

17 March 2021

Attention: Tami Sargeant

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**By email to:** Tami.Sargeant@orc.govt.nz

## REVIEW OF KAIKORAI ESTUARY INVESTIGATION

1. You have asked us to independently review the compliance investigation conducted by the Otago Regional Council (**ORC**) into a fish kill incident at the Kaikorai Estuary (**Estuary**) on 20 February 2021, particularly as to whether ORC's conduct in opening the Estuary tidal inlet (**Tidal Inlet**) was permitted by the Regional Plan: Coast for Otago (**Coastal Plan**), or may have constituted an offence against the Resource Management Act 1991 (**RMA**).

### Executive summary

2. Based on the available evidence, the specific cause of the fish kill cannot be conclusively determined. We consider the most likely cause was the opening of the Tidal Inlet by ORC's engineering team in circumstances where water within the Estuary may have stratified. Although the opening of the Tidal Inlet was not the singular cause of the fish kill, it contributed to other factors at play which likely meant that oxygen levels were depleted to an extent that some aquatic life perished.
3. While ORC's actions in opening the Tidal Inlet may have contributed to the fish kill, we have formed the view that its conduct was lawful for the following reasons:
  - a. The Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (**NES-F**) do not apply to the area where the works were undertaken to open the Tidal Inlet.
  - b. In the absence of any applicable regulation under the NES-F, ORC was entitled to rely on, and act in accordance with, Rule 9.5.3.1 of the Coastal Plan. Based on our understanding of the work which was carried out to open the Tidal Inlet, the conditions of Rule 9.5.3.1 were met.
4. The investigation carried out by ORC was thorough and sound. We have made some general recommendations which ORC may wish to implement in the future concerning the opening of the Tidal Inlet.

### Factual background

5. As the Estuary is situated near the Green Island Landfill (**Landfill**), the ORC inspects its water level on a weekly basis to ensure it does not exceed the trigger limit of 101.6. If the water level within the Estuary exceeds this trigger limit, it has the potential to cause leachate from the Landfill to discharge into the Estuary.

6. On 16 February 2021, ORC inspected the Estuary and found that the water level was 101.7, which was 100mm above the trigger limit. The cause of the elevated water level within the Estuary was a blockage of the Tidal Inlet, which was the result of a sand bar restricting water flow.
7. Purporting to rely on Rule 9.5.3.1 of the Coastal Plan, ORC's engineering team, in consultation with its contractor, George Ellis Transport, mechanically opened the Tidal Inlet on 19 February 2021 by using a digger to excavate a channel in the sand bar, allowing the Estuary to drain. The works were carried out in or around the Tidal Inlet area.
8. On 20 February 2021, Ian Hadland of Fish and Game reported a fish kill within the Estuary to ORC.

### **The investigation**

9. Shortly after ORC was alerted to the incident, two environmental officers attended the Estuary to investigate the fish kill. They made the following observations:
  - a. The Estuary appeared to be in a low-flow state, which was subsequently confirmed following investigation into tidal flows.
  - b. There were several dead fish of various sizes near the Brighton Road bridge, though there were also live fish and invertebrates hiding underneath algae. Fish casualties included bullies, flounder and trout.
  - c. The water clarity was poor, which meant that visibility was limited.
  - d. The air temperature was approximately 19 degrees Celsius and the water was warm to touch.
10. A water sample was taken from within the Estuary near the Brighton Road bridge, as well as from the Kaikorai Stream near the Landfill. The samples were subsequently analysed for biochemical oxygen demand, chemical oxygen demand, total nitrogen and total phosphorus.
11. Following receipt of analytical data from the water samples, technical advice from within ORC was obtained as to the likely cause of the fish kill. While a definitive cause could not be identified, several factors seemingly contributed to the fish kill, including the degraded water quality within the Estuary, an extended period of good weather immediately before the incident, and the opening of the Tidal Inlet. In particular, the opening of the Tidal Inlet at low tide may have had the unintended effect of draining the Estuary of its top, oxygen-rich, water layer, which meant that the resulting water within the Estuary was anoxic.
12. On 26 February 2021, a representative water sampling programme was undertaken by ORC where water samples were collected from the Kaikorai Stream and the Estuary. Once analytical data from these samples was obtained, Ryder Environmental were engaged to conduct an independent review on the water quality within the Estuary following the fish kill.
13. Based on observations made by Mr Hadland concerning the fish kill, Ryder Environmental noted that the incident was most likely caused by severe deoxygenation within the Estuary in the vicinity of the Brighton Road bridge. Consistent with ORC's own observations concerning nutrient enrichment of the Estuary, Ryder Environmental observed that in some areas of the Estuary there was algae and black anoxic margins. However, Ryder Environmental noted that there was no conclusive relationship between the fish kill and the opening of the Tidal Inlet, though the mechanical opening may have played a role.

14. As part of its wider investigation, ORC made enquiries with both the Landfill and the Dunedin City Council's wastewater treatment plant in Green Island (**WWTP**) to ascertain whether there had been any incidents of unexpected discharges from those facilities, which there had not. Additionally, a pollution incident was also investigated, but it was confirmed that the contaminant had not entered the Estuary.

### National Environmental Standards

15. Before considering potential offences under the RMA which may have been committed as a result of opening the Tidal Inlet, we address the potential application of the recent NES-F, which came into force on 3 September 2020.<sup>1</sup>
16. Generally, a rule in a plan cannot be more lenient than an NES-F regulation.<sup>2</sup> Therefore, where an NES-F regulation is more stringent than a corresponding rule in a plan, the NES-F will prevail. A regulation will be more stringent than a rule if it prohibits or restricts an activity that the rule permits or authorises.<sup>3</sup>
17. Due to the fact that the Kaikorai Lagoon Swamp and Kaikorai Creek Swamp have been identified as regionally significant wetlands, if there are NES-F regulations relating to wetlands which are more stringent than rules within the Coastal Plan the regulation will prevail, even though ORC may have complied with the conditions of a permitted activity rule.
18. In this instance, regulation 52 of the NES-F regulates the drainage of natural wetlands as follows:
- (1) Earthworks outside, but within a 100 m setback from, a natural wetland is a non-complying activity if it—
    - (a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and
    - (b) does not have another status under any of regulations 38 to 51.
  - (2) The taking, use, damming, diversion, or discharge of water outside, but within a 100 m setback from, a natural wetland is a non-complying activity if it—
    - (a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and
    - (b) does not have another status under any of regulations 38 to 51.
19. Under the NES-F, a natural wetland has the meaning given to it by the National Policy Statement for Freshwater Management 2020, which means a wetland (as defined by the RMA) that is not:<sup>4</sup>
- (a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or
  - (b) a geothermal wetland; or

<sup>1</sup> We note that subpart 3 of Part 2 of the NES-F comes into force on 1 May 2021, and regulations 12 to 14 and subpart 4 of Part 2 come into force on 1 July 2021. These provisions are not relevant for the present investigation.

<sup>2</sup> This is the net effect of s 43B of the RMA and regulation 6 of the NES-F. The exceptions provided for in regulation 6(2) do not apply.

<sup>3</sup> Resource Management Act 1991, s 43B.

<sup>4</sup> National Policy Statement for Freshwater Management 2020, s 3.21.

- (c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain-derived water pooling.
20. Assuming the Kaikorai Lagoon Swamp and the Kaikorai Creek Swamp meet the definition of natural wetlands in the NES-F, regulation 52 may be relevant to the works carried out by ORC's engineering team and its contractor because earthworks occurring outside, but within a setback from, a natural wetland is a non-complying activity, provided those works result, or are likely to result, in the complete or partial drainage of a natural wetland. The effect of regulation 52 is that it is more stringent than rule 9.5.3.1 of the Coastal Plan, and therefore, if applicable, would prevail over the permitted activity relied upon by the ORC to open the Tidal Inlet.
21. However, we do not consider that the NES-F applies in this instance because the Environment Court in *Bay of Islands Maritime Park Incorporated v Northland Regional Council* recently held that the NES-F only applies to the section of the coastal marine area (CMA) which is upstream of the "river mouth" as defined by the RMA.
22. 'Mouth' is defined in the RMA, for the purpose of defining the landward boundary of the coastal marine area, as meaning the mouth of the river either:<sup>5</sup>
- (a) As agreed and set between the Minister of Conservation, the regional council, and the appropriate territorial authority in the period between consultation on, and notification of, the proposed regional coastal plan; or
  - (b) As declared by the Environment Court under section 310 upon application made by the Minister of Conservation, the regional council, and the appropriate territorial authority prior to the plan becoming operative, -
- and once so agreed and set or declared shall not be changed in accordance with Schedule 1 or otherwise varied, altered, questioned, or reviewed in any way until the next review of the regional coastal plan, unless the Minister of Conservation, the regional council, and the appropriate territorial authority agree.
23. The mouth and the CMA boundary are identified in Schedule 1 of the Coastal Plan, which is consistent with a GIS diagram of the Estuary provided to us by ORC. The diagram identifies the Kaikorai Lagoon Swamp, the Kaikorai Creek Swamp, the river mouth and the CMA boundary. A copy of the GIS diagram is annexed as **Annexure 1**.
24. Based on *Bay of Islands Maritime Park Incorporated*, the area where the works were carried out to open the Tidal Inlet are not within the area of CMA which is upstream of the river mouth (as defined in Schedule 1 of the Coastal Plan). As such, the NES-F does not apply because the works were carried out in the general CMA. Even if the NES-F did apply, we consider that regulation 52 is unlikely to apply in any event because the area where the works were carried out to open the Tidal Inlet appear to have occurred beyond a 100m setback from the nearest identified wetland (assuming the regionally significant wetland meets the definition of a natural wetland under the NES-F).
25. However, it should be noted that the Environment Court's findings in *Bay of Islands Maritime Park Incorporated* are subject to two appeals in the High Court. We raise

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<sup>5</sup> Resource Management Act 1991, s 2.

this issue so that in the event of any future actions to open a blocked river mouth or tidal inlet, ORC is alive to the fact that if earthworks occur within 100 metres of a natural wetland, the NES-F is relevant, particularly if the legal position changes with respect to the application of the NES-F more broadly in the CMA (i.e. not just to the CMA upstream of the river mouth).

### Section 12 of the RMA and Rule 9.5.3.1 of the Coastal Plan

26. The RMA restricts the use of the CMA. Section 12 relevantly provides that:

- (1) No person may, in the coastal marine area, -
  - (a) Reclaim or drain any foreshore or seabed; or
  - ...
  - (c) Disturb any foreshore or seabed (including by excavating, drilling, or tunnelling) in a manner that has or is likely to have an adverse effect on the foreshore or seabed (other than for the purpose of lawfully harvesting any plant or animal); or
  - ...
  - (e) Destroy, damage, or disturb any foreshore or seabed (other than for the purpose of lawfully harvesting any plant or animal) in a manner that has or is likely to have an adverse effect on plants or animals or their habitat;
  - ...

unless expressly allowed by a national environmental standard, a rule in a regional coastal plan as well as a rule in a proposed regional coastal plan for the same region (if there is one), or a resource consent.

27. Under the RMA, the CMA means the foreshore, seabed, and coastal water, and the air space above the water:

- (a) of which the seaward boundary is the outer limits of the territorial sea;
- (b) of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of –
  - (i) 1 kilometre upstream from the mouth of the river; or
  - (ii) the point upstream that is calculated by multiplying the width of the river mouth by 5.

28. Having regard to the CMA illustrated in Annexure 1, the works carried out by ORC's engineering team and its contractor occurred within the CMA, which means that s 12 of the RMA applies. While the exact nature of the work carried out to open the Tidal Inlet is unclear,<sup>6</sup> we consider that excavating a channel in a sand bar within the CMA is likely to fall within at least one of the sub-sections of s 12 of the RMA outlined above at paragraph 30. Accordingly, for ORC's actions to have been lawful, they must have been expressly allowed by, relevantly, a rule in the Coastal Plan.

<sup>6</sup> We note that the engineering response document records that channel opening work was carried out on 19 February 2021. However, the exact nature of that work is not explained in any detail.

29. We understand that ORC relied on Rule 9.5.3.1 of the Coastal Plan, which provides:

Clearing a blocked outfall pipe, or opening a blocked river mouth or tidal inlet is a **permitted** activity provided:

- (a) No material is removed from the foreshore<sup>7</sup> or seabed; and
- (b) The disturbance is limited to the extent necessary to clear the blockage; and
- (c) No contaminants are released into the coastal marine area from equipment being used for the clearance operation on any area of foreshore or seabed; and
- (d) All equipment is removed from the site on completion of the clearance operation; and
- (e) Any sediment removed from a blocked pipe or river mouth is placed below the line of mean low water, or if deposited on the foreshore, is smoothed over so that it is no higher than one metre above the normal surrounding foreshore level.

30. Based on our understanding of the works carried out to open the Tidal Inlet following discussions with ORC, we consider its actions were expressly permitted by Rule 9.5.3.1. While we are satisfied that no contaminants were released into the CMA from the digger and that the digger itself was removed after the Tidal Inlet was opened, our view is based on the following assumptions:

- a. No material was removed from the foreshore or seabed. Rather, a channel was simply excavated in the sand bar and all material was left in situ.
- b. The size of the channel was limited to the extent necessary to lower the water level within the Estuary.
- c. The excavated material was placed below the line of mean low water, or if deposited on the foreshore, was smoothed over so that it was no higher than one metre above the surrounding foreshore level.

31. By acting in compliance with Rule 9.5.3.1 of the Coastal Plan, we consider that the works carried out by ORC's engineering team and its contractor were expressly permitted, such that ORC has not contravened s 12 of the RMA.

### **General comments on the investigation and cause of the fish kill**

32. Based on our review of ORC's investigation, we consider it was thorough, timely and sound. After ORC was alerted to the fish kill, environmental officers responded within less than an hour. Water samples were taken from appropriate locations and visual observations were made of the Estuary.

33. To rule out other causes for the fish kill, appropriate enquiries were made with surrounding industrial premises, including the Landfill and the WWTP. These enquiries aided the investigation by ruling out the potential for any discharge of a toxic contaminant having caused the fish kill. To that extent, we note that the location of the dead fish appears to be inconsistent with the cause being the discharge of a toxic contaminant, as we would have expected ORC staff to have

<sup>7</sup> Foreshore means any land covered and uncovered by the flow and ebb of the tide at mean spring tides and, in relation to any such land that forms part of the bed of a river, does not include any area that is not part of the coastal marine area.

observed dead fish within the upper reaches of the Estuary and within the Kaikorai Stream.

34. Based on the available evidence, we agree with the technical advice received by ORC that the likely cause of the fish kill was due to a combination of factors, particularly the existing water quality within the Estuary and the effect that the opening of the Tidal Inlet may have had in removing oxygen rich water. While we note Ryder Environmental's observation that there is no strong evidence to support a correlation between the opening of the Tidal Inlet and the fish kill, we consider there is sufficient circumstantial evidence to conclude that the works carried out by ORC's engineering team and its contractor were a contributing factor. In particular, we note that:
- a. There is no evidence of a toxic contaminant having entered the Estuary.
  - b. There were no observations of dead fish when the works were carried out by ORC's engineering team, though reports were received by ORC the following day.
  - c. Water quality within the Estuary is, relatively speaking, poor. In particular, the water in some areas appeared murky and there was a lot of algae growth, which has the effect of depleting oxygen levels. Further, we note that anoxic black margins were observed in some areas of the Estuary.
  - d. The Estuary is known to stratify in deeper locations.
35. From our perspective, it appears that the water quality within the Estuary was degraded and the effects associated with the opening of the Tidal Inlet were essentially the tipping point resulting in the fish kill, which was caused by myriad factors.

## Recommendations

36. As a preliminary point, we note that ORC itself has recommended that it develop comprehensive procedures that require testing of dissolved oxygen levels within the Estuary prior to undertaking works to open the Tidal Inlet. We support this observation and note that it is consistent with Ryder Environmental's recommendation to monitor dissolved oxygen levels and water temperatures within the Estuary prior to any decision to open the Tidal Inlet.
37. Further, we note Mr Hadland's comments that Fish and Game were previously notified when works were to be undertaken in opening the Tidal Inlet. Rule 9.6.1. of the Coastal Plan promotes consultation between ORC and other agencies, including the establishment of protocols between the agencies which have the responsibility for unblocking river mouths, and the Department of Conservation, and Otago Fish and Game Council.<sup>8</sup>
38. Under the Coastal Plan, the principal reason for adopting the consultative approach between agencies over the unblocking of river mouths was for the purpose of identifying values which may be affected by that activity, which will enable more informed decision-making. Further consultation with Otago Fish and Game is likely to achieve other recommendations made by Ryder Environmental, including arranging for mechanical openings to occur on windy days (as opposed to hot, still days) and to coincide with incoming tides to avoid sudden drops in water levels and reductions in dissolved oxygen. Of course, some of these recommendations will

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<sup>8</sup> Coastal Plan, Rule 9.6.1.2.

need to be balanced against any urgent requirements to reduce water levels within the Estuary to avoid the potential for toxic contamination to occur from the Landfill.

### Conclusion

39. In summary, we consider that the work carried out by ORC's engineering team and its contractor in opening the Tidal Inlet was expressly permitted by Rule 9.5.3.1 of the Coastal Plan, which means that any potential liability from s 12 of the RMA does not arise. Based on current Environment Court authority, the NES-F does not apply.
40. As regards the cause of the fish kill, no conclusive findings could be made. Based on the available circumstantial evidence, we consider that the fish kill was most likely caused by the existing poor water quality within the Estuary, which was inadvertently exacerbated by the opening of the Tidal Inlet. A combination of factors meant that oxygen levels within certain parts of the Estuary were likely to have been depleted, which is consistent with the observations that some fish remained alive.
41. We consider that ORC's investigation into the fish kill was thorough, timely and sound. Moving forward, ORC should consider the recommendations contained in our advice, which largely mirror issues which ORC itself has already recognised, as well as recommendations made by Ryder Environmental.
42. If you wish to discuss our advice, please let us know a suitable time to call.

Yours faithfully  
**Wynn Williams**



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ANNEXURE 1

GIS Diagram of Kaikorai Estuary, Lagoon and Stream

