BEFORE THE ENVIRONMENT COURT

AT AUCKLAND

I TE KŌTI TAIAO O AOTEAROA

KI TĀMAKI MAKAURAU

IN THE MATTER	of appeals under Clause 14 of Schedule 1 of the Resource Management Act 1991
BETWEEN	**BOONHAM** **(ENV-2021-AKL-000061)** **MANGAWHAI MATTERS INCORPORATED & OTHERS** **(ENV-2021-AKL-000062)** **Appellants**
AND	**KAIPARA DISTRICT COUNCIL** **Respondent**

STATEMENT OF EVIDENCE OF DR MARTIN WILLIAM NEALE ON BEHALF OF MANGAWHAI CENTRAL LIMITED

(FRESHWATER ECOLOGY)

17 December 2021

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INTRODUCTION

Qualifications and experience

1. My name is Dr Martin William Neale.

2. I am lead Environmental Scientist and a Director at Puhoi Stour Limited.

3. I hold the qualifications of BSc (Hons) Biological Sciences (University of Plymouth, UK (1995)), MSc Environmental Quality (Bournemouth University, UK (2000)) and a PhD in Freshwater Ecology (University of Ulster, UK (2004)).

4. I have over 20 years' experience in research and management of freshwater environments, with experience gained in the public and private sectors in Europe (2000 to 2007) and New Zealand (2007 to present).

5. I am a member of the Royal Society of New Zealand, the Society for Freshwater Science, the Freshwater Biological Association, Water New Zealand and the New Zealand Freshwater Sciences Society.

6. Since 2012, I have held an Honorary Lectureship at the University of Auckland, where I am involved in teaching and research activities. My teaching responsibilities include leading the delivery of a post-graduate course on "Assessing Environmental Effects". My research has focussed on novel methods of assessing river health, which has led to the publication of multiple internationally significant journal papers.

7. In my previous roles at Auckland Regional Council/Auckland Council between 2007 and 2015, I led the development of the Stream Ecological Valuation (SEV) and Environmental Compensation Ratio (ECR) tools that are used to assess and manage effects on streams from development projects. During this time, I also managed the regional State of the Environment monitoring and Applied Environmental Research programmes, including a range of complex environmental research and monitoring programmes covering air quality, soil science, biodiversity, marine and freshwater.

8. I have completed the Making Good Decisions course for decision makers under the Resource Management Act 1991 ("RMA") and I have provided expert evidence in the Environment Court, at EPA Board of Inquiry hearings, the Proposed Auckland Unitary Plan (PAUP) hearings, plan change hearings, resource consent hearings and court prosecutions.

9. I am familiar with the application site and the surrounding locality. I have read the relevant parts of: the plan change application material and council-level hearing documents; the hearing panel recommendation; and the notices of appeal and s274 notices.

Code of Conduct

10. I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note (2014) and I agree to comply with it. In that regard, I confirm that this evidence is within my expertise, except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

BACKGROUND AND SCOPE OF EVIDENCE

11. Mangawhai Central Limited ("MCL") has engaged me to advise on freshwater ecology issues relating to Plan Change 78 ("PC78") and the development at 83 Molesworth Road.

12. As part of this engagement, I have visited the PC78 site on several occasions to survey freshwater habitats.

13. The scope of my evidence is freshwater ecology aspects associated with PC78, except for Wetland 3[1] and its tributaries. Wetland 3 is addressed in the evidence of Mr Montgomerie due to his experience and detailed knowledge of Wetland 3 and the issues relating it. The freshwater features within the scope of my evidence (and Wetland 3, addressed by Mr Montgomery) are shown in the map at Annexure A to my evidence.

[1] Wetland 3 is the terminology used through PC78, based on the report by Freshwater Solutions submitted as part of the plan change (Mangawhai Central Ecology – Private Plan Change Ecology Effects Assessment, November 2019).

14. In my evidence, I:

    (a) provide an executive summary of my key conclusions;

    (b) describe the extent and values of freshwater habitats (excluding Wetland 3) relevant to PC78;

    (c) assess the potential environmental effects of PC78 on freshwater habitats (excluding Wetland 3).

    (d) address relevant appeal points and s274 notices.

EXECUTIVE SUMMARY

Freshwater habitat description

15. My investigations have identified three areas of freshwater habitat relevant to PC78 that are shown in Annexure A and described below.

Wetland 1 and Watercourse A:

16. Wetland 1 is a natural wetland, with an associated tributary stream (Watercourse A) that borders the northern boundary of the site. The wetland is contiguous with the saltmarsh of the Mangawhai Estuary and is mapped as a significant wetland by Northland Regional Council. However, the wetland is dominated by reed sweet grass, an invasive exotic species.

17. Watercourse A originates from within the PC78 site and flows into Wetland 1. The watercourse is typical of small streams in pastoral landscapes, with little riparian vegetation, low quality instream habitat and a low diversity invertebrate community.

Wetland 2 and Watercourse C

18. Wetland 2 is a natural wetland-stream complex that runs through the south-western portion of the site, which receives flow from Watercourse C. The wetland area within the PC78 site is approximately 1 hectare in size and also dominated by reed sweet grass.

19. This wetland is not mapped by Northland Regional Council as a site of ecological significance, but it does meet the definition of a significant wetland under the Proposed Regional Plan. The wetland is divided into two areas by an artificial causeway that supports a farm track.

20. Wetland 2 receives flow from several tributary streams, most of which originate outside of the PC78 site. All of the stream inputs are typical of small streams in pastural landscapes, with no woody riparian vegetation, low quality instream habitat due to stock damage, and high sediment loading

Watercourse/Wetland D

21. The area labelled as Watercourse/Wetland D is a natural wetland-stream complex on the southern boundary of the PC78 site. This complex includes a small 'induced' wetland that has formed in the channel of a small stream that has been modified by human activity.

22. The wetland is also dominated by reed sweetgrass, but supports a number of other facultative wetland plants. However, the wetland is in a poor condition and infested with gorse, kahili ginger and woolly nightshade.

23. This wetland is not mapped by Northland Regional Council and does not meet the significance criteria in the Proposed Regional Plan for Northland.

Effects assessment

24. There are a range of potential effects on freshwater systems that may be associated with urban development. These effects primarily arise from physical habitat changes during the development process and water quality and quantity changes related to discharges from impervious surfaces.

25. PC78 seeks to manage these potential effects through a range of approaches, including:

    (a) Avoiding or minimising physical disturbance of aquatic habitats;

(b) Creating vegetated buffers around freshwater habitats;

(c) Restoring areas of degraded or reclaimed wetland habitat;

(d) Managing water quality and quantity according to best practice.

26. I consider the approach to managing effects adopted by PC78 is appropriate for the site and consistent with current statutory requirements for management of freshwater habitats.

Physical habitat change

27. As a threatened habitat type, the management of wetlands is a high priority issue in New Zealand. This is reflected in the National Policy Statement for Freshwater Management 2020 ("NPSFM") and National Environmental Standards for Freshwater 2020 (NESFW), both of which contain provisions to prevent further loss of wetlands and to promote their restoration. The PC78 approach to wetland management is consistent with these protective provisions, as disturbance is generally avoided, and degraded areas are proposed to be restored. Overall, PC78 will result in positive effects on the wetland habitats on the site, including arising from the creation of vegetated buffers and the restoration of wetland habitat lost to the existing crossing in Wetland 2.

28. There is approximately 620 metres of stream habitat on the PC78 site (within the scope of my evidence) and a similar management approach to that applied to wetlands is proposed. Most of the streams on site will not be disturbed by proposed development and all retained stream channels will have a 10-metre-wide vegetated buffer created around them. This enhancement will result in a net gain in ecological function for the streams on the PC78 site, consistent with the policy direction in the NPSFM.

Water quality and quantity

29. Without management, the proposed development has the potential to result in adverse effects on freshwater habitats from alterations in the discharge of water and contaminants. Potential effects may be short

term (i.e., sediment generation and discharge from construction activities) or long-term (i.e., changes in stormwater quantity and quality from new impervious surfaces).

30. The approach to managing these effects is to adopt best practice;

    (a) For sediment, this involves adopting sediment and erosion controls in accordance with Auckland Council's Guideline Document 05;[2]

    (b) For stormwater, this involves adopting a Water Sensitive Design approach, including rainwater collection and re-use, stormwater treatment devices and maintaining multiple, small, diffuse discharges to freshwater habitats to replicate the pre-development hydrology.

31. The adoption of best practice for sediment and stormwater management, together with the revegetation of buffers around streams and wetlands means there is unlikely to be any detectable negative effects from water quality or quantity changes on the freshwater habitats on the PC78 site.

32. Two high-flow water takes have been consented as part of the proposed PC78 development. This involves the harvesting of water above median flows in close proximity to wetland habitats (Wetland 2 and Watercourse/Wetland D). However, the flow regime below median flow will remain unchanged, and therefore I consider that the takes will not result in a reduction in wetland habitat.

FRESHWATER HABITATS

33. Through my desktop review and multiple site visits, I identified three areas of freshwater habitats relevant to PC78:

[2] Leersnyder, H., Bunting, K., Parsonson, M., & Stewart, C. 2018. Erosion and sediment control guide for land disturbing activities in the Auckland region. Auckland Council Guideline Document GD2016/005. Incorporating Amendment 2. Prepared by Beca Ltd and SouthernSkies Environmental for Auckland Council.

(a) A natural wetland[3] area that borders the northern boundary of the site and an associated tributary stream. These are named Wetland 1 and Watercourse A;

(b) A natural wetland-stream complex that runs through the south-western portion of the site. These are named Wetland 2 and Watercourse C;

(c) A natural wetland-stream complex on the southern boundary of the site, adjacent to 88 Old Waipu Road. This area is named Watercourse/Wetland D.[4]

34. These areas are shown in Annexure A and I describe the extent and ecological values of these areas below.

Wetland 1 and Watercourse A

35. Wetland 1 is located on the northern boundary of the site. It is a large area of wetland that is contiguous with the saltmarsh of the Mangawhai Estuary, which is mapped as a significant biodiversity wetland by Northland Regional Council.[5] The wetland receives freshwater from an un-named stream and is a transitional habitat between freshwater and marine environments.

36. The wetland area within and proximate to the PC78 site is dominated by reed sweet grass (*Glyceria maxima*), which is an invasive exotic species. Native species were more common around the edges of the wetland and included swamp flax (*Phormium tenax*), raupo (*Typha orientalis*), cabbage trees (*Cordyline australis*) and mānuka (*Leptospernum scoparium*).

37. Watercourse A originates within the PC78 site and flows into Wetland 1. The watercourse consists of approximately 200 metres of intermittent stream channel and 80 metres of permanent stream channel.

[3] As defined in the National Policy Statement for Freshwater Management 2020.

[4] I have named this wetland-stream complex "Watercourse/Wetland D" in this evidence to attempt to effectively convey the nature of the feature, while not creating confusion with the naming of the wetland/watercourse features that has been adopted during the PC78 process to date.

[5] As identified in note 2 of the Proposed Northland Regional Plan's definition of "significant Wetland": *"The Regional Council's wetland mapping indicates the extents of known wetlands – these can be found on the Regional Council's website. The purpose of this mapping is to help locate and identify different wetland types. The maps do not form part of this Plan"*

38. The watercourse is typical of small streams in pastural landscapes, with little woody riparian vegetation and low quality instream habitat due to previous stock damage. The macroinvertebrate community in the stream was sampled by Freshwater Solutions[6] and reported as being of 'fair' quality based on the MCI scoring system.[7]

Wetland 2 and Watercourse C

39. Wetland 2 is a wetland-stream complex that runs through the south-western portion of the PC78 site. This wetland area was originally identified and mapped by Freshwater Solutions[8], but following the revised national policy direction and wetland definitions associated with the NPSFM, I re-surveyed the area on 12 July 2021 consistent with the NPSFM and associated guidance (Ministry for the Environment, 2020[9]: 2021[10]).

40. The Wetland 2 area within the PC78 site is approximately 1 hectare in size and also dominated by reed sweetgrass, but with soft rush (*Juncus effusus*), Juncus sarophorus, willow weed (*Persicaria maculosa*) and creeping buttercup (*Ranunculus repens*) present around the margins of the wetland.

41. Whilst the wetland is dominated by a pest plant species and not mapped by Northland Regional Council as a site of ecological significance, the wetland area meets the definition of a 'significant wetland' in the Proposed Regional Plan for Northland (appeals Version – October 2021).

42. The Wetland 2 area, and the extent of dense reed sweetgrass growth, continues upstream and downstream of the PC78 area. As shown in Annexure A, the wetland comprises two separate areas (Wetland 2A and 2B) either side of an existing farm track and associated causeway, which is proposed to be upgraded as part of the PC78

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6 Freshwater Solutions (2017) Mangawhai Central Ecology – Private Plan Change Ecology Effects Assessment, November 2019

7 The Macroinvertebrate Community Index (or MCI) is a widely used system for assessing the ecological condition of streams in New Zealand and provides a four category scoring system (excellent, good, fair and poor).

8 Freshwater Solutions (2017) Mangawhai Central Ecology – Private Plan Change Ecology Effects Assessment, November 2019

9 Ministry for the Environment. 2020. Wetland delineation protocols. MfE publication ME 1515.

10 Ministry for the Environment. 2021. Defining 'natural wetlands' and 'natural inland wetlands'. Ministry for the Environment.

development. A single 1100mm diameter culvert provides for water movement through the causeway. The base of the culvert was below the bed of the stream-wetland complex and on each site visit the culvert had slow-flowing water within it, which will allow for fish passage under most flow conditions.

43. The wetland receives flow from several tributary streams, most of which originate outside of the PC78 site. Watercourse C is the largest stream channel, and as indicated on Annexure A, passes through a culvert under Old Waipu Road and flows for approximately 220 metres through rank pasture before flowing into the wetland. The wetland also receives flow from two unmapped streams from the adjoining property to the north-west, in addition to two small intermittent tributaries (cumulatively 90 metres in length) which originate from within the site.

44. All of the stream inputs are typical of small streams in pastural landscapes, with no woody riparian vegetation, low quality instream habitat due to stock damage, and high sediment loading. The invertebrate community in the largest stream channel was sampled by Freshwater Solutions[11] and the stream was classified as 'poor quality' based on an MCI score of less than 80.

Watercourse/Wetland D

45. The area labelled as Watercourse/Wetland D on the map at Annexure A was originally classified as a "short flowing stream section that transitions into wider reed sweetgrass lined shallow gully" in the Freshwater Solutions report prepared for PC78 in 2019.[12] As with Wetland 2, I resurveyed this area of the site in March 2021 following the revised national policy direction and wetland definitions.

46. Under the NPSFM, this area contains a wetland of approximately 0.2 hectares in size. This wetland is not mapped by Northland Regional Council and does not meet the significance criteria in the Proposed Regional Plan for Northland (appeals Version – October 2021).

[11] Freshwater Solutions (2017) Mangawhai Central Ecology – Private Plan Change Ecology Effects Assessment, November 2019

[12] *Mangawhai Central Ecology: Private Plan Change Ecology Effects Assessment* (November 2019), Freshwater Solutions Ltd (page 14).

Based on my field observations, I consider that the wetland has formed in the channel of a small stream that has been modified by human activity.

47. The flow of water from upstream has been disrupted by an artificial pond on the neighbouring property. This pond is currently an amenity pond in a private garden, but would have likely been originally constructed as a farm pond.

48. The flow of water downstream of the current area of wetland has been disrupted by a farm track, under which the stream passes through a culvert. At the time of the site visit, there was no water discharging from the amenity pond towards the wetland, nor from the wetland through the culverted farm track crossing. However, the culvert and farm track will be impeding the flow of near-surface groundwater so that wetland soil conditions can exist during periods of no flow. Given this, in my opinion the wetland is an 'induced wetland" as described in Ministry for the Environment guidance documentation on the NPSFM,[13] and is therefore a "natural wetland" for the purposes of the NPSFM.

49. Retaining the track and culvert at the stream crossing (or an equivalent structure) is critical to maintaining the presence and extent of the wetland, whereas if the structure was removed, the return to a more stream-like hydrology would likely result in the wetland area drying out. The development proposed for that area under PC78 can be undertaken with the retention of an equivalent crossing and structure, which should ensure the wetland soil conditions are maintained.

50. The wetland is also dominated by reed sweetgrass, but also supports a number of other facultative wetland plants, including centella (*Centell uniflora*) and soft rush. However, the wetland is in a poor condition and infested with gorse (*Ulex europaeus*), kahili ginger (Hedychium *gardnerianium*) and woolly nightshade (*Solanium mauritianum*).

[13] Ministry for the Environment. 2021. Defining 'natural wetlands' and 'natural inland wetlands'. Wellington: Ministry for the Environment.

EFFECTS ASSESSMENT

51. There are a range of potential effects on freshwater systems that may be associated with urban development. These effects primarily arise from physical habitat changes during the development process and water quality and quantity changes related to discharges from impervious surfaces.

52. PC78 seeks to manage these potential effects through a range of mechanisms, including by:

    (a) avoiding or minimising physical disturbance of the freshwater habitats on the site, including through the Structure Plan and Zoning Map design (for example zoning nearly 30 hectares of existing native vegetation, wetlands, and streams Natural Environment Sub-Zone 8, the purpose of which is to protect and enhance existing natural environment features,[14] and including provisions applying Sub-Zone 8 rules to any natural inland wetland outside the mapped extent of Sub-Zone 8);[15]

    (b) re-vegetating 10-metre-wide buffers around all freshwater habitats;[16]

    (c) improving existing wetland habitat by enhancement planting and weed and pest control (by way of ecology management plan(s));[17]

    (d) including provisions for managing the hydrology of onsite wetlands;[18]

    (e) minimising water quality and quantity effects by using best practise erosion and sediment controls and Water Sensitive Design stormwater management approaches (refer to Mr Van de Munckhof's evidence regarding stormwater management under PC78).

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[14] Refer PC78 16.6.8.1 Sub-Zone Description.
[15] Refer PC78 16.6.8.1 Sub-Zone Description and 16.7.1.3.
[16] Refer PC78 16.10.8.1 j), 16.10.8.2 i) and 16.15.2.1.
[17] Refer PC78 16.6.8.1 Sub-Zone Description, 16.10.8.1 j) and 16.10.8.2 i).
[18] 16.10.8.1 ee): *"Stormwater management plan for the hydrology of Wetlands 1, 2 and 3"* and assessment criteria 18.10.8.2 ee): *"For the catchment of Wetlands 1, 2 and 3, a stormwater management plan shall address the best practicable option to maintain surface flow hydrology."*

53. I consider the approach adopted by PC78 is appropriate for the site and consistent with current statutory requirements as detailed below. Additional detail regarding the approach adopted by PC78 with respect to freshwater ecological effects is provided in the evidence of Mr Van de Munckhof (stormwater management), Mr Montgomerie (freshwater ecology – Wetland 3), Dr Kelly (marine ecology) and Mr Tollemache (planning).

Physical habitat change

Wetlands

54. Wetlands are a nationally threatened habitat type, and their management is a high priority issue in New Zealand. This is reflected in the NPSFM and NESFW, both of which contain provisions to prevent further loss of wetlands and to promote their restoration.

55. The wetlands on the PC78 site have been comprehensively mapped, including by Freshwater Solutions (2019) and more recently by myself and colleagues. As identified above, the development approach proposed by PC78 has been designed to avoid negative effects from loss or physical habitat changes for all of the wetlands on the site. This is proposed to be achieved by (among other things) creating a 10-metre-wide buffer around all wetlands[19], which is important for two reasons.

56. First, with one exception (see paragraph 58 below), no earthworks or urban development will occur within the wetlands or the buffer area, which will ensure no loss of wetland extent occurs and provide a buffer around the wetland from any physical disturbance.

57. Second, the buffers will be re-vegetated with a mix of native species suited to riparian margins[20]. In the medium term, the vegetated buffers will provide physical habitat for terrestrial and wetland fauna, and also provide water quality benefits through shading of the wetland margins and by filtering overland run-off.

[19] PC78 16.8.2.3.
[20] Refer PC78 16.6.8.1 Sub-Zone Description, 16.10.8.1 j) and 16.10.8.2 i).

58. There is one area of Wetland 2 that would likely be subject to physical disturbance should PC78 proceed. This disturbance is likely to occur on and around the existing crossing which requires upgrading to meet current safety standards for public roads (refer to the PC78 Structure Plan map showing a local road at the location of the existing crossing).

59. The current crossing bisects Wetland 2 and is located on reclaimed land that does not provide any wetland values or functions, and does not meet the definition of wetland. The current crossing is up to 14 metres wide and using modern construction methods can be reconstructed on a narrower footprint. As a result, upgrading the crossing will provide an opportunity for the restoration of some of the wetland lost when the current causeway was constructed, which would have positive ecological effects. Short-term construction effects could be minimised by constructing the replacement culvert offline and following appropriate erosion and sediment controls.

60. Overall, if PC78 progresses, it will result in positive effects on the wetland habitats on the site, including through the creation of re-vegetated buffers. This is consistent with the policy direction in the NPSFM, which is addressed in detail in the evidence of Mr Tollemache.

Streams

61. The streams on the site have also been comprehensively mapped. The current extent of streams on the site is shown on Annexure A and has been used to guide the development approach for PC78.

62. Collectively, Watercourses A, C and D constitute approximately 620 metres of stream habitat and a similar management approach to that applied to the wetlands is proposed. Most of the stream length will not be disturbed by proposed development and all retained stream channels will have a 10-metre-wide buffer created around them.

63. Effects of any habitat disturbance can be managed by enhancing the remaining stream that will not be disturbed by the development. With such enhancement, it will be possible to achieve a net gain in

ecological function for the streams on the PC78 site, consistent with the policy direction in the NPSFM.

Water quality and quantity

64. As outlined in the evidence of Mr Van de Munckhof, without careful management, the proposed development has the potential to result in adverse effects from alterations to the discharge of water and contaminants to the wetlands and streams on site. Potential discharge related effects may be short term (i.e., sediment generation and discharge from construction activities) or long term (i.e., changes in stormwater quantity and quality from new impervious surface). Furthermore, two high flow water takes have been consented and are proposed proximate to Wetland 2 and Watercourse D. These issues are considered in turn below.

Sediment

65. Works within the catchment of a waterbody can result in an uncontrolled discharge of sediment laden water during construction. Sediment entering aquatic systems can reduce water clarity within the water column (suspended sediments) and/or reduce habitat quality when deposited on the bed of the waterbody (sedimentation).

66. The wetlands and streams on the PC78 site have for a considerable period been impacted by high sediment loading from on-going rural land uses and previous stock damage of unfenced stream and wetland. Therefore, the aquatic habitat on site is unlikely to be particularly sensitive to sediment discharges. Nevertheless, excessive sediment discharges may have negative effects on the wetland-stream complex and downstream habitats if not appropriately managed.

67. It is recommended that earthworks close to aquatic habitats are undertaken during the earthworks season, when there is likely to be less surface run-off. In addition, I recommend best practice erosion and sediment control measures are implemented consistent with

Auckland Council's Guideline Document 5[21], which provides a greater level of control than regional and district standards.

68. Given that PC78 (as attached to Mr Tollemache's evidence) includes provisions addressing the above recommendations relating to erosion and sediment control measures (and earthworks season restrictions are addressed by Auckland Council's Guideline Document 5 and are routinely required through resource consent conditions), I anticipate no detectable sediment related effects on the aquatic habitats on the site.

Stormwater

69. Stormwater related effects from urban development have had well-documented negative effects on aquatic systems[22]. These effects arise from changes in hydrology (i.e., increases and decreases in flow regime extremes) and water quality (i.e., contaminant generation and run off from impervious surfaces).

70. However, contemporary approaches to stormwater management have been demonstrated to reduce the effects significantly[23.] As Mr Van de Munckhof outlines in his evidence, these approaches are collectively termed Water Sensitive Design (WSD) and are commonly applied to modern day urban developments. The high-level objective of the WSD approach is to maintain the pre-development hydrology as far as practicable.

71. I agree with Mr Van de Munckhof that the stormwater management design for the proposed PC78 development is consistent with the WSD approach[24] and includes rainwater collection and re-use tanks, distributed stormwater treatment devices (i.e., raingardens) and

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21 Leersnyder, H., Bunting, K., Parsonson, M., & Stewart, C. 2018. Erosion and sediment control guide for land disturbing activities in the Auckland region. Auckland Council Guideline Document GD2016/005. Incorporating Amendment 2. Prepared by Beca Ltd and SouthernSkies Environmental for Auckland Council.

22 Walsh, CJ., Roy, AH., Feminella, JW., Groffman, PM., & Morgan, RP. 2005. The urban stream syndrome: current knowledge and the search for a cure. Journal of North America Benthological Society 24 (3):806-723.

23 Ahiablame, LM., Engel, BA & Chaubey, I. 2012. Effectiveness of Low Impact Development Practices: Literature Review and Suggestions for Future Research. Water, Air, and Soil Pollution 223 (7):4253-73.

24 Lewis, M., James, J., Shaver, E., Blackbourn, S., Leahy, A., Seyb, R., Simcock, R., Wihongi, P., Sides, E., & Coste, C. 2015. Water sensitive design for stormwater. Auckland Council Guideline Document GD2015/004.

multiple small, diffuse discharges to wetland and stream habitats to replicate the pre-development hydrology.

72. When implemented, these management approaches would contribute to maintaining the pre-development flow regime in the aquatic habitats on site (avoiding extreme peak and low flows) and maintaining water quality in the receiving environments by capturing and treating urban stormwater contaminants in the raingardens. The WSD approach to stormwater management for the proposed development, together with the re-vegetation of buffers is unlikely to result in any negative stormwater related effects on the streams or wetlands.

High flow takes

73. To provide potable water to the proposed reticulated portion of PC78 development, two high-flow water takes have been consented and are proposed to abstract water and pump it to a storage reservoir.

74. While the consented takes are not from within wetlands, they are in close proximity to wetland habitats. However, the consented water takes are high flow takes, and will only abstract water when flows are above median. Hence, the flow regime below median flow will remain unchanged, and therefore I consider that the takes will not result in a reduction in wetland habitat.

75. In addition, the wetland areas are dominated by reed sweetgrass, which is a species that is resilient to changes in water levels. Therefore, I anticipate no detectable effects on the extent of wetland vegetation or ecological values from the harvesting of high flows.

RESPONSE TO ISSUES RAISED IN NOTICES OF APPEAL/S274 NOTICES

76. I have reviewed and considered the notices of appeal and s274 notices to the extent they relate to matters within my area of expertise. I note that most parties that raised concerns about ecology and the environment were focused on potential effects on the estuary. These matters have been addressed by Dr Shane Kelly.

77. Peter Rothwell has raised issues relating to the ‘wetland fen’, which I interpret to be Wetland 3. This wetland is addressed in Mr Montgomerie’s evidence.

78. The New Zealand Fairy Tern Charitable Trust and Peter Rothwell have expressed an interest in stormwater, with both s274 notices referring to ‘the lack of adequate stormwater treatment’. As previously stated, the proposed stormwater management for PC78 is consistent with international best practice through the implementation of Water Sensitive Design.

Dr Martin William Neale
Puhoi Stour Limited

17 December 2021

ANNEXURE A – FRESHWATER HABITATS RELEVANT TO PC78