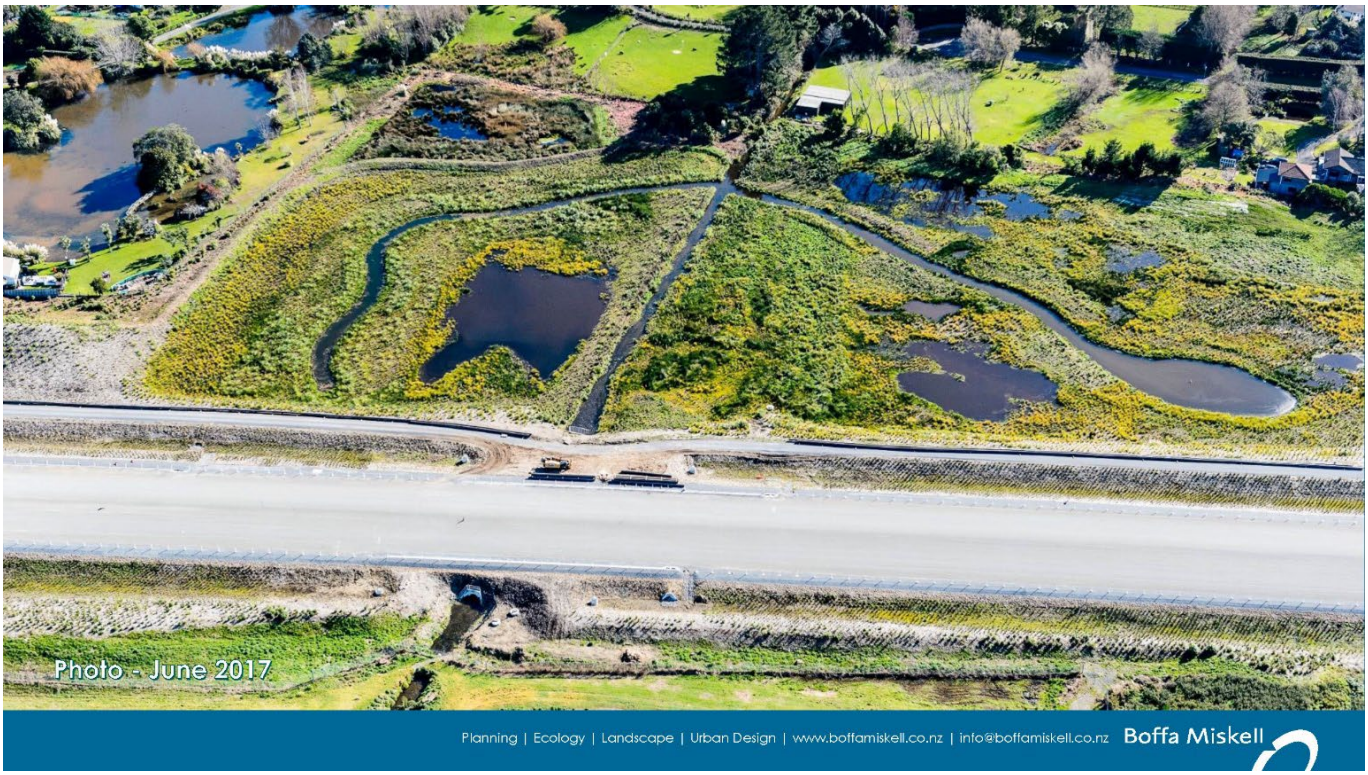
Photo - June 2017
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell

PLANTING, SALVAGE & NATURAL RECOVERY

Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz Boffa Miskell


Getting ponds right
Photo – October 2020
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell


Ephemeral wetlands
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell


Natural Arrivals
Submerged aquatics
Ferns and herbs
Raupo
Isolepis & turf plants
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
Boffa Miskell


Weeds
Planning | Ecology | Landscape | Urban Design | www.boffamiskell.co.nz | info@boffamiskell.co.nz
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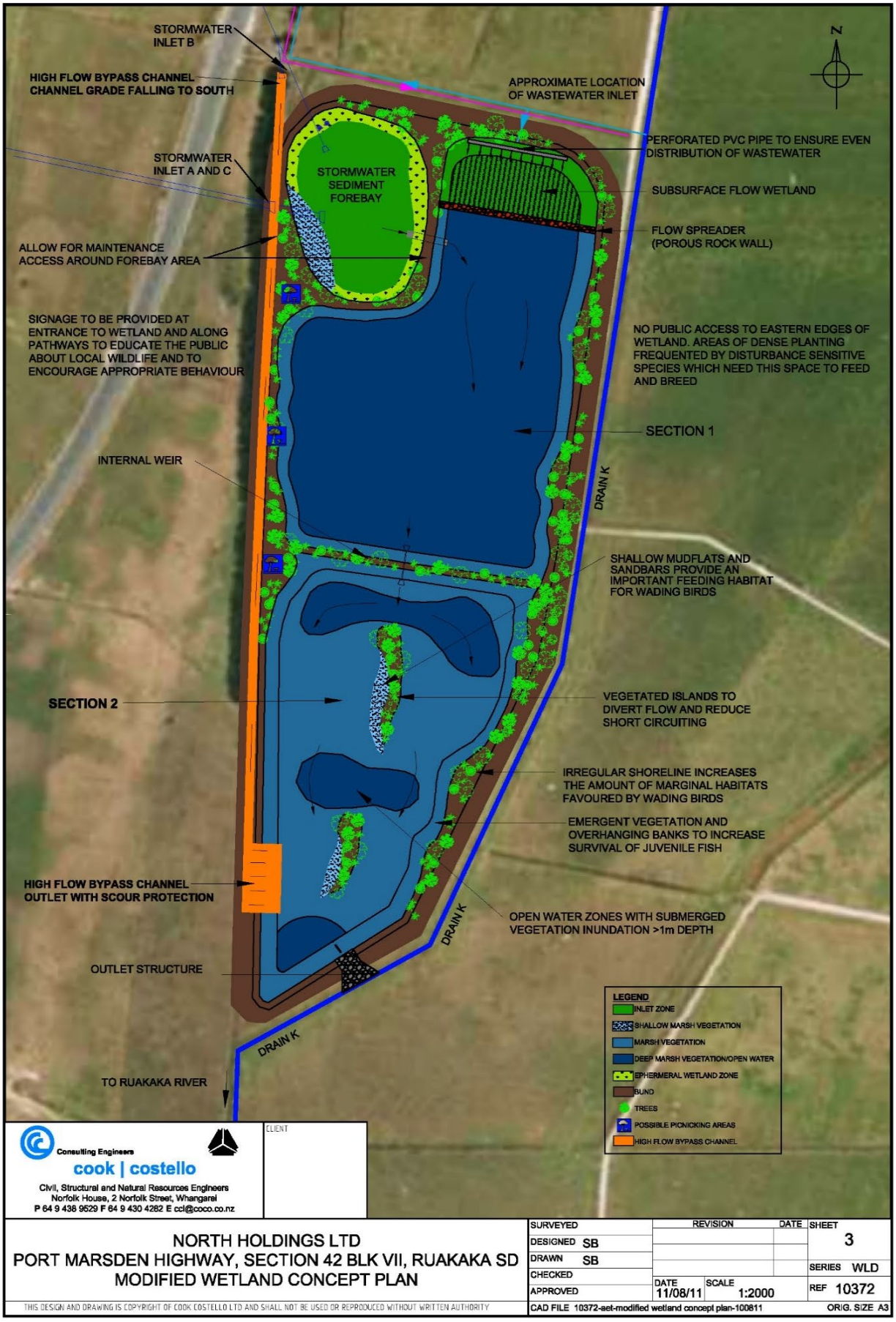
ATTACHMENT 2

Stormwater Pond at Ruakaka –pre-construction (2002) and post construction (2012)

Stormwater Pond at Ruakaka – Design



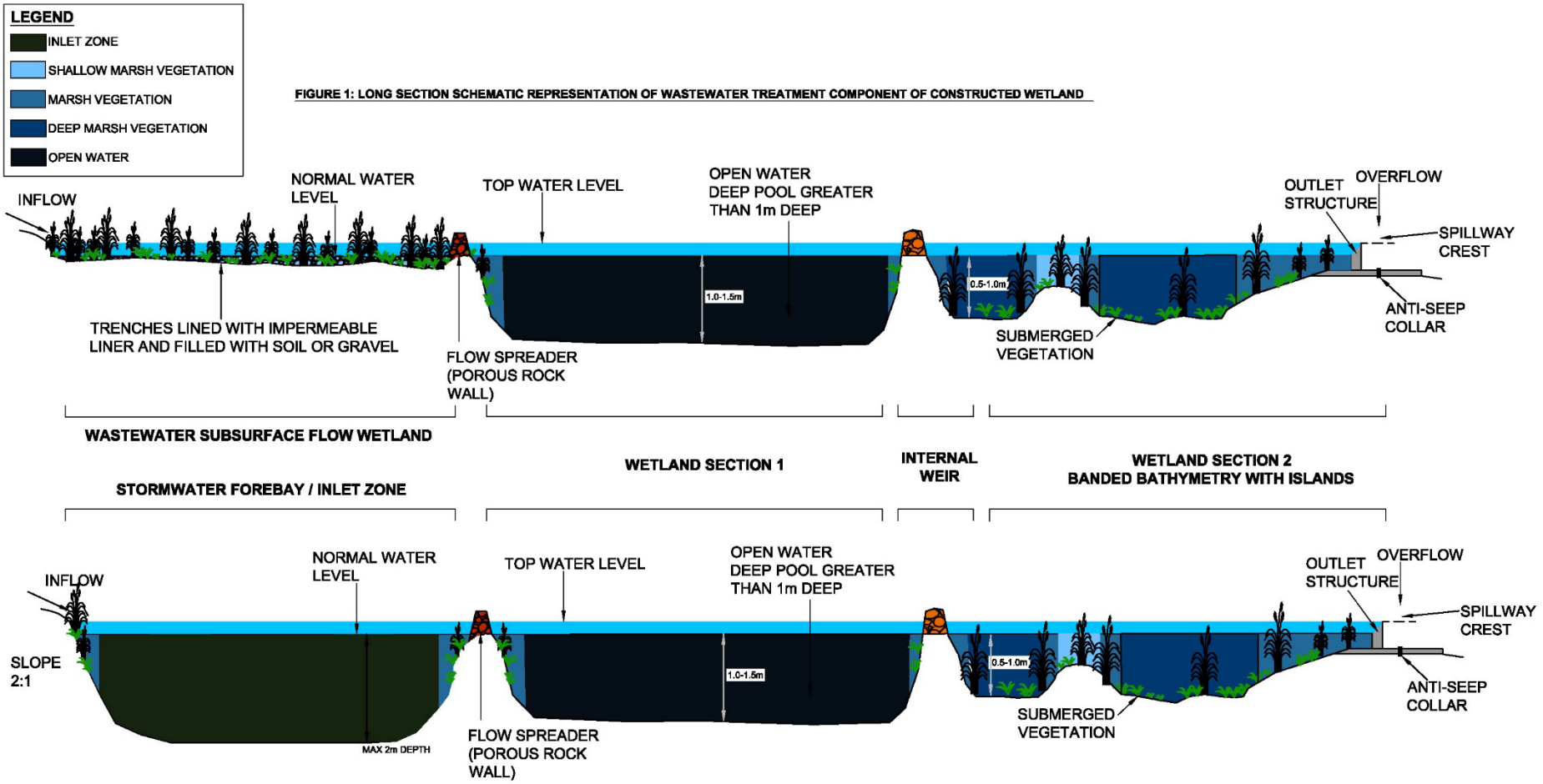


FIGURE 1: LONG SECTION SCHEMATIC REPRESENTATION OF WASTEWATER TREATMENT COMPONENT OF CONSTRUCTED WETLAND

FIGURE 2: LONG SECTION SCHEMATIC REPRESENTATION OF STORMWATER TREATMENT COMPONENT OF CONSTRUCTED WETLAND

SOURCE: CONSTUCTED WETLAND SYSTEMS - DESIGN GUIDELINES FOR DEVELOPERS (MELBOURNE WATER) 2005

Consulting Engineers
cook | costello
Civil, Structural & Natural Resource Engineers
Norfolk House, 2 Norfolk Street, Whangarei
P 64 9 438 9529 F 64 9 430 4282 E ccl@cocco.co.nz

CLIENT

NORTH HOLDINGS LIMITED
PORT MARSDEN HIGHWAY, SECTION 42, BLK VII RUAKAKA SD
LONG SECTION SCHEMATIC OF WETLAND

SURVEYED		REVISION / DATE	SHEET 5
DESIGNED	AT		
DRAWN	SB		SERIES WLD
CHECKED	AT	DATE 11/08/11 SCALE NTS	REF 10372
APPROVED			

CAD FILE 10372-eb-ls schematic-100811 PLOT DATE ORIG. SIZE A3

Stormwater Pond at Ruakaka (Taken 19 June 2024)