Before the Board of Inquiry
Waterview Connection Project

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*in the matter of:* the Resource Management Act 1991

*and*

*in the matter of:* a Board of Inquiry appointed under s 149J of the Resource Management Act 1991 to decide notices of requirement and resource consent applications by the NZ Transport Agency for the Waterview Connection Project

# Statement of rebuttal evidence of **Dr Robert Bell (Coastal Processes)** on behalf of the **NZ Transport Agency**

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Dated: 2 February 2011

Hearing start date: 7 February 2011

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**INDEX**

**STATEMENT OF REBUTTAL EVIDENCE OF DR ROBERT BELL ON BEHALF OF THE NZ TRANSPORT AGENCY**

## INTRODUCTION

1 My full name is Dr Robert Gordon Bell. I have the qualifications and experience set out in paragraphs 1 to 10 of my statement of evidence in chief dated 12 November 2010 (my *EIC*).[1]

2 I repeat the confirmation that I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court.

3 My rebuttal evidence addresses physical coastal process issues raised in submitter evidence; only to the extent clarification is needed, as the issues raised have already been addressed in the original application (and its associated technical reports) or in my EIC. No new issues related to coastal processes have emerged.

4 In this statement of rebuttal evidence I respond to key coastal processes issues in the evidence of:

4.1 Mr Dominic McCarthy on behalf of the Auckland Council (Evidence #111–5);

4.2 Mr Robert Black, resident of Waterview (Evidence #186–1);

4.3 Mr William McKay on behalf of North Western Community Association (Evidence #185–1);

4.4 Mr Michael Coote on behalf of the Forest and Bird Motu Manawa Restoration Group (Evidence #217–1);

4.5 Dr Mark Bellingham on behalf of the Royal Forest and Bird Protection Society of NZ Incorporated (Evidence #217–2); and

4.6 Ms Hiltrud Grüger on behalf of the Springleigh Residents Association (Evidence #43–1).

5 I also respond to relevant key matters raised in the Section 42A Report prepared by Environmental Management Services Ltd (*EMS*) for the Environmental Protection Agency to assist the Board of Inquiry. I address:

5.1 EMS's initial s42A Report (dated 7 December 2010);

[1] NZTA EIC No. 17.

5.2 Appendix A to the EMS Report relating to marine ecological effects (prepared by Dr Stewart of Ryder Consulting Limited dated November 2010); and

5.3 EMS's later Addendum s42A Report (dated 20 December 2010).

6 These issues were canvassed at a pre-hearing caucus on Coastal Processes[2] held on 28 January 2011, with agreement reached by those present on most issues.

**OVERVIEW**

7 I have carefully considered the evidence of Messrs McCarthy, Black, McKay and Coote, Dr Bellingham and Ms Grüger. Within my areas of expertise, the key issues raised in their evidence cover:

7.1 The high tidal currents under the Causeway Bridges and associated navigation issues;

7.2 Flushing of the western end of Waterview Estuary via the existing culvert;

7.3 Sedimentation in Oakley Inlet and Waterview Estuary; and

7.4 The chenier or shell banks north of the Causeway.

8 My responses to those issues are covered below and I will indicate where agreement was reached at caucusing.

9 While I address the witnesses' main concerns, I record by way of overview that, overall, I have found no reason to require any amendment to my EIC. As a result, the conclusions set out in my EIC, as summarised in paragraphs 13 to 17 of that evidence, stand.

10 I have responded to four main issues raised in the EMS Section 42A reports, related to the importance of the shell (chenier) banks, the Rosebank culvert, navigation under the Whau Bridges and whether to provide a condition to address sea-level rise issues associated with the Causeway.

11 I also provide errata containing a few factual amendments to my EIC.

[2] Expert Caucusing Joint Report to the Board of Inquiry – Coastal Processes (dated 28 January 2011), attached as **Annexure A**.

**MR McCARTHY (#111–5)**

12 Mr McCarthy agrees that the additional monitoring condition I proposed in my EIC (C.13)[3] suitably addresses concerns raised by the former Auckland City Council about the potential effect of reclamation works on the natural migration of a drainage channel in the Whau River, between Patiki Road and the Rosebank Domain.[4]

13 Mr McCarthy supports the abandonment of the existing culvert under SH16 just east of Rosebank Peninsula,[5] which I proposed in my EIC.[6] His reasoning is that "reinstatement options are likely to cause greater adverse than positive effects on the CMA".[7]

**MR BLACK (#186–1)**

14 Mr Black raises concerns about fast currents under the Causeway Bridges and that "safe passage of vessels is not possible …".[8] He requests that "Waterview Inlet in Sector 6 is lengthened and raised to … ensure safe passage for kayakers".[9] I understand Mr Black is referring to the Causeway Bridges in this paragraph.

15 I have covered current speed under the Causeway Bridges in my EIC,[10] noting that the measured peak velocity, averaged over the channel cross-section, is presently 1.2–1.3 m/s on ebbing spring tides. This peak velocity has decreased by about 30% since the early 1980s when the last measurements were taken. This gradual decrease in peak velocity over time has consequently reduced the hazard exposure to kayakers and small vessels passing through the channel.

16 Further, detailed measurements taken in September 2010 show that the peak ebb velocities that exceed 1 m/s (2 knots) and 0.8 m/s (1.6 knots) during spring tides, cover only short 40–45 minute and 90 minute durations, respectively, within a 12.4 hour tide cycle, and could be avoided by channel users. Velocities throughout the flooding tide are below 0.9 m/s on a spring tide.

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3 Bell EIC, Annexure C and paragraph 112.1.

4 McCarthy Statement, paragraphs 13, 23 and 40.

5 McCarthy Statement, paragraphs 19(xii).

6 Bell EIC, paragraph 16.

7 McCarthy Statement, paragraphs 19(xii).

8 Black Statement, paragraph 16.

9 Black Statement, paragraph 31 under Relief Sought.

10 Bell EIC, paragraph 97.2.

17 Widening the Causeway as part of the Project will, in my opinion, have very little effect on current velocities under the Bridges.[11]

18 Leaving aside the cost implications of lengthening the existing Causeway Bridges, as sought by Mr Black, the reduction in current velocities that would result from increasing the area of channel under a longer-bridged scenario would in my opinion, substantially alter the existing geomorphology and approach-channel depths.[12]

**MR McKAY (#185–1)**

19 Mr McKay raises the same concern as Mr Black about "tidal rip effect" under the existing Causeway Bridges.[13] He is also concerned about "insufficient allowance for navigation by small boats, kayaks and jet-skis …" but states that "[t]he reduced clearance under the causeway bridge appears to still allow passage but could create safety issues, especially given the rip nature of water exiting … after high tide."[14]

20 I have previously addressed the effects of a slightly reduced headspace for navigation under the widened Bridge soffits in the Coastal Processes Technical Report[15] and in my EIC.[16]

21 Mr McKay requests widening "the existing SH16 causeway bridge mouth and/or add other culverts to reduce the rip effect during tidal draining ...".[17] I disagree, as stated earlier in paragraph 18, and stand by my reasoning for not widening the channel under the Bridges or adding more flushing culverts in paragraphs 97.4 to 97.5 of my EIC.

22 Experts at the caucusing (Coastal Processes) agreed that "fast currents and less headspace under the Causeway Bridges" are not significant issues.[18]

**MR COOTE AND DR BELLINGHAM (#217-1 AND #217–2)**

23 Both Mr Coote[19] and Dr Bellingham[20] raise concerns about the culvert under SH16 just to the east of Rosebank Peninsula.

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11 Bell EIC, paragraph 94.

12 Bell EIC, paragraphs 97.4 and 97.5.

13 McKay Statement, paragraph 6.8.3.

14 McKay Statement, paragraph 6.17.1.

15 Refer Technical Report G.4, page 84.

16 Bell EIC, paragraph 97.7.

17 McKay Statement, paragraph 8.8.

18 Expert Caucusing Joint Report (Coastal Processes), paragraph 9.

19 Coote Statement, paragraphs 5(e) and 6(e).

20 Bellingham Statement, paragraphs 16–17 and 18(g).

Mr Coote considers retention and clearance of the culvert is necessary to provide a residual tidal flow to maintain the mangroves in the north-western inlet of Waterview Estuary.[21]

**Decommissioning of the culvert under SH16**

24 In my EIC[22] I note my reasoning for abandonment of the existing culvert under SH16 east of Rosebank Peninsula. My reasoning was supported by field measurements of the tidal hydraulic performance of the existing culvert on a spring tide in October 2010. The NZTA agreed to conduct the field measurements following a meeting on 8 October with the Forest and Bird Protection Society of NZ.

25 The reduced efficiency of tidal volume exchanged via the existing culvert is now governed by the high intertidal seabed level inside the Estuary, resulting from ongoing sedimentation, not the capacity of the existing culvert or the fact that the adjacent culvert is blocked. The intertidal plateau in the area in and around the boardwalk is now 1 metre above the invert level of the culvert, apart from a very small, deep scour hole at the landward end of the culvert that still allows it to be operational, delivering tidal waters only around the period of spring high tides. This small scour hole will be covered by the widened Causeway.

26 A proportion of the high sedimentation rate around the boardwalk area was most likely derived directly from the culvert operation. Wave-stirred marine sediments forming turbid fringes to the north of the Causeway would have been drawn in through the culvert and would have then preferentially settled in the quiescent conditions of the Estuary.

27 Even with the culvert de-commissioned, the north-western inlet of Waterview Estuary will continue to be irrigated by brackish tidal waters on spring tides that enter via the Causeway Bridges channel. This scenario can be inferred from salinity and water movement observations I made during the October 2010 spring tide survey.

28 I proposed a coastal monitoring condition (C.15) in my EIC[23] to check and confirm that this area of the Waterview Estuary does indeed still receive tidal irrigation of brackish waters around high tides after de-commissioning the culvert.

29 Discussion of these issues surrounding the existing culvert in caucusing resulted in agreement that "the current poorly designed

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21 Coote Statement, paragraphs 5(e) and 6(e).

22 Bell EIC, paragraphs 42–51, 95, 97.6.

23 Bell EIC, Annexure C.

culvert system is not sustainable ... [and] and should be decommissioned".[24]

**Providing an alternative tidal inflow**

30 Dr Bellingham suggests that an alternative to reopening the culvert under SH16 east of Rosebank Peninsula is "to provide for more tidal flow at another point".[25] I disagree with implementing this suggestion.

31 Providing an alternative tidal inflow further east or west of the existing culvert into the Western Inlet, to the west of Traherne Island, would still only provide minimal flushing as the seabed levels south of the shared cycleway are also high from past infilling and further infilling by marine sediments would occur via a new culvert.

32 While I agree that the Western Inlet does need more circulation,[26] I can see no practical, sustainable solution, given substantial sedimentation, already up to the mean high-tide mark, has occurred since the initial construction of the Causeway.

33 In caucusing, Dr Bellingham and Mr Coote proposed "a new properly designed replacement culvert be created and a channel, similar to the 1950's channel, be excavated".[27] The experts present (Drs De Luca, Stewart and myself) did not agree with this proposal due to issues around habitat loss and mobilisation of sediment-bound contaminants.

**MS GRÜGER (#43–1)**

34 Concerns are raised by Ms Grüger about the coastal processes investigations,[28] sedimentation impacts on Oakley Creek, the estuary of Oakley Creek and beyond including the Motu Manawa Marine Reserve (*Marine Reserve*)[29] and effects on the chenier or shell banks.[30]

**Coastal processes investigations**

35 Ms Grüger states that information in the AEE "on currents, water levels and turbidity are anecdotal".[31] I disagree, as a combination of expert opinion and modelling was used in preparing the AEE. Further, following the lodgement of the AEE, supplementary field

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24 Expert Caucusing Joint Report (Coastal Processes), paragraph 5.

25 Bellingham Statement, paragraph 17.

26 Expert Caucusing Joint Report (Coastal Processes), paragraph 5 (1st sentence).

27 Expert Caucusing Joint Report (Coastal Processes), paragraph 11.

28 Grüger Statement, paragraph 8.4.

29 Grüger Statement, paragraphs 14.5 to 14.7.

30 Grüger Statement, paragraph 14.4.

31 Grüger Statement, paragraph 8.4.

measurements and numerical modelling were commissioned by the NZTA in response to feedback from the EPA through the Section 149G review.[32] This additional suite of investigations was addressed in the "Post-Lodgement Events" section of my EIC.[33]

36 Experts at the caucusing (Coastal Processes) agreed that the level of information I provided on coastal processes is sufficient, but that the historic background data is inadequate.[34]

**Sedimentation impacts on Oakley Creek and beyond**

37 Ms Grüger discusses[35] various aspects of suspended-sediment transport and settling processes in the context of long-term sedimentation in Oakley Creek, the estuary of Oakley Creek and beyond, including the Marine Reserve. She indicates these issues are not described in sufficient detail in the AEE.[36]

38 In-situ processes, like settling and dispersion of sediment particles in estuaries, are inherent in the MIKE 21 FM Mud Transport Model used for the AEE investigations by my Project team member, Dr Senior of Tonkin & Taylor Limited. Simulations of three different size classes of fine, medium and coarse silt were undertaken to demonstrate the sensitivity of the results to different grain sizes, which in essence can mimic the effect of flocculation.[37] Accordingly, I consider coastal mixing and sediment transport and settling processes have been sufficiently taken into account in the numerical modelling investigations to support the assessment of effects on the coastal marine area.

**The chenier or shell banks**

39 In paragraph 14.4 of her statement, Ms Grüger states that the Project will have "a major effect on the Chenier plain in the Hauraki through sedimentation" and that "[t]he Chenier plain is a rare geological site that is of global importance." I will address chenier features in the next section as a similar comment was also made by Dr Stewart of Ryder Consulting Ltd in his Marine Ecology Section 42A Report.

**SECTION 42A REPORT – MARINE ECOLOGY – RYDER CONSULTING**

40 I will now respond to relevant parts of the "Review of the Assessment of Marine Ecological Effects" prepared by Dr Stewart of

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32 Bell EIC, paragraph 114.

33 Bell EIC, paragraphs 89 to 95.

34 Expert Caucusing Joint Report (Coastal Processes), paragraph 10.

35 Grüger Statement, paragraphs 14.5 to 14.6.

36 Grüger Statement, paragraph 14.6.

37 See Coastal Processes Technical Report G.4, Appendix A.

Ryder Consulting Ltd forming Appendix A of the EMS Section 42A Report.

**Chenier (shell) ridge/bank features**

41 In paragraph 7.4 of his Report, Dr Stewart explores the importance of the chenier ridges in the Marine Reserve – a term he uses interchangeably with chenier plain. After defining a "chenier ridge (or plain)", Dr Stewart then mentions that "[t]here are purportedly only about 12 of these shell plains in the world". Ms Grüger comments similarly on this aspect in her paragraph 14.4.

42 From my reading of the literature on chenier plains combined with field observations at Traherne Island, analysing aerial photographic sequences and discussions with my colleague Dr Terry Hume, a coastal geomorphologist (who co-authored the Coastal Processes Technical Report G.4), it is my opinion that the shell ridges or banks found north of the Causeway are not chenier plains, as defined by Otvos,[38] and therefore are not of "global importance" as suggested by Ms Gruger.[39]

43 So while the shell banks and ridges north of the Causeway are not internationally rare chenier plains, I accept that they are nevertheless not common around Auckland, other than in the Marine Reserve, Clarks Beach (Manukau Harbour) and Shelly Park (Eastern Bays), and the existence of shell banks was one of the features that inspired the formation of the Marine Reserve.[40]

44 In paragraph 4.64 of his Report, Dr Stewart agrees that the mitigation measures proposed for the dry shell banks (chenier ridges)[41] are adequate.

45 Further, experts at the caucusing (Coastal Processes) agreed that the chenier ridges are important features and habitat, but all experts were satisfied with proposed Coastal Condition C.12.[42]

**Rosebank Peninsula culvert**

46 Dr Stewart suggests[43] that clearing of the currently blocked culvert under SH16 be revisited. I have already covered this aspect in my responses to Mr Coote and Dr Bellingham above, including the agreement reached between the experts during caucusing.

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[38] Otvos, E.G. (2005). Cheniers. In: Schwartz, M.L. (Ed.) *Encyclopedia of coastal science*, p. 233–235, Springer.

[39] Grüger Statement, paragraph 14.4.

[40] Statement of Ms Marilyn Fullam (Evidence #32–1), paragraph 4.1.

[41] Bell EIC, paragraphs 75 and 99.

[42] Expert Caucusing Joint Report (Coastal Processes), paragraph 6.

[43] Stewart s42A Report, paragraph 7.5.

## SECTION 42A REPORT (AND ADDENDUM) – ENVIRONMENTAL MANAGEMENT SERVICES

### Assessment of effects on coastal processes

47 In paragraph 7.5 of the EMS Section 42A Report, the reviewers note that they are generally satisfied that the Project's effects on coastal processes have been adequately assessed.

### Whau River Bridges: Navigation

48 In its Section 42A Report, EMS comments[44] on navigation issues under the Whau Bridges. However, at the time of EMS's initial s42A Report, EMS had not assessed the NZTA evidence in chief and misunderstood the navigation issue. Subsequently, in its Section 42A Addendum Report,[45] EMS notes that my EIC addresses this point.

49 For clarification, the reduction in minimum clearance under the Whau River Bridges will be 180 mm, not 140 mm as listed by EMS in paragraph 3.7.3 of the Addendum Report.

50 EMS notes[46] that there is no evidence that investigates what craft, that currently regularly use the upstream moorings, would be affected by this reduction in headspace under the Bridges, and to what extent.

51 In a meeting coordinated by the NZTA on 12 October 2010 with Te Atatu Boating Club representatives, I carefully explained the reduced headspace and provided them with information on the slight reductions in the tidal window that would occur for vessels currently limited by the headspace under the Bridges.[47] The NZTA encouraged the Boating Club to provide specific evidence detailing the number of vessels that would be affected by the reduction in tidal passage. Unfortunately, the Te Atatu Boating Club has not supplied a statement of evidence, following its submission, to further quantify the Project's potential impacts on navigation (if any).

52 Slightly reduced headroom needs to be considered in the overall context of the multiple decisions[48] a skipper of a larger or high vessel already makes when navigating this tidal reach of the Whau River with the currently restricted headroom beneath the Bridges. In my opinion, the reduction of 180 mm in minimum clearance under the Whau River Bridges will not adversely affect navigation,

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44 EMS s42A Report, paragraphs 10.3.16 –10.3.17.

45 EMS s42A Addendum Report, paragraphs 3.7.3 - 3.7.5.

46 EMS s42A Addendum Report, paragraph 3.7.4.

47 Bell EIC, paragraph 65.

48 See Bell EIC, paragraph 65 for a discussion of these various decisions.

as it will be one of several factors a skipper will need to consider for safe passage under the Bridges.

53 Experts at the caucusing (Coastal Processes) agreed that for navigation of vessels "the slightly lower Whau Bridge is not a significant issue". [49]

54 However, as a practical aid to navigational safety, I consider an appropriate pier(s) on the Whau Bridges (and even the Causeway Bridges) could be marked with height graduations encompassing the full tide range and zeroed near the soffit level (with a safety margin) to indicate to skippers what headspace is present above the water level at the time of attempted passage.

55 The impacts on navigation during construction have been alleviated by the provision of an 18 m wide gap between the temporary staging platforms. [50]

**Sea-level rise and the Causeway height**

56 In its Section 42A Report, EMS notes[51] there is a lack of information on how sea-level rise has been incorporated into the Causeway design. These comments preceded EMS's assessment of NZTA evidence in chief.[52]

57 I have worked with the Ministry for the Environment in the formation of ideas and a draft for a potential National Environment Standard (*NES*) on Sea-level Rise, stemming from NIWA's work writing the Local Government Guidance Manual on Coastal Hazards and Climate Change for the Ministry. I have provided similar sea-level rise values to the engineers designing the Causeway. Other than that, I agree with EMS[53] that the Board cannot give consideration to the unknown provisions of such an NES.

58 In its Section 42A Addendum Report, EMS suggests[54] that the NZTA may provide an additional coastal condition or monitoring obligation to address sea-level rise issues. Throughout the Auckland region, as sea levels rise, the NZTA will undoubtedly be conducting ongoing coastal hazard vulnerability assessments of the State highway system without the need for specific monitoring conditions requiring them to do so. However, in my opinion the NZTA should not be responsible per se for monitoring sea-level rise in the Auckland

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49 Expert Caucusing Joint Report (Coastal Processes), paragraph 7.

50 Bell EIC, paragraph 64.

51 EMS s42A Report (7 December 2010), paragraphs 6.3.5 and 12.6.

52 I covered this matter in paragraphs 28 to 36 of my EIC, having regard to Policy 10(2)(a) of the NZCPS 2010.

53 EMS s42A Report (7 December 2010), paragraph 6.3.5.

54 EMS s42A Addendum Report, paragraph 3.5.1.

region, sea-level monitoring being a regional government or port responsibility. This stance was supported by experts at the Coastal Processes caucusing.[55]

59 It is my understanding that NZTA and its selected contractor will also need flexibility in the staging of the Causeway height, given the uncertainty in the future rates of sea-level rise, provided they work within the final designated footprint. I have provided a rate of 0.8 m sea-level increase by 2100 to guide the whole-of-life planning and staging for raising the Causeway. If the actual rate of sea-level rise is higher than this, then the next stage of works would be brought forward and vice versa if the rate is less than anticipated.

**ERRATA – EVIDENCE IN CHIEF No. 17**

**Causeway Design: Height and Crest Width**

60 In relation to paragraph 34 of my EIC:

60.1 The overtopping rate provided should be "per metre length of Causeway" (not width);

60.2 The start of the next sentence should read "This is the upper threshold, where it would be unsafe for…".

61 In relation to paragraphs 15, 35 and 36, the Causeway height of 3.0 metres[56] should be qualified in each case to apply to the crest of the Causeway rock revetments (not the centre of the Causeway) and for the particular design cross-section Option D(W) submitted by Mr Hind in his EIC.[57] The final height profile of the Causeway cross-section, after allowing for settlement, to accommodate the specified range of coastal hazards and sea-level rise, will be determined during the detailed design phase of the Project. However, the Causeway will remain constrained within the designated coastal marine area footprint sought by the NZTA.

**Dr Robert Bell**
**2 February 2011**

[55] Expert Caucusing Joint Report (Coastal Processes), paragraph 8.

[56] Above Auckland Vertical Datum-1946

[57] Hind EIC, Annexure A.

**ANNEXURE A: EXPERT CAUCUSING JOINT REPORT TO THE BOARD OF INQUIRY – COASTAL PROCESSES (DATED 28 JANUARY 2011)**

Before the Board of Inquiry
Waterview Connection Project

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*in the matter of:* the Resource Management Act 1991

*and*

*in the matter of:* a Board of Inquiry appointed under s 149J of the Resource Management Act 1991 to decide notices of requirement and resource consent applications by the NZ Transport Agency for the Waterview Connection Project

# Expert Caucusing Joint Report to the Board of Inquiry – Coastal Processes

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Dated: 28th January 2011

Due: 7 February 2011

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# EXPERT CAUCUSING JOINT REPORT TO THE BOARD OF INQUIRY

## INTRODUCTION

1 This joint signed report is written in response to the Board of Inquiry's Minute and Directions dated 23 December 2010. The Directions require the experts, following caucusing, to provide a report by 10am on 7 February 2011 "that includes:

- Areas that have been resolved and how (e.g. by agreement about conditions)
- Areas that are not resolved, and succinctly why."

2 This report relates to the caucusing topic of Coastal Processes.

3 Caucusing meeting(s) were held on 28th January 2011.

4 Attendees at the meetings were:

- Dr Rob Bell, Coastal Scientist, Representing NZTA.
- Dr Sharon De Luca, Marine Ecologist, Representing NZTA.
- Dr Brian Stewart, Marine Scientist, Representing the Board of Inquiry.
- Dr Mark Bellingham, Royal Forest and Bird Protection Society of New Zealand.
- Mr Michael Coote, Royal Forest and Bird Protection Society of New Zealand, Motu Manawa Restoration Group.

## AREAS THAT HAVE BEEN RESOLVED

### Decommissioning of the Rosebank Culvert

5 We agree that the Western inlet of Waterview Estuary does need more circulation. However, the current poorly designed culvert system is not sustainable in the long term for providing water circulation. We agree that the culvert should be decommissioned.

### Chenier (shell) ridges and remediation

6 We agree that the chenier ridges are important features and habitat. We are all satisfied with condition C.12.

**Navigation for vessels under slightly lower Whau Bridge.**

7 We agree that the slightly lower Whau Bridge is not a significant issue.

**Sea-level rise and causeway height**

8 We agree that a monitoring condition for sea-level rise does not need to be included in the Project conditions, as this is a Regional Council responsibility.

**Fast currents under Causeway Bridges and less headspace for kayakers**

9 We agree that fast currents and less headspace under the Causeway Bridges is not a significant issue.

**Level of information on coastal processes and suspended sediment modelling are not adequate.**

10 We agree that the level of information on coastal processes provided by Dr Bell is sufficient, but that the historic background data is inadequate.

**AREAS THAT HAVE NOT BEEN RESOLVED**

**Decommissioning of the Rosebank Culvert**

11 Mark Bellingham and Michael Coote propose a new properly designed replacement culvert be created and a channel, similar to 1950's channel, be excavated.

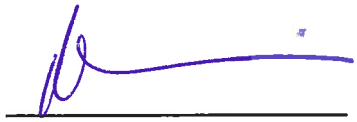
Sharon De Luca, Rob Bell and Brian Stewart did not agree with a replacement culvert due to the issues around habitat loss and mobilisation of historic sediment bound contaminants.

Date: 28 January 2011

**Dr Sharon De Luca**

**Dr Rob Bell**

**Dr Brian Stewart**



**Dr Mark Bellingham**

**Mr Michael Coote**