

**IN THE MATTER OF**      the Resource Management Act 1991  
**AND**

**IN THE MATTER OF**      resource consent applications and  
Notices of Requirement by the Bay of  
Plenty Regional Council to undertake  
the proposed Kaituna River Re-  
diversion and Ongatoro / Maketū  
Estuary Enhancement Project

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**STATEMENT OF EVIDENCE OF STEPHEN CAMPBELL EVERITT**

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**INTRODUCTION**

**Qualifications and experience**

1. My full name Stephen Campbell Everitt.
2. I am the Technical and Engineering Manager for the Kaituna River Re-diversion and Ongatoro / Maketū Estuary Enhancement Project (**Project**). In this role I provide strategic project management advice to the Bay of Plenty Regional Council (**Regional Council**) Project Manager. I undertake the engineering investigations, reporting and preliminary design, within my area of expertise, and I manage the input from other technical specialists.
3. I am a Project Management and Civil Engineering Consultant and a director of WaterLine Engineering Consultants in Whakatane. I provide civil engineering services and advice to clients in the Bay of Plenty on investigation, consenting, design and construction projects, mainly in the water and soil engineering field.
4. I have been providing these services for 16 years, prior to which I was employed by the Electricity Corporation of New Zealand as a dam safety and civil engineering manager. This required me to have a thorough understanding of the design, operations and maintenance of large embankment and concrete dams and hydropower facilities. During this time I spent 5 years managing the investigations, design, resource consent applications, construction and re-commissioning of the Matahina Dam.

5. Prior to this I was employed by the Ministry of Works in Hamilton, Wellington and New Plymouth investigating, designing and constructing bridges, roads, river works and wastewater disposal systems.
6. I hold the qualification of Bachelor of Engineering with Honours in Agricultural Engineering (1980) from the University of Canterbury. I am a member of the Institute of Professional Engineers.

### **Scope of Evidence**

7. I was first engaged by the Regional Council in January 2012 to assimilate and summarise the numerous issues, investigations and reports relevant to the water flows through the Ongatoro / Maketū Estuary.
8. In August 2012 I assisted the Regional Council's Project Manager, Pim de Monchy, in preparing the Summary and Analysis of Options and Alternatives, which is included in Volume B Folder 1 of the Assessment of Environmental Effects.
9. I have provided engineering advice on the conceptual hydraulic design that was developed in conjunction with Ben Tuckey of DHI, Phil Wallace of River Edge Consulting and Ingrid Pak of the Regional Council, who had investigated and reported on the numerous options prior to 2012.
10. I have undertaken an assessment of the potential effects arising from changed water levels determined by the DHI numerical modelling, including on drainage and flood hazard risk, as contained in my report Summary of Effects Resulting from Water Level Changes in Volume B Folder 2 of the Assessment of Environmental Effects.
11. I have led the development of the construction methodology and the physical implementation plan for the Project as contained in my report Construction Description and Drawings in Volume B Folder 2. As part of this process I have also been tasked with discussing the prospect and details of mooring facilities for the Coastguard and Butch Waterhouse, water supply requirements for Allan Titchmarsh as well as managing the investigation of the effects on the drainage scheme and liaising with Rivers and Drainage regarding the options for mitigation of these.
12. My evidence covers:
  - 12.1 A description of the existing water movements and the changes the Project will make to those;
  - 12.2 The potential effects of water level changes caused by the Project on:

- (a) Land adjacent to the lower Kaituna River;
- (b) Farmland around the upper and middle reaches of the estuary; and
- (c) the Maketū township;

including how these will be managed or mitigated; and

### 12.3 Construction methodology and effects.

- 13. I will also provide comments on the submissions as they relate to the scope of my evidence. Other witnesses also provide comments on the submissions relevant to their areas of expertise and project involvement. I have been directly involved in a number of the submitter meetings.
- 14. I have read and am familiar with the section 42A report and the proposed set of consent conditions and will refer to these where relevant to my evidence.
- 15. Lastly, I have read the Code of Conduct for Expert Witnesses in the Updated Environment Court Practice Note (2014) and agree to comply with the Code. This evidence is within my area of expertise, except where 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 I express.

## **EXECUTIVE SUMMARY**

- 16. The land surrounding the lower river and the estuary is susceptible to flooding and is classified as flood hazard zone in the Western Bay of Plenty District Plan. This reflects the historic nature of the area, prior to the extensive flood protection works installed, largely to allow for the land to be used for agricultural development. Most of the land, excluding the Maketū Township, is protected by the Kaituna Flood Protection and Drainage Scheme stopbanks, pumpstations and flap-gated culverts.
- 17. The Project will increase the volume of freshwater diverted into the Ongatoro / Maketū estuary. In doing so, it is intended to partially reverse the adverse environmental effects that have occurred due to the extensive works in the catchment. In turn, existing water levels will change and this will have some level of impact on the operation of the Drainage Scheme and, without mitigation, on the level of flood risk to Maketū township.
- 18. I have considered the predicted water level changes, based on the comprehensive modelling undertaken by DHI, and have assessed the extent of the potential effects of the water level changes on the Drainage Scheme and Maketū, as well as the effects of the

Project on the Lower Kaituna Wildlife Management Reserve and on existing water supplies in the Lower River.

19. I have concluded that the water level changes will affect the discharge rates and/or volumes of Drainage Scheme gravity outlets and the rate of drainage of water from the farmland. There is also potentially an impact on the privately owned Dean pumpstation.
20. The Project team, including myself, has been engaging extensively with Rivers & Drainage, who manage the Kaituna Catchment Control Scheme. There is general agreement that effects of the Project can be appropriately addressed, and there are several options for achieving this, for example via increased or additional gravity culverts and / or toward increased running costs of pump stations. For the Dean pumpstation, improving the gravity drainage off this property to the Kaituna Rd drain is likely to be a viable option.
21. There is a comprehensive and robust process proposed in Proposed Conditions 21 and 22 requiring the Consent Holder to undertake further investigations, reach agreement on and undertake this mitigation, prior to commencement of works. This investigation has already commenced and I will provide an update at the hearing.
22. The water level changes in the estuary will, if not mitigated, also increase the area of land at risk of flooding at Maketū township in an infrequent storm event during which high river flows combine with high sea levels. This risk can be managed by controlling the additional flows from the Kaituna River through the new culverts when the combination of events that give rise to the potential effects occur. At times where the flooding risk is increased unacceptably, the flow into the estuary will be restricted, meaning there will be no additional effects caused by the Project. The proposed conditions require the mechanisms for achieving this to be detailed in the Operations and Maintenance Manual, to be prepared in consultation with the Rivers & Drainage Manager and the Western Bay of Plenty District Council.
23. Effects on the Lower Kaituna Wildlife Management Reserve and the existing water supply can be addressed and proposed conditions prescribe the actions to be undertaken by the Consent Holder to do so.
24. My evidence also describes the construction works required to undertake the Project and their extent, duration, timing and effects on the environment. The works are designed and programmed to avoid or minimise adverse effects on the environment and where this is not practical, mitigation measures are described. These will be addressed in a Construction Environmental Management Plan. Conditions will have to manage the effects of

construction while providing maximum flexibility so that construction tenderers can be innovative in their methodologies.

25. I consider that any adverse effects of the Project can be appropriately managed such that they are acceptable.

## **DESCRIPTION OF EXISTING WATER MOVEMENTS AND HOW THIS WILL CHANGE**

26. Ongatoro / Maketū Estuary and the Kaituna River are very closely connected to the sea so that water levels and flows within the two water bodies are influenced by natural tidal fluctuations. The river and estuary each have a natural tidal range. Water goes out on the ebb tide and comes in on the flood tide, causing water levels to fall and rise in the natural way. Although the two water bodies are connected through Ford's Cut, the four existing flap-gated culverts under Ford Rd create a hydraulic "disconnection" which modifies the tidal flows and water levels.
27. In the existing Ford's Cut there is a small difference in the timing of the tidal effects between the river and the estuary. In the river, the tide rises and falls some 75 minutes earlier than in Ford's Cut. As a result there are long periods of time when the water level in the river is higher than in Ford's Cut, and similar periods when the river level is lower.
28. This difference in timing is due to the distance of the two points from the sea and the hydraulic efficiency of their connections to the sea. In the river the distance to the sea is 920 metres. The water channel is "efficient" i.e. it is short, straight, smooth and the ratio of its cross-section area to its wetted perimeter is high. In Ford's Cut the distance to the sea is 4,600 metres. The water channel is "inefficient" i.e. it is long, shallow, wide, rougher, curved. Hence the delay of approximately 75 minutes between levels in the river and the levels in Ford's Cut.
29. It is this timing difference that the Department of Conservation (**DOC**) used in 1996 when it installed the existing culverts in order to increase the water flow from the river into the estuary.
30. Importantly though, DOC wanted to keep water in the estuary and cause it to flow through the estuary to the east and out through the estuary mouth at Maketū, rather than flowing back into the river as would naturally occur when the tide began falling in the Kaituna River at Te Tumu. To prevent water in Ford's Cut flowing back out through the culverts they were fitted with flapgates that close when the water level in Ford's Cut is higher than that in the river. By maximising the ebb tidal flow through the estuary entrance in this way, the benefits of the partial re-diversion to the health of the estuary would also be maximised.

31. It is this natural variation in water levels and the prevention of backflow on which the existing system relies and on which this present application for consents is based. In order to fill the estuary with water and cause it to flow out through the mouth to the sea it must be prevented from emptying out through Te Tumu.
32. The Project will increase the connectivity of the river to the estuary to take full advantage of the higher water levels in the river than in the estuary. The increase in connectivity is achieved by increasing the cross-sectional area of Ford's Cut (doubling its area) and increasing the number of culverts at its connection to the river (from 4 to 25).
33. It is important to note that it is the flow rate, as measured in cubic metres per second (cumecs, m<sup>3</sup>/s) that will significantly increase in the channels, and not the velocity of flow (the current speed as measured in metres per second, m/s or knots). Water velocity will barely increase, even during floods.
34. This minimal change in current speed is due to the relatively small difference in water level (head) between the river and the estuary, and the relatively large channels through which the water flows. This small difference in water level provides the only natural energy to force water into estuary and any reduction in this energy must be avoided. Energy is lost and wasted when water currents are fast hence the design to keep water currents low. These low water currents have the added benefit of minimising erosion.

## EFFECTS OF WATER LEVEL CHANGES

35. I prepared a report summarising the potential effects resulting from the change in water levels attributable to the increased diversion of flows from the Kaituna River to the Maketū Estuary.<sup>1</sup> In assessing the effects, I have relied on the comprehensive numerical modelling undertaken by DHI in terms of the predicted water level changes in the estuary and the lower river.
36. I have considered the effect of the water level changes on water supplies (including to the Lower Kaituna Wildlife Management Reserve (**Reserve**) and Allan Titchmarsh's water takes), on land drainage, and on flooding risk. To assess the effects of the Project on flooding and drainage, a number of combinations of river flows, sea levels and rainfall events were investigated for the lower river, the estuary and Maketū township under various scenarios, being:

36.1 Normal and low river flows;

36.2 Heavy rain on the farmland;

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<sup>1</sup> Assessment of Environmental Effects, Folder 2, Tab B

36.3 High water flows / levels and how this impacted on stopbanks and drainage; and

36.4 High water levels in the estuary and Maketū flood risk.

37. Different sea and river levels and river flows were considered for different locations around the Project environs. In the lower river, a low river flow (the 5-year 7-day low flow) was applied to investigate the effects on the water supply to the Reserve and to Allan Titchmarsh. In the same location a very high river flow (the 100-year flow) was applied to investigate the effects on the stopbanks. In the estuary around the Maketū foreshore varying combinations of high river flows and high sea levels (100-year and 20-year flows and sea levels) were applied to investigate the effects on flood levels in the township. To investigate effects on the farmland drainage various combinations of rainfalls on the land and water levels in the estuary (dry-weather, 20-year events) were applied to investigate effects on the drainage scheme.
38. In this section I will summarise the existing environment and the potential effects (as outlined in my report) and then explain the proposed mitigation to address the effects of the Project.

### **Existing environment**

39. The land surrounding the lower river and the estuary is classified as flood hazard zone in the Western Bay of Plenty District Plan. The greatest determinant of high water levels in the estuary is the high level of the sea during low pressure systems and storm surge especially on a high spring tide. High flows in the river do not add significantly to this flood risk because of the constriction at the Ford's Cut culverts.
40. Large areas of farm land are also regularly subjected to surface flooding during rainfall events.
41. Most of the land, excluding Maketū Township which I discuss below, is protected by the Kaituna Catchment Control Scheme (**Scheme**). The Scheme provides both flood protection and land drainage services by operating and maintaining a network of drains, stopbanks, pumpstations and flap-gated culverts. There is also one privately owned flood pump (on property owned by the Dean family).
42. The key components of the Scheme, and the Dean pump, are shown in **Attachment A**. The stopbanks along the river and around the estuary prevent high water levels flooding the farmland and are designed to a 100-year standard. Any rainfall on the farmland collects in farm drains that connect to Scheme drains that discharge water to the lower river and the estuary via culverts and pumpstations through the stopbanks. I understand the Scheme

was originally designed to keep the groundwater level in the farmland at about 600mm below ground. Since its construction the land has lowered as the peat has shrunk and this objective has been increasingly difficult to achieve. It is balanced now with maintaining a water level that minimises peat shrinkage without limiting pasture growth. The Scheme has an objective of removing floodwaters off the land within three days of a 20-year rainfall event.

43. Drainage of water from the farmland adjacent to the lower river and the estuary relies on the Scheme's network of open drains, and gravity and pumped outlets to the river and estuary (Figures 1 and 2 below). During dry weather the groundwater from the farms flows under gravity through culverts during low tides out to the river and estuary. As the tide rises, flapgates close to prevent water entering the drains. At some drain outlets there are pumps that begin to operate as the water levels rise in the drains (Diagonal Drain Pump Station, Ford Road Pump Station and Maketū Pump Station - referred to as Singleton Pump Station in my report). These pumps are required to augment the gravity drainage volume (to maintain drain water within a targeted band of levels) and therefore operate regularly. There is also a private pump station owned by the Deans (identified in Attachment A). This pump station operates in a similar fashion, but only to clear floodwaters after heavy rain. It is not used to maintain low water level in the drains within the farmland. This is adequately achieved by drainage under gravity to the south into the Kaituna Rd drain, a Scheme drain.



Figure 1 Typical flapgated gravity culvert outlet from a Scheme drain from the farmland (Burgess Drain). In the left foreground is the water in the estuary, high enough so that the flapgate is closed.



Figure 2 Typical pump station outlet (Maketū pump station) from a Scheme drain from the farmland. In the right foreground is the water collecting from the drain (Singleton Pumped Drain) ready to be pumped by the two green cylindrical pumps into the estuary to the left.

44. Maketū township is not protected by the Scheme and is also identified as a flood hazard zone in the District Plan. This land relies on natural high ground, Maketū Road, and private works for protection. Parts of Maketū are inundated during high sea levels. Attached to my Water Level Effects report at Appendix 5 are aerial photos of the flood risks around Maketū township – I refer you to Sheet 4 which shows in blue the present, likely area of inundation during a 100-year sea level combined with a 20-year flood. There are no flood defences around this town and hence even in more frequent, moderate river flows and moderate sea states flooding will occur.
45. There are some locations in Maketū township where the natural land surface is not high enough and slopes to the estuary, where water enters drains and streams discharging under Maketū Road through flapgated culverts. The main culvert, in the Otumakoro Stream (identified on map Attachment A), is currently undersized and unable to cope with high flows, leading to flooding on land adjacent to it – see Figures 3 and 4 below.



Figure 3 Culvert under Maketū Rd on the Otumakoro Stream in Maketū.



Figure 4 Flooding of low land in Maketū from the Otumakoro Stream, upstream of the undersize culvert under Maketū Rd.

46. The land north of Ford's Cut is very low (most of it is below the high tide level in the estuary), flat and poorly drained. It has a series of open drains leading to one pump station discharging to the river under Ford Road. This land is exposed to a risk of flooding when the estuary is high due to high sea levels. It is protected from high river flows by the Ford Rd embankment and has some level of protection from private stopbanking around the estuary edge and two causeways in the estuary.

47. The Reserve is located next to the river, but separated from it by the Scheme's flood protection stopbank. There is no similar stopbank on the landward side of the Reserve. Water is only able to enter the wetland when the river water level is high through culverts in the stopbank. Water escapes the wetland through groundwater infiltration, evaporation, and when high enough, back to the river through another culvert in the stopbank. There are competing requirements here; adjacent farmers wish to see the water level lowered on their properties adjacent the Reserve, while DOC, Fish and Game and the Regional Council wish to see water tables in the Reserve kept high.
48. Mr Titchmarsh takes water using a floating intake from the river for his stock-drinking and pasture irrigation supplies. The area of the river where the supply is located is subject to saline influence, and Mr Titchmarsh must manage the timing of his takes accordingly.

### Effects of the Project on the Lower River

49. When I refer to the lower river, I am referring to the following area:

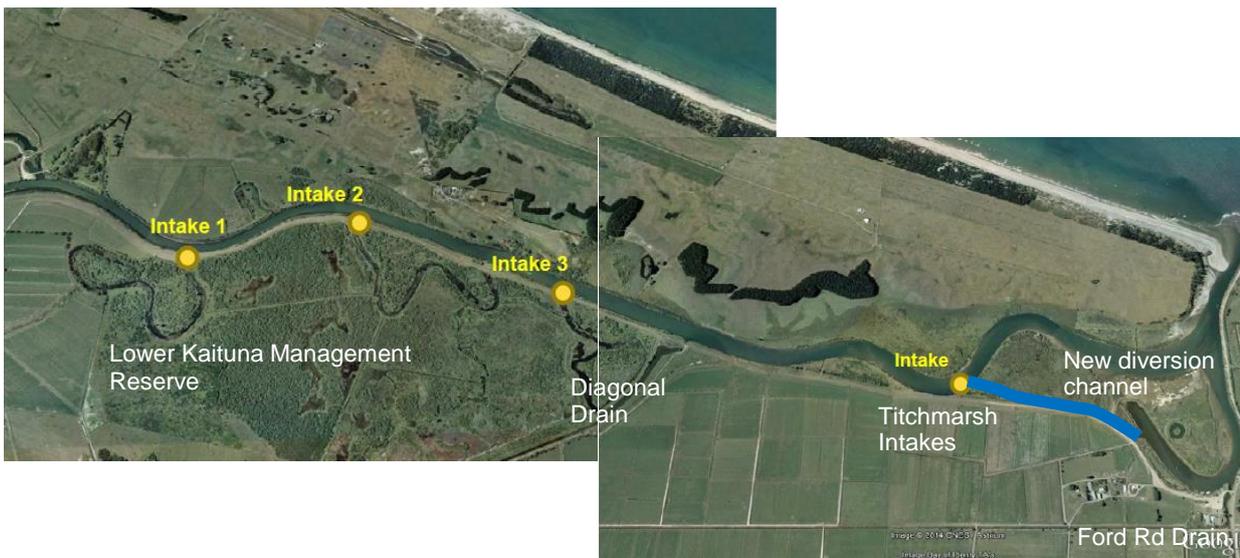


Figure 5 Lower river

50. In this reach the Project has the general effect of lowering the high tide water levels and, except at Ford Rd drain outlet, leaving the low tide water levels unchanged. This effect is noticeable during floods when the peak water levels are predicted to be between 10 and 60cm lower than now (depending on location and flood scenario). During low flows the high tide water levels are 5cm lower. During normal river flows the water levels remain relatively unchanged.
51. At the Ford Rd drain discharge point, the water levels are raised by the Project at low tide by between 10 to 20cm depending on river flow rate.

52. The key effects of these changes are:
- 52.1 At the Ford Rd Drain outlets the increase in river water levels at low tide will inhibit drainage under gravity through the culverts and increase the amount of time pumps will need to operate to maintain the same water level in the drain. It may also increase the time taken for water to drain off the farmland after heavy rain events.
  - 52.2 At the Reserve, the lower high tide water levels when the river is flowing very low, for example in a sustained drought, will reduce the amount of water that flows through the culverts into the Reserve. DHI has estimated that the volume getting into wetland over a spring tide cycle is reduced by approximately 10%.
  - 52.3 During similar low flow and high spring tide times, there will be incursions up river of higher salinity water that have the potential to enter Mr Titchmarsh's stockwater supply and irrigation supply. I have discussed this with him. This risk exists presently and Mr Titchmarsh must manage his takes accordingly. The Project causes higher peaks in salinity and reduces the time available to take water, between the peaks, but by a less than minor amount. It will drop from 9.7 hours per tidal cycle now to 9.2 hours post-Project. The Project slightly increases the number of occasions each year that water takes will need to be restricted due to excessive salinity.
53. No further effects are anticipated on the land adjacent to the lower river. For completeness:
- 53.1 At the point in the river where the Diagonal Drain enters the river there will be no increase in river water levels as a result of the Project, for both low and high river flows. The effectiveness of the gravity drain and pump station will not be reduced.
  - 53.2 During flood events in the river caused by both heavy rain in the catchment and high seas, the water levels in the river stay below the presently predicted flood event level. In fact the Project reduces the flood levels. Hence the stopbanks will continue to provide their present level of service.

### **Effects on the Estuary and Maketū Township**

54. A significant objective of the Project is to direct more water from the river into the estuary; hence the increase in size of Ford's Cut and the addition of more culverts. A second objective is to restore the natural water flows in the upper estuary by removing the two man-made causeways that prevent this. One of the consequences of the more efficient flow paths is the raising of water levels in Ford's Cut, the estuary and around the Maketū foreshore.

55. In the estuary, the day-to-day raise is approximately 4cm at low tide and 8cm at high tide. During high river flows the rise is approximately 50cm at low tide and 40cm at high tide.
56. The key effects of these changes are:
- 56.1 The higher water levels in Ford's Cut and the estuary will affect the discharge rates and/or volumes of the Brain, Dean, Burgess (2) and Singleton gravity outlets and the rate of drainage of water from the farmland. This will potentially impact on the ability of the Scheme to meet its objectives. At the Maketū Pumpstation the pumps may have to work longer to maintain the same farm drain water levels to compensate for reduced drainage through the four shoreline outlets, but this is dependant on the amount of water pumped by the Fords Rd pumps.
- 56.2 Around the Maketū foreshore, the effect of the re-diversion of a greater volume of water into the estuary is to increase the amount of land that is at risk of flooding in a 1% AEP (1 in 100 year) river flood combined with a 5% AEP (1 in 20 year) sea level – see Sheet 2 of my report. During other flood events with differing combinations of sea level and river flow, the incremental flooding effect caused by the Project is between nil and minor. This is particularly so for the present, critical flood event for Maketū being the 5% AEP river flood combined with a 1% AEP (1 in 100 year) sea level, during which some areas of Maketū are already at risk of severe flooding – see my Sheet 4. In the context of the level of flooding that would already be occurring on land in Maketū in this size event, the effect of the water level changes caused by the Project would be barely discernible.
57. At the outlet of the Otumakoro Stream through the culvert under Maketū Rd, I have concluded that the water levels in the estuary, both at present and after the Project, do not and will not affect the ability of this culvert to convey water. This is because the flow through the culvert is dictated by its inlet size and configuration. An upgraded culvert crossing is necessary to alleviate current flooding risk. The increased water levels in the estuary caused by the Project will have a negligible effect on water levels upstream of any upgraded culvert.
58. Lastly, the Project would impact upon the land north of Ford's Cut by causing more frequent inundation. The causeways from Papahikahawai Island to the Maketū Spit, and Papahikahawai Island to the land, act as stopbanks to prevent high estuary water levels inundating the property. The Project proposes to remove these to maximise the ecological and cultural benefits. Widening of Ford's Cut also removes the high land along its north side that presently protects the land from high water levels there.

59. As part of the Project the Applicant is proposing to purchase the land to the north of Ford's Cut (Brain land) and will use this land to re-establish wetland. A key factor in the decision to purchase the Brain land is the disproportionate costs of trying to properly protect this land once the Project is operational, particularly given the limitations on agricultural production options the land already faces (ie a fairly low level of existing protection and high groundwater levels / salinity levels limiting pasture growth).
60. I was asked to provide a description of the work that would be required in order to protect the land such that it could be used for farming post-Project. The works would include stopbanking, drainage and seepage control. The costs associated with protecting the land to a sufficient level would be at least \$1.04M, and to a standard usually applied to farmland within the Scheme, approximately \$1.55M.
61. The Applicant is separately negotiating the acquisition of this land. Therefore, I do not propose any mitigation to address these effects, as they will be addressed via this separate purchase process.

### **Proposed mitigation and management of effects**

62. The effects of the Project that I consider need to be mitigated are:
- 62.1 The effect of reduced flows on the Reserve;
  - 62.2 The effect of increased salinity on Mr Titchmarsh's water takes;
  - 62.3 The effect of changed estuary water levels on the drainage of land adjacent to the estuary and lower river; and
  - 62.4 The increase to flood risk at Maketū during infrequent combination events.

### *The Reserve*

63. To avoid the reduction in water volume getting into the Reserve, DHI suggested installing another culvert in a location suitable to the stakeholders. I concur with this proposal. The Applicant has been liaising with DOC and Fish & Game, and a condition has been agreed to address this issue. Proposed Condition 20 requires the maintenance of flows into the wetland to be achieved by installing an additional culvert. The final plan for the additional culvert is to be determined in consultation with the Department of Conservation and Fish and Game, and will be certified by the Regional Council. Proposed Condition 27.5 also requires monitoring following installation of the additional culvert for a minimum of two years to be undertaken in two locations, including the existing site and one in close proximity to the new culvert location.

*Mr Titchmarsh's water take*

64. In my opinion, the effects of increased salinity on Mr Titchmarsh's water supplies can be addressed by installing a salinity meter alone. However in acknowledgement of the possibility of failure of such devices (albeit very low), I have also proposed providing additional storage for stockwater.
65. Proposed Condition 18 requires the Consent Holder to install a salinity monitoring device that shuts off the existing stock water intake when the salinity makes the water unsuitable for use as stock drinking water. It also requires the Consent Holder to provide a 30,000 litre tank for stockwater. Note that the same salinity control must be installed on the irrigation water supply – Condition 18.3 needs to stipulate this, and I have recommended a change to the condition accordingly.
66. Mr Titchmarsh is not satisfied with this Condition (as at 14 April 2015) as it relates to his irrigation supply. While he seems comfortable with the arrangement for stockwater extraction if reliable operation can be assured, for irrigation he states that the altered salinity peaks will require more intensive management of his irrigation system. I am not of this view. Figure 6 below (DHI figure 9-34) shows the salinity in the river water at Mr Titchmarsh's intake over a 15 day tidal cycle when the river is at a low flow (typical for an irrigation season). The peaks in salinity are obvious both presently (black line) and as a result of the project (blue line). Irrigation of pasture should not occur when salinity is greater than 5PSU. Presently there are 19 high tides over this 15 day cycle when the salinity exceeds this and there is approximately 9.7 hours per tidal cycle when irrigation water can be taken. As a result of the Project, there are three additional occasions when irrigation should cease and the duration water can be taken is reduced to 9.2 hours twice per day.

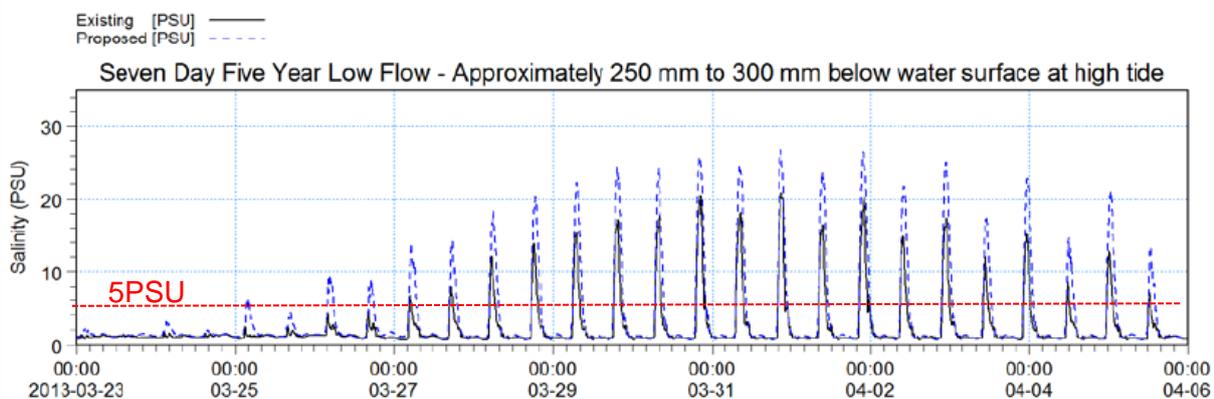


Figure 6 Plot of salinity concentration of the surface water in the river at the Titchmarsh intake over a full tidal cycle during a period of low flow in the river. The duration over which water is at 5PSU or less is reduced from 9.7 hours to 9.2 hours per tidal cycle.

67. I will provide an update on my discussions with Mr Titchmarsh at the hearing, but note that I do consider the proposed mitigation will be more than sufficient to address the effects of the Project.

### *Drainage*

68. The effects of the Project on the operation of the Kaituna Catchment Control Scheme and the Dean pumpstation are important matters for resolution. I am of the opinion that the effects can be remedied by the installation of increased gravity drainage culverts and/or increased pumping periods. The final determination of the level of effects attributable to the Project will be reached during the proposed detailed investigations required by Condition 21.
69. Detailed analysis of the drainage system from the farmland to the estuary is currently underway. The technical team, including myself, have had ongoing and positive discussions with Rivers and Drainage, the Regional Council department that manages the Scheme, about the mitigation required to address the effects of the Project on drainage of land around the river and the estuary.
70. There is general agreement that the effects can be appropriately addressed via increased or additional gravity culverts along the estuary foreshore and/or contribution toward the increased running costs at the Ford Rd and Maketū pump stations. Again, this will be determined during the detailed investigations referred to in Proposed Condition 21. I have suggested that the condition reflect that these options could be pursued together or as alternatives, rather than requiring all of them in the event that this is not considered to be necessary. I note that the Reporting Officer agrees that the proposed conditions provide an appropriate mechanism for determining and providing the amount of compensation payable to ensure that adverse effects are mitigated.<sup>2</sup>
71. The privately owned Dean flood pump may have to operate for longer or this may be avoided by improving the gravity drainage off this property to the Kaituna Rd drain. This will be determined during the detailed investigations referred to in Proposed Condition 22, which largely reflect the process set out in Proposed Condition 21.

### *Flood risk*

72. The area exposed to increased flood risk at Maketū as a result of the Project can be managed by controlling the additional flows from the Kaituna River through the new culverts when the combination events that give rise to the potential effects occur. At times where

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<sup>2</sup> At page 63 of the Officer's Report.

the flooding risk is increased unacceptably (when they would otherwise not do so in the absence of the Project's re-diverted flow), the flow into the estuary will be restricted, meaning there will be no additional effects caused by the Project.

73. The objectives and procedures required to provide this control will be developed in conjunction with the Western Bay of Plenty District Council and the Manager of Rivers and Drainage. These objectives and procedures will be documented in the Operations and Maintenance Manual which will be agreed prior to opening any of the new culverts. The objective of and description of the various requirements of the Manual are described in Proposed Conditions 23.4 and 23.5 which state the various monitoring, analysis, predictions, warnings, roles and decision points.
74. The District Council supports this approach (letter dated 13 August 2014) and reiterate their requirement for joint collaboration during its preparation, which is accepted and included as a consent condition.

## **CONSTRUCTION METHODOLOGY AND EFFECTS**

75. The proposed construction activities, methodology, timing and effects are described in the report I prepared, titled Construction Description and Drawings (in Volume B Folder 2 of the AEE). Subsequent to that report, the decision was made to progress the new public boat ramp in a different location, and an application was made for consents and an amended designation associated with this. As a result, the carpark adjacent to Ford Rd and the associated widening and realignment of Ford Rd initially proposed will no longer be pursued. This will reduce the extent of work by reducing the amount of soils that have to be moved from the Titchmarsh property, over the Corbett property and along Ford Rd.
76. As the detailed design progresses and discussions occur with contractors, it is expected that there will be scope to pursue options that result in improvement to the indicative timeframes and that will reduce the costs and, potentially, the environmental effects. As I stated in my report, the proposed conditions need to provide flexibility to allow for this, but within the constraints of key environmental outcomes.<sup>3</sup>
77. In summary, the key construction activities and indicative construction sequence are as shown in Table 1 below. It must be noted that this indicative sequence may well be varied, within the constraints of conditions, depending on the successful contractor's mode of operation.

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<sup>3</sup> See page v.

Table 1: Indicative construction sequence

	Component	Description
1	Site establishment	Establishment of contractor's facilities including offices, telecom, power, water, canteen, toilets, etc. and traffic safety controls. Re-direct Ford Road Drain flows to Diagonal Drain and Maketū Pump Stations during construction.
2	Inlet Structures	21 new concrete box culverts on either side of the 4 existing culverts beneath Ford Road; construct inlet from river to new diversion channel
3	New Stopbank	New stopbank with a crest level of RL3.2m, crest width of 3 metres, and side slopes of 1 in 3
4	Remove Existing Stopbank	Remove existing stopbank - northern toe retained below RL1.3m as a bund to keep seawater out of new channel
5	New Re-Diversion Channel	Excavate new re-diversion channel approx. 60m wide, but do not open to river
6	New Moorings	Construct new moorings adjacent to Ford Road ( <i>now excludes new boat ramp and car park</i> )
7	Salinity Block	Fill in the existing channel (Ford's Loop) to stop seawater from Te Tumu Cut entering the re-diversion
8	Improve Ford's Cut and River Loop	Widen Ford's Cut to approx. 60m wide, deepen Ford's Cut and the river loop south of Ford Island
9	Remove Stopbanks and Causeways	Remove causeways in upper estuary, construct new bridge between Papahikahawai Island and Maketū Spit
10	New Culvert for Kaituna Wetland	Construct new 20m long 900mm dia culvert to supply water to the Lower Kaituna Wildlife Management Reserve
11	Open Channel Inlet	After all other works complete, open new channel to river flows and open. Re-open Ford Road Drain outlet.
12	Wetland Creation	Wetland planting and restoration on land north of Ford's Cut, and on Papahikahawai Island in conjunction with owners

78. The potential effects of these activities include:

78.1 Sediment production from either rainfall runoff or excavation under water e.g. during stopbank construction, excavation of the new channel, installation of the new culverts, construction of the salinity block etc;

78.2 Traffic as erosion protection material and the new culverts are brought to site and as excavated soil is carted to fill the salinity block;

78.3 Noise during the large volume of excavation and filling operations;

78.4 Increased flood risk during the works;

- 78.5 Dust during the new stopbank construction and existing stopbank de-construction;  
and
- 78.6 Physical disturbance of ecological habitat e.g. whitebait breeding and migration areas, avian nesting and feeding areas
79. During construction, specific mitigation measures and environmental monitoring will be required to ensure that potential adverse effects on the environment are avoided, remedied or mitigated, as appropriate. A key means of archiving the outcomes is via the Construction Environmental Management Plan (CEMP).
80. The CEMP forms an important construction-related component of the proposed consent and designation conditions and has key objectives that must be met in terms of managing effects during construction.
81. There is a hierarchy that comprises the CEMP and various sub plans. The CEMP is the overarching 'umbrella' document which provides a methodology and framework for other management plans and protocols, to be implemented during construction. In essence it outlines details of the "who, what, where and when" in respect of the environmental management and mitigation measures to be implemented. The CEMP includes an Erosion, Sediment and Dust Control Plan and Construction Flood Management Plan as well as a Construction Traffic Management Plan (refer Proposed Resource Consent and Designation Conditions).
82. In addition to the more typical construction related effects management (ie noise, traffic, sediment), the CEMP will also need to specifically address:
- 82.1 Access for the public along Ford Rd to the popular fishing spot at the river entrance;
- 82.2 Access to the lower river for whitebait fishing;
- 82.3 Access to the river from the existing boat ramp; and
- 82.4 Access to the river for the Coastguard and the commercial fisherman and barge owner (discussed further below).
83. The CEMP is submitted to Council prior to works commencing. It is normal practice to submit the plans in stages as the works progress but always prior to works in that location or type commencing. It is also normal practice for the Plans to be amended at any time. Amendments only occur if it is necessary to maintain or enhance the degree or extent that any adverse effects resulting from construction activities are avoided or mitigated.

## Commissioning Plan and Staging

84. It is proposed that as soon as the new culverts and their associated gates are installed, the gates are locked in the closed position. This will minimise water flows through the work site easing the construction problems and minimising the distribution of sediment plumes.
85. Once approval has been granted by the Consent Authority to open the gates this will be done in two stages. Stage 1 will see the tidal cycle volume increased from the present 150,000m<sup>3</sup> up to 400,000m<sup>3</sup>. Monitoring will be undertaken of numerous observations for 12 months. Once the Applicant is satisfied that the system is operating as predicted, the remaining culvert gates will be released and allow 600,000m<sup>3</sup> per tidal cycle to flow. The Proposed Consent Conditions require the preparation of a Commissioning Plan detailing the stages and outlining how the operation of the culverts such that the objectives of no unacceptable increased flood risk or erosion and minimising of adverse water quality effects, are met (Refer Proposed Condition 19).

## RESPONSE TO SUBMISSIONS

86. I have considered the submissions that have raised issues relating to the scope of my role in the Project.

### *Coastguard and Butch Waterhouse*

87. These two parties have raised issues of navigability, uninterrupted use of their moorings during construction, replacement of their existing facilities with the similar facilities in a new location and ongoing rights to occupy a new location. Dr Martin Single will discuss their issues raised regarding potential for adverse effects on their navigability of the river entrance and bar.
88. The Applicant has been open to discussions with the Coastguard and Butch Waterhouse regarding the prospect of relocating their mooring facilities so they are closer to Te Tumu Cut / entrance. Accordingly, I have had discussions with both parties face-to-face, via email and over the telephone, regarding this option. At the time of evidence preparation Agreements in Principle between both parties and the Applicant have been prepared and discussed. The draft Agreements cover matters such as the standard of the relocated facilities, ownership, land occupation agreements, maintenance, costs and security. There has been co-operation from all parties and a willingness to discuss the various options.
89. Sheet 15 of the construction plans shows the location of their relocated mooring and land facilities as proposed in December 2014, along Ford Road north of the saline block. Considerations since this drawing was produced have raised the option of locating their

land facilities on the salinity block and placing the jetties immediately north of the salinity block rather than alongside Ford Road. This has been favourably received by all parties and the Applicant would like to retain flexibility to continue to discuss this as an option. This option would reduce the construction and on-going impacts on Ford Rd. It is however, like the other option on Ford Road, contingent on other approvals, including from the Crown (in respect of title to the reclaimed land).

90. Leaving aside the option of permanent relocation, during construction there is a need to temporarily relocate the Coastguard, Butch Waterhouse, and the barge operator, to ensure they can still access the sea from Te Tumu while their existing moorings are landlocked by the installation of the saline block. The construction programme has been developed that so that either temporary or permanent mooring facilities are constructed before the parties are required to move out of the construction zone. There will be need for minor interruptions in the order of part days while the relocation is undertaken. This is covered in Proposed Condition 11.5(f) and the parameters of any facilities are set out in Proposed Condition 34.

*Mr Don Paterson*

91. Mr Don Paterson has submitted that the proposed works will not achieve the stated Project objectives and that his option is better. I have met with Mr Paterson on three occasions and had numerous email and telephone correspondence. I am aware that Mr de Monchy has also had very regular contact with Mr Paterson regarding his proposed alternatives to the Project.
92. In my discussions with Mr Paterson we agreed that the most benefit to the estuary would be achieved by diverting all of the Kaituna River water back into the estuary – this is consistent with the full diversion option investigated for many years. To achieve this Mr Paterson proposed an overtopping weir at Te Tumu that diverted all the river water into the estuary and prevented saltwater entering the river and then the estuary. On 5 March 2014 I documented my understanding of his proposal and on 6 March 2014 Mr Paterson agreed I had done so correctly.
93. On 17 March 2014 I documented my assessment of the feasibility of his proposal from an engineering perspective, from which I now summarise the critical point.
94. The weir at Te Tumu would prevent floodwaters from exiting the river and raise flood levels upstream. He and I agreed on this adverse effect for which previous investigators including myself had proposed flood relief gates at Te Tumu. In disagreement Mr Paterson proposed

that the low height weir would soon overtop causing outward rushing river water to erode sideways and then down and scour out a flood relief channel.

95. I could not agree with Mr Paterson that this mode of flood relief would be predictable, reliable and timely to prevent flooding of farmland and Maketū township. Furthermore, after the flood, the sand would have to be replaced either side of the overtopping weir to re-divert the river water back into the estuary.
96. In his submission (3<sup>rd</sup> para 5<sup>th</sup> page), Mr Paterson proposes another alternative differing from that on which we agreed. Mr Paterson proposes that the river entrance at Te Tumu is **not** blocked with an overtopping weir thus allowing satisfactory flood passage, with which I concur. To prevent highly saline water entering the estuary through his re-opened old river channel into the Papahikahawai Creek, he now proposes to construct a low height weir low enough to pass mid to high tide water flows. He proposes this will allow predominantly freshwater that floats on top of saltwater into the estuary and prevent the underlying saltwater entering the estuary.
97. This is an option that was considered (Options N and P) and which is summarised in Options and Alternatives Report of September 2013, at page 15. These investigations concluded this option will not separate freshwater from saltwater. The work done by DHI shows that the water coming in through Te Tumu on the rising tide is highly saline due to the mixing of freshwater and seawater at the turbulent water of the seashore. Furthermore, the low height weir will allow water out of the estuary back through Te Tumu, again contrary to the objective to get more water flowing out through the Maketū estuary entrance.
98. In my view, the various alternatives to the Project have been thoroughly considered and assessed, and I support the Project as proposed.

#### *Rivers & Drainage*

99. Rivers and Drainage Section of the Regional Council are the managers of the Kaituna Catchment Control Scheme on behalf of the land owners which it services. Their submission on the Project is neutral and subject to effects on the Scheme being adequately mitigated. Their concerns are not yet resolved but must be prior to commencement of works in accordance with Condition 21, which I have discussed in detail above.

#### *Western Bay of Plenty District Council*

100. Key matters raised in the Council's submission were requesting consideration be given to dredging of the Kaituna River; sand in the channels along the base of the sea wall, around

the Maketū boat ramp and around the foreshore. We have provided a response to the Council explaining that:

- 100.1 Dredging of the river will provide no benefit to the drainage systems because only very significant dredging will result in lower water levels in the river and only well upstream of the locality. This is because water levels adjacent to the outlets of the drainage scheme are dominated by the sea level downstream.
- 100.2 Dredging around Maketū involves significant works that should only be undertaken if they are avoiding or mitigating and adverse effects of the Project; they have their own environmental effects and should only be undertaken after thorough investigation and consultation. The investigations undertaken by myself and Eco Nomos show very little likelihood of damage to these assets caused by the Project. The dominant damaging condition is high and rough seas that the Project is not worsening. The sensible approach is to monitor the condition of these assets and report on effects attributable to the Project, or other forces. A monitoring condition for these locations is included (Proposed Condition 28.4).

101. We have included the Council as a key party to a number of the Proposed Conditions.

*Eion Harwood*

102. Mr Harwood is concerned that flood levels will rise in the river as a result of the Project. This concern was shared by Catalyst High Rise Limited. Section 8.2 and Table 8-3 in the DHI report shows that peak flood levels within the river will actually decrease compared to the current situation for the 5 flood scenarios modelled. This is because flows are able to 'escape' more easily through the larger channel and culverts to the estuary in addition to the river mouth at Te Tumu.
103. Mr Harwood also objects to excavated material from the new diversion channel and the widened Ford's Cut being used to help create wetland on the Brain property. However, judicious placement of appropriate excavated material is likely to result in a wider range of wetland habitats being created on the land north of Ford's Cut, and will assist in creating the right hydrological conditions to maximise the area of wetland established.

*Allan Titchmarsh*

104. Mr Titchmarsh has asked that any additional areas of land that will be at risk of flooding will be adequately addressed. There are no additional areas of his land that will be at increased risk of flooding as a result of the Project (except the land required for the Project

and purchased by the Regional Council). The proposed realigned stopbanks on his land will be designed to ensure they provide the same level of service.

105. Mr Titchmarsh also requires that his infrastructure (sheds, power lines, pumps, irrigation lines, farm tracks, fences, drains) are not detrimentally affected. During detailed design and planning account will be taken of his farming systems and infrastructure. Mr Titchmarsh will be consulted during the planning phase. Any infrastructure necessary for the farming operations that conflicts with the project construction will be discussed with Mr Titchmarsh to determine whether it needs to be relocated.
106. Mr Titchmarsh is also concerned that the Project will worsen the salinity of the groundwater and the water in the drains that is already affecting his property. According to Mr Titchmarsh, pasture growth is already affected adversely by saline intrusion during drier summers in an area of approximately 500 m radius from the Ford Road pump station.
107. I have received advice from a DHI hydrogeologist (groundwater scientist) in relation to this issue. The additional effects of the Project are predicted to be minor, and are rendered insignificant by the maintenance of drain water levels below mean sea level (which has the effect of drawing in saline water through the soil to compensate).
108. In any case, the Project's works will mitigate the effect of saline intrusion by raising the ground level in the affected area as directed by Mr Titchmarsh. This work is highly likely to mitigate the additional effects of the Project, and could even address some of the general salinity issues already faced.

*Alan Brain*

109. Mr Brain submits, amongst other matters, that his land will be at increased risk of flooding as a result of the Project. I have addressed this above at paragraphs 59 -61 where I discuss effects and costs of mitigation.
110. Mr Brain also submits there is no pressure to provide the hydraulic forces to cause more water to flow into the estuary from the river and that the one-way flapgates do not prevent backflow into the river. In my opinion there is sufficient height difference between the river water level and the estuary water level, caused by timing differences between the tides in the two bodies of water, to induce the observed flow. This is observable now and has existed since the culverts were installed in the 1990s. I have observed the operation of the one-way culverts over the last three years and have seen them operating as designed with only minor backflow occurring at very infrequent occasions caused by debris jamming the gates open.

*Te Tumu landowners*<sup>4</sup>

111. The submissions of the Te Tumu landowners support the Project. Their submissions also raise issues regarding erosion, access and water level monitoring.
112. The land in question is owned by various landowners with similar concerns and is located primarily along the true left bank of the Kaituna River downstream of the proposed diversion channel inlet. There is also a small parcel of land on the true right bank, known as Ford Island, that will be impacted by the construction works.
113. On the true left bank of the river the landowners have submitted that the Project will worsen the erosion that they are experiencing presently. The Project will not increase water currents along this shoreline and will not exacerbate any erosion that might be occurring. While the Project will cause more boats to use this reach of the river, because of the altered route from the public boat ramp at Boy Corbetts, the erosion effect of this increase is insignificant compared to the number of boats presently using this reach from Bell Road ramp and the speed with which they travel. However, as a precautionary approach and in response to the submitters, monitoring of this shoreline is included in Conditions 28.5 and 28.6. However, the Applicant and the submitters have discussed and agreed on the fact that future erosion at this location is not necessarily linked to the Project's effects, and as such, will not necessarily be addressed by the Applicant.
114. There is an area of land around the southern edge of Ford Island that will be exposed to increased erosion forces as a result of the Project (see Drawing Sheet 16). Presently the water is quiet and the land is constantly subjected to changes in water level caused by the tide and by wake waves from the three permanently moored boats and from the recreational boaties using the boat ramp. The shoreline appears to be stable but fragile. Due to the proposed new diversion channel entering this embayment from the west, the shoreline in question will be subject to higher water velocities every day and during flood events. The velocities will remain relatively low on a daily basis at between 0 and 0.5 m/s, increasing during the 100-year return period flood to peak at 1.5m/s.
115. The Applicant is proposing to install erosion protection as shown on Sheet 16 of the drawings to mitigate the increased erosion risk where this occurs. The exact location and specification will be determined during detailed design.
116. Along the north side of Ford Island the shoreline is presently exposed to the rise and fall of the tide and river currents and at its eastern end it is also exposed to any waves entering

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<sup>4</sup> Comprising Te Tumu Kaituna 14 Trust; Te Tumu Kaituna 11B2 Trust; Te Tumu Landowners Group; and Ford Land Holdings Pty Ltd.

the river mouth from the sea. It is a steep face of exposed compacted silts and muds with some vegetation and appears stable but fragile. Along this shoreline the Project does not change the variation in water levels nor increase the water currents. The Applicant has agreed to include the shoreline in an erosion monitoring programme to ensure that any effects that arise, for example due to increased recreational boat movements, can be detected. However, the Applicant and the submitters have discussed and agreed on the fact that future erosion at this location is not necessarily linked to the Project's effects, and as such, will not necessarily be addressed by the Applicant.

117. The eastern shoreline of Ford Island is presently subject to the rise and fall of the tide and wake waves from the three permanently moored boats and from the recreational boaties. At its northern end it is also subject to any waves that come in through the river entrance from the sea. It is a gently sloping shoreline that can absorb wave energy and it appears stable but fragile. As a result of the Project, a significant proportion of this shoreline will be protected by the fill placed in the channel for the salinity block. No further erosion of this land edge will occur. At its northern end it will remain in its present state. There will be less boat traffic past this shoreline and hence less wake wave. The shoreline will therefore be subject to less erosion potential. No erosion protection is proposed in this location.
118. The Project affects the landowners existing informal access to Ford Island. Foot access will be provided by the construction of the salinity block. The Applicant is also currently negotiating an agreement with Ford Land Holdings Pty Ltd that involves the provision of legalised vehicular access over the salinity block.
119. At the salinity block, the submission also requests rock rip rap protection on both the southern northern faces up to mean high water spring. This is being provided on the northern side. However, the southern end is designed to be a gently sloping surface allowing gradual transition from water to land-based ecological habitat. It will be supported by a small rock fill toe to prevent the soft soils collapsing into the diversion channel.
120. The Ford submission has also requested additional telemetered monitoring sites for the collection of water level and water quality data. This request has been taken into account and is reflected in the proposed Condition 27.1.

#### *Other submitters*

121. There are also submissions by RLH & CD Weld, Martyn Brid, Peter Crossan and Roger Hintz concerned with the effects of the project on flooding and drainage of farmland. Their concerns are responsibility for increased costs of pumping water; upgrading pumps if they have insufficient capacity; flooding and the effect the Project will have on drainage of water

from flooded farms; the effect of the Project on the tidal floodgates i.e. Fords Rd gravity gates and pumping stations. I have addressed these concerns at Paragraphs 68 to 70 above (re mitigation)

122. Powerco has requested that their assets (power lines, power poles, transformers etc) are kept secure during construction and that they are involved in all stages of planning, design and construction. Powerco request these matters be documented in a Network Utility Management Plan to be prepared jointly by the Applicant and Powerco. The Applicant has agreed to this requirement and this is reflected in the Proposed Resource and Designation Conditions.

## **SECTION 42A REPORT**

123. I have read the s42A report prepared by Shanan Miles dated 7<sup>th</sup> April 2015. I have the following clarifications, comments and recommendations as they relate to my expertise and evidence.
124. I recognise the early provision and acceptance of the Operations and Maintenance Manual, and in particular the section describing the flow management through the culverts to mitigate the increased flood risk at Maketū. Proposed Condition 23 and in particular Condition 23.1 is supported.
125. I recognise DOC and Fish and Game's wish to maintain water supply to the Reserve, particularly during dry weather when the Project's effect is to lower the crucial high tide levels at the intakes. The Applicant has agreed on a condition (Proposed Condition 20) with both DOC and Fish and Game which addresses their concerns.
126. Page 37 of the s42A report states the Applicant has reached agreement in principle with Mr Allan Titchmarsh on methods to mitigate adverse effects on his water supplies. These discussions are ongoing, but I am confident that adverse effects can be adequately mitigated.
127. The Officer's Report at page 81 discusses the timing of the new culvert works under Ford Rd and refers to the Application stating that this will occur in the August to November months. On the same page the s42A report states Condition 11.5(b) will restrict this. This requires clarification and correction. Firstly, my proposed programme shows closure of Ford Rd for 10 weeks to install the new culverts during August to November. This is constrained by the date on which construction commences and the desire to avoid the busy summer period. If the construction commencement date shifts, the Applicant should have the flexibility to construct these works at a different time of the year but still avoiding the busy summer period. I recommend that a new condition be added reading "the closure of

Ford Rd for the installation of the new culverts shall not be undertaken between the 20<sup>th</sup> December and 7<sup>th</sup> February” (refer Proposed Condition 11.5(t)).

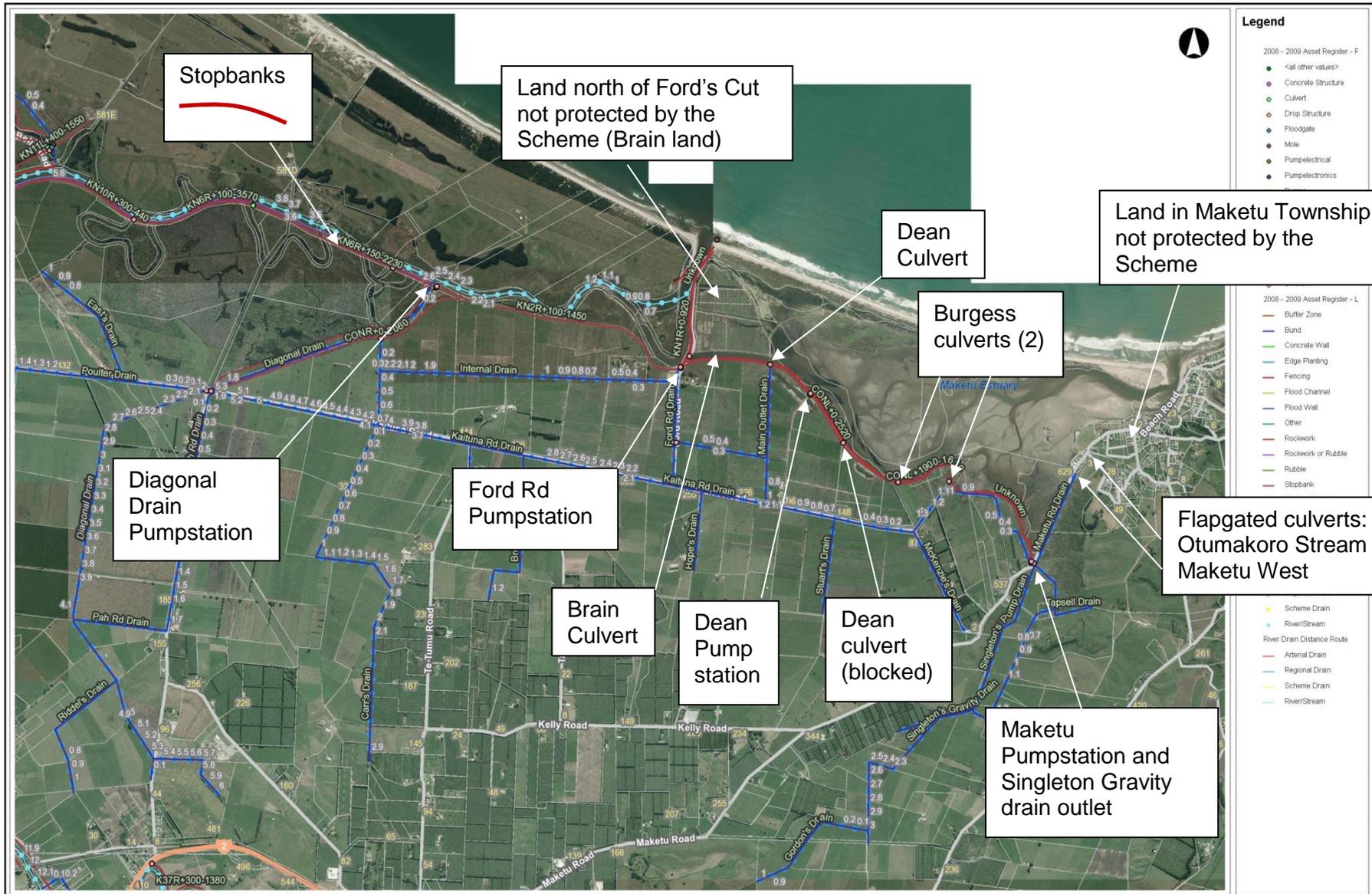
128. Condition 11.5(b) is correct in that it relates to the work in the river at the inlet to the new diversion channel (see Drawing Sheet 16, left hand side). This work requires excavation of the river bank in flowing water. It is this work that should be restricted so that it does not occur during the whitebaiting season (from 15<sup>th</sup> August to 30<sup>th</sup> November inclusive).
129. I have proposed an amendment to Proposed Condition 21 to ensure that the options for mitigating the effects on the Drainage Scheme remain as options. Some or all of these options may be pursued, or potentially even alternatives to what is proposed, and this is something that will be worked through with Rivers & Drainage.
130. I have also proposed an amendment to the flood management objective of the Operations and Maintenance Manual. The amendment is designed to ensure that the focus is on the effect of the Project – for example Maketū Road can be overtopped due to high sea levels even where there is no or low flow from the Kaituna River into the estuary, meaning that this is not attributable to the partial re-diversion. Referring to “levels” rather than “risk” is also a more accurate reflection of what is being controlled, and what will be measured.
131. Lastly, it is very important that flexibility of construction sequencing is maintained, provided the key environmental constraints are identified and appropriately managed. I do not support a requirement to adhere to the sequencing in the construction report, which was indicative. I have proposed amendments to the relevant conditions to address this.

## **SUMMARY**

132. I have considered the various effects that the water level changes induced by the Project will have and have proposed mitigation to address any adverse effects that could arise. There are comprehensive conditions of consent dealing with these proposed.
133. I consider that all construction effects can be managed such that they are acceptable, and have likewise proposed conditions relating to these.

Steve Everitt

17 April 2015



HORIZONTAL DATUM: New Zealand Geodetic Datum 2000. For practical purposes, NZGD2000 equates to WGS84 VERTICAL DATUM: Mean Sea Level. PROJECTION: New Zealand Transverse Mercator 2000. © Bay of Plenty Regional Council, 2013. © Sourced from Land Information New Zealand data. CROWN COPYRIGHT RESERVED.

Lower Kaituna River and Ongatoro/Maketu Estuary - Catchment Control Scheme Assets



Projection: NZGD\_2000\_New\_Zealand\_Transverse\_Mercator

SCALE 1:25,000

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