REF APP-123774

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER OF	discharge and land use resource consents for the operation and maintenance of the Wairoa wastewater treatment plant and sewer pump station overflows
BY	**Wairoa District Council**
	Applicant

STATEMENT OF EVIDENCE OF GARY CHARLES TEEAR ON BEHALF OF WAIROA DISTRICT COUNCIL

16th November 2020

INTRODUCTION

1. My name is **Gary Charles Teear.**

2. I am a Director of Offshore & Coastal Engineering Limited ("**OCEL**"), an engineering consultancy firm specialising in marine/maritime work.

3. My evidence is given in relation to the application for resource consents for the Wairoa Wastewater Treatment Plant ("**WWWTP**") by Wairoa District Council ("**WDC**").

QUALIFICATIONS AND EXPERIENCE

4. I have the following qualifications and experience relevant to the evidence I shall give:

   a) Bachelor of Engineering (1st class honours);
   b) Master of Commerce (Hons) (Economics);
   c) Professor Kirk's Masters Level Coastal Processes Paper Offered at University of Canterbury.
   d) I am a member of Engineering NZ;
   e) Qualified commercial diver, to mixed gas and saturation level; and
   f) Qualified and experienced in the use of explosives.

5. I am a Chartered Engineer (CPEng, PE (Int)) with more than 45 years' experience in offshore, subsea, coastal and port engineering, marine civil engineering. 12 of those was spent working for French subsea contractor COMEX, now Subsea 7. I continued work for COMEX following my return to New Zealand in 1989. A significant portion of OCEL's work is contracting international and domestic companies.

6. My background working with contractors has given me a strong practical feel for what works in a marine environment. My lifelong interests in surfing, sailing, boating and diving complement my professional interest.

7. I have appeared as an expert witness on numerous occasions in Environment Court proceedings. These topics have included: ocean outfalls, submarine pipelines, marinas, coastal protection, harbour developments and offshore salmon and mussel farms.

CODE OF CONDUCT

8. I confirm that I have read the 'Code of Conduct' for expert witnesses contained in the Environment Court Practice Note 2014. My evidence has been prepared in compliance with that Code. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

BACKGROUND AND ROLE

9. In preparing my evidence I have:

a) Drawn on the results and observations made during a site survey visit in 2019 where I led an OCEL survey team comprising an OCEL engineer/diver/surveyor and a dive team. During the visit the team walked along the proposed alignment as far as possible prior to a dive in the river channel at the proposed outfall diffuser location to check the nature of the riverbed sediment. Water jet probing was undertaken to identify soil strata below the riverbed;

b) Reviewed site reports, including the eCoast site survey work and responded to design review queries concerning hydraulic loads and scour potential; and

c) Reviewed the design of the outfall that I undertook in 2019.

SCOPE OF EVIDENCE

My evidence addresses the following matters:

(a) Existing River Environment

(b) Existing Discharge Structure and Limitations

(c) Design Objectives

(d) Design Parameters

(e) Design Solution

(f) Construction Methodology and Effects

EXISTING RIVER ENVIRONMENT

10. The River is subject to frequent floods which bring down large numbers of trees and forest debris. This ends up stranded on the river flats, which was something observed at the time of the OCEL site survey.

11. The mouth of the river is bounded by a sand bar. The river entrance moves west in response to prevailing littoral drift, increasing the length of the river channel. This simultaneously reduces its hydraulic efficiency, until the river either breaks through the sand spit to the east of the entrance or the entrance is relocated using excavators.

12. The morphology of the lower Wairoa River is dependent on its flow regime, supply of sediment and the interaction of the river with coastal processes. The main channel and the thalweg have moved over time and currently lie well to the east of the end of existing outfall.

13. The movement of the river channel is largely a function of natural morphological change. This is consistent with the expected pattern of river

behaviour with deposition on the inside of a meander and erosion on the outside.

14. The behaviour of the Wairoa River in the vicinity of the outfall is to be expected. The channel has migrated east and away from the outfall at an average rate of 2-4 m/year. It is likely that this trend will continue in the absence of bank protection or other interventions.

EXISTING DISCHARGE STRUCTURE AND LIMITATIONS

15. The end of the existing outfall structure has been blocked and buried repeatedly by sediment as the main channel has moved east. In 2017 the end of the outfall was fitted with a riser assembly to lift the discharge above the riverbed. The riser has been partially buried with sediment impeding the hydraulic performance of the outlet. A cross section survey by OPUS in 2019 showed that the outfall would need to be extended by a minimum of 100 m to allow it to discharge into the main flow channel without a riser. Furthermore, the existing concrete pipe outfall is 40 years old and beginning to deteriorate. This shows it is coming to the end of its economic life.

DESIGN OBJECTIVES

16. The design objective was to replace the existing deteriorated, blocked, stranded, outfall with a new, more resilient outfall discharging directly into the middle of the main river channel. This new structure would be capable of taking future flows with a design life of at least 50 years.

DESIGN PARAMETERS

17. The peak flow taken for the design was 185 litres/sec. Hydraulic analysis work undertaken by OPUS for the WDC – Wairoa WWTP Outfall Model Build and Assessment Report 2017 – identified that peak flow in the existing outfall caused hydraulic surcharge levels within the pipe. A new outfall with greater capacity was nominated as part of the solution to the surcharge levels.

DESIGN SOLUTION

18. Discharging into the main river channel could have been achieved by extending the existing outfall approximately 160 m. However, given the condition of the existing outfall pipe and the additional cost associated, it was decided to replace the outfall with a new 400 m long pipeline.

19. The replacement outfall will be fabricated from Polyethylene (PE) pipe. The pipeline will be installed in the bottom of a trench with a minimum top cover of 1.5 m. Piles will be used to provide lateral stability to the pipeline in the event that it becomes exposed in a flood event.

20. The design solution features a diffuser structure, installed at the end of the pipeline. The diffuser is secured in position by two piles. Because the diffuser

projects above the river bed, it has to be designed to withstand impact from tree trunks swept along in the river flow.

21. It is not necessary to increase the depth of cover over the pipe at the outfall as suggested by Mr Harte (attached to Mr Kuta's evidence[1]), as the geotextile bags and deep piles will prevent or cope with any scouring. However, extending the geotextile bags to cover the final 20 m of the pipeline is acceptable, as suggested by Mr Kuta, as this will assist with protecting it from scouring.

CONSTRUCTION METHODOLOGY

22. The construction methodology is detailed in Wairoa WWTP Effluent Outfall Installation Methodology report (included in the **Common Bundle of Attachments**). In summary, construction will involve:

a) Pipestring Fabrication;
b) Diffuser Installation;
c) Pipestring Installation;
d) Piling;
e) Reinstate pipe cover and install diffuser scour mat; and
f) Onshore Connection.

23. The construction timeframe for installing the new outfall once the pipestring has been completed will be less than a week.

Gary Charles Teear

16 November 2020

[1] Statement of Evidence, Laddie Kuta, memo dated 13 October 2020, page 134 of the Section 42A Report