**Appendix L:**

# MetOcean Gisborne Port Maintenance Dredging and Disposal Monitoring Report

# EASTLAND PORT MAINTENANCE DREDGING AND DISPOSAL PROJECT

Proposed Monitoring Requirements

Report prepared for Eastland Port, Gisborne

February 2020

MetOcean SOLUTIONS

# Document History

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# Introduction

Eastland Port Ltd are seeking to renew their maintenance dredging and disposal consents at the Port of Gisborne.

Currently, dredged sediment is disposed at an offshore disposal site situated in approximately 18 – 20 m water depth (Figure 1.1), with an average annual rate of approximately 73,000 $m^3$ based on estimates obtained between 2002 and 2019 by Eastland Port.

Maintenance dredging is expected to occur using the Trailing Suction Hopper Dredge (TSHD) "Pukunui" although, if there are significant inflows of sediment due to large storm events, a higher productivity Trailing Suction Hopper Dredge (TSHD) may be required to ensure the required port and channel depths can be maintained. It is likely that some maintenance dredging may also be undertaken using a Backhoe Dredger (BHD) or Cutter Suction Dredger (CSD).

MetOcean Solutions (MOS) has been contracted to provide coastal oceanographic expertise to investigate both physical and morphological effects and associated sediment transport patterns resulting from the dredging and disposal of maintenance dredging material at the current disposal site.

As part of the renewed resource consent a range of monitoring actions are proposed in order to ensure that the sedimentological, morphological and hydrodynamical responses are consistent with those expected and there are no adverse effects, or if significant, unforeseen changes occur an adaptive management framework consisting of additional monitoring and/or investigations can be implemented.

The report is structured as follows: Section 2 outlines a list of recommended monitoring actions within the shipping channel and swinging basing environs, while Section 3 outlines a list of recommended monitoring actions for the proposed disposal ground and environs. A summary is provided in Sections 4.

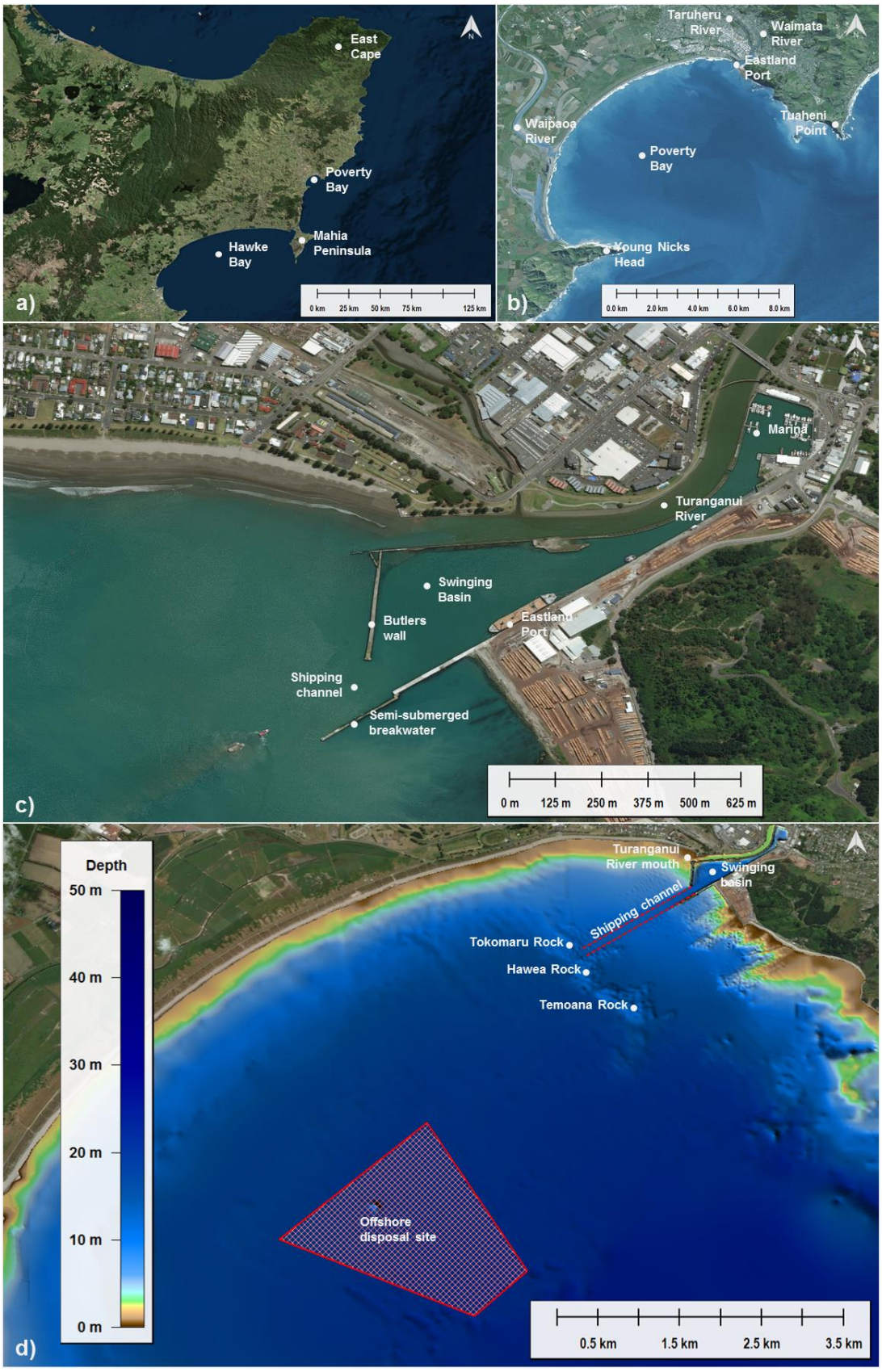


*Figure 1.1 Maps showing the location of Poverty Bay (a, b), and Eastland Port (c) with the locations used in the present study. Both offshore disposal and shipping channel (the areas to be dredged) are indicated on top of the bathymetry in (d).*

# 1. Dredging operations monitoring

Monitoring of the dredging operations within the shipping channel, swinging basin and adjacent to the main berths (see Figure 1.1) is required in order to ensure proposed design depths are maintained and the morphological responses of the channel and environs are consistent with what is expected. It is recommended that monitoring should consist of;

1. Annual to bi-annual hydrographic surveys of the channel and swinging basin using appropriate, industry standard approaches and qualified hydrographic surveyors, with a preference to multibeam surveying (over single-beam). All surveys to be reduces to an appropriate defined datum and supplied in a suitable horizontal co-ordinate system. Survey data to be rendered into a 3-dimensional surface or contours and survey results compared to the immediate prior survey in order to examine morphological trends. Processed digital versions (ASCII XYZ) of the survey data to be retained by Eastland Port.
2. Hydrographic, shore normal transects aligned with the Gisborne District Council beach profiles inshore of the Shipping Channel to be completed at time of the Annual to bi-annual hydrographic surveys (1. above). Of benefit would be for Eastland Port to coordinate with Gisborne District Council to ensure that the Council undertakes the beach profiling at the same time as Eastland Port undertakes the hydrographic surveys. This monitoring activity should be maintained for the duration of the consent providing GDC continue to undertake beach profiling. All surveys to be reduces to an appropriate defined datum and supplied in a suitable horizontal co-ordinate system. Survey data to be rendered into a 2-dimensional profile and survey results compared to the immediate prior survey in order to examine trends. Processed digital versions (ASCII XYZ) of the survey data to be retained by Eastland Port.
3. Records of dredging operations are to be maintained, including start/stop locations of dredging and approximate unconsolidated volume of sediment dredged. Ideally, these data should be digitally recorded and archived securely.

The above recommended monitoring will provide valuable information on the morphological response of the immediate shipping channel and swinging basin environs, and the shoreline stability (by aligning the shore normal transects with those maintained by the Gisborne District Council). Given that Eastland Port are seeking a renewal of their maintenance dredging and disposal consents, it is not expected that surfing conditions at either Roberts or Midway beaches will be adversely impacted so no monitoring of the either surf break is considered necessary.

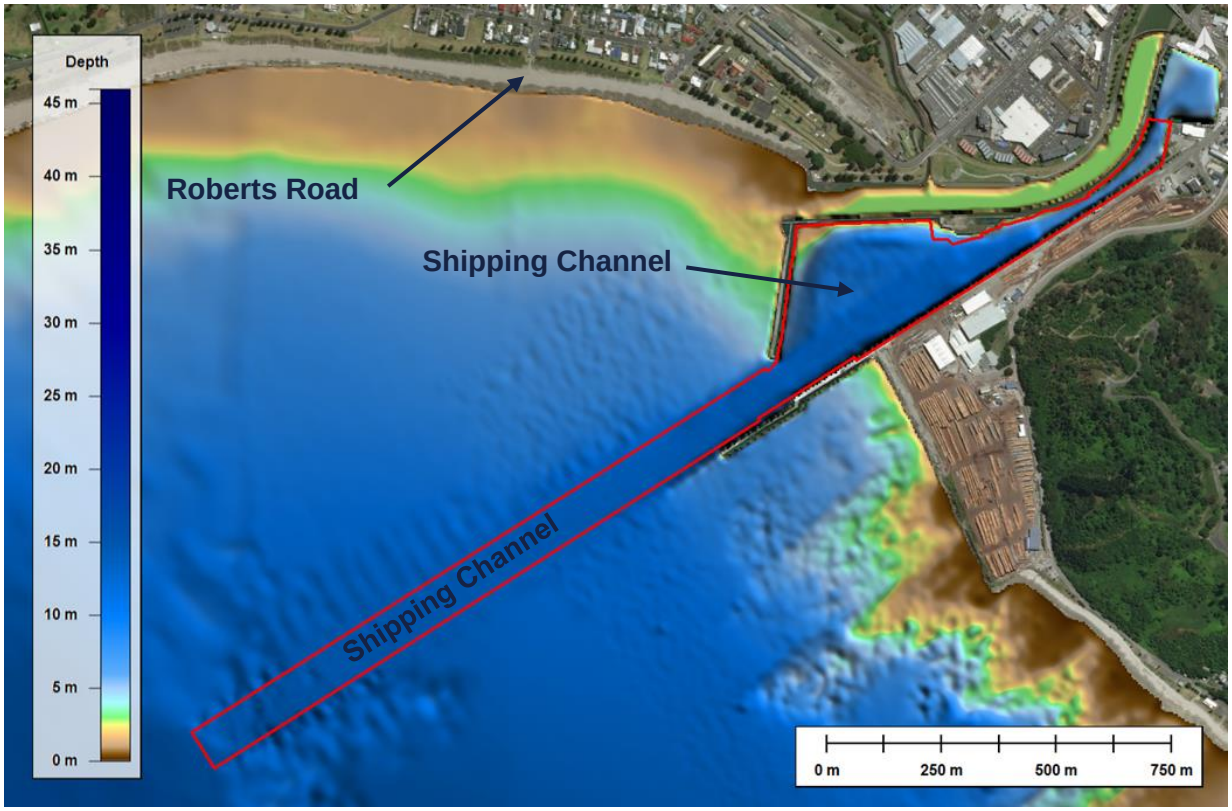


*Figure 1.1 Maps showing the location of the dredged shipping channel and swinging basin. Also shown is the approximate beach profile survey location maintained by Gisborne District Council.*

# 2. Offshore disposal ground monitoring

Monitoring of the disposal operations at the offshore disposal site (see Figure 1.1d) is required in order to ensure the ongoing suitability of the disposal ground for the discharging of maintenance dredge material. It is recommended that monitoring should consist of;

1. Annual to bi-annual hydrographic surveys of the disposal ground using appropriate, industry standard approaches and qualified hydrographic surveyors, with a preference to multibeam surveying (over single-beam). All surveys to be reduces to an appropriate defined datum and supplied in a suitable horizontal co-ordinate system. Survey data to be rendered into a 3-dimensional surface or contours and survey results compared to the immediate prior survey in order to examine morphological trends. Processed digital versions (ASCII XYZ) of the survey data to be retained by Eastland Port (See Figure 2.1).
2. Hydrographic, shore normal transects aligned with the Gisborne District Council beach profiles inshore of the disposal ground to be completed at time of the Annual to bi-annual hydrographic surveys (1. above). Of benefit would be for Eastland Port to coordinate with Gisborne District Council to ensure that the Council undertakes the beach profiling at the same time as Eastland Port undertakes the hydrographic surveys. This monitoring activity should be maintained for the duration of the consent providing GDC continue to undertake beach profiling. All surveys to be reduces to an appropriate defined datum and supplied in a suitable horizontal co-ordinate system. Survey data to be rendered into a 2-dimensional profile and survey results compared to the immediate prior survey in order to examine trends. Processed digital versions (ASCII XYZ) of the survey data to be retained by Eastland Port.
3. Records of dredging operations are to be maintained, including disposal locations (beginning and end of discharge cycle). Ideally, these data should be digitally recorded and archived securely.
4. Annual to every 2-year surficial sediment sampling of the disposal ground and control sites should be undertaken, consistent with the sampling undertaken in 2017 (see Figure 2.2). Because surficial sediment in Poverty Bay is a mixture of sand (> 62.5 μm) and mud (< 62. 5 μm) limitations are imposed on the available analysis techniques. In order to get a good representation of the sediment textural distribution, sample analysis should be undertaken using an appropriate and standardised method. Previous samples were analysed using a Malvern laser particle size analyser; model *MSS17* (Figure 2.3), and where practicable the same analysis techniques should be followed in order to maintain consistency of results. This analysis is intended to identify if a textural change to the surficial sediment occurs over time due to dredge disposal activities.
5. Previous hydrographic surveys have shown that the proposed offshore disposal ground is in a state of dynamic equilibrium; in that the disposal ground is by and large dispersive with regards to dredge disposed sediment. However, in order to separate morphological changes due to the disposal of dredged material from those naturally occurring within Poverty Bay, it is recommended that a control area (see Figure 2.2) be hydrographically surveyed annually. All surveys to be reduces to an appropriate

defined datum and supplied in a suitable horizontal co-ordinate system. Survey data to be rendered into a 3-dimensional surface or contours and survey results compared to the immediate prior survey in order to examine morphological trends. Processed digital versions (ASCII XYZ) of the survey data to be retained by Eastland Port.

6. Comparison analysis of the hydrographic survey data should be undertaken between the disposal and control sites to determine if the dynamic equilibrium of the proposed disposal site is adversely affected by the continued disposal of maintenance dredge material. If, 3 or more consecutive hydrographic surveys of the disposal ground show inconsistencies with the control site in terms of morphological evolution, then it is recommended that additional analysis and reporting be undertaking; consisting of wave climate analysis and numerical morphological modelling to determine causality.

The above recommended monitoring will provide valuable information on the morphological response of the disposal ground and the shoreline stability (by aligning the shore normal transects with those maintained by the Gisborne District Council). Given that Eastland Port are seeking a renewal of their maintenance dredging and disposal consents, it is not expected that surfing conditions inshore of the disposal ground will be adversely impacted, so no monitoring of the "*Big River*" surf break is considered necessary.

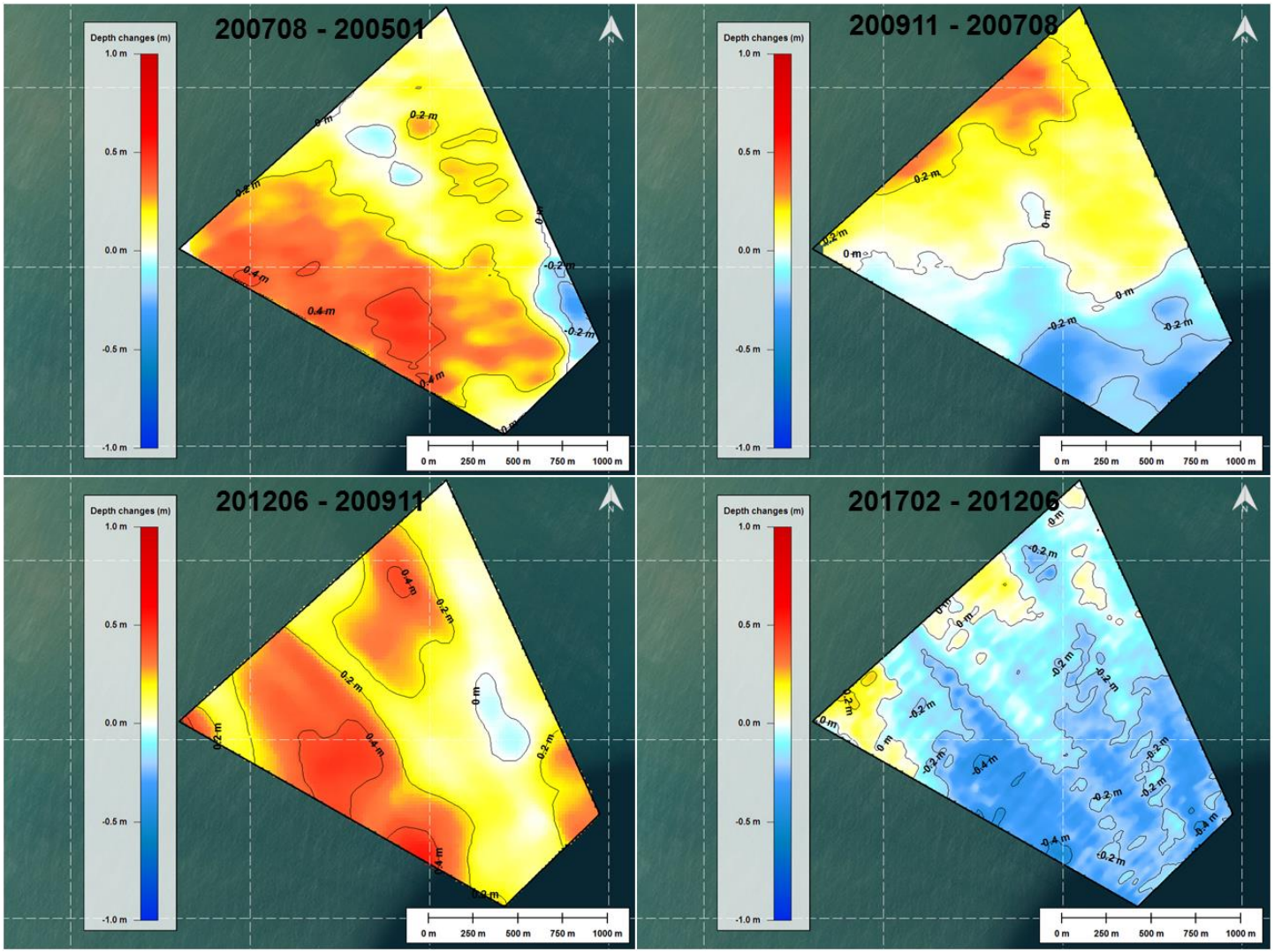


Figure 2.1 Measured depth changes over the disposal area for four different periods.

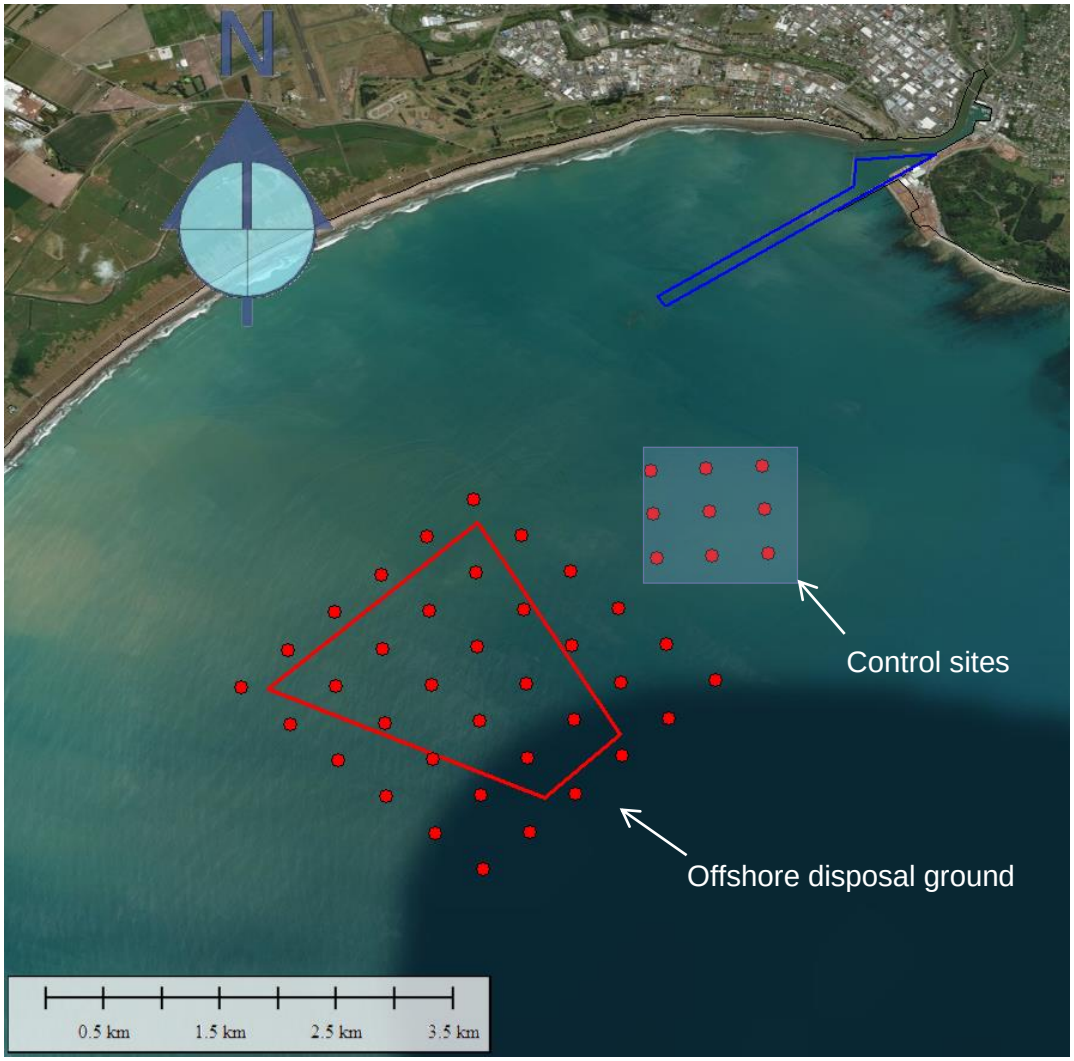


*Figure 2.2 Surficial Sediment sample locations at both the disposal ground and control sites.*


*Figure 2.3 Malvern laser particle size analyser, showing the sample dispersion unit used to treat the sample with ultrasonic noise used to disperse the flocculated particles.*

# 3. Summary

A range of recommended monitoring actions have been proposed that are designed to provide confidence in accompanying resource consent documentation and reports and monitor the sedimentological, hydrodynamical and morphological impact of the propose continuation of the maintenance dredging and disposal on the immediately impacted environs.

With respect to dredging of the shipping channel and swinging basin, recommended monitoring actions consist of annual to bi-annual hydrographic surveys of the dredged area and hydrographic survey transects tied into Gisborne District Council shoreline/beach profiles. Additionally, dredging records consisting of start/stop locations and unconsolidated volumes are recommended to be maintained.

With respect to disposal of the maintenance dredge material at the offshore disposal site; recommended monitoring actions consist of annual to bi-annual hydrographic surveys of the disposal ground, hydrographic survey transects tied into relevant Gisborne District Council shoreline/beach profiles immediately inshore of the disposal ground. Further, it is recommended that hydrographic surveys of a control area be undertaken in order to differentiate between annual to interannual morphological changes within the broader Poverty Bay to those potentially occurring at the proposed disposal ground in response to maintenance dredge disposal activities. If 3 or consecutive more hydrographic surveys of the disposal ground show inconsistencies with the control site in terms of morphological evolution, then it is recommended that additional analysis and reporting be undertaking. Finally, annually or every 2-years surficial sediment sampling should be undertaken within the proposed disposal ground and at a control site in order to determine if the *in-situ* surficial sediment at the disposal site changes significantly over time to a point that morphological processes could be effected.