



## **Port Otago Limited**

Disposal of Dredged Material - Three Inshore Sites adjacent  
to the entrance of Otago Harbour

Resource Consent Application and Assessment of  
Environmental Effects

June 2016

# Table of contents

1.	Introduction .....	4
1.1	Purpose of this report.....	4
1.2	Background.....	4
1.3	Scope and limitations.....	4
2.	Existing environment.....	5
2.1	Otago Harbour .....	5
2.2	Current capital works programme.....	5
2.3	History of disposal in Otago.....	5
2.4	Existing disposal sites.....	7
2.5	Seabed elevation at disposal sites .....	7
2.6	Geology.....	8
2.7	Coastal processes .....	8
2.8	Disposal records .....	9
2.9	Previous resource consents .....	11
2.10	Monitoring requirements of current resource consent.....	12
3.	Proposal .....	13
3.1	Proposed activity and locations .....	13
3.2	Proposed disposal volumes.....	14
3.3	Monitoring and adaptive management .....	15
3.4	The alternative proposal .....	15
3.5	Dredging and disposal methodology .....	16
3.6	Disposal site selection .....	18
3.7	Consideration of alternatives .....	19
4.	Statutory planning assessment.....	23
4.1	Otago Regional Plan: Coast.....	23
4.2	Activity status summary.....	24
5.	Assessment of environmental effects .....	25
5.1	Introduction .....	25
5.2	Economic effects.....	25
5.3	Social effects.....	26
5.4	Physical effects on coastal processes.....	26
5.5	Effects on water quality.....	31
5.6	Effects on ecosystems .....	33
5.7	Contamination.....	36
5.8	Effects on recreational and commercial fishing .....	39
5.9	Cultural impacts .....	40
5.10	Natural hazards and hazardous substance risk .....	40
5.11	Summary of effects.....	40

6.	Assessment of objectives and policies .....	41
6.1	New Zealand Coastal Policy Statement .....	41
6.2	Operative Otago Regional Policy Statement .....	41
6.3	Proposed Regional Policy Statement .....	41
6.4	Otago Regional Plan: Coast .....	42
6.5	Kāi Tahu ki Otago Natural Resource Management Plan.....	42
7.	Part 2 assessment .....	44
7.1	Section 5 - Purpose .....	44
7.2	Sections 6, 7 and 8 .....	44
8.	Consultation .....	46
8.1	Consultation undertaken.....	46
8.2	The Working Party .....	46
8.3	Iwi consultation .....	48
8.4	Other key stakeholders and interested parties .....	49
8.5	Public open days.....	49
8.6	Public feedback provided.....	51
8.7	Other consultation.....	52
8.8	Consultation on draft AEE .....	52
8.9	Notification .....	53
9.	Monitoring .....	54
9.1	Monitoring for all sites .....	54
9.2	Specific monitoring for Aramoana site .....	54
9.3	Specific monitoring for Heyward Point site .....	56
9.4	Summary of recommended ecological monitoring .....	56
9.5	Proposed adaptive management process .....	57
10.	Draft consent conditions.....	61
11.	Conclusion .....	68
	References .....	69

## Figure index

Figure 1	Location map .....	6
Figure 2	Proposed disposal sites.....	13
Figure 3	Port Otago suction dredge New Era .....	16
Figure 4	Port Otago grab dredge Vulcan .....	17
Figure 5	Proposed Aramoana disposal site .....	30
Figure 6	Proposed Heyward Point disposal areas.....	31
Figure 7	Seawater and sediment sampling sites .....	38

Figure 8	Historical baseline for the 5 m isobath at Aramoana .....	55
Figure 9	Historical baseline for the 6 m isobath at Aramoana .....	55
Figure 10	Historical baseline for the 7 m isobath at Aramoana .....	56
Figure 11	Overview of the adaptive management process .....	58

## **Appendices**

Appendix A – Location of disposal sites

Appendix B – Disposal records

Appendix C – Current resource consent RM11.153.01

Appendix D – MetOcean Solutions Ltd – wave and sediment dynamics report

Appendix E – Shore Processes and Management Ltd - beach health reports

Appendix F – MetOcean Solutions - plume modelling report

Appendix G – NIWA – benthic ecology reports

Appendix H – Objectives and policies assessment

# 1. Introduction

## 1.1 Purpose of this report

Port Otago Limited (Port Otago) is seeking a new replacement coastal permit to replace existing permit RM 11.153.01 to allow for the continued disposal into the sea of up to 450,000m<sup>3</sup> per year of dredged material. The disposal of dredged material is proposed to continue to occur at the currently consented sites subject to some modification and extension to the boundaries of two of the three sites which have historically been used for the activity. New limits are also proposed which reduce the amount of material able to be disposed of in consecutive years. A term of 35 years is sought for this consent.

In the event that the extension to the disposal sites sought is not approved, then Port Otago is seeking as an alternative, the renewal of existing coastal permit RM 11.153.01, subject to the terms and conditions of this existing permit.

This assessment of effects (AEE) report has been prepared by GHD Limited for Port Otago Limited to support an application for the proposed activity in accordance with Section 88 of the Resource Management Act 1991 (RMA).

## 1.2 Background

Port Otago owns and operates the land based commercial port infrastructure at both Dunedin and Port Chalmers, and has occupancy rights to the coastal marine area (CMA) at and adjacent to its berths and commercial port area. Port Otago also maintains the commercial shipping channels, berths and swinging area within the Otago Harbour. Port Otago is a primary export port for the South Island region of New Zealand.

As with other tidal ports around the world, the channels and basin areas within Otago Harbour need ongoing dredging, in order to maintain adequate depth for shipping. This generates a requirement for the disposal of dredged material at sea.

Since the 1880s all dredged material was placed at or in the general vicinity of a disposal site near the harbour entrance at Heyward Point. This is one of the disposal sites still used today (see Figure 1 below). Disposal included material derived from both development and maintenance dredging. In 1985, the Aramoana disposal site was first used. The third location, Shelly Beach, was added in 1987 to assist in re-nourishing the adjacent Shelly Beach and sand dunes which were suffering from erosion.

## 1.3 Scope and limitations

This report has been prepared for the benefit of Port Otago Limited for the purpose agreed between GHD and Port Otago Limited as set out in Section 1.1 of this report. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person. This disclaimer shall apply notwithstanding that the report may be made available to other persons for a permission or approval or to fulfil a legal requirement.

## **2. Existing environment**

### **2.1 Otago Harbour**

Otago Harbour is a long and narrow inlet aligned SW-NE. The harbour is approximately 21km long, 2km wide and has a mean surface area at high spring tides of 46km<sup>2</sup>.

Peninsulas at Port Chalmers and Portobello and their adjacent islands divide the harbour into an upper and lower basin. The harbour is relatively shallow with an average depth of 3.3 metres below mean sea level. Outside the main channels water depths are mostly less than 2 metres and nearly 30% of the harbour comprises exposed sediment flats at low spring tides.

The shipping channel extends along the western shore for much of the harbours length. Until 2015, the main channel between Port Chalmers and Dunedin had been maintained to a depth of 7.5 metres below Chart Datum. From Port Chalmers to the entrance the channel depth was maintained at 13 metres with a 14.5 metre depth outside the Mole (depths relative to Chart Datum).

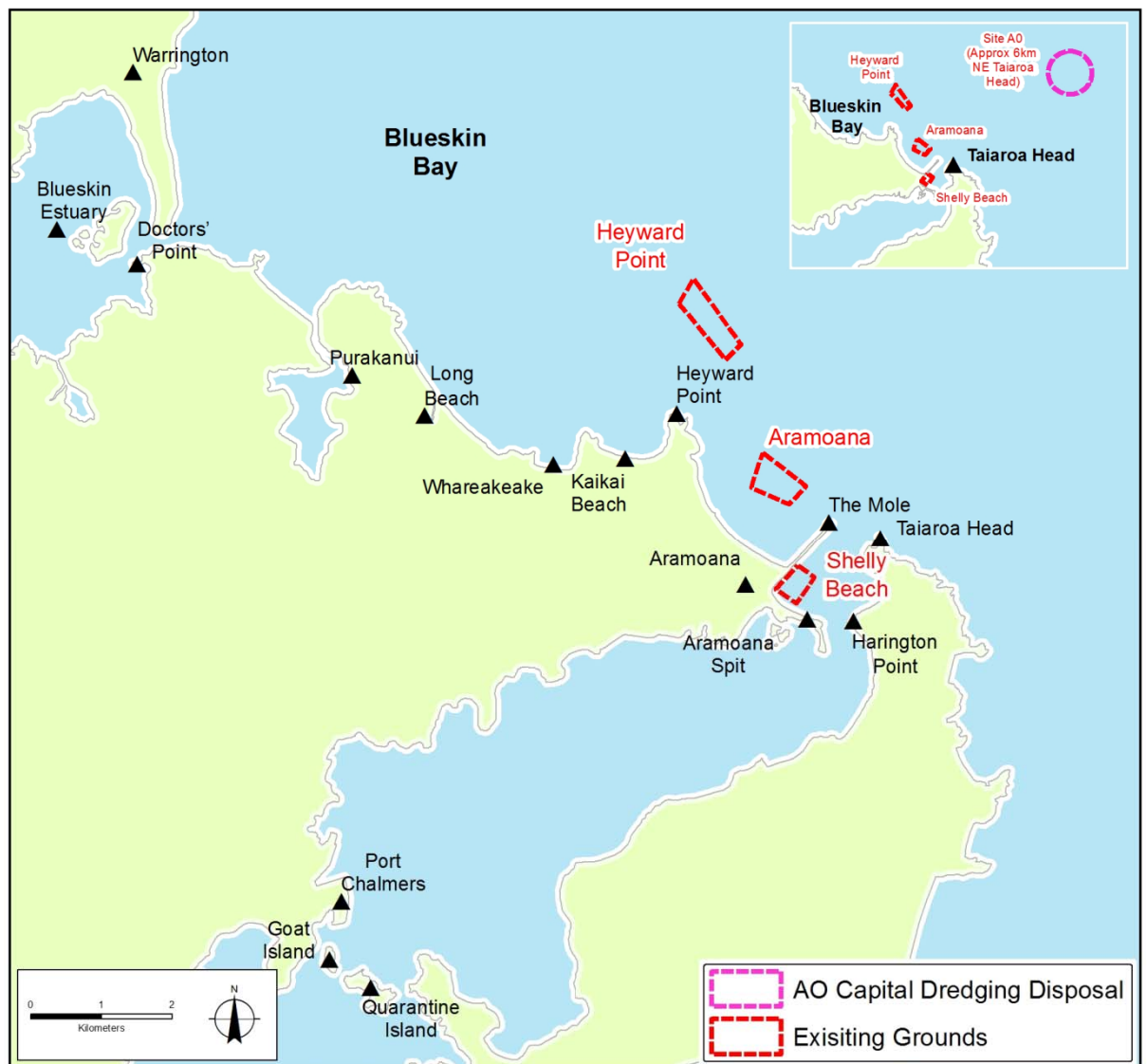
### **2.2 Current capital works programme**

In 2015 Port Otago commenced a two-year \$30 million capital works programme that positions the southern port for the next generation of shipping (known as Project Next Generation). This programme involves a series of inter-related projects that respond to the rapidly changing shipping environment. The imminent arrival of larger container and cruise ships on the New Zealand coast and the need to be able to aggregate cargo at key ports are the main drivers of the development at Port Chalmers.

The key project which is relevant to this resource consent application is the shipping channel deepening which is currently underway. The present works are to deepen the channel from 13 metres to 14 metres depth. The deepening is being undertaken in a staged manner with a depth of 13.5 metres completed in February 2016 and 14 metres scheduled to be completed in 2017.

### **2.3 History of disposal in Otago**

The historic, currently consented disposal sites are illustrated on Figure 1 below.



**Figure 1 Location map**

The first dredging in Otago Harbour occurred just after the Otago gold rush in 1865 when convict labourers manned a small travelling grab dredge to deepen alongside of jetties in the Dunedin basin. Since that time, the harbour has regularly undergone major development including the dredging of shipping channels, basins and berth pockets, the reclamation of large areas of foreshore and the construction of many wharves and jetties. Other works such as the stabilisation of the entrance channel with the construction of The Mole and placement of various rock groynes to train the tidal flow have also been carried out to assist in maintaining channel position. All of this work has been carried out to service the region by enabling shipping to progressively continue to meet the demands for world trade.

The initial development of the channels and berth areas involved dredging large quantities of material. Much of this material was able to be utilised to form reclamations around the foreshore of Dunedin, with reclaimed land now encompassing the shoreline from Anderson's Bay to Logan Park. As reclamations were completed, the only other economical option for disposal of dredged material was to take it out to sea to deposit it back to where much of the material had come from. This practice has been carried out since at least 1882 when attempts were first made to deepen the sand bar at the entrance to the harbour.

Prior to 1985 all dredged material was placed at or in the vicinity of the Heyward Point site. This included material derived from both development and maintenance dredging. In 1985, the

Aramoana disposal site was first used and was found to be a good site because it is closer, resulting in the dredge spending less time going to and from the disposal site. However, the Heyward site continues to be preferred in rough weather as it can often be calmer than the Aramoana site due to the greater depth of water available.

A third location, Shelly Beach was added in 1987. Sediment was placed here to assist in re-nourishing Shelly Beach which was suffering from erosion. The site has a limitation in that only sand from claims seaward of and including Taylers Bend is able to be disposed of there to ensure that material moving onto the beach is of a similar composition to the sand that already exists there. Shelly Beach has been a useful location when the weather has been too rough to take the suction dredge out to sea, although this only occurs on a few days each year. There is also a limit to the quantity of sand that can be disposed at this site, as whilst the sand does get gradually moved onto the beach during calmer weather, it is moved eastwards along the beach during periods of more extreme events leading to erosion. Some sand placed at Shelly Beach eventually gets carried across the rock groyne at the eastern end of the beach on the flood tide to be deposited further up the harbour. Therefore this site has been used sporadically at times as the beach dunes have stabilised and also because the site is limited to disposing at or near high water to maintain a safe under keel clearance for the dredge.

As with other tidal ports all around the world, the channel and basin areas within Otago Harbour need ongoing dredging, in order to maintain depth. Disposal at sea is the key economically viable way to dispose of dredged material.

## **2.4 Existing disposal sites**

### **2.4.1 Heyward Point**

Heyward Point is the northern most disposal site. The existing site lies in waters varying from 9 to 23 metres depth off the cliffs and rocky reefs of the Heyward Point headland. The Heyward Point site is seaward of the Whareakeake surf break, which is a nationally recognised surf break in the New Zealand Coastal Policy Statement 2010 (NZCPS).

### **2.4.2 Aramoana**

The Aramoana site lies in waters varying from 6 to 12 metres in depth and is seaward of the Aramoana beach and the Aramoana Spit surf break. The Spit is a nationally recognised surf break in the NZCPS.

### **2.4.3 Shelly Beach**

The Shelly Beach site is the inner-most disposal site in Otago harbour. It is a shallow disposal site in around 3-8 metres of water. The site is adjacent to sand dune area which protects the ecologically valued Aramoana saltmarsh area. The sand dune suffers from natural erosion of sediment volume.

## **2.5 Seabed elevation at disposal sites**

A mound on the seabed has been evident at the Heyward Point site since the late 1970s. The position of the mound at the SW corner of the disposal site is fairly constant, but the size of the mound has varied significantly over time. Growth and reduction has been approximately coincident with periods of high and low dredge spoil disposal at the site.

The seabed in the immediate vicinity of the Aramoana site is also dynamic, with substantial changes in both the size and position of a raised part of the bed since 1982.



The surveys of the Shelly Beach site from 1987 to 2009 show an area of shoaling in the southwest corner of the disposal site. This was a common feature of the disposal site until 2002, when dredged sediment was placed closer to the central area of the site (Shore Processes and Management Ltd, May 2011).

## **2.6 Geology**

The following description of the regional geology and sediment composition is summarised from a technical report prepared to support the previous resource consent application for the disposal activity, entitled Port Otago maintenance dredging consents – physical coastal environment (Shore Processes and Management Ltd, May 2011).

### **2.6.1 Regional setting**

The Dunedin volcanic complex and modern alluvial deposits dominate the shorelines of Otago Peninsula and Blueskin Bay. The coastline north of Blueskin Bay estuary to Karitane is characterised by Tertiary Sediments and remnants of the volcanic flows that now form the sea cliffs along this section of shore.

Otago Peninsula, Dunedin and Otago Harbour are located on what is thought to be the centre of the Dunedin Volcano. Alluvium was laid down over the volcanic rocks during the Quaternary period (i.e. the last 1.8 million years). Loess deposits are also present. The source is likely to be the area that is now seabed, as during glacial periods sea level was at a significantly lower elevation than today.

The glacial and interglacial periods that featured during the Late Quaternary through to the Holocene period were the main controlling factors of the morphology of the Otago Shelf and the sedimentary deposits on the shores. The area has been subject to prolonged periods of sediment supply from offshore, progradation of the shores and infilling of the harbour and estuaries. Sand deposits on the shores are relatively young, and probably reflect processes and sediment supply to the shore since the last glaciation.

### **2.6.2 Seabed sediments**

The quartz sands of the nearshore zone off Otago are derived from Otago Schists. The dominant source for the modern sediment (younger than 6,500 years) is the Clutha River, which delivers in the order of 3.14 million tonnes of sediment to this coastal system each year. Smaller sources of sediment include the Taieri River, which provides about 0.6 million tonnes per year, and nearshore and biogenic productivity, which provide about 0.4 and 0.25 million tonnes of sediment per year respectively. The textural characteristic of the nearshore sediment is medium to fine sand, with a mean diameter between 0.125mm and 0.14mm.

The sediment of the nearshore is predominantly very well sorted, but reflects the varying degrees of energies acting upon the shoreline between Karitane and Taiaroa Head, with anomalies away from the general trend of very well sorted sediment confined to localised areas.

The physical nature of the sediments of the coastal system between Taiaroa Head and Heyward Point have not changed significantly since they were first studied and the disposal of the sediment dredged from the shipping channel at Shelly, Aramoana, and Heyward Point has not changed the textural nature of the beach and nearshore sediments (Shore Processes and Management Ltd, May 2011).

## **2.7 Coastal processes**

The disposal sites lie within Blueskin Bay, north of the Otago Peninsula and are exposed to a range of oceanographic forces at regional and local scales. As detailed in the MetOcean

Solutions report contained in Appendix B, the wave climate along the southeast coast of New Zealand consists of frequently energetic southerly swells combined with locally-generated events from the northeast, as well as far-field swells from the northeast. As the sites are on the north side of the Otago Peninsula, this provides a degree of shelter from the southerly swells but the sites remain directly exposed to northeast wave events. The average wave height near Aramoana Beach is around 1.0 m. The regional hydrodynamic regime is also influenced by the Southland Current.

The combination of the Southland Current and frequent southerly swells drives a north-directed drift of sand. The configuration of the Blueskin Bay region, set back from the Outer Otago Shelf, combined with relatively low wave energy due to sheltering from the Peninsula make the Blueskin Bay area a depositional environment within this predominant northward sediment drift.

A proportion of the sediment transported up the coast of the South Island by the prevailing currents is ducted into the Otago Harbour on the flood tide and whilst some of this material is also transported out of the harbour on the ebb tide, there is a net retention of material within the harbour. This sediment is moved progressively up the harbour channel towards Dunedin, with deposition occurring on the insides of the bends and also within areas where the channel is wider and the current strength is thereby reduced.

Another factor in the sedimentation process within the harbour is wave action which is responsible for putting into suspension fine silt sediments from the large area of shallows. Tidal and wind generated currents carry this suspended material, some of which is deposited into the upper Dunedin basin area where tidal and wave action is weak. Where the seabed gradients are steep around the harbour basin perimeter, there is a secondary means of moving sediment by gravity into the basin and berth areas.

Fine silts also enter the harbour during periods of heavy rainfall via the Leith River and the many small creeks and stormwater drains that also discharge into the harbour.

It should be noted that whilst not part of the natural siltation process, the sides of the shipping channel also contribute some material that needs to be dredged to maintain an efficient channel. It is noted that as has been the case with previous capital dredging of the channel, the current channel deepening is expected to be followed by increased maintenance dredging requirements until the side slopes settle to their natural angle.

Port Otago carries out at least annual hydrographical surveys to identify areas of sedimentation which then determines its annual dredging program.

## **2.8 Disposal records**

The actual volume of material deposited at each of the sites has varied over the years. Disposal records for the last 30 years are attached as Appendix B. Earlier disposal records are detailed in a report prepared by David Lusseau in October 1999, entitled “ (Lusseau, 1999)”. Key points from the Lusseau report are:

- Records do not clearly quantify where material was disposed of prior to 1914, although we know much was relocated to reclamations or otherwise taken to sea.
- Between 1914 and 1971, material dumped at sea was described under various headings, i.e. “Heads”, “At Sea”, or Heyward Point, although it is thought that most of this material was disposed in the vicinity of Heyward Point (13.5M m<sup>3</sup> 1914 – 1998).
- Until the early 1970s much of the dredge material was relocated to reclamations in Dunedin, which also includes volumes listed as “Vulcan’s Pit” (8.7M m<sup>3</sup> 1914 – 1998).
- The largest quantity disposed of to a dump site at sea, was in 1976 when 3.3M m<sup>3</sup> of material was dumped at Heyward Point, following development dredging of the lower

harbour channel. This disposal site was subsequently moved seaward to allow this large volume of material to disperse.

- Following the 1976 development of the lower harbour channel and berths, the disposal quantities were high for a number of years, as side slopes stabilised, with a maximum quantity of 0.63M m<sup>3</sup> disposed of at Heyward Point in 1982.
- The Aramoana disposal site was established and first used in 1985 as an alternative and closer site.
- The Shelly Beach site was established in 1987 after discussions with the Department of Conservation to address the erosion (or lack of sand supply) at this site.

The information contained in Appendix B is a summary of the last 30 years of disposal (i.e. from 1985 to 2015). The key points are summarised below:

- The average annual quantity of material disposed of at sea (over the 3 disposal sites) over the last 30 years is 209,831m<sup>3</sup>. Over the last 10 years the total annual average was 150,128m<sup>3</sup>.
- The maximum annual volume disposed was 367,116m<sup>3</sup> in 1988. The maximum annual volume during the term of the current short-term consent was 285,015m<sup>3</sup> in 2015.
- Over the last 30 years, the allocation of material going to each of the sites was on average:

Heyward Point = 37%

Aramoana = 54%

Shelly Beach = 9%

- The amount of disposal at the Aramoana site has decreased since around 2006 and has been consistently less than at Heyward Point since 2008.
- During the term of the current resource consent, i.e. 2014 and 2015, there was minimal disposal at Aramoana, while the amount of material disposed of at the Heyward Point site has been steady. This has altered the split between the sites in recent years, as follows:

2014:

Heyward Point = 92%

Aramoana = 2%

Shelly Beach = 6%

2015:

Heyward Point = 75.3%

Aramoana = 13.4%

Shelly Beach = 11.2%

- Disposal quantities at Shelly Beach have been up and down over the last 20 years, as required for beach nourishment.
- With the Project Next Generation channel deepening commencing in 2015, the disposal records in Appendix B show a slight step up in total disposal volumes over recent years, but this is comparable with higher volumes experienced in the 1980s, early 1990s and in 2000. This is because most of the capital dredging material is being disposed at the offshore A0 disposal site rather than these inshore disposal sites.

## 2.9 Previous resource consents

Port Otago has historically been able to dredge the shipping channel within the Otago Harbour to a depth of 8.5 m (upper channel) and 13 metres (lower channel) without the need for resource consent. This is because the dredging activity is provided for as a permitted activity in the applicable statutory plan, which is the “Regional Plan: Coast for Otago (Otago Regional Council, 2001)”. The dredging for the current channel deepening along with a new off-shore disposal site (known as A0) and ancillary activities have been authorised by a suite of resource consents approved in 2012 for Project Next Generation<sup>1</sup>.

The use of the historic disposal sites at Heyward Point, Aramoana and Shelly Beach have been subject to a resource consent approval to dispose of dredged material for many years. Consents with various terms have been held by Port Otago over the years.

### 2.9.1 Consent RM 11.153.01

The current consent is a short-term 3-year consent (Consent No RM 11.153.01) issued by the Otago Regional Council (ORC) in January 2014. A copy of this consent is included in Appendix C. Port Otago specifically sought the short-term 3-year consent in 2011 on a notified basis, and consent was granted by the ORC following resolution of appeals from surfing interests through a mediation process.

Consent RM 11.153.01 authorises the ongoing disposal activity within the three disposal sites with volumes set for each site, as follows:

- Heyward Point 350,000m<sup>3</sup>/year
- Aramoana 50,000m<sup>3</sup>/year
- Shelly Beach 50,000m<sup>3</sup>/year

This consent is subject to a number of conditions of consent which require monitoring of the activity and its effects generally, and specific requirements for Port Otago to commission monitoring and scientific research to better understand the environmental effects of the activity to inform this long term consent renewal process upon expiry of the current consent. The current monitoring regime is detailed further in Section 2.10 below.

A renewal resource consent application must be lodged by 15 July 2016 for Port Otago to be assured of its rights to continue the disposal activity while the consent application is considered by the Council, pursuant to Section 124 of the RMA.

### 2.9.2 Prior consents

Prior to the Resource Management Act, local Catchment Boards (now Regional Councils) administered the Water and Soil Conservation Act 1967. Pursuant to Section 21 of the Water and Soil Conservation Act 1967, the act of discharging dredge spoil into natural water required authorisation from the Catchment Board in the form of a Water Right.

Port Otago held Water Right 0367C dated June 1991 from the ORC, which authorised Port Otago to discharge up to 450,000m<sup>3</sup> of dredged spoil from in and around Otago Harbour. This Water Right was granted for a period of ten years, expiring 1 May 2001 and permitted the disposal of up to 200,000m<sup>3</sup> offshore from each of Heyward Point and Aramoana, and up to 50,000m<sup>3</sup> offshore from Shelly Beach.

Following this, resource consent was sought by Port Otago (Consent No. 2000.472). This consent was publicly notified and granted for a duration of 10 years, expiring December 2011. This was the consent that was in place immediately prior to the current consent. The volumes of

---

<sup>1</sup> ORC consent reference numbers 2010.193 - 2010.200 and 2010.202 – 2010.203

material discharged at each of the three disposal sites were consistent with the earlier Water Right above.

## **2.10 Monitoring requirements of current resource consent**

The current resource consent for the disposal activity (RM 11.153.01) requires regular monitoring and a number of specific environmental studies to be completed. The current monitoring requirements are set out below.

### **2.10.1 Regular monitoring**

Regular monitoring that Port Otago is required to complete includes:

- Detailed records of material disposed at each site including, volume, material type, source of material, timing of disposal, GPS location within the disposal ground and a running cumulative total of material disposed.
- Regular bathymetric surveys of the seabed at the disposal sites to show the degree of change.
- Requirement for regular reporting to a community interest working party to consider studies as they are completed, the forward dredging programme and the need for any mitigation of environmental effects through adaptive management of the disposal activity.

### **2.10.2 Monitoring studies**

The specific environmental monitoring studies required under the current consent have now been completed and included:

- A biological study to recommend a long term monitoring programme to manage the effects of disposal activities on species diversity, community composition, and species abundance. The condition envisaged selection and use of indicator species would be used for adaptive management purposes.
- A modelling study to analyse the coastal and sediment dynamics of the disposal sites to identify the optimum location and extent of disposal grounds in terms of sediment supply requirements for the beaches west of the harbour entrance and for surfing wave corridors, and wave quality at the nationally significant Aramoana Spit and Whareakeake surf breaks.
- Physical wave and current measurement through the deployment of wave and current meters at sea, to calibrate and validate the modelling work.
- Web-camera photographic monitoring of the Aramoana and Whareakeake surf breaks to allow recording of surf conditions and correlation with model results, if required.
- The establishment of a web site to allow surfers to record their personal observations of surf quality to allow correlation with model results, if required.
- Beach profile analysis and reporting of long-term shoreline change analysis from aerial photographs to understand the presence of any beach erosion.
- A summary environmental assessment which integrates and documents recommendations for managing effects of Port Otago's inshore dredging disposal relating to beaches, surfing and benthic ecology.

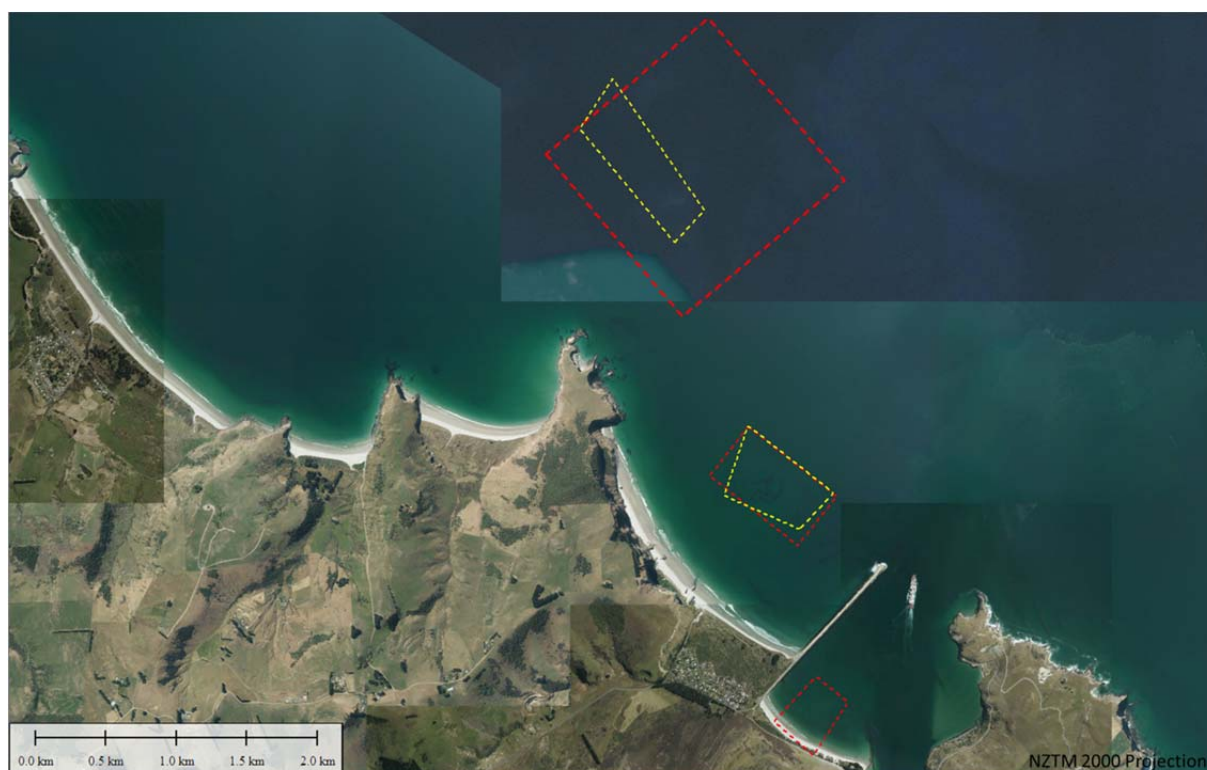
# 3. Proposal

## 3.1 Proposed activity and locations

Port Otago is seeking a 35-year replacement consent to allow for the continued disposal into the sea of up to 450,000m<sup>3</sup> per year of dredged material. This will replace the current resource consent RM 11.153.01, which expires in January 2017.

The material is derived from dredging of the channel and berth areas in and about the Otago Harbour.

The proposed disposal sites are three existing disposal sites and include alteration and extension to two of these sites as illustrated on Figure 2 below. The proposed disposal sites are illustrated in red below. The existing Aramoana and Heyward Point grounds are illustrated in yellow. The Shelly Beach site is unchanged.



**Figure 2 Proposed disposal sites<sup>2</sup>**

Changes to the size and boundaries of the existing disposal grounds have been recommended through the wave and sediment transport monitoring work carried out by MetOcean Solutions as a condition of the current resource consent for the disposal activity (MetOcean Solutions Ltd, June 2016). The recommendations report is included in Appendix D. MetOcean Solutions recommended a reduction in the overall maximum volume that can be disposed of year to year through the inclusion of 5-yearly rolling average limits, a significant extension to the Heyward Point disposal site and a modest change to the Aramoana site in order to provide for the disposal activity over the next 35 years. The extensions are proposed to assist with managing the effects of the disposal activity on the identified surf breaks of national significance.

The proposed new extended Heyward Point site is approximately 225 hectares in area, whereas the existing ground in this location is approximately 40 hectares.

<sup>2</sup> Image courtesy of MetOcean Solutions Ltd



For the Aramoana site, a minor boundary reconfiguration is proposed to assist with placing disposal material accurately, in order to manage effects on the adjacent surf break. Specifically, the proposal is to adjust the ground parallel towards the beach contours to provide a tidy rectangular shape with a bit more space to provide for disposal location flexibility. The revised Aramoana ground is approximately 36 hectares in area, as compared with the irregular shaped 28 hectares site which has been used in this location historically.

It is proposed that sand only be deposited at Aramoana and Shelly Beach. Although rock and silt may also be deposited at Heyward Point, the deposition of rock and silt will be restricted to specifically designated areas.

The area of seabed subject to the proposed disposal grounds comprises typical Blueskin Bay soft-bottom benthic biodiversity. This habitat is well studied, comprising in excess of 265 different species, most of which are widely distributed within the bay and elsewhere around New Zealand. There is no evidence of any species restricted to this area, or any soft-bottom communities of special biodiversity value. There is no evidence of any regionally or nationally significant benthic habitat within or adjacent to the proposed disposal grounds. Further detail on benthic habitat of the proposed disposal sites is contained within Appendix G.

## 3.2 Proposed disposal volumes

### 3.2.1 Rolling averages

New 5-year rolling average limits are proposed for the Heyward Point and Aramoana sites. This change will enable closer management of cumulative volumes and associated effects of disposal activities within the main disposal grounds. The rolling averages have the effect of limiting consecutive large volumes of material being deposited. For example, if the limit is 100,000m<sup>3</sup>/year, measured on a 5 yearly rolling average. Then it would be possible to deposit a larger volume of say 300,000m<sup>3</sup> in one calendar year, but for the next 4 years, there could only be 50m<sup>3</sup> each year. Alternatively, there could be two years with no disposal and 2 years with 100,000m<sup>3</sup> deposited. The rolling average would apply to any 5-year period, so for the 300,000m<sup>3</sup> scenario described above, there would also need to have been lower deposition levels for the preceding 4 year period as well, i.e. the rolling average is measured at any point in time.

The disposal activity is proposed to be carried out in accordance with the following specific maximum annual discharge quantities at each location.

### 3.2.2 Heyward Point

Heyward Point, being an area of approximately 225 hectares, will receive up to 200,000m<sup>3</sup>/year of sand, rock and silt material, measured on a 5-yearly rolling average. Except that, in the event the Aramoana site is not able to be used for any reason, then the Heyward Point site will receive up to 300,000m<sup>3</sup>/year, measured on a 5-yearly rolling average basis. The grid coordinates for the proposed Heyward Point site are:

Latitude-Longitude	NZTM
45° 44.62' S 170° 41.40' E	1420309 E 4931834 N
45° 45.26' S 170° 42.12' E	1421276 E 4930679 N
45° 44.75' S 170° 43.03' E	1422429 E 4931657 N
45° 44.12' S 170° 42.31' E	1421462 E 4932797 N

### 3.2.3 Aramoana

Aramoana, being an area of approximately 36 hectares, will receive up to 100,000m<sup>3</sup>/year of sand, measured on a 5-yearly rolling average. The grid coordinates for the proposed Aramoana site are:

Latitude-Longitude	NZTM
45° 45.87' S 170° 42.24' E	1421464 E 4929554 N
45° 46.15' S 170° 42.71' E	1422088 E 4929053 N
45° 45.96' S 170° 42.94' E	1422376 E 4929414 N
45° 45.68' S 170° 42.46' E	1421739 E 4929914 N

### 3.2.4 Shelly Beach

Shelly Beach, being an area of approximately 14.5 hectares, will receive up to 50,000m<sup>3</sup>/year of sand, measured annually. The grid coordinates for the proposed Shelly Beach site are:

Latitude-Longitude	NZTM
45° 46.56'S 170° 42.81'E	1422239 E 4928298 N
45° 46.74'S 170° 42.56'E	1421925 E 4927955 N
45° 46.85'S 170° 42.77'E	1422203 E 4927759 N
45° 46.66'S 170° 42.98'E	1422465 E 4928119 N

The location and extent of the Shelly Beach site is unchanged from previous consents held for the disposal activity, however the grid coordinates have been adjusted, as the previous coordinates contained errors.

## 3.3 Monitoring and adaptive management

Ongoing environmental monitoring is included as part of the proposal in order to detect any unforeseen effects that could arise, along with an adaptive management process. Monitoring and adaptive management is proposed as it is inevitable for an activity which takes place within complex coastal systems there will be an element of uncertainty remaining. Monitoring and adaptive management will enable appropriate management of any potential adverse effects associated with this over the term of the consent sought for the activity.

The adaptive management process will be triggered if monitoring results are outside trigger levels described later in this report and set out in draft consent conditions included in Section 10. The draft consent conditions form part of the proposal for which consent is sought.

## 3.4 The alternative proposal

In the event that issues arise through stakeholder feedback or the consent process with respect to the new proposal outlined in Sections 3.1-3.2 which meant the resource consent is unable to be granted, Port Otago seeks in the alternative, to continue to dispose of dredging material pursuant to the terms and conditions applying to the current resource consent RM 11.153.01. For the alternative renewal proposal the activity is for disposal at the existing sites only in accordance with the terms and conditions currently applying to resource consent RM 11.153.01. Accordingly the site areas and disposal volumes for the alternative proposal are:

- Heyward Point, being an area of approximately 38.2 hectares, to receive up to 350,000m<sup>3</sup> of material annually



- Aramoana, being an area of approximately 28.3 hectares, to receive up to 50,000m<sup>3</sup> of material annually
- Shelly Beach, being an area of approximately 14.5 hectares, to receive up to 50,000m<sup>3</sup> of material annually

The alternative proposal is sought in order to maintain the right to continue dredging disposal during the consenting process pursuant to Section 124 of the RMA. Port Otago's preference and the focus of this AEE is the proposal described in Sections 3.1-3.2 above.

### 3.5 Dredging and disposal methodology

There are five main areas that require dredging in the Otago Harbour: the entrance Channel; the lower harbour channel; the Port Chalmers Inner Basin and Berths; Victoria Channel and the Dunedin Basin and Berths.

The dredging is able to be carried out almost entirely with the trailer suction dredge New Era, which has been owned and operated by Port Otago since 1986. This dredge has a large suction pump and trailing dredge pipe with a drag-head containing a rotating visor at its base. The operation is similar to that of a vacuum cleaner. The drag-head is lowered to the sea floor and dragged along the bed as the dredge moves forward. A mixture of sand, silt and sea water is pumped up through the dredge pipe and this mixture is deposited into the dredge hopper. In the hopper the solids quickly settle out, and the water and some of the finer material such as silt that remains in suspension flows back overboard through the discharge chute, into the harbour channel. A full load of sand is firm enough to walk on in the hopper and is very close to the natural or in-situ density of undisturbed sand on the seabed.

A video which illustrates the New Era dredging and disposal process is available to view on the Port Otago website at <https://www.portotago.co.nz/our-harbour/inshore-dredging-disposal-consent-renewal/>



**Figure 3 Port Otago suction dredge New Era**

Port Otago also uses the barge mounted grab dredge "Vulcan" to dredge less accessible areas and for materials which tend to be more difficult to remove, including clays and weathered rock. The Vulcan operation has historically been supported by two 150m<sup>3</sup> dumb barges towed by a

small workboat. Recently Port Otago has commissioned a new tug and a 750m<sup>3</sup> barge which will be used to support the Vulcan operation.



**Figure 4 Port Otago grab dredge Vulcan**

The time taken to dredge the various channel areas is generally proportional to the amount of silt and clay within the dredge material. A load of clean sand from the entrance area can be dredged in 1 hour whereas it may take up to three hours to obtain a full load from the Leith claim near the Dunedin basin, which has higher silt content. The higher proportion of silt results in slower settlement of material in the hopper.

The vessel containing the dredge material is motored or towed to the disposal ground and the hopper is then split in half using the onboard hydraulic system. As the vessel continues moving through the water, the dredged material falls from the hopper from a height of about 1-2 metres below surface water level with any remaining material being washed from the hopper sides. All of the current dredging plant is the split hopper variety which generally discharges the entire load.

The trailer suction dredge and any tugs towing barges have differential GPS to navigate to the disposal grounds, and when positioned above the designated area of the disposal ground open to discharge the load.

A discussion of the five main areas that have historically required dredging in the Otago Harbour is provided below.

### **3.5.1 Entrance Channel**

The entrance channel is bounded along its eastern edge by a large accumulation of sand forming a bar. The tidal currents on the ebb tide assist in maintaining the position of this channel.

However, once seaward past the outer end of The Mole, the ebb tide strength decreases and sand is constantly being deposited along the eastern channel toeline. This accretion or build-up of sand is further exacerbated during easterly storms as the increased wave height and energy deposit large quantities of material over the bar.

The dredging of the entrance channel is a significant component of the dredging effort required to maintain the lower harbour. The material dredged from the entrance channel is generally clean fine to medium grained sand.

### **3.5.2 Lower Harbour Channel**

The areas within the Lower Harbour Channel where deposition occurs and which particularly require regular maintenance are located along the inner edge of the bends. This is primarily due to the currents being considerably weaker in this region with the result that they are no longer able to transport the sediments either in suspension or as bed load.

The material dredged from the Lower Harbour Channel comprises predominantly fine grained sand, although some areas contain a component of shell. The proportion of silt contained within the dredged material increases with distance from the harbor entrance. Floating seaweed is at times collected by the dredge although this tends to be seasonal and is particularly prevalent following a period of strong winds.

### **3.5.3 Port Chalmers Inner Basin and Berths**

The material within the Port Chalmers inner basin and berths varies from clayey silt at the container berths to some areas of rock at the Beach Street berth on the eastern side of the basin.

The dredging of these areas is carried out using the grab dredge suspended off a barge mounted crane. The suction dredge is unable to dredge the silt, clay and rocky bed and has difficulty manoeuvring within the confined areas of the basin.

### **3.5.4 Victoria Channel**

The natural scour of the channel means that limited areas require dredging, particularly where sediment builds up on the bends of the channel.

### **3.5.5 Dunedin Basin and Berths**

The sediment within the Dunedin Basin which extends to the end of Victoria Channel near the mouth of the Leith River (including the boat harbour and access channel) is predominantly silt material. The material has a low density and once mixed with water takes a long time to settle out. Its removal is not well suited to the use of a trailing suction dredge and the grab dredge is predominantly used to load the material into a dumb barge, which is then towed to the disposal sites.

Because of the distance to the disposal grounds from the upper harbour the trailing suction dredge New Era has at times been used as a barge when grab dredging this area. The new barge will assist with dredging this area, but dredging will continue to be a slow process in this location.

As in Port Chalmers, the currents within the basin and berth area are quite low and whilst the natural scour of the channel penetrates some distance into the basin, the siltation occurs over a wide area and requires exact positioning to dredge the correct spots.

## **3.6 Disposal site selection**

The Shelly Beach site has been chosen in order to provide nourishment to the adjoining beach and dunes. In addition, disposal at this location also benefits the Aramoana saltmarsh that the spit shelters. Other locations and methods would not provide these ecological and amenity benefits.

The other two sites have been used for many years without significant adverse effects identified through monitoring completed by MetOcean Solutions, Shore Processes and Management and NIWA. The extended areas comprise naturally moving sandy bottoms and they are of sufficient area to ensure that disposition is absorbed into the natural coastal movement of material. The extended sites for Heyward Point and Aramoana have been specifically recommended by MetOcean Solutions to ensure the ongoing disposal of dredged material does not cause adverse effects on surf breaks of national significance at Whareakeake and Aramoana Spit. The reasons that extended sites will assist with avoiding adverse effects on surf breaks are outlined later in this report at Section 5.4.

The historical sites are specifically recognised and provided for under the Otago Regional Plan: Coast (Regional Plan), as sites for the disposal of dredged material. The extended sites are not specifically recognised in the Regional Plan, but the consent status is no different for the proposed extended sites as for the specifically recognised sites. The consent status is set out in Section 4 of this report.

### **3.7 Consideration of alternatives**

#### **3.7.1 Currently consented sites**

Retaining disposal activity within the existing consented disposal sites is a viable alternative option for Port Otago. However, the larger sites as proposed have been assessed in the specialist coastal process (Appendix D) and ecology assessments (Appendix G) as likely to result in less environmental effects on surf waves and benthic ecology. Accordingly, the current small sites are less desirable from an environmental effects perspective.

#### **3.7.2 Off-shore disposal**

An offshore site (known as "A0") has been approved as part of the Project Next Generation capital dredging and is currently being used for this purpose. It is generally regarded by Port Otago as being less suitable for the disposal of material from maintenance dredging once the capital work on the channel is completed. Its distance from shore both restricts access by the New Era when seas are rough and also increases the cost of disposal. Furthermore, dredging from the Upper Harbour, Dunedin Basin and the berth areas is not consented for disposal to the A0 site. Hence the importance of sufficient capacity inshore.

Alternative sites to the south-east of Taiaroa Head would be very often too rough for safe passage of the dredge and barges. They also would involve significant steaming from and back to the harbour entrance. This would be both expensive and an additional hazard for a fully laden dredge or barge to use for regular day-to-day disposal work. The disposal sites must be clear of the natural venturi into the harbour in respect of deposited material. This is difficult to achieve to the south of Taiaroa. Other sites to the west of Taiaroa that avoid the flood tide movement are little different to those for which consent is sought.

#### **3.7.3 Lower harbour disposal**

There could potentially be other suitable inner harbour disposal sites, however to date, these have not been identified and are not considered necessary by Port Otago, given the suitability of the sites historically used for the disposal activity. Retaining the existing sites is considered preferable as the monitoring of these areas is now well established, which assists with management of the effects. Such long term monitoring information is invaluable and cannot be automatically applied to other harbour locations, making other lower harbour locations less suitable.

### **3.7.4 Upper harbour disposal**

Suggestions have previously been made by interest groups for a series of man-made islands to be constructed within the upper harbour, as a means of disposing of dredged material and creating habitat areas. Islands could be planted out to support wildlife. Other suggestions have raised the possibility that silt material could be used to reclaim intertidal portions of the Upper Harbour area to restore muddier inter-tidal habitats that have been lost as a result of development works in the past.

Reclamation within the harbour is not permitted without resource consent and there is not widespread community support for this option. Whilst there are groups who support this option a considerable portion of the community such as Otakou Runanga and environmental groups oppose any large scale reclamation of any sort in the harbour. This issue was explored at the hearings when the consent was obtained to use site A0 for the Next Generation dredging disposal.

### **3.7.5 Land based disposal**

This is impractical as trucking material to a landfill has been assessed as being cost prohibitive, due to the transportation costs involved in moving material to any existing landfills. Further, there would be costs and environmental effects associated with establishing new disposal sites capable of taking the volumes of dredging material necessary.

### **3.7.6 Use of dredged material for aggregate**

Port Otago is open to providing dredged sand to other places and uses, if a demand is identified. This does not alleviate the need for the sea based disposal because of the small quantities involved.

Work completed in 2008 showed some commercial uses for small volumes of sand locally. Use of sand in the region includes:

- Foundry mounding sand – less than 1,000m<sup>3</sup> per month or 10,000m<sup>3</sup> per annum. This sand generally is supplied from Waldronville.
- Concrete aggregate sand – about 1-2,000m<sup>3</sup> per annum supplied from Tomahawk lagoon entrance.
- Building concrete slab fill – less than 1,000m<sup>3</sup> per annum.
- Road aggregate – blended mix.

The most significant potential aggregate use for the dredged material would be as aggregate for ready mixed concrete. Ready mixed concrete production in the Dunedin region is approximately 40-50,000m<sup>3</sup> per annum, of which approximately 40% volume is sand. The sand used in ready mixed concrete is graded with the very fine dredged sand representing approximately 14% of the total sand requirement, amounting to approximately 2,500m<sup>3</sup> per annum. This is a very small fraction of the total quantity that is dredged from the harbour and as such is not a suitable method for total disposal.

### **3.7.7 Reclamation**

Port Otago is unaware of any commercial, community or private plans for major reclamation works in the vicinity of Port Chalmers or along the margins of Otago Harbour that would benefit from receipt of significant portions of dredged sand material. While there has been interest expressed for additional community land resources along the margin of the harbour in Careys Bay and Deborah Bay, there is no immediate requirement for reclamation fill. In terms of the current roading works around the harbour, it is noted that the volumes of material for this work



are small and dredge access would not be available due to shallow depths, therefore it would not be straightforward to use the material for this work.

Although such small reclamations may offer community benefits, they would also result in associated environmental and economic costs, and disposal of the remaining majority of the dredged material by another means would still be required. Consequently, the requirement for disposal to sea would still exist.

### **3.7.8 Beach re-nourishment**

A number of sand beaches in the Dunedin area are subject to either long-term or short-term erosion of sediment volume. Small bays within Otago Harbour have been replenished with sand in the past to restore and protect local recreational resources and some property. Beach re-nourishment requires sand of an appropriate size, texture, colour and cleanliness to be effective and acceptable to the beach users. In assessing the potential use of the dredged material for beach re-nourishment in the Dunedin area, these factors have been considered and areas of suitable sand are monitored as required by the community.

The total volume required for possible beach re-nourishment projects has been estimated below:

#### **► Re-nourishment of the local ocean beaches**

Dredged sand from the harbour channels has proven to be satisfactory sand for beach renourishment of the Dunedin ocean beaches at St Clair, Middle and St Kilda Beaches. According to the emergency response plan of the Dunedin City Council, the estimated volume required to mitigate the adverse effects of erosion could be approximately 100,000m<sup>3</sup> every 5 years. There is an immediate requirement for more sand in the coming 6-months to assist with erosion mitigation works underway at St Clair.

The method used previously involves an excavator at a city wharf, which can extract 400-450m<sup>3</sup> of sand from the New Era hopper while the vessel is laid up overnight. The sand is trucked the 4km distance across South Dunedin to the ocean beaches. The sand is then stored near the beach and placed as necessary along the foreshore and dunes. Approximately 1,000 to 2,000m<sup>3</sup> of sand is typically stockpiled at a time.

Referring to the disposal records in Appendix B, the quantity of sand historically provided to the Dunedin City Council for “ocean beach” renourishment is:

- 11,528m<sup>3</sup> in 2007
- 9,622m<sup>3</sup> in 2008
- 5,045m<sup>3</sup> in 2009
- 2,400m<sup>3</sup> in 2015

Further supply of sand for upcoming work will be provided to the Dunedin City Council in June-July 2016.

As there is a limit to the amount of sand required at any one time for this use, an area would be required to stockpile the material and the stockpile would require management to avoid wind-blown sand and sediment runoff. Accordingly, this option is best undertaken at the time that re-nourishment is needed. This current consent application will not limit this alternative from taking place in the future, as has been demonstrated during the term of the existing and previous consents.

#### **► Te Rauone Beach**

The Te Rauone community and Dunedin City have long been concerned about the erosion of the beach frontage at Te Rauone Beach. Re-nourishment using dredged sand is a possible

solution to erosion at the northern end of the beach, and concept design plans prepared by Port Otago in conjunction with the Te Rauone Beach Coast Care Committee indicate a maximum of 90,000m<sup>3</sup> of sand would be required over a period of up to two years. Further work would be required to protect and hold the sand in place, and so re-nourishment would be a part of an integrated management programme including engineering work, dune fencing, planting and regular renourishment over time.

Design and consultation work for the Te Rauone Beach community project has been undertaken by Port Otago as a separate exercise to this consent. Current bathymetry shows that it would not be possible to deposit sand onto the beach directly from the dredge-hopper, as there is insufficient depth of water to manoeuvre the dredge inshore. A potential solution would be to pump the sand onto the beach and then spread with a bulldozer once the sand settles out and the excess water drains. A temporary mooring for the dredger would be required in conjunction with either a pumping system to move the dredged material from the low point in the channel and along a pipeline to the beach site. These pump out operations are time consuming and relatively expensive. However, Port Otago is committed to supply sand to Te Rauone provided that community or Council funding is secured for the construction of a breakwater structure. As it would be a new activity with different effects, it would need to be separately consented.

The renewal of the disposal consent will not impede the use of sand for community beach re-nourishment projects and while a reasonable amount of sand can be disposed of through such projects, there remains a requirement for Port Otago to have the ability to use the inshore dredge disposal grounds also.

### **3.7.9 Conclusion**

There are some alternatives to deposition of sand at sea but the small volumes involved mean the bulk of the spoil obtained from dredging is required to be deposited at sea. Port Otago has in the past, and will continue to keep an open mind regarding alternative methods of dredge material disposal. However, as these alternatives are able to accommodate only small volumes of the material which has to be dredged to maintain access to the Port there is no practical alternative which can handle the total dredged material volume on an ongoing basis. Port Otago requires the ability to dispose dredged material to the three disposal sites as it is crucial to ongoing use of the Port and to provide access for other users of the harbour channel.

## 4. Statutory planning assessment

The proposed dredging and disposal activity involves disturbance of and deposition to the seabed which is restricted by Sections 12(1)(c) and (d) of the RMA. The dredging and deposition activity is also restricted by Sections 14 and 15 of the RMA in respect to the taking and discharge of seawater during the dredging process. The activities are allowed if permitted by rules in the relevant regional coastal plan or by resource consent.

### 4.1 Otago Regional Plan: Coast

#### 4.1.1 Dredging

The activity of dredging is a **Permitted Activity** under the Regional Plan pursuant to Rule 9.5.3.2 which states:

*The disturbance of the seabed for the purposes of maintenance dredging of the existing channel and berths within Otago Harbour is a **permitted** activity provided:*

- (a) *It is for the purposes of maintaining water depth in the following areas to the following depths:*
  - (i) *The upper berths and swinging areas: 10 metres*
  - (ii) *The upper channel: 8.5 metres*
  - (iii) *Port Chalmers berths and swinging areas: 14.5 metres*
  - (iv) *Lower channel: 13 metres; and*
- (b) *It is for the purposes of ensuring the safe and convenient navigation of ships in navigation channels and at berthing and mooring facilities.*

*Note: The depths are based on the Chart Datum on the latest navigational chart NZ6612, of Otago Harbour published by the Hydrographic Office of the Royal New Zealand Navy.*

The requirements of this rule are satisfied by the ongoing maintenance dredging activity. Capital dredging along with ongoing dredging to maintain the depths at the new permitted levels are covered by the consents obtained for Project Next Generation<sup>3</sup> and the dredging of the boat harbour and access.

#### 4.1.2 Disposal of dredged material at current sites

The disposal of dredged material derived from a maintenance dredging operation is a **Discretionary Activity** under the Regional Plan pursuant to Rule 9.5.4.1 which states:

*The deposition of sand, shell, shingle, or other natural material from a maintenance dredging operation in any 12 month period is a **discretionary** activity if:*

- (a) *The sand, shell, shingle, or other natural material is deposited at the sites as shown in Schedule 5 and described below:*
  - (i) *Heyward Point*
  - (ii) *Spit Beach*
  - (iii) *South Spit Beach (Shelly Beach).*

---

<sup>3</sup> ORC consent reference numbers 2010.193 - 2010.200 and 2010.202 – 2010.203



Grid co-ordinates are provided for the above sites, consistent with the existing consented areas illustrated in Figure 1 above. Note – Spit Beach, as referred to in the Regional Plan, is an alternative name for the Aramoana disposal ground.

#### **4.1.3 Disposal of dredged material at new site**

The disposal of dredged material at a site other than those specified under Rule 9.5.4.1 is a **Discretionary Activity** under the Regional Plan pursuant to Rule 9.5.4.3 which states:

*Except as provided for by Rules 9.5.4.1, any activity involving the deposition of sand, shell, shingle, or other natural material in the coastal marine area is a discretionary activity.*

#### **4.1.4 Taking and use of water**

The taking and use of seawater associated with dredging and disposal are **Permitted Activities** under Rules 11.5.1.1 and 11.5.2.1 of the Regional Plan which authorise the taking and use of seawater. Rule 11.5.1.1 authorises the taking of seawater for a ship's normal operational purposes and other purposes. Rule 11.5.2.1 authorises any non-consumptive use of seawater.

#### **4.1.5 Discharge of water or other contaminants**

The discharge of water from maintenance dredging of the Otago Harbour to the coastal marine area that is permitted by Rule 9.5.3.2 is a **Permitted Activity** pursuant to Rule 10.5.6.1(e) of the Regional Plan. Any other discharge of water or contaminants into the coastal marine area is a **Discretionary Activity** pursuant to Rule 10.5.6.2 of the Regional Plan.

The discharge requirements of the activity are in part covered by Rule 10.5.6.1(e) and in part by the coastal permit to discharge issued for Project Next Generation<sup>4</sup> in terms of the discharge associated with the dredging component. To the extent that the dredging material being discharged contains water and/or contaminants this is a **Discretionary Activity** pursuant to Rule 10.5.6.2.

## **4.2 Activity status summary**

The following resource consent is therefore sought:

- Resource consent (coastal permit) to deposit dredged material (including water and contaminants, and associated seabed disturbance) is required for the proposed activity as a **Discretionary Activity**, pursuant to Rules 9.5.4.1, 9.5.4.3 and 10.5.6.2.

Overall this coastal permit application to dispose of dredged material to three specific disposal sites within the Coastal Marine Area is required to be assessed as a **Discretionary Activity** pursuant to the provisions of the Regional Plan.

---

<sup>4</sup> ORC consent reference numbers 2010.193 - 2010.200 and 2010.202 – 2010.203

## **5. Assessment of environmental effects**

### **5.1 Introduction**

Under Section 104(1)(a) of the RMA, when considering an application for resource consent the consent authority must, subject to Part 2, have regard to any actual and potential effects on the environment. The actual and potential effects of the proposal have been evaluated to a level appropriate to the scale and significance of effects as required by Section 88 and Schedule 4 of the RMA.

Of particular relevance to this application is the need to consider the value of the investment of the existing consent holder, where an application is affected by Section 124 of the RMA (Clause 2, Schedule 4). As Section 124 applies to this activity, there is a need to consider the existing value associated with Port Otago's dredging disposal activity alongside the environmental effects arising.

### **5.2 Economic effects**

This application seeks the ability to continue to provide for ongoing disposal to sea of dredged material to specific sites on the seabed. Maintaining an efficient Port has positive implications for economic efficiency and for regional income and employment. Convenient disposal sites which are cost effective to access has significant positive economic effects for Port Otago and in turn the wider community, created through direct and indirect economic outputs and through the retention of jobs within the local community. The existing value associated with the disposal activity is an integral part of the Port Otago operation that cannot be isolated from the overall economic benefits arising from the port.

An economic assessment was completed for the Project Next Generation consent application by Butcher Partners Ltd in 2010. The key economic benefits of the Port are summarised from this work. The value of export cargo shipped through Port Chalmers in the 2008-2009 financial year was \$5.35 billion, or 14% of New Zealand's total export value. Port Chalmers is the country's third largest export port (by cargo value).

Port Otago itself currently generates direct economic output of \$53 million per annum, \$41 million of which is business and household income (including \$21 million in wages & salaries), and 320 jobs. The inclusion of downstream multiplier effects means that the operation of Port Otago currently generates regional output of \$85 million per annum, \$56 million of which is regional business and household income (including \$26 million in wages and salaries), and generates 480 jobs in the region. In addition employment and income is generated by land freight taking cargo to and from Port Chalmers.

Should the required dredging and associated disposal required to maintain the operation of the Port not be carried out or be significantly curtailed, the ships would have restricted access to the harbour and the above figures would be significantly impacted.

Restriction on access to the Port could cause shipping companies to review their options of calling at Port Chalmers in favour of other ports, thereby significantly increasing the costs for local producers and manufacturers to export their products to competitive global markets. As an example of the significance of the costs associated with cargo having to move through another New Zealand port if access to Port Chalmers was not maintained, additional freight costs to ship dairy produce from Otago and Southland would add approximately \$7 million to annual supply chain costs for the dairy industry alone. Manufacturing profits would potentially decline by 10 – 20%. These negative effects would reduce farming profitability and rural land values, and would

affect manufacturers' location choices, with consequential flow on effects to other sectors of the economy.

Accordingly, retaining access to Port Chalmers is reliant on dredging, which in turn requires the disposal of dredged material to appropriate and practical locations. The continuation of the disposal activity at the existing disposal sites has significant economic benefits for Otago and Southland, and the wider New Zealand economy also.

### **5.3 Social effects**

The economic benefits of the continued disposal activity directly translate to social benefits for the wider community as a result of strong economic activity in the region, and through the retention of jobs and spending within the local community.

Maintaining easily accessible inshore disposal sites is essential to the operation of the Port as the offshore capital dredging disposal site (A0) is not always safe to use in rough sea conditions. Accordingly, there is a health and safety need for these sites, which in turn provides for positive social effects for Port staff operating the dredge.

### **5.4 Physical effects on coastal processes**

The disposal of sediment can lead to a number of potential consequences related to coastal processes, including:

- Concentrations of sediment and seabed deposition from suspended-sediment plumes
- Changes to waves and currents associated with changes to the seabed
- Changes to sediment transport

The key potential adverse environmental effects arising from coastal process changes in the context of disposal of dredged material in the Otago Harbour are:

- Beach erosion effects associated with altered coastal processes;
- Effects on surf breaks associated with disposal mounds changing the way that waves break.

A summary of the findings from the recent technical studies undertaken to confirm long-term sustainable volumes, locations, and other physical limitations for the disposal activity is provided below. The studies discussed in Sections 5.4.1-5.4.2 below were required as a condition of the current resource consent for the disposal activity.

#### **5.4.1 Beach erosion**

Shore Processes and Management Ltd have been regularly monitoring and reporting on beach health at beaches in and around the disposal sites, since 2011. Annual beach profile surveys are carried out by a surveyor, a beach inspection is undertaken and results are reported. The most recent report is entitled "Beach profile surveys and morphological change, Otago Harbour entrance to Karitane May 2014 to June 2015" (Shore Processes and Management Ltd, September 2015). The Beach Profile Survey report addresses beach change for the period May 2014 to June 2015 for the beaches of Blueskin Bay from the entrance to Otago Harbour north to Karitane. A copy of the Beach Profile Survey report is attached in Appendix E. Key findings are:

- The beaches are accretional but in a state of recovery after a moderate to large storm during the study period as there was evidence of erosion of the dunes at Aramoana and Long Beach, but subsequent deposition and accretion to the beach surface.

- Erosion of beach volume at Karitane was noted and concluded to be associated with the movement of beach sands along the shore from south to north. There was no evidence of long-term erosion or retreat of the backshore at Karitane.
- The dunes at Warrington and along Shelly Beach showed evidence of accretion, with an increase to the height and bulk of the secondary line of dunes.
- The changes since 2014 are indicative of beach response to a variety of wave energy events including erosive storm events and depositional swell conditions. They do not indicate a change in the sediment supply to the coast or changes in the beach response / wave energy relationship at any particular disposal site.

In addition to reporting on annual beach health, a long-term beach study has been completed to consider long-term beach effects that may not be picked up through annual monitoring.

The Shore Processes and Management Ltd report entitled “Long-term shoreline change analysis, Otago Harbour entrance to Karitane” (Shore Processes and Management Ltd, July 2015) has been prepared to assess long term beach health and identify if any erosion associated with the dredging disposal activity has occurred. A copy of the Long-Term Shoreline Change report is included in Appendix E.

The Long-Term Shoreline Change report covers the time period from about 1863 to 2013 and uses aerial photographs and previous beach studies to plot the position of the shoreline over this period.

The Long-Term Shoreline Change report found that all of the shores except Karitane have prograded (built out seaward) in the past. In recent times the beaches have been subject to erosion and accretion of sediment, resulting in periods of both retreat and progradation of the shoreline respectively.

The shorelines of Warrington, Purakanui and Long Beach continue to prograde in the long-term, while Kaikai shows overall retreat of the shoreline. While retreat (erosion) is noted for Kaikai near the middle of the bay between 1980 and 1999, an accretional phase from 1999 to 2005 has resulted in a relatively stable shoreline position now. Of note, the shoreline position has remained largely unchanged since 2005. Overall, Kaikai Beach is relatively stable.

Karitane, Whareakeake and Aramoana appear to be in a state of dynamic equilibrium over the long-term. The beaches in the vicinity of Doctors’ Point have accreted, but exhibit little shoreline change due to the sand being stored in the nearshore resulting in relatively large fluctuations in depth of the nearshore shoals and bars around the entrance to Blueskin Estuary. Shelly Beach has eroded in the past, but because Port Otago has been depositing sand within the Shelly Beach disposal ground, the beach is now relatively stable in position and form.

Subject to continuation of sand deposition at Shelly Beach, no concerning beach erosion was noted in the Long-Term Shoreline Change report or the recent annual Beach Profile Survey report. It is noted that at least some of the beaches (e.g. Aramoana) exhibit the potential to retreat and prograde in response to changes in the wave environment, which links in with the wave and surf modelling discussed in Section 5.4.2 below.

The beach conditions observed in the past have provided confidence that adverse erosion effects from the disposal activity have not been occurring. However, this does not necessarily mean that erosion risk could not arise in the future. Accordingly, ongoing monitoring will be important to ensure an adequate supply of sand is reaching the nearby beaches and that beaches are not adversely impacted by the disposal sites. Recommended monitoring to enable beach health effects to be detected and managed through an adaptive management process is outlined in the recommended conditions included in Section 10 of this report.

#### **5.4.2 Effects on waves and surf breaks**

Several reports have been prepared by MetOcean Solutions Ltd on wave and sediment dynamics to understand how the deposited material moves around and affects coastal processes such as wave transformation, currents and sediment movement. The final recommendations report is attached as Appendix D to this report and it provides the overall recommendations and incorporates the results of earlier technical reports. This report is entitled "Port Otago wave and sediment dynamics study – recommendations on the long term strategy for inshore dredging disposal" (MetOcean Solutions Ltd, June 2016).

The MetOcean Solutions work involved review of historical disposal records, field measurements of waves and currents, and numerical modelling and validation to develop a robust model that can predict the wave and sediment effects associated with disposal of dredged material. This work confirms the actual and potential effects of disposal activity on wave and sediment movement near the harbour entrance. In this regard it links closely with the beach monitoring assessment work described above. The MetOcean Solutions work has been a pivotal component for confirming the optimal inshore grounds for long-term disposal of dredged material in terms of coastal processes.

The MetOcean Solutions work also considers the effect of the Project Next Generation shipping channel deepening which is currently underway in the Otago Harbour. This includes widening and deepening of the existing shipping channel both in the entrance region and within the harbour. This will have an effect on the sediment and hydrodynamics as follows:

1. A deeper channel will result in increase of the sediment trapping potential, thereby increasing the maintenance dredging volumes.
2. The increase in sediment trapping will reduce the amount of sediment that naturally bypasses the channel presently and is transported to the west.

The changes to coastal processes arising from the channel deepening project have been factored into the MetOcean Solutions model.

Surfing is a popular pastime at many locations along the Otago coastline including a number of beaches from Aramoana through to Karitane. Of particular note are the Aramoana surf break ("The Spit") and Whareakeake surf break which are specifically recognised in the NZCPS and are located close to the Aramoana and Heyward Point disposal grounds. The MetOcean Solutions work confirms there is a relationship between the disposal grounds and the wave quality at these surf breaks. The effect has the potential to be positive or negative in terms of the waves required for good surfing conditions.

Quality surf at Aramoana is due to intense wave refraction and focusing that develop over a submerged bar adjacent to the shipping channel, which directs a zone of focused wave energy towards the beach. Some additional wave focusing and shoaling can also develop over the Aramoana disposal ground when a distinct mound is present. During the wave refraction over the delta bar, the wave crests and troughs develop an offset phasing, meaning the wave crests are no longer linear and they exhibit a segmented character (i.e. wave crest snapping), which then move towards the beach. The combined process of wave energy focusing and wave crest snapping are the two key processes responsible for the high quality surfing waves at Aramoana. While these are processes that occur prior to waves passing over the Aramoana ground, the presence of a mound has potential to cause adverse effects that needs to be managed carefully. For example, if the ground is over supplied then progressive migration of sand toward the shore may distort the wave shoaling process or cause premature wave breaking to occur.

At Whareakeake, wave refraction over a shallow circular mound at the Heyward ground resulting in a distinct focussing of wave energy in the lee of the mound. This normally has a beneficial effect by providing locally increased wave heights at the surf break. The preservation

of the functional aspects of the swell corridor and the conservation of the wave crest characteristics is an important consideration for maintaining surf quality at Whareakeake.

Disposal at Shelly Beach does not affect surf breaks, so no specific management is required to avoid adverse effects on waves and surf breaks with continued use of this disposal site.

Specific recommendations for the size, location and use of the Heyward Point and Aramoana disposal sites have been provided by MetOcean Solutions, in order to avoid adverse effects on waves and surf breaks over time 35-year consent term.

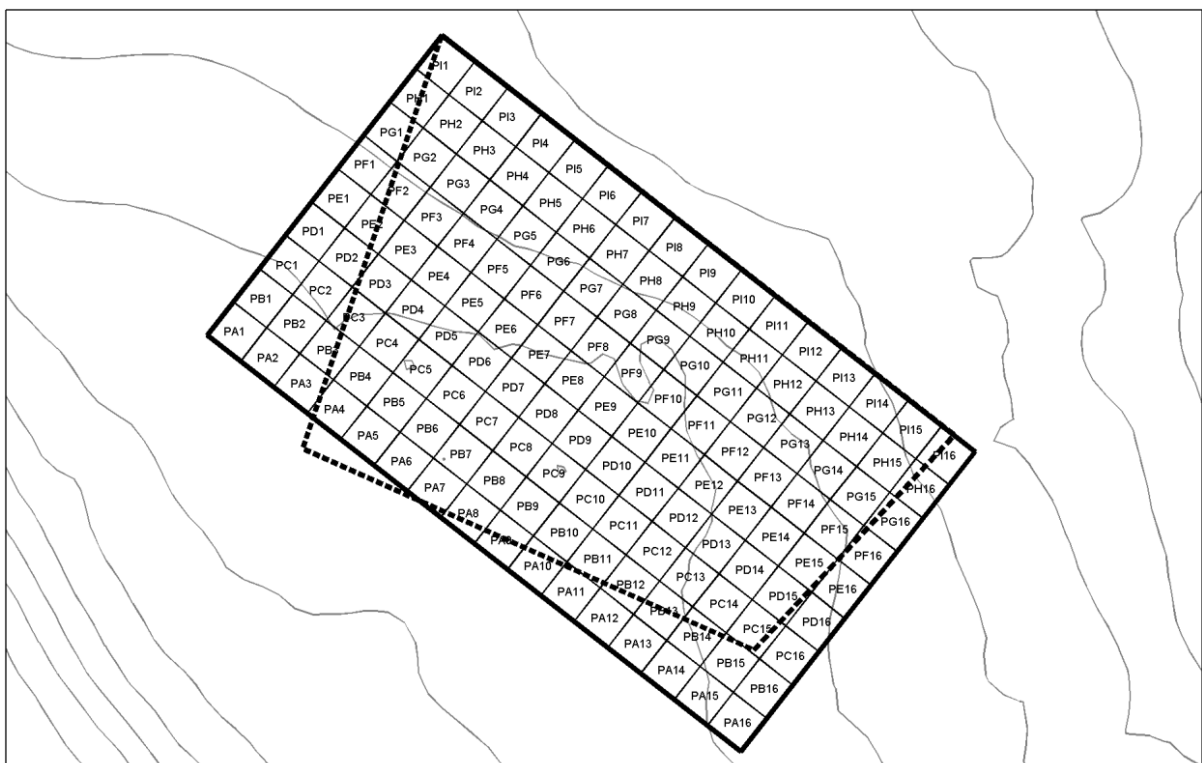
Changes to the size and boundaries of the existing disposal grounds were recommended by MetOcean Solutions as outlined in Section 3.1 of this AEE. The extensions are recommended to avoid effects of the future disposal activity on the identified surf breaks.

MetOcean Solutions have recommended a slight change to the previous disposal volumes for Aramoana and Heyward Point, in order to manage long-term effects on coastal systems i.e. sand supply for beaches and the right morphology for suitable surfing waves. No change in volume is necessary for Shelly Beach.

The MetOcean Solutions report recommends a move from an annual volume limit to a 5-year rolling average which will enable larger disposal volumes on occasion, but will ensure that cumulative adverse effects from repeated large volumes cannot arise. The recommendations also include a requirement to manage where disposal takes place within two of the disposal sites in order to avoid adverse effects on waves and surfing amenity. The recommended volumes and parameters are outlined below for each site and incorporated into the recommended conditions for the consent in Section 10 of this AEE.

### 5.4.3 Aramoana

The recommended delineation for the Aramoana disposal site is illustrated in Figure 5 below. The existing ground is shown with the dotted line. The recommended disposal ground has the solid line and there are 144 identical square cells of 50 x 50 m which can be used to direct the dredging activity to the appropriate location within the ground. The change is recommended to align the margins of the ground with the seabed contours in the area.





**Figure 5 Proposed Aramoana disposal site<sup>5</sup>**

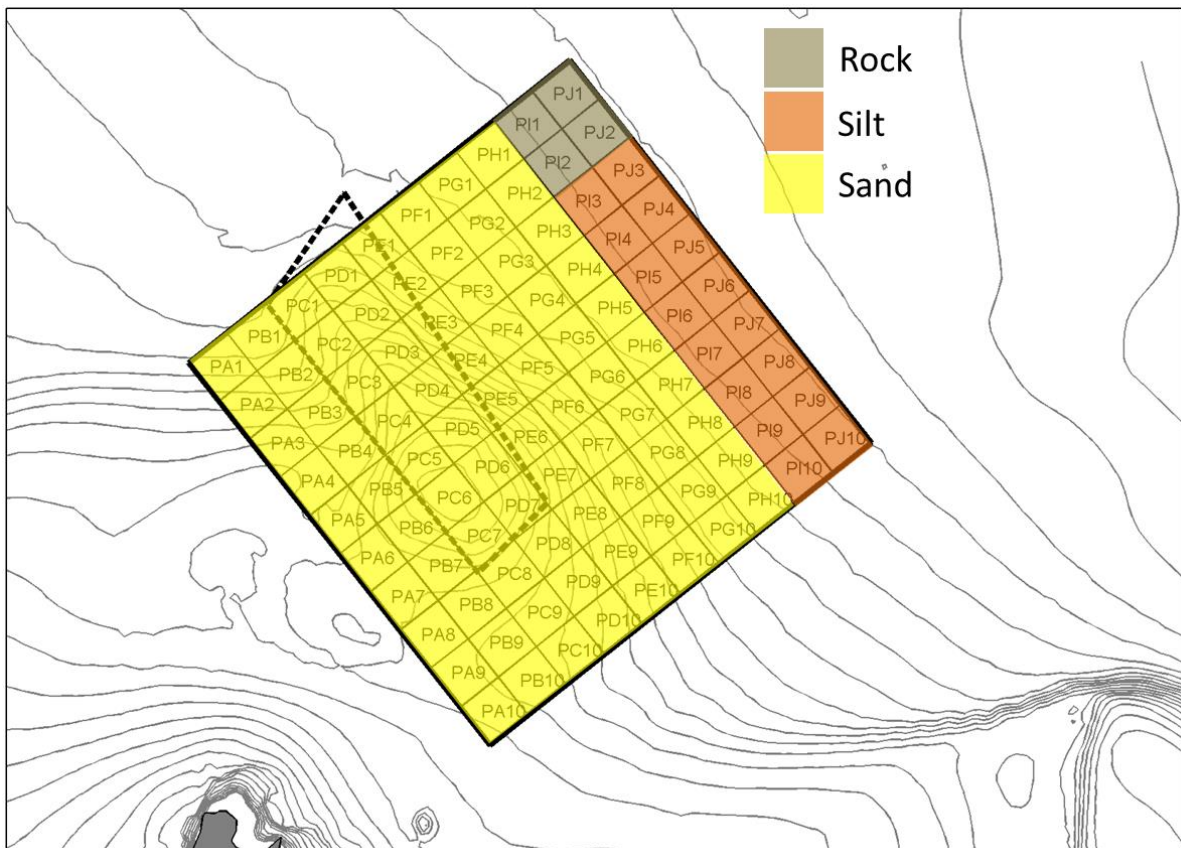
The recommended volumes and consent limits for this ground are:

- The total volume deposited should not exceed an average of 100,000 m<sup>3</sup> / year, calculated over any 5-year period (i.e. 500,000 m<sup>3</sup> within any 60 month period).
- Disposal should be carried out to maintain the historical positions of the 5, 6 and 7 m beach contour lines, as measured below mean sea level (msl)). This measure is required to avoid an over-supply situation and the disposal ground encroaching too close and welding to the beach and creating detrimental effects on surf quality.
- Only sand material should be deposited within this site.

It is noted that the envelope described above should ideally not be exceeded due to either excessive or insufficient disposal activity, in order for surf quality to be maintained. In this regard, Port Otago may need to halt disposal or indeed prioritise more disposal to the Aramoana site, in order to achieve this “envelope” on a consistent basis. In the unlikely event that no dredging and consequential disposal is necessary for a period of time, then this may not be possible. If this situation arises, the adaptive management process will kick in and specific technical advice would need to be sought on a revised regime to minimise adverse effects on surf conditions.

#### 5.4.4 Heyward Point

The recommended delineation for the Heyward Point disposal site is illustrated below in Figure 6. The existing ground is shown with the dotted line. The recommended disposal ground has the solid line and there are 100 identical square cells of 150 x 150 m which can be used to manage dredging disposal within the ground.



<sup>5</sup> Image courtesy of MetOcean Solutions Ltd

## Figure 6 Proposed Heyward Point disposal areas<sup>6</sup>

The recommended volumes and consent limits for this ground are:

- The total volume deposited should not exceed an average of 200,000 m<sup>3</sup> / year, calculated over any 5-year period (i.e. 1,000,000 m<sup>3</sup> within any 60 month period), except that if for any reason disposal at Aramoana is not available, then up to 300,000 m<sup>3</sup>/year can be accommodated in this ground (calculated over any 5-year period) provided that disposal ceases at Aramoana during the same period.
- Disposal in the ground should be carried out in a manner to avoid the creation of wave interference patterns and wave crest disruptions at Whareakeake. This can be achieved by ensuring the existing prominent circular disposal mound located within cells PB5,6,7, PD5,6,7, and PC5,6,7 on Figure 6 does not build up to be less than 9.5 m below msl. In addition, the surrounding 12 m depth contour should be maintained so it is greater than 300 m in diameter to make sure that the mound does not get too big or steep. Material within the balance of the disposal ground should be spread out evenly across the seabed, except for a spur area within cells PC1,2,3,4 and PD1,2,3,4 where disposal should be ceased, to prevent disturbance to wave focusing.
- Disposal of sand, silt and rock can be accommodated on this site, provided it is deposited in accordance with the identified areas in Figure 6 above. This is recommended to ensure that silt is in deep water where it is farthest from beaches so adverse mobilisation effects on beach amenity, kelp habitat, etc can be avoided. It is recommended that rock is directed to deep water in the north-west of the site. This is because it will be static once deposited forming a cap. If this were to occur in shallower water or near the existing mound, it would prevent desirable movement of sand material and potentially create wave interference effects. The sand is positioned where it has good potential to disperse and feed the adjacent beaches.

### 5.4.5 Shelly Beach

It is proposed to continue with disposal of up to 50,000 m<sup>3</sup> / year of sand material within the current Shelly Beach disposal ground, in order to provide a suitable sand source to feed the sand dune features at the adjacent beach to mitigate erosion.

On the basis of the specialist beach monitoring work (Appendix E), it is concluded that the coastal processes have not been significantly adversely affected by the disposal activity in the past and this will continue to be the case if the activity is managed as it has been in the past.

## 5.5 Effects on water quality

Dredging disposal is associated with a temporary reduction in water clarity, when the vessel discharges its load. The effects of dredging on water quality was described by Mark James in his statement of evidence for Project Next Generation on behalf of Port Otago, dated March 2011. Dr James stated that the main effects at the disposal site (in that case A0) and immediately downstream are predicted to be the direct effects of smothering of the benthic community, increased levels of suspended sediments and reduced water clarity. Dr James stated that the increased levels of suspended sediments and reduced clarity will affect the immediate disposal site but the levels of suspended sediments will be rapidly diluted away from the site. Dr James stated that with New Era dredging, the predicted suspended sediment concentrations for all silt classes are estimated to be less than 11 mg/l in surface water layers and less than 57 mg/l in the bottom layers, even in the immediate vicinity of the disposal site. Therefore turbidity effects are low and their effects on water quality are confined. Dr James did

---

<sup>6</sup> Image courtesy of MetOcean Solutions Ltd



not highlight any species that would be unable to persist due to suspended sediments during dredging disposal.

Given the significant extension to the boundaries of the Heyward Point ground, modelling of the areas potentially affected by concentrations of sediment (in the water column) and seabed deposition arising from suspended-sediment plumes has been undertaken for this consent application.

Detailed modelling of the passive plume sediment dispersal and deposition (i.e. plume modelling) was completed by MetOcean Solutions (MetOcean Solutions Ltd, August 2015). A copy of this report is included as Appendix F to this AEE.

The modelling assumed that the passive plume comprised 10% of the total spoil released, a high and thus ecologically conservative value, given available information indicating that passive plumes may comprise as little as 1% of the total spoil load deposited. The plume modelling looks at the plume alone and does not illustrate the more than 90% of material deposited that descends directly to the seabed, from each release.

Separate deposition contours were produced for the two main spoil types (silt and fine sand) and for two dredges, being the New Era (load volume 600 m<sup>3</sup>; release depth 2 m) as well as a very large trailing suction hopper dredger (TSHD, load volume 22,000 m<sup>3</sup>; release depth 7 m below surface). The modelling of the very large TSHD was theoretical only and Port Otago has no plans to use a dredge of this size in the Otago Harbour. Accordingly, the plume dispersion results for the New Era vessel are relevant to this AEE.

There are various images of suspended sediment plumes in the MetOcean Solutions report in Appendix F. While dispersion occurs for silt, the affected area does not extend as far as any of the beaches. Generally the suspended sediment and consequential deposition footprints arising from ambient hydrodynamic forces result in footprints that are elongated in the northwest-southeast axis, with larger extents in the southeast direction. Deposition footprints typically extend up to 2-4 km southeast from the release sites (i.e. reaching Taiaroa Head and possibly further) and 1-2 km towards the northwest. Deposition patterns consistently cross the Harbour entrance region with some suspended sediments predicted within the outer entrance channel.

The key conclusions from this modelling for the Heyward Point ground (taken from NIWA's summary of the plume results) are as follows:

- there is essentially no passive plume deposition resulting from release of fine sand from either the New Era or the larger dredge;
- silt in the passive plume disperses and is deposited more widely than sand, with much of this extending beyond the proposed ground's boundaries;
- dispersion of the passive plume is greatest and the deposition footprint largest when silt is released in deeper water – this means when sediment settles out though, it is in a very thin layer;
- New Era's passive plume's silt deposition footprint beyond the proposed Heyward Point ground boundaries is very light (almost all <0.025 mm thickness);
- the passive plume from a hypothetical larger dredge (TSHD) disperses more widely and with much thicker sediment layers (mostly 0-1 mm) extending well beyond the proposed Heyward Point ground boundaries, especially for loads released in shallower water

NIWA considered the effects of suspended sediment on kelp beds and benthic ecology. NIWA's conclusions on the ecological implications of the suspended sediment effects are summarised in Section 5.6 below.

Thus, under the proposed deposition regime, overall, effects on water quality will continue to be the same or similar to those experienced in relation to this activity in the past.

It is noted that the environment in which the activity takes place is dynamic and natural coastal processes (for example larger wave events and wind) will at times cause material to be resuspended in the water column. In addition, periods of high rainfall can lead to high turbidity associated with runoff from land. These natural effects are not dissimilar to the water quality effects associated with dredging disposal.

## **5.6 Effects on ecosystems**

### **5.6.1 Benthic effects**

The main benthic effects within and around the disposal sites relate to the direct effects of smothering of the benthic community, increased levels of suspended sediments and reduced water clarity.

The ecological effects of continued dredging disposal within the enlarged disposal grounds has been assessed in the NIWA AEE report included in Appendix G (NIWA, April 2016).

NIWA confirmed that dredged sediment deposition may disrupt the natural, dynamic equilibrium of benthic ecology values through burial and suspended sediment effects. These effects are minimised by ensuring that each site receives dredged material that is similar to its natural bottom sediments, and by the hydro-dynamically active environments at these grounds.

Blueskin Bay soft-bottom, benthic biodiversity is well studied, comprising in excess of 265 species, most of which are widely distributed within the bay and elsewhere around New Zealand. There was no evidence that the disposal sites or surrounding area comprises any regionally or nationally significant habitat for any species or communities.

NIWA confirmed that actual effects of dredging disposal on soft bottom benthos within these grounds varied and were largely constrained to within the immediate deposition area. Dredged sediment deposition appears to reduce benthos densities and diversities at both grounds studied (Heywood Point and Aramoana), but there was considerable variability in these measures, both for benthos within and outside the grounds. This variability was evident in the poor discrimination between ground and control stations for both grounds in multivariate analyses and graphical representations of faunal similarities. A large field experiment at Aramoana confirmed there is continual change in benthos over time, regardless of exposure to dredged sediments, and reduced densities and diversities following deposition. The experiment also showed that benthos recovery was well advanced within 12 days of deposition.

NIWA concluded that continued disposal of the volumes anticipated within this application within each of these grounds is unlikely to have any significant adverse ecological effects on the benthic ecosystem beyond the disposal ground boundaries. Furthermore, the potential for adverse ecological effects will be significantly reduced by enlarging the existing Heywood Point ground to approximately 2.25 km<sup>2</sup> and disposing similar volumes of dredged sediments as in the past across this enlarged ground.

The larger area will mean disposal equivalent to an average of 3 mm layer/week over the entire ground, so there will be quicker recovery of benthic communities within the ground. The reasoning for the “lesser effects” with a bigger area conclusion is that smaller sediment deposits will result in shallower over-burden, allowing more of the buried fauna to migrate to the new sediment surface. Re-colonisation of new deposits will be quicker when the deposits are smaller deposition events that are spaced as widely as practical across the receiving ground – i.e. a larger disposal ground facilitates lower impacts, over a larger area.

NIWA supported enlarging the Aramoana ground as a rectangle oriented parallel to shore as proposed. This enlargement will slightly reduce annual average deposition depth, as well as facilitating an ecologically, less disruptive placement regime as outlined above for the Heyward Point site.

NIWA recommended using a smaller dredge (i.e., New Era) because its smaller passive plume and depositional footprint poses a much lower risk to marine benthic ecosystems than that modelled for a larger dredge, such as the hypothetical TSHD used for modelling purposes.

An adaptive management approach is recommended to ensure that unforeseen effects are identified, prioritised and resolved early via a collaborative process involving relevant stakeholders where necessary. Periodic monitoring of benthic in-faunal community composition and structure following a consistent plan is required as a key part of this process.

On the basis of the NIWA assessment, we conclude that effects on the benthic values from the continued and proposed extended disposal of dredged material at the three disposal sites will continue to be minor and will impact a relatively small area, of seafloor within the coastal environment.

### **5.6.2 Effect on kelp beds**

Fine suspended sediment poses a significant threat to kelp forests and the associated communities, as well as to other marine algae and invertebrates, as it restricts light levels reaching these habitats.

The NIWA assessment of ecological effects report (NIWA, April 2016) noted that the threat to kelp forests posed by deposition is low under the recent operational regime. Suspended sediment plumes are generated by silt deposition events and, to a lesser extent, by subsequent reworking of recent deposits. Modelled dispersion of passive plume sediments at the sea surface, at mid depths and the sea floor indicate that only a small proportion (<1%) of the sediment released remains in suspension beyond these depositional footprints for the New Era and the larger dredge that was modelled.

The long history of deposition of the same volumes of much the same types of sediments on these grounds suggests that, even if the dredge passive plumes contribute to the turbidity of waters around the kelp forests, continued deposition under an equivalent operational regime is unlikely to have any further effects on them. This is the case at least for suspended sediment plumes resulting from the New Era's operations. Plumes from a larger dredge, such as the TSHD, or from a dredge with different discharge characteristics, however, may be quite different. In the case of the TSHD, passive plumes are much larger, take longer to settle, disperse more widely and, therefore, have greater potential to alter the critical light environment for kelp forests and other benthic macroalgae around Blueskin Bay than do plumes from the smaller New Era.

NIWA concluded that monitoring of kelp forests and rocky reef benthos around Blueskin Bay is unwarranted unless sediment plumes generated during dredging operations increased, e.g. through use of a larger dredge for the disposal activity. A condition is recommended to allow for specific ecological consideration of effects on kelp forests and the associated algal communities and invertebrates, in the event that a materially larger dredge is used for the disposal activity in the future.

### 5.6.3 Effect on marine mammals<sup>7</sup>

Sea lions and yellow-eyed penguins are present in the Blueskin Bay area, and the bay comprises significant habitat for Hector's dolphins also.

The hoiho, or yellow-eyed penguin, is classified as "threatened and nationally vulnerable" in New Zealand. They are found along the south-east coast of the South Island, on Banks Peninsula and on certain off-shore islands. Their diet consists of small to medium sized fish and squid and they dive to the sea floor to gather their prey. These penguins usually come back to the area they were born, in order to breed. Threats include habitat destruction, predation, disease and human interference. The yellow-eyed penguin is equally dependent on marine and land habitats, which include forest and coastal scrubland. A great deal of community effort has been put into providing nesting sites and shelter on grazed pasturelands on the Otago Peninsula and in North Otago. The yellow-eyed penguin's marine habitat is important because it provides food, and allows for dispersal and movement between land habitats.

In the current 2015/16 season, there are less than 200 breeding pairs on the Otago coast, and this sub-population is considered to comprise approximately 3% of the total population. A steep decline in nest numbers is the cumulative effect of an unidentified mass mortality in January 2013, widespread starvation in 2014, and an increase in predation by barracouta in early 2015. The Department of Conservation has confirmed that up to 6 yellow-eyed penguin nests have been recorded during their breeding season (October-February) on the coast immediately inshore of the Aramoana disposal ground. Ensuring healthy beach and dune systems will help maintain access for yellow-eyed penguins to this nesting area.

Aside from land habitat being reduced through land development such as farming, the penguins are also affected by predators including stoats, ferrets, cats and dogs. Coastal predators include barracouta, sharks, seals and sea lions. Injuries from barracouta are the most common, with bites to the feet, legs and abdomen eventually becoming fatal if left untreated. Disease is also a major threat to chick and adult survival. Humans approaching too closely can also negatively affect penguins accessing their food supply.

Sea lions are "nationally critical", which is the highest threat classification for species in New Zealand. The New Zealand sea lions are one of the rarest seal species in the world. Sea lions are found mainly on beaches in Otago and Southland, and on New Zealand's subantarctic islands.

Sea lions eat squid, fish, some sharks and rays, octopus, and other invertebrates. They may also eat penguins and sea birds. Sea lions dive for their food and can travel up to 175 km from the coast to feed. Every year a significant number of New Zealand sea lions drown due to incidental entanglement or other causes associated with various fisheries.

Sea lions were hunted for their fur until the late 1880s when the animals were first protected. The current decline in the New Zealand sea lion population is due to a complex interaction between human impacts, including fishing, and natural causes. For example, accidental catches of sea lions in fishing gear may be particularly harmful to population numbers if they happen at the same time as a disease outbreak. The Department of Conservation has confirmed that sea lion pups have been recorded at Aramoana on occasion.

Hector's dolphins are also relevant, as they are found only in the inshore waters of New Zealand. Hector's dolphins are also nationally endangered. Hector's dolphins are found generally around the coast of the South Island but distribution is patchy. The population estimate for the Blueskin Bay area is around 50 individuals. Like other dolphins, Hector's use

---

<sup>7</sup> Information obtained from the Department of Conservation website and communication with Jim Fyfe, Department of Conservation

sonar to find their food. Measures put in place to help protect this species as part of a Threat Management Plan implemented in 2008 included a set net ban out to 4 nautical miles in this area, as set net fishing poses the major threat to Hector's dolphin. Like all marine mammals, they surface regularly to breathe, so entanglement in set nets frequently cause death. Because these dolphins occur close inshore, often in bays and harbours, they are also at risk of collisions with boats.

In addition a colony of Otago Shags (recently confirmed as being a genetically distinct entity in the group previously known as Stewart Island Shags) roosts and nests at Taiaroa Head and forage through the area. Threatened whale species such as Right Whales and Orca are also occasional visitors.

In considering the impacts of the disposal activities on marine mammals, it is noted that yellow-eyed penguins are known to travel up to around 20 kilometres to source food and sea lions travel much further. Hector's dolphins may also be present within the vicinity of the disposal sites, from time to time. Accordingly, the proposed extensions to the disposal grounds will affect a small part of the potential food foraging ground used by these marine mammals. It is noted that commercial fishing (in particular trawling) has a much more widespread impact on the habitat for these mammals. In addition, fishing is known to have direct impacts on the identified species also.

The effects on the marine wildlife habitat is considered to be minor, as the directly impacted area is a small part of the foraging area available for these animals. The Department of Conservation has advised that the benthic assessment and monitoring proposed will be useful to help understand any wider ecological impacts of the proposal also, and will be suitable to guide an initial response to any unexpected results.

In addition, a condition has been recommended in Section 10 to ensure that dredging operators are cognisant of the need to avoid getting too close to marine mammals, in order to avoid collision or disruption to their movement and feeding activities.

## **5.7 Contamination**

There is a potential to contaminate new areas of seabed if contaminated sediments were to be disposed of at the extended disposal sites as a result of this application. Areas of particular interest in the past have been those sediments in the swinging basin and berth areas adjacent to Port Chalmers and from the upper harbour area around the Dunedin city wharves.

### **5.7.1 Lower harbour – harbour entrance to Port Chalmers**

Sediments predominantly in the swinging basin adjacent to Port Chalmers and the middle to lower harbour were analysed for a wide range of contaminants in 2010 by GHD Ltd for Project Next Generation. The results of that investigation were summarised by Christopher Hickey in his statement of evidence for Project Next Generation on behalf of Port Otago (dated April 2011). Dr Hickey concluded that there was no reason for any concern for chemical contaminant related adverse effects associated with the proposed dredging and disposal operation for Project Next Generation which includes the same sources of sediments to be disposed of at these inshore disposal sites. Concentrations of metals and other ecologically harmful substances in sediments from these locations were all below the Australia New Zealand Environment and Conservation Council (ANZECC) guidelines for fresh and marine water quality and the New Zealand Guidelines for Sea Disposal of Waste (NZGSDW) low level guidelines, apart from slightly elevated arsenic in a few locations.

These findings also align with testing reported by Shore Processes and Management in 2011 for the previous inshore dredging consent application, as follows:

*Geotechnical investigations were carried out by Opus International Consultants (Opus) to characterise in detail the sediments to be dredged during a proposed Capital Dredging program and to determine whether or not the dredged sediment would be contaminated. Subsurface samples were taken from within the area proposed for dredging. The area is adjacent to and beneath the existing channel, and beside the swing basin at Port Chalmers ... Chemical analysis of the sediments was carried out by Opus and by NIWA. Both analyses found that the samples contained only trace levels of contaminants. None of the parameters analysed exceeded the guideline values used. Based on these results, it was concluded that the materials to be dredged are not contaminated.<sup>8</sup>*

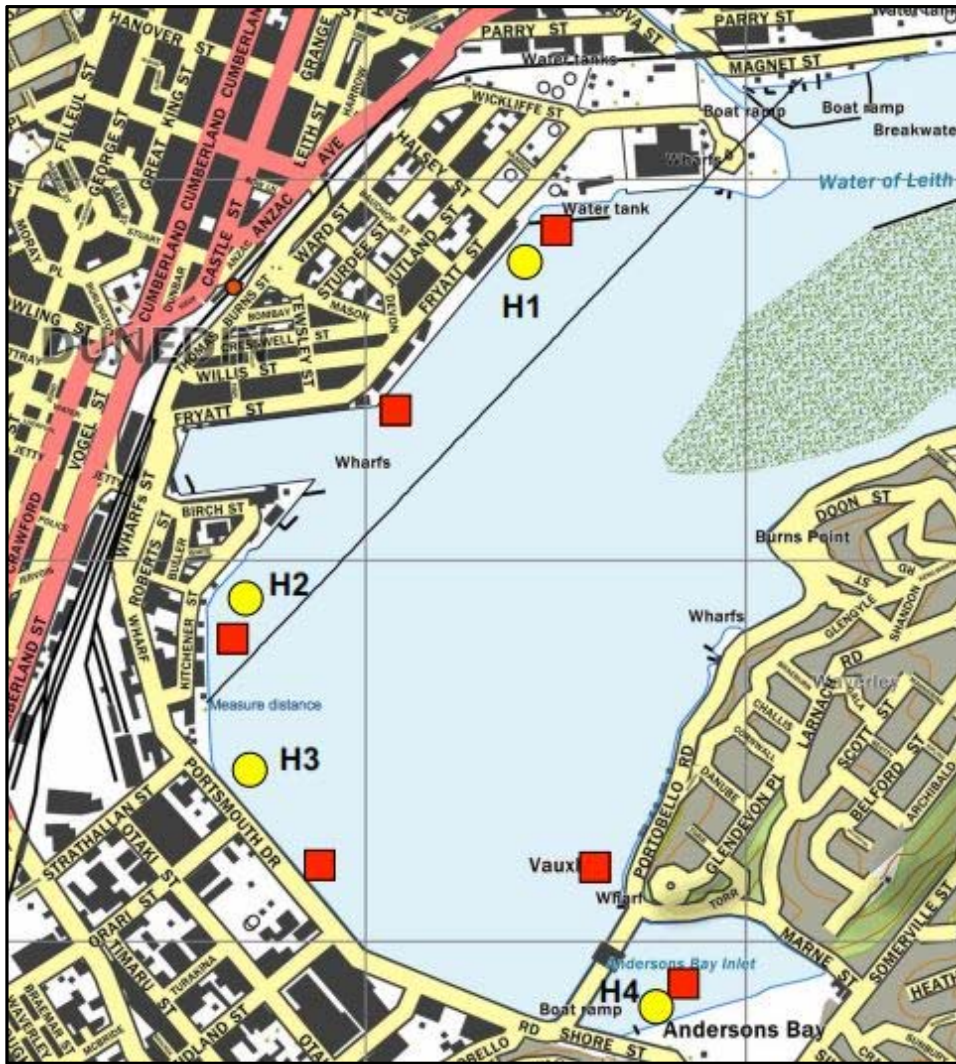
### **5.7.2 Upper harbour – Port Chalmers to Dunedin**

The key risk associated with dredging in the upper harbour area is disturbing contaminants deposited by stormwater from surrounding industrial land. Stormwater contaminants in Dunedin Harbour were analysed in the 2013 Dunedin City Council application to renew its global stormwater consents (RM.11.313.01 – RM.11.313.10), and subsequent monitoring reports in 2014 and 2015. The most recent seawater and ocean floor sediment sampling was carried out in June 2015 at the locations shown in Figure 7 below (red squares are seawater quality sites, yellow circles are sediment sites) (Ryder Consulting Limited, 2015).

---

<sup>8</sup> (Shore Processes and Management Ltd, May 2011)





**Figure 7 Seawater and sediment sampling sites**

Sediment sampling showed that levels of mercury, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons and organochlorine pesticides were all very low<sup>9</sup>. Only the Kitchener Street and Shore Street harbour sites exceeded consent trigger levels for zinc and nickel respectively – refer to Table 1 below (highlighted pink) (Ryder Consulting Limited, 2015). Of most relevance to the dredging activities are the Halsey Street results which were all less than the trigger level values. This is consistent with the original assessment of environmental effects for RM.11.313.01 – RM.11.313.10 which concluded that “while not pristine, the Upper Harbour and the communities associated with the intertidal areas adjacent to major stormwater outfalls appear not to be undergoing any significant further degradation as a result of stormwater inputs” (URS New Zealand Limited, 2012). The only exception identified is adjacent to the South Dunedin outfalls where contamination of harbour sediments is likely to have occurred due to historical land uses.

No dredging is undertaken or proposed south of Birch Street (i.e. adjacent to the South Dunedin outfalls where historical contamination may be present).

Thus, there is not expected to be any disturbance of contaminated sediment in the upper harbour.

<sup>9</sup> Samples were compared to the ANZECC guidelines

**Table 1: Contaminant concentration (mg/kg dry weight) in sediments sampled at sites shown in Figure 7 above**

Site	As	Cd	Cr	Cu (WAE)	Cu	Pb	Hg	Ni	Zn
Halsey Street	7.68	0.113	28	0.001	16.2	19.1	0.142	15.6	88.8
Kitchener Street	8.17	0.188	16.8	0.062	16.5	43.4	0.063	12.3	419
Orari Street	2.53	0.0481	8.73	0.03	4.26	8.4	0.041	4.22	47.3
Shore Street	12	0.194	22.1	0.022	15.3	26	0.125	29.2	120

Site	TPH	PAH	Organochlorine pesticides
Halsey Street	BDL	BDL	BDL
Kitchener Street	220	22.53	0.032*
Orari Street	BDL	0.55	BDL
Shore Street	139	12.43	BDL

\* 0.018 4,4'-DDD  
0.014 4,4'-DDT

### 5.7.3 Summary

In terms of water quality, Dr James (March 2011) stated that any contaminants that were released into the water column would be rapidly diluted and dispersed. Therefore, in the absence of any contamination issues being identified in the dredged material, there is no contamination effect expected to arise as a result of the continuation of dredging disposal.

On this basis, it is concluded that any risks arising from potential contamination of sediments dredged within the harbour and deposited at the expanded sites will be no more than minor and not materially different to the risk posed with the historical disposal activity.

### 5.8 Effects on recreational and commercial fishing

Otago Harbour and the coastal environment are used for a number of water-based recreational activities, including fishing.

Recreational boating activity within Otago Harbour includes sailing, motor boats, kayaking and rowing. Recreational fishing from boats occurs within the harbour and the entrance channel is a particularly popular site for salmon and other species. Fishing from The Mole and Taiaroa Head near the entrance channel is also popular as is surfcasting from many beaches and rocky headlands. Commercial fishing for various local species is carried out in wide ranging areas across the predominantly sandy portions of the offshore coast.

The ongoing disposal of dredged material is unlikely to cause any significant conflict with fishing activities within the coastal marine area, as the activity only affects a small portion of the fishable area of the harbour. Furthermore, as the ecological assessment has demonstrated, the disposal activity has had no significant adverse effects on the benthic habitats to date. This means that the ecosystem which fishing activity relies on is unlikely to be affected by the disposal activity. Furthermore, neither the dredge movements nor the disposed material are considered to be a danger to navigation.

Recreational diving is very popular at The Mole which is a voluntary marine reserve. This area is not directly affected by the disposal activity. Reduced water clarity could have a minor impact on this activity, however, reduced water clarity is a temporary effect and the popular swimming and diving areas are not close to the actual disposal sites.

Overall, the continuation of the dredging disposal activity is not expected to generate any specific adverse effects on recreational commercial fishing activity in the Otago Harbour.



## 5.9 Cultural impacts

The disposal sites are not within any area identified in the Regional Plan as having Kai Tahu cultural and spiritual values, although the sites are near to Coastal Protection Area 15 Aramoana which has Kai Tahu cultural and spiritual values. Port Otago recognises that the entire Otago Harbour and Blueskin Bay are of special significance to iwi.

The Cultural Impact Assessment (Kai Tahu Ki Otago Ltd, May 2010) prepared for Project Next Generation provides detailed information on the resources and significance of the Harbour and Blueskin Bay to iwi. Tangata whenua have a long association with this area in terms of travel, settlement and fishing. Key species and ecosystems of significance to tangata whenua include tuaki, flat fish, seagrass and kelp. Concentrating the disposal activity around the existing disposal sites should minimise effects on these resources.

The cultural, spiritual, historic and traditional relationship for iwi in the Otago coastal marine area is understood by Port Otago, as is the need for sensitivity to cultural values during the disposal of dredging material.

Consultation with iwi in relation to dredging disposal has been continuing throughout the term of the existing consent for the disposal sites via the Working Party, and also more recently through the Manawhenua Consultative Group (MCG) established to work alongside Port Otago on the implementation of Project Next Generation. In addition, iwi have been specifically consulted in relation to this application.

Consultation is being carried out through Kai Tahu Ki Otago Ltd (KTKO Ltd), the Working Party and the MCG to address any matters of significance to tangata whenua. Discussions to date have been positive and we understand that KTKO are updating the 2010 Cultural Impact Assessment to assess matters relevant to the extended inshore disposal sites and the long-term consent sought for the activity. It is expected that similar cultural impacts and recommendations will apply and early feedback to date has indicated that consent conditions in line with those that establish the MCG engagement process would be appropriate to apply to this activity also.

Accordingly, it is considered that cultural impacts that will arise as a result of this proposal can be appropriately managed. These effects can be mitigated through consent conditions in line with the cultural conditions applying to Project Next Generation<sup>10</sup>.

## 5.10 Natural hazards and hazardous substance risk

The dredging and disposal process does not involve the use of hazardous substances, other than standard fuel and lubricant substances used on the dredge, in a similar manner to other vessels operating in the Otago Harbour. The disposal activity is unlikely to exacerbate or be affected by any natural hazards and coastal process impacts have been well studied and are understood.

## 5.11 Summary of effects

This assessment has demonstrated that the adverse effects of continued disposal at the Heyward Point, Aramoana and Shelly Beach sites, including extensions to the Heyward Point and Aramoana sites can be appropriately managed such that any adverse effects will be no more than minor. There are also a number of positive economic, social and in the case of the Shelly Beach site specifically, ecological benefits associated with the activity.

---

<sup>10</sup> ORC consent reference numbers 2010.193 - 2010.200 and 2010.202 – 2010.203

## 6. Assessment of objectives and policies

Under Section 104(1)(b) of the RMA, when considering an application for resource consent the consent authority must, subject to Part 2, have regard to any relevant provisions of national policy statements, national environmental standards, regional policy statements and plans and proposed plans. A summary assessment of the proposal against the key themes from the New Zealand Coastal Policy Statement (NZCPS), the Operative Otago Regional Policy Statement (RPS), the Proposed Otago Regional Policy Statement (Proposed PPS) and the Regional Plan: Coast for Otago (Regional Plan) is provided below. A detailed assessment of the relevant clauses from all the applicable planning documents is contained within Appendix H.

In summary, the planning documents generally seek to enable the port activity, as essential infrastructure within the region, whilst avoiding significant adverse effects on important values and features in the coastal environment.

### 6.1 New Zealand Coastal Policy Statement

The NZCPS became operative in 2010 and provides national guidance for the management of coastal resources and the coastal environment within New Zealand.

The NZCPS provides key policy direction in light of the Supreme Court decision in *Environmental Defence Society Inc v New Zealand King Salmon Company Limited* case (the King Salmon decision).

Two key themes that are relevant to this application requiring specific consideration in the NZCPS are:

- The need to recognise the role of Ports in contributing to a sustainable transport system and providing for their efficient and safe operation and the development of their capacity for shipping; and
- The protection of identified surf breaks of national significance by ensuring that activities in the coastal environment do not adversely affect them.

The AEE concludes that the continued disposal of dredged material, including extensions to the disposal site areas as sought in this application, subject to the recommended conditions of consent, can be carried out without adversely affecting the identified surf breaks of national significance that are located close to the disposal sites. Furthermore, this proposal will contribute to the efficient and safe operation of the port facilities within Otago Harbour.

Specific objectives and policies in the NZCPS relating to wider coastal environment management are identified and assessed in Appendix H. It is considered that the measures and methods proposed in this application coupled with the consent conditions proposed have appropriate regard to the relevant objectives and policies of the NZCPS.

### 6.2 Operative Otago Regional Policy Statement

The RPS became operative in 1998. The RPS contains provisions that are relevant to this proposal relating to the sustainable management of the region's coastal environment, matters of significance to tangata whenua, and the sustainable management of infrastructure. These are detailed in Appendix H. Subject to the recommended conditions of consent, the proposal can satisfy the objectives and policies of the RPS.

### 6.3 Proposed Regional Policy Statement

The Proposed RPS was notified in May 2015. Submissions have been called for and a hearing was held in November 2015. No decisions on submissions had been issued at the time of writing. Given the early stage of the Proposed RPS and because there are numerous

submissions seeking changes to the objectives and policies in the Proposed RPS, only limited weight can be afforded to it. Notwithstanding this, the relevant provisions have been identified and assessed in Appendix H. Subject to the recommended conditions of consent, the proposal can satisfy the objectives and policies of the Proposed RPS.

## **6.4 Otago Regional Plan: Coast**

The Regional Plan became operative in 2001. The Regional Plan identifies a number of coastal management areas that are relevant to the disposal sites and are important to the consideration of this proposal. The disposal areas are in the vicinity of the following Coastal Management Areas identified in Schedules 2 and 3 of the RCP:

- Coastal Protection Area 15 Aramoana - Kai Tahu cultural and spiritual values.
- Coastal Development Area 4 Otago Harbour - Commercial port facilities
- Coastal Recreation Area 8 Spit Beach - Swimming, walking and surfing.
- Outstanding Natural Features and Landscapes 8 Heyward Point - Outstanding headland, sand beaches, and spit at the entrance to Otago Harbour.
- Coastal Hazard Area 5 The Spit - Sandy beach erosion (spit and saltmarsh at risk)

The disposal activity appropriately responds to the above values. None of the disposal sites are within areas identified in Schedules 2 or 3 as having cultural or spiritual values to Kai Tahu. However, the Shelly Beach site is adjacent to Coastal Protection Area 15, Aramoana, which is recognised within Schedule 2 of the Plan as being an area of cultural and spiritual significance to Kai Tahu. Cultural and spiritual values are addressed through Port Otago's consultation with iwi, which is discussed in detail in Section 8.3 below.

The proposal is a core part of the commercial port activity recognised by the Coastal Development Area 4 notation in the Regional Plan and indeed, the existing disposal sites are explicitly recognised in the Regional Plan.

It is considered that any adverse effects on recreation, surfing in particular, will be avoided through implementation of the recommended measures provided through the extensive wave and sediment dynamic work completed by MetOcean Solutions and translated into recommended conditions of consent. The activity will not have any visual or other effects on the identified outstanding landscape values. The disposal at Shelly Beach is aimed at reducing erosion to The Spit and saltmarsh area so positively influences these important features.

The relevant objectives and policies from Chapter 9: Alteration of the Foreshore and Seabed Regional Plan are addressed in Appendix H and the proposal is consistent with these.

Overall, the proposal aligns well with the relevant objectives and policies in Regional Plan.

## **6.5 Kāi Tahu ki Otago Natural Resource Management Plan**

The KTKO Natural Resource Management Plan (NRMP) 2005 is relevant to the consideration of this application pursuant to Section 104(1)(c) of the RMA. The NRMP is divided into catchments, with specific provisions for the whole Otago area and for each catchment. The current proposal is located within the Otago Harbour Catchment.

The NRMP contains objectives and policies for the coastal environment. The particularly relevant provisions are discussed below.

*Objective 5.8.3 – The spiritual and cultural significance of taku tai moana me te wai māori is recognised in all management of the coastal environment.*

*Policy 5.8.12 - To require that dredging and reclamation works avoid physical damage to kai moana sites, habitat and the integrity of the seabed.*

*Policies 8.2.3 - To encourage research and monitoring into sediment deposition at Blueskin Bay and Pūrākaunui.*

- *To encourage the dumping of all dredging material beyond the continental shelf.*
- *Dredging activity should not impact on tuaki and other marine life.*

Consultation with iwi is being undertaken to ensure that the spiritual and cultural significance of this location is recognised and provided for in this application. The disposal activity relates to historic disposal sites and extensions of these. Any physical damage to kai moana sites, habitat or seabed that will result from this proposal will be minor. Port Otago is continuing to engage with iwi through KTKO, the MCG and the Working Party.

In relation to the policy which seeks to encourage that all sediment deposition be carried out beyond the continental shelf, it is noted that the Cultural Impact Assessment prepared for Project Next Generation accepted that this was not economically viable for that project. This applies to the current application also.

In terms of effects on tuaki and other marine life, marine biota and sediment paths have been the subject of ongoing monitoring conditions are recommended to ensure that adverse effects are avoided.

## 7. Part 2 assessment

In terms of Part 2 of the RMA the following provisions are considered to be relevant to this proposal:

### 7.1 Section 5 - Purpose

- (1) *The purpose of this Act is to promote the sustainable management of natural and physical resources.*
- (2) *In this Act, "sustainable management" means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while -*
  - (a) *Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
  - (b) *Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
  - (c) *Avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

Applying Section 5 involves an overall judgement of whether a proposal would promote the sustainable management of natural and physical resources. In practice, there are two general elements that must be considered when assessing the resource consent application. They are:

- Enabling people and communities to provide for their social, economic and cultural wellbeing.
- Safeguarding environmental quality and avoiding, remedying or mitigating adverse effects.

Section 5 of this report addressed the contribution that this activity will continue to make to enabling people and communities to provide for their social, economic and cultural wellbeing and health and safety, in particular through the economic benefits that dredging disposal offers.

The specialist reports and discussion in Section 5 of this report have addressed how the proposed replacement disposal sites will sustain the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations, and how the life supporting capacity of the environment will be safeguarded. It is noted also that the port facilities are a significant physical resource in their own right.

In terms of the requirement to avoid, remedy or mitigate adverse environmental effects, we consider the effects of the ongoing dredging disposal activity have been comprehensively studied and assessed through the monitoring work carried out over the last 15 years and specifically the reports prepared as a condition of the current consent. The relevant adverse environmental effects have been identified and it is considered that they can be appropriately avoided, remedied or mitigated through appropriate conditions of consent.

### 7.2 Sections 6, 7 and 8

Sections 6, 7 and 8 of the RMA set out the principles to be applied in achieving the purpose of the Act. These principles are subordinate to the overriding purpose of the Act. Potentially relevant matters include:

- Section 6(a) natural character of the coastal environment;
- Section 6(d) maintenance and enhancement of public access;

- Section 7(c) maintenance and enhancement of amenity values;
- Section 7(d) intrinsic values of ecosystems;
- Section 7(f) the quality of the environment; and
- The provisions contained in Sections 6(e), 7(a) and Section 8 addressing the Treaty of Waitangi, kaitiakitanga and the relationship of Maori and their culture and traditions with their waahi tapu and customary rights.

Based on the assessment of effects undertaken, we conclude that there are no matters within these sections that would suggest the ongoing disposal of dredged material and the extensions to that activity proposed in this application, undertaken in accordance with the proposed conditions, will be inappropriate in terms of the relevant Section 6, 7 or 8 matters.



# 8. Consultation

## 8.1 Consultation undertaken

For this project, Port Otago has carried out consultation with a wide range of key stakeholders and the wider public in developing the future disposal regime and this consent application. A discussion of the consultation that has been carried out is provided below.

## 8.2 The Working Party

Condition 10 of the current resource consent RM 11.153.01 (and the consent prior to this) required that a formal Working Party be established and meet regularly to discuss and review the annual monitoring report and specific monitoring reports required in under the current consent in preparation for this long term consent application for the disposal activity.

The condition required that the Working Party include representatives of Te Runanga Otakou, Kati Huirapa Runanga ki Puketeraki, the Department of Conservation and Otago Regional Council. Furthermore, the condition required that a representative of the Surfbreak Protection Society and the South Coast Board Riders Association join the previously established Working Party to provide input on surfing interests.

The Working Party has met at least annually since its first meeting in January 2003, with more regular meetings held during the last few years leading up to the preparation of this consent application. Detailed minutes of all meetings have been kept and circulated in accordance with the consent requirements.

The following notes briefly summarise the activities of the Working Party during the period of the current consent RM 11.153.01.

### 30 April 2013

The Working Party discussed the Heyward Point disposal graph which showed a higher proportion of material from the Vulcan than previous years, with work in the upper harbour resulting in 150,000m<sup>3</sup> of material. Another 190,000m<sup>3</sup> of sand had been disposed at the Heyward Point site from the upper harbour. Inshore monitoring work was proposed to be undertaken over a six month period to understand the optimal size and location for future disposal sites. At Heyward Point, sand material disposed of below 16-17m was confirmed as unlikely to be mobilised.

Peter McComb<sup>11</sup> detailed his programme to measure waves and currents at Aramoana and Heyward Point. The surfing community showed interested in having a camera along with wave measurements. This was being investigated and likely to occur. Members of the surf community were opposed to disposal activity at Heyward Point and Aramoana under the three year consent. Surfers were unconvinced that the long disposal history and presence of the surf break demonstrated no adverse effects on surf wave quality. This was reinforced in a statement of position provided by the Surfbreak Protection Society which showed a “hardening” of their view advocating no disposal.

Overall capacity needed to achieve disposal of 450,000m<sup>3</sup> per annum to meet the Port’s needs. Martin Single<sup>12</sup> and Peter McComb were supportive of the increase at Heyward Point supported by monitoring, however the surfers did not accept this. It was noted that the intention of the

---

<sup>11</sup> From MetOcean Solutions Ltd

<sup>12</sup> From Shore Processes and Management Ltd

three year consent was to gain further information about the movement of material from the Heyward Point disposal ground so disposal and monitoring would help this.

#### 18 March 2014

The three year consent was finalised between the two meetings. Cameras and monitoring equipment had recently been set up in the water. Surfers reported that waves had been good at Whareakeake with few issues with the break. Total volume of disposal at Heyward had been less than consented; mostly silty material had been deposited in the deeper area. Total to be dredged in 2014 predicted to be around 150,000m<sup>3</sup>. Six monthly seabed surveys would begin within the next three months. Peter McComb prepared a draft report on the effect of further utilising the Heyward Point disposal ground on the wave climate. Since 2010 the mound at Heyward Point has shifted westward but there has been no change in wave height. There was a preference identified by the Working Party not to dispose at Aramoana over the following 6 months for monitoring purposes.

#### 29 September 2014

The Working Party reviewed a grid that had been established at the Heyward Point ground making disposal more targeted. This was proposed to be updated on a six monthly basis with a disposal plan aiming to spread material more evenly. The Working Party reported that feedback had been positive from the surfing community, as surfing at Aramoana had returned to 1980's conditions. A second monitoring camera was discussed and would be added at Aramoana looking at crest offsetting. It was agreed that to keep the beach healthy there will be a need for continued deposition at Aramoana. Surfers would like ease of access to waves to be a main consideration in deposition activity. Changes have been made to the disposal regime at Heyward Point to stop waves breaking on the mound. All attendees agree to not dispose at Aramoana for up to one year. Peter McComb will circulate a plan showing the current and a proposed new Heyward Point disposal ground.

#### 19 March 2015

The proposed new Heyward Point disposal ground was discussed at this meeting. Rock components will be disposed of in the deeper north-west corner of Heyward site. At the Aramoana site sediment is being dumped in five to six metre wide contours to keep the beach nourished. To manage the Aramoana site 50,000m<sup>3</sup> of sediment will be disposed per annum in late 2015 and early 2016. The next report will have more modelling and further information on what material has been disposed of at Aramoana.

#### 3 August 2015

Port Otago outlined ongoing dredging and disposal activities and presented the six monthly dredging plan for feedback. Martin Single presented his recently updated report on shore change north of the disposal sites. The Working Party discussed the disposal plan and agreed that precision of disposal and recording would be critical to the adaptive management approach. It was agreed to reinforce this to the dredging crew. Peter McComb recommended undertaking the disposal plan and issuing an interim update in three months if required. Biological work was also discussed, with the group agreeing that a larger disposal area at Heywards would provide more opportunities to manage effects. The meeting concluded with an update on the long-term consent application and consultation that was being planned in the lead up to lodgement.

#### 15 February 2016

Surf monitoring feedback and camera records were reviewed. Disposal records were discussed and it was noted that the disposal operation had been able to keep in the nominated area with careful management. A possible change in the shape of the Aramoana disposal ground as part of the adaptive management process was discussed. It was confirmed that there is no

proposed increase in the disposal volume. Ongoing arrangements for Port Otago to supply sand to Ocean Beach for Dunedin City Council were outlined. Feedback was provided on the recent consultation carried out during open days and meetings with interested parties. It was agreed that the consultation was effective and no major concerns were raised. The meeting concluded with an overview of the biological monitoring report and preparation of the integration report with recommendations for the long-term disposal regime.

### Summary

The Working Party meetings have been constructive and positive, and have been key influence on the proposal outlined in this consent application. We understand in general, the Working Party supports the new disposal sites and the management regime outlined in this AEE.

## **8.3 Iwi consultation**

Port Otago regularly meets with the Manawhenua Consultative Group (MCG) established as an engagement forum for the Project Next Generation capital works. The MCG is working with Port Otago to design and implement a cultural monitoring programme including the development of cultural health indicators for key matters of importance to iwi.

Port Otago staff met with members of the MCG on 11 November 2015 in relation to Project Next Generation with the new disposal area for Heyward Point and this consent application also being discussed. The proposal was outlined along with the timing for the lodgement of the consent application. Port Otago were directed to Kai Tahu Ki Otago Ltd (KTKO) to progress formal consultation on this project.

Specific contact was made with KTKO and all iwi groups were sent letter about the public consultation held in October 2015 (and discussed further in Section 8.5 below). A 1:1 meeting was held on 17 December 2015 between Lincoln Coe<sup>13</sup> and Tim Vial<sup>14</sup>, and led to an understanding that KTKO would:

- Review the relevance and currency of the May 2010 Cultural Impact Assessment prepared for Project Next Generation for this current project;
- Coordinate interviews with Manawhenua groups to discuss the project;
- Review technical information prepared by Port Otago's consultants to identify any cultural issues arising from the scientific work.

A follow up letter was been sent to KTKO to outline the above agreement, to supply the relevant technical reports, and to request KTKO to commence their review. A further meeting with KTKO was held on 15 April 2016. KTKO have commenced their review of the Cultural Impact Assessment (CIA) and technical information. A further meeting with KTKO was held on 24 May 2016. A technical discussion was held between the KTKO technical reviewer and the authors of the modelling and ecological reports that support this AEE, on 27 May 2016. It is understood that an updated CIA can be expected in July 2016.

Feedback provided by KTKO and Manawhenua representatives to date has indicated the importance of adopting a holistic approach to the cultural effects of the disposal activity and the need to manage the cultural issues and engagement in a similar manner as has been established for Project Next Generation. This means the MCG and the cultural monitoring programme and cultural health indicators are relevant to this proposal also. On this basis, we have included in Section 10 of this AEE, a suggested condition which reflects the conditions imposed concerning engagement and cultural monitoring from the Project Next Generation consent.

---

<sup>13</sup> Port Otago Ltd

<sup>14</sup> KTKO Ltd

At the time of completing this AEE, the updated CIA was not available. However, recent meetings have indicated the following interest areas:

- Importance of protecting food gathering areas, including areas of rocky coastline
- General support for the adaptive management approach, provided triggers are appropriate and there is good monitoring
- A desire to deal with maintenance and capital dredging and disposal activities in an integrated manner.

Port Otago looks forward to receiving the updated CIA and will review this carefully and initiate further meetings with iwi through KTKO as appropriate. Port Otago will consider any recommended additional mitigation to address cultural effects identified in the CIA, as far as practicable.

## **8.4 Other key stakeholders and interested parties**

Port Otago informed the Port Environment Liaison Committee of the long term inshore disposal consent at meetings held on 8 September 2015. Attendees were also specifically invited to attend the public open days.

A Department of Conservation representative attended a public open day session. To date, the Department of Conservation has not requested a 1:1 meeting and no concerns have been reported other than issues raised and identified during the Working Party meetings.

The following interested parties were specifically invited to attend the public open days to discuss the long term disposal proposal and specifically the proposal for an extension to the Heyward Point site:

- Otago Rock Lobster Industry Assoc. Inc
- Port Chalmers Fishermen's Co-operative Soc. Ltd
- Southern Clams Limited
- Pauamac 5 Incorporated
- T Taiaroa
- Argo Fishing Company Limited
- NZ Federation of Commercial Fishermen (Inc)
- Port Otago Fisherman's Co-op
- The Marine Protected Area Forum
- The Aramoana Conservation Society
- Yellow Eyed Penguin Trust

Further to this, an informal meeting was requested and held with the Otago Rock Lobster Industry Association on 14 October 2015.

## **8.5 Public open days**

### **8.5.1 Public notice**

A public notice was published in two regional newspapers to advise of the public of the open days (or drop in sessions). The public notice was featured in the Star on 8 October 2015 and was reoccurring in the Otago Daily Times from 10 – 15 October 2015.

### **8.5.2 Media release**

A media release informed the public of the existing resource consent and the requirement for a new consent under Section 124 of the RMA. It also highlighted the locations and times of the public open days. An article about the open days and the consent renewal was published on 15 October 2015 in the Otago Daily Times.

### **8.5.3 Further media coverage**

Dunedin TV compiled a news article covering Port Otago harbour dredging and the capital development work. This aired on 29 September 2015. The link to the feature is as follows: <http://www.dunedintv.co.nz/news/infrastructure-upgrades-boost-business-port-otago>

The regional television channel also did a feature on residents' responses to the harbour dredging project. This aired on 15 October 2015 and can be found at the following location: <http://www.dunedintv.co.nz/news/dredging-project-generating-range-responses>

### **8.5.4 Public Open Days**

Two public open days (drop-in sessions) were held as the main method to inform the wider public about the new disposal consent, and specifically the large extension proposed to the Heyward Point site. The open days involved sharing information, educating a wide range of stakeholders and the community on the proposal and seeking feedback. These were held on the following dates at locations accessible to the local community:

- Wednesday 14 October 2015 - Port Chalmers Town Hall
- Thursday 15 October 2015 - Mercure Leisure Lodge, 30 Duke Street, Dunedin

27 members of the community attended over the two open days. Port staff and project consultants Mary O'Callahan (Planning), Peter McComb (Modeller), Graham Fenwick (Ecology) and Martin Single (Beaches) were available to explain the project and the likely effects. This was done on an informal basis while the public viewed display material relating to the project.

The open days provided an opportunity for the public to view the plans and discuss dredging disposal options including the option of an extended site at Heyward Point. Materials were used to enhance the public's understanding of the project. These included:

- Interactive models displayed on a computer called 'Wave Play' which demonstrated the effect of the proposal on surf and currents. This was available for the attendees to experiment with so they could understand the relationship between deposition and coastal processes.
- Video demonstrating Port Otago's dredge New Era operating within Otago Harbour. This aimed to clarify to the public what is involved in the process so they could visualise the effects.
- A large conceptual plan demonstrated the location of the new disposal area and how it would be used.
- Fact sheets and posters covering "Beaches", "Biology", "Surf" and "Why Inshore Disposal?" were displayed.
- Feedback forms were provided for attendees asking for comments on the following:
  - Key interests associated with the Otago Harbour
  - Preference for retaining disposal sites or allowing an extension at the Heyward site
  - Further concerns or comments

The range of interactive engagement material was both educational and interesting for the public.

## **8.6 Public feedback provided**

Limited feedback was garnered from the public open days with only ten feedback forms received. These submitters stance on dredging disposal was as follows:

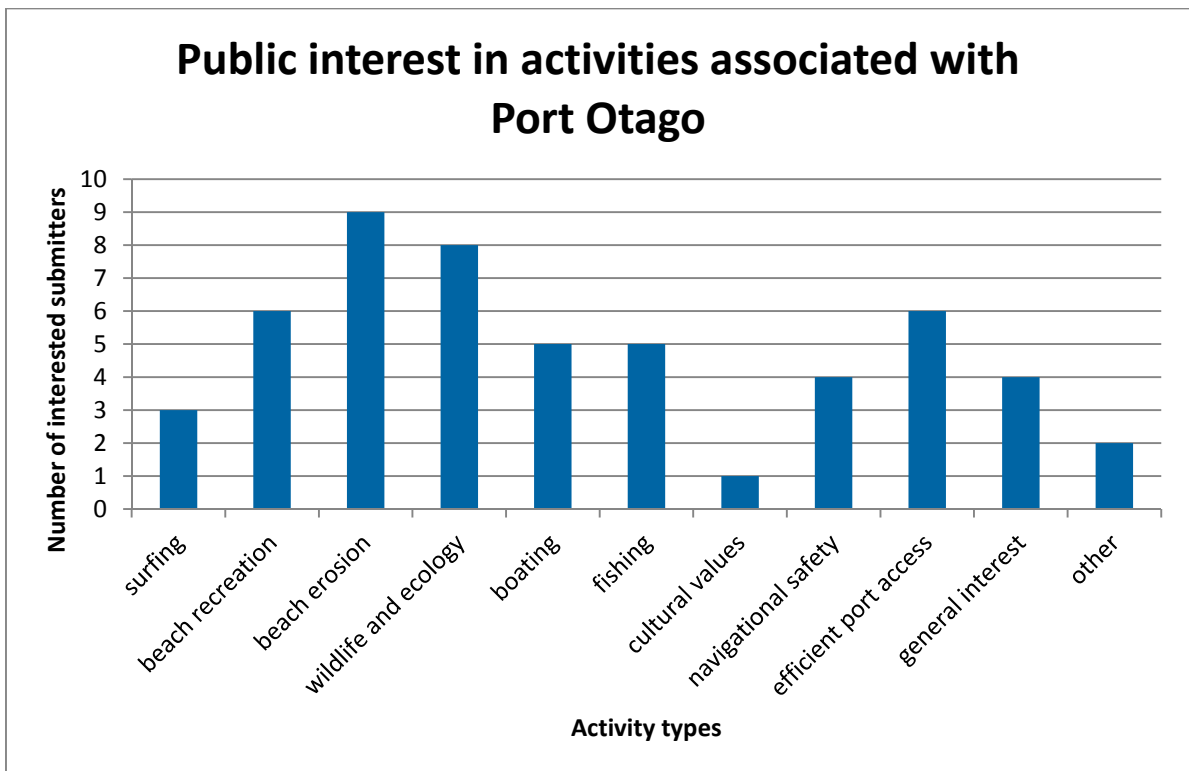
- 1 submitter supported retaining the existing disposal grounds
- 6 submitters supported allowing the extension to the Heyward site
- 1 submitter supported both retaining the existing disposal grounds and allowing the extension of the Heyward site
- 1 submitter selected the 'none of the above' option
- 1 submitter skipped the question

The feedback received has identified the following key concerns or interest areas:

- Support for ongoing monitoring of dredging effects on the surf and the marine environment
- Concern about beach erosion- Shelly Beach and Te Rauone Beach were noted to be in need of sand supply
- Interest in conserving wildlife and ecology- particularly kelp forest habitat and the Aramoana saltmarsh
- Support that future rock disposal should be placed in a designated area
- Support that ongoing care of the harbour and port should result in their use for future generations
- Belief that the harbour channel should be widened to support larger container ships to keep their business in Dunedin
- Concerned local trawl grounds will be affected by over dumping in deep water.

The public's interest associated with the harbour varied. Information gathered from the public open day and feedback forms highlighted the following interest areas.





## 8.7 Other consultation

### 8.7.1 Surfers website survey

A surf survey was a condition of the current resource consent to assist with community engagement over the disposal activity and its effects and to feed into the wave modelling work undertaken during the period of the current resource consent. A copy of the survey results is available on the Port Otago website at <https://www.portotago.co.nz/our-harbour/inshore-dredging-disposal-consent-renewal/monitoring-and-reports/#SurfSurveyReports>. The surf survey is an ongoing tool to gauge the public opinion of the surf quality adjacent to the disposal activity. By summarising the information in the surf surveys, the public perception of the surf can be used to gauge what constitutes good surf, and then cross referenced with surf models and photos. Accordingly, there has been a consultation aspect to the surf survey, which will remain live through the consultation and formal RMA process to provide an avenue for surfers' feedback.

The established surfers website has been enhanced during consultation, with January 2016 updates highlighting a need for feedback on surf conditions at Aramoana following a trial mound aimed at improving surf conditions. This has allowed for specific engagement and has created another avenue for public feedback on the disposal activity.

### 8.7.2 Project website

A project webpage is established and maintained on the Port Otago's website entitled "Inshore dredging disposal consent renewal". Information is supplied to the website regularly to update people on progress and upcoming events associated with the consent application.

## 8.8 Consultation on draft AEE

A draft copy of this AEE was circulated to all parties who attended the public open days and provided contact details, as well as iwi and Working Party members. The draft AEE was also

been available on the Port Otago website for viewing and comment from the end of April up until lodgement.

The draft AEE was discussed at the Working Party meeting held on 23 May 2016. The draft conditions of consent were discussed in detail and specific feedback was provided on these. The draft conditions in Section 10 of this AEE were subsequently updated to take account of feedback. Specific changes to the draft conditions included:

- Adding a condition requiring webcam monitoring of the Aramoana and Whareakeake surf breaks
- Linking the beach monitoring results with a requirement for adaptive management to address potential future erosion effects
- Better defining the rolling average volume limits and areas for bathymetric survey; and
- Adding criteria for defining different material types (sand, silt and rock) deposited within the grounds.

Feedback was also provided on habitat of the sea lion and yellow-eyed penguins in Blueskin Bay and potential impacts on marine mammals. This information and an assessment have been incorporated into Section 5.6.3 of the AEE, in consultation with the Department of Conservation representative on the Working Party.

Feedback was also received from the Aramoana Conservation Trust following a request to meet following circulation of the draft AEE. Two meetings were held with the Aramoana Conservation Trust on 19 and 24 May 2016.

The discussion centred on disposal site at Shelly Beach and a need to maintain sediment supply to benefit the sand dunes which assists with protecting marine mammals in this location. The Aramoana Conservation Trust's main concern was the sea lion and yellow-eyed penguins being able to roam free without interference from people. It was confirmed that Aramoana Conservation Trust were concerned about vehicles on Shelly Beach and on the road behind Spit Sand dunes and the Shelly Beach disposal site was not their main concern.

The Aramoana Conservation Trust considered that sand disposal at Aramoana disposal ground was good to prevent erosion of yellow-eyed penguin habitat. There were some comments made about future effects arising from the proposed 35-year term for the consent. The proposed monitoring and adaptive management safeguards were explained. Disposal records were also supplied.

The draft AEE was also discussed with ORC consents and compliance staff in May 2016, with some helpful suggestions received on the content of the document.

## **8.9 Notification**

Port Otago acknowledges the potential public interest associated with a long-term consent to dispose of dredged material and the proposed modifications to the sites used for this activity in the past. In this regard, the Port Otago is requesting that the resource consent application is publicly notified by the Council under Section 95A(2)(b) of the RMA, in order to provide a transparent process for the community.

## 9. Monitoring

Moving to a long-term consent for the disposal activity will require regular monitoring to ensure that unanticipated adverse effects do not arise. The proposed monitoring is set out in detail below and is reflected in the draft consent conditions in Section 10 of this report. The proposed monitoring and draft consent conditions incorporate an adaptive management process that will apply when certain thresholds or triggers are reached. The proposed adaptive management process is described in Section 9.5.5 below.

### 9.1 Monitoring for all sites

The following specific monitoring is proposed for all disposal sites. This is a continuation of the monitoring that has previously been carried out for the disposal activity:

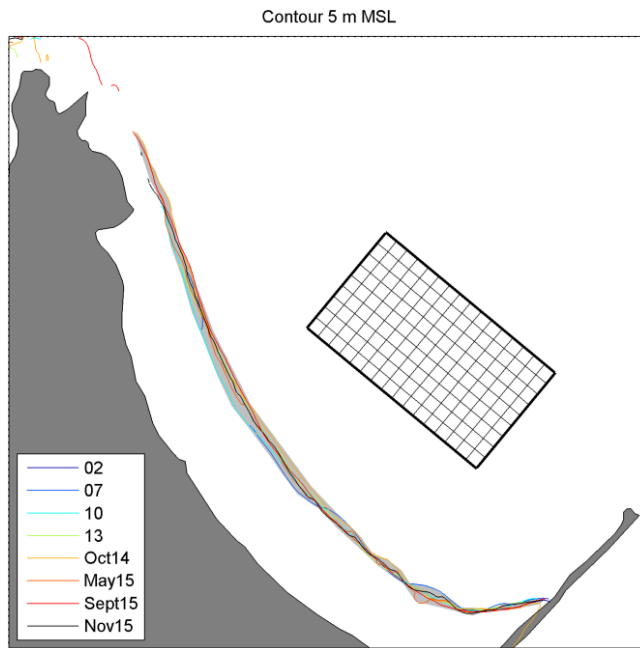
1. Detailed disposal records including volumes, disposal location, material type, source of claim and time of disposal.
2. Annual bathymetric surveys of the seabed in and around each disposal site.
3. Annual beach profile surveys and an assessment of the rate and extent of sediment accumulation in Blueskin Bay and the effect of disposal activity on beach health. These reviews shall be carried out yearly for the first 5 years and thereafter once every 5 years.

No site specific monitoring is recommended for the Shelly Beach site as disposal at this location is for community initiated environmental enhancement reasons rather than Port Otago requirements. The sand provides a source of material to an eroding beach which protects the saltmarsh ecological area to the south of Shelly Beach. The disposal activity is well accepted by stakeholders as being positive. Accordingly, beach profile surveys and assessment (as detailed above) consistent with the current consent held for the disposal activity is sufficient monitoring for this site. It is noted that the Shelly Beach site was not part of the scope of the wave or benthic ecology work, as no potential adverse effects have been identified with disposal at this location in the past.

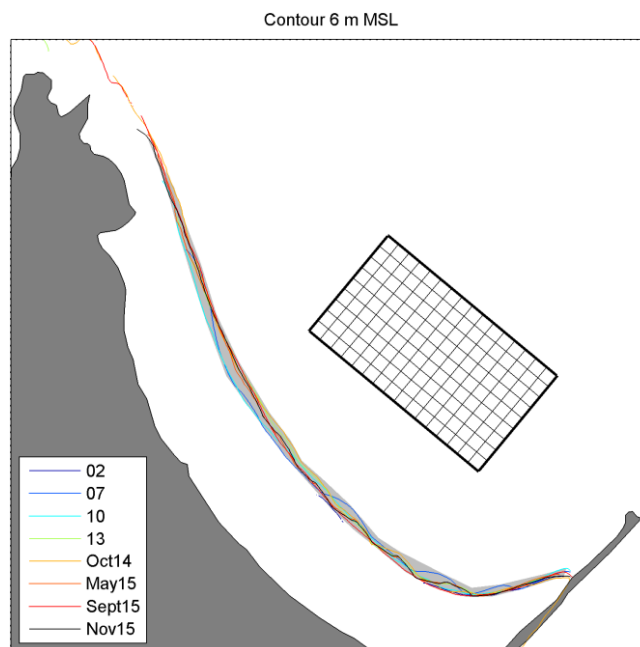
### 9.2 Specific monitoring for Aramoana site

The following specific new monitoring is proposed for the Aramoana site:

1. Annual review of bathymetric surveys to check that positions of the 5, 6 and 7 metre depth contours are consistent with the historical positions illustrated in Figure 8, Figure 9 and Figure 10 below. Where there is a departure from the specified contours, a review of the bathymetric surveys shall be undertaken by a suitably qualified expert in coastal processes to identify the potential for adverse effects on wave and sediment transport, and further expert reviews thereafter as recommended by the coastal process expert.

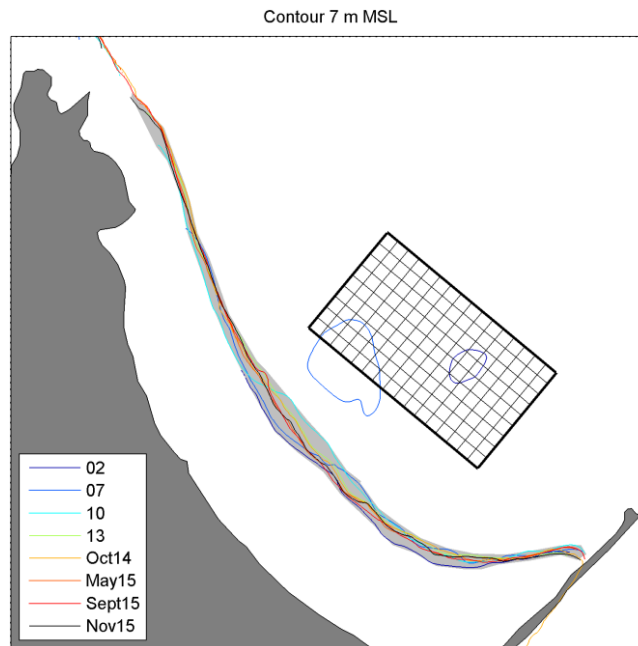


**Figure 8 Historical baseline for the 5 m isobath at Aramoana<sup>15</sup>**



**Figure 9 Historical baseline for the 6 m isobath at Aramoana<sup>16</sup>**

<sup>15</sup> Image courtesy of MetOcean Solutions Ltd  
<sup>16</sup> Image courtesy of MetOcean Solutions Ltd



**Figure 10 Historical baseline for the 7 m isobath at Aramoana<sup>17</sup>**

2. Ecological monitoring in accordance NIWA's recommendations for long-term ecological monitoring (NIWA, April 2016) should occur biennially (every two years) for at least the first six years. Thereafter, the frequency of sampling events should be as recommended by a suitably qualified ecologist, based on results of the previous surveys. A summary of NIWA's recommendations for ecological monitoring is provided in Section 9.4 below.

### 9.3 Specific monitoring for Heyward Point site

The following specific new monitoring is proposed for the Heyward Point site:

1. Annual review of bathymetric surveys to check the dimensions and depths of the mound and spur features (i.e. mound not less than 9.5 m below msl, surrounding 12 m depth contour greater than 300 m in diameter, no disposal on spur area within cells PC1,2,3,4 and PD1,2,3,4 and balance of material spread out evenly). Where there is a departure from the specified contours, a review of the bathymetric surveys shall be undertaken by a suitably qualified expert in coastal processes to identify the potential for adverse effects on wave and sediment transport, and further expert reviews thereafter as recommended by the coastal process expert.
2. Ecological monitoring in accordance NIWA's recommendations for long-term ecological monitoring (NIWA, April 2016) should occur biennially (every two years) for at least the first six years. Thereafter, the frequency of sampling events should be as recommended by a suitably qualified ecologist, based on results of the previous surveys. A summary of NIWA's recommendations for ecological monitoring is provided in Section 9.4 below.

### 9.4 Summary of recommended ecological monitoring

NIWA prepared a detailed ecological monitoring plan in May 2015 and then completed a first round of ecological monitoring later that year and proposed some changes to the initial monitoring recommendations at that time (NIWA, October 2015). The initial monitoring plan was then updated in April 2016 to reflect the changes recommended (NIWA, April 2016). These

<sup>17</sup> Image courtesy of MetOcean Solutions Ltd

reports are included in Appendix G. A summary of the proposed ecological monitoring regime is as follows:

- The purpose of the monitoring is to assess the effects of dredging disposal beyond the disposal ground boundaries and not within the grounds.
- Indicator species were considered as the basis for ecological monitoring, but NIWA recommended monitoring total benthos composition instead, coupled with reviewing differences between control and impact sites (this process may identify effective indicator species in the future). Community composition monitoring will involve comparison of total benthos abundance, total benthos richness or diversity, and species diversity. Replicate samples are recommended for each sampling site to facilitate more robust statistical comparisons between impact sites adjacent to disposal grounds and more distant control sites.
- Specific control and impact sites were set initially. The location for the far control sites were adjusted after the initial monitoring assessment was completed, due to the potential for riverine influences that were unrelated to the dredging activity. The recommended locations for impact monitoring sites (which are the monitoring sites located very close to the disposal grounds) were also adjusted to accommodate the proposed extension to the Heyward Point disposal site. Close matching of control and impact site depths (no more than  $\pm 1$  metre difference) was also recommended following the completion of the initial monitoring study.
- A trigger or threshold value for detecting potentially ecologically significant differences between control and impact sites on any given variable was proposed. This interim trigger level, the statistical probability (or chance; calculated using various statistical tests) that a difference in any of the identified benthos indicators between control and impact sites is due to chance alone (i.e., not due to dredging operations), was set at 0.2, or a chance of 1 in 5 (or less). Breaching this interim trigger level would not necessarily mean there are adverse ecological effects, but would trigger the adaptive management process. In the first instance, it would initiate closer consideration of available information to determine whether any change to operations management was required. The trigger level may be adjusted to become a more ecologically meaningful trigger level as successive sampling rounds are completed.
- The monitoring plan requires a report be prepared within three months of sampling. The report must analyse each new set of results, report on differences between impact and control sites, discuss any trends between successive surveys and confirm any recommended management measures or adjustments to monitoring.

## **9.5 Proposed adaptive management process**

### **9.5.1 Context**

Adaptive management is a means of minimising environmental harm from human activities when the environmental effects of an activity are uncertain. It draws upon the results and experience of monitoring to modify activities and responses, as the effects become known. Involving key stakeholders in the adaptive management process increases the effectiveness of adaptive management because it accommodates different perspectives, ensuring that any effects are managed to minimise compromising a range of values and not just a single issue. For these reasons, an adaptive management approach is proposed for the disposal activity, so that monitoring results can be reviewed by Port Otago in collaboration with either the existing Working Party or an alternative advisory forum established through this consent process.



### 9.5.2 Adaptive management process

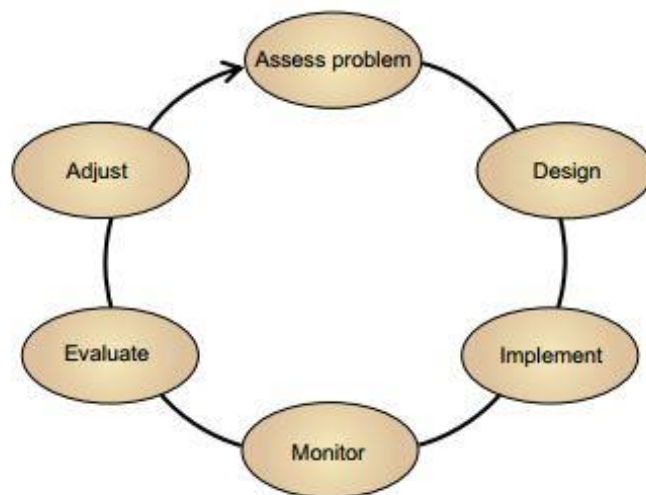
The adaptive management process is conceptually simple and helps to develop optimal outcomes in situations where environmental effects may be unknown in advance or where there remains an element of uncertainty. The second scenario is the case for this dredging disposal activity, as the effects on beaches, benthic ecology and surf are now well understood.

However, it is inevitable for an element of uncertainty to remain over the effects of activities that take place within complex coastal systems. Examples of the uncertainties that remain include:

- Changes to sediment and wave patterns once the channel deepening works are completed, potentially differing from the predicted effects on beaches and surfing waves;
- Sediment composition changing from that monitored in the past, potentially altering the effects on local ecology;
- Rising sea levels and associated changes in weather patterns may alter hydrodynamics and sedimentation processes.

Accordingly, an adaptive management process is recommended for the disposal activity. The adaptive management process would only be triggered if monitoring results were outside the trigger levels described in Sections 9.1, 9.2, 9.3 and 9.4 above (i.e. contours outside the recommended parameters, ecological trigger level exceeded, or potential beach health effects reported).

The process of adaptive management is illustrated in Figure 11. The process involves assessing and defining the operational problem(s), designing a management approach to achieve certain objectives, implementing that approach, monitoring the outcomes, evaluating the effectiveness based on monitoring results, then adjusting the operational activities and/or monitoring approach if required.



**Figure 11 Overview of the adaptive management process<sup>18</sup>**

### 9.5.3 Adaptive management objectives

For applying an adaptive management process to the deposition of dredge spoil within the disposal grounds, a set of clear objectives is necessary. The following objectives will be used to inform the adaptive management process:

<sup>18</sup> Image courtesy of NIWA

1. That beaches within Blueskin Bay have an adequate supply of sand such that beach health<sup>19</sup> is not adversely affected by disposal activity;
2. That disposal activity does not adversely affect surfing amenity at the Aramoana Spit and Whareakeake surf breaks; and
3. Ecological effects on functioning and diversity of benthic ecosystems beyond the disposal ground boundaries are avoided.

#### **9.5.4 Adaptive management steps**

The following adaptive management steps are proposed:

1. Science team undertakes routine monitoring, as detailed in Sections 9.1, 9.2, 9.3 and 9.4 above.
2. Science team collates data and prepares reports on findings, advising on whether expected monitoring results are being achieved.
3. Science team reports on monitoring findings to Port Otago.
4. Port Otago convenes a meeting of the Working Party or alternative advisory forum, which can be either a scheduled annual meeting, or a special meeting if required.
5. The Working Party or advisory forum reviews findings and agrees actions to remedy any observed effects that fall outside the objectives listed in Section 9.5.3 above.
6. Port Otago implements agreed actions.

When convened to evaluate monitoring results, whether routine or unexpected, the Working Party should evaluate all available monitoring results and information. The group's evaluation process may require further background work and additional discussions to determine the implications of any identified issues and to determine the most appropriate actions. Once actions are agreed, Port Otago will implement those actions and, if appropriate, initiate an agreed supplementary monitoring regime to evaluate the consequences of the remedial action, thus continuing the cyclic adaptive management process.

#### **9.5.5 Potential adaptive management responses**

One of the central elements to adaptive management is the uncertainty associated with outcomes from the human activities on the natural environment. The implement-monitor-evaluate steps are fundamental to all stakeholders' understanding how coastal processes respond to operational adjustments, and this learning will suggest further management actions. There is a range of management actions that may be implemented in response to the results of the monitoring. These will be examined in the light of the monitoring results, the concerns and desires of the key stakeholders through the Working Party or advisory forum and the requirements of the future consent for the activity.

Potential management actions might include:

- Do nothing.
- Revise objectives.
- Continue operations as they are while gathering some more specific information.

---

<sup>19</sup> Beach health includes consideration of whether beaches are adequately nourished with appropriate sediment; whether beaches are responding to changes in the wave environment/energy, in a way consistent with beach theory; and in relation to the port activities, not in a way that is non-systemic or focused by the disposal ground morphology.

- Continue operations as they are but monitor more frequently.
- Continue operations and adjust the type and nature of environmental monitoring, to better understand effects.
- Modify disposal operations (e.g., discharge material over longer time period while steaming at x knots).
- Temporarily relocate deposition while gathering some more specific information.
- Temporarily or permanently reduce the rate of deposition at one of the grounds.
- Development of a new disposal ground.
- Discontinue using one disposal ground (may require development of a new ground).

Determining just what actions are optimal in any situation will require close attention to the project's objectives and Working Party views on values and their priorities. Compromise is inevitable, so a key part of the process is ensuring that the projects' agreed objectives are clear, kept in focus and revised as appropriate.

# 10. Draft consent conditions

## Volumes

1. The following specific maximum annual discharge quantities shall apply:
  - (i) No more than 450,000 cubic metres in total shall be disposed of on an annual basis across the three sites.
  - (ii) The total volume deposited at the Heyward Point site shall not exceed an average of 200,000 cubic metres / year, calculated over any 5-year period, except that if for any reason disposal at Aramoana is not available, then an average of 300,000 cubic metres / year can be accommodated in this ground (calculated over any 5-year period) provided that disposal ceases at Aramoana during the same period.
  - (iii) The total volume deposited at Aramoana should not exceed an average of 100,000 cubic metres / year, calculated over any 5-year period.
  - (iv) No more than 50,000 cubic metres shall be disposed of on an annual basis at Shelly Beach.

## Material Type

2. Material discharged shall only be derived from dredging that is authorised by the Coastal Plan or by a resource consent, and that is sourced from the Otago Harbour and its entrance.
3. Disposal of sand, silt and rock within the Heyward Point disposal ground must be deposited in accordance with the specified cells for each material type on Figure 6<sup>20</sup>.

For the purposes of this consent:

- “silt” means solid material that is less than 63 microns in size
  - “sand” means solid material that is more than 63 microns and less than 2 mm in size, apart from natural background material such as shells
  - “silt load” means that solid fraction of any individual hopper load that contains less than 65% of sand material
  - “sand load” means the solid fraction of any individual hopper load that contains more than 90% of sand sized material.
4. Only sand material shall be deposited within the Aramoana site.
  5. Material discharged at the Shelly Beach site shall not be derived from any further westward of Longitude 170° 39' 50" (being in the vicinity of Otago Harbour beacons 15 & 16A between Pulling Point and Tayler Point), and, as far as practicable, be only discharged on an ebb tide. No rock material is to be disposed of at the Shelly Beach site.

## Disposal Records

6. The consent holder shall record the following information in relation to the disposal of material at each of the three disposal sites.
  - (i) the volume of dredge material in each disposal event;
  - (ii) the volume and percentage of each material type in each event;
  - (iii) the source geographic claim location information;
  - (iv) the GPS location (WGS84 format) of the event;

---

<sup>20</sup> Figure 6 (on Page 31 of this AEE) would form an attachment to the consent

- (v) the date and time of disposal; and
- (vi) a cumulative total of the volumes of disposal (including material type) from the commencement of the consent.

The records shall be kept and submitted in report format, including digital records that allow for GIS plotting, to the consent authority on an annual basis, no later than the anniversary of the date of the commencement of this permit.

#### Bathymetry Survey

7. As a minimum, the consent holder shall undertake annual bathymetric surveys of the seabed at each of the disposal site locations and the beach areas inshore of these. All bathymetric surveys shall have an accuracy of 0.25 metres vertically. The extent and frequency of bathymetric survey may be amended with the agreement of the Working Party and the consent authority.
8. The consent holder shall submit an annual report to the consent authority no later than the anniversary of the date of the commencement of this permit that summarises the results of all bathymetric surveys undertaken in accordance with this consent and shall clearly indicate the degree of change to the seabed in the surveyed areas.

#### Bathymetric Checks

9. An annual report on bathymetric surveys shall be prepared for the Heyward Point disposal site to check the dimensions and depths of the mound and spur features are within the following limits:
  - (i) The mound within cells PB5,6,7, PD5,6,7, and PC5,6,7 is maintained in its present location and is not less than 9.5 m below mean sea level;
  - (ii) The 12 m depth contour surrounding the mound is greater than 300 m in diameter;
  - (iii) That minimal disposal occurs on the spur area within cells PC1,2,3,4 and PD1,2,3,4 illustrated on Figure 6; and
  - (iv) That the balance of material is spread out evenly.

The limits have been specified to ensure that the mound is managed in a manner that avoids it becoming too high above natural seabed level, or the sides of the mound becoming too steep. This is required to avoid the creation of wave interference patterns and wave crest disruptions at the Whareakeake surf break.

The report shall be submitted to the consent authority on an annual basis, no later than the anniversary of the date of the commencement of this permit.

Where there is a departure from the specified contour levels, a review of the bathymetric surveys shall be undertaken by a suitably qualified expert in coastal processes to identify the potential for adverse effects on waves and sediment transport, and the adaptive management process outlined in Condition 20 shall be commenced.

10. An annual report on bathymetric surveys shall be prepared for the Aramoana disposal site to check the positions of the 5, 6 and 7 metre depth contours are consistent with the historical positions illustrated on Figure 8, Figure 9 and Figure 10<sup>21</sup>.

The report shall be submitted to the consent authority on an annual basis, no later than the anniversary of the date of the commencement of this permit.

---

<sup>21</sup> Figure 8, Figure 9 and Figure 10 of this AEE would form an attachment to the consent

Where there is a departure from the specified contour levels, a review of the bathymetric surveys shall be undertaken by a suitably qualified expert in coastal processes to identify the potential for adverse effects on wave and sediment transport, and the adaptive management process outlined in Condition 20 shall be commenced.

#### Surf Recording

11. A visual or photographic record of surf conditions shall be maintained and archived for the Aramoana and Whareakeake surf breaks. This shall be made available and reviewed as necessary, in the event that the adaptive management Condition 20 is triggered and the Working Party identifies a potential surf quality issue. This data is to be recorded through webcams or alternative technology as agreed with the Working Party. Visual recording may be discontinued in the future, with the agreement of the Working Party and the consent authority.

#### Ecology

12. Prior to using any dredge with a hopper capacity of greater than 1000m<sup>3</sup> for disposal activities, the consent holder shall confirm the dredge's passive plume and deposition footprint and seek advice from a suitably qualified ecologist to determine if any additional monitoring is required to detect ecological effects on kelp forests and associated algal communities and invertebrates.
13. Ecological monitoring shall be carried out for the Heyward Point and Aramoana disposal sites in accordance the report entitled "Port Otago inshore dredging disposal programme – recommendations for long-term ecological monitoring" prepared by NIWA, dated April 2016. Monitoring is to be carried out biennially (every two years) for at least the first six years from the date of the commencement of this permit. Thereafter, the frequency of sampling events should be as recommended by a suitably qualified ecologist, based on results of the previous surveys.
14. A report summarising the results of the monitoring shall be prepared by suitably qualified ecologist and submitted to the consent authority within three months of sampling. The report must analyse each new set of results, report on differences between impact and control sites, discuss any trends between successive surveys and review overall ecological effects. The report should also review the suitability of the 0.2 significance level (1 in 5 chance that two values differ by chance alone) as a trigger for the adaptive management process and advise on any necessary adjustments for future monitoring.
15. Where the threshold for adaptive management is triggered (which will be confirmed in the report required by Condition 14), the adaptive management process outlined in Condition 20 shall be commenced.
16. The consent holder is to take all reasonable efforts to avoid harm to marine mammals, feeding birds or schooling fish during dredging operations. This includes the following measures:
  - a. A competent observer will be on board the dredge, and will watch for any marine mammal, feeding birds or schooling fish within 300m of dredging equipment. A competent observer is part of the normal crew who has been briefed and trained with respect to avoidance of marine mammals and sightings of endangered species.
  - b. In the event that feeding birds or schooling fish are sighted, the dredge will avoid those feeding birds and schooling fish as far as practicable, whilst not compromising the safety of vessels or personnel.
  - c. In the event a marine mammal is sighted, whilst not compromising the safety of vessels or personnel, the following actions will be taken:
    - i. The dredge will avoid the mammal as far as practicable;



- ii. The dredge will avoid approaching the marine mammal head on;
- iii. The dredge will maintain a constant speed when within 300m of the mammal;
- iv. The dredge will avoid sudden changes in direction;
- v. The sighting, and any management actions undertaken will be recorded, and reported to the Department of Conservation and Otago Regional Council. Reporting shall be on an annual basis.

#### Beach Monitoring

17. Beach profile surveys for the Aramoana, Kaikai, Murdering, Long, Purakanui, Warrington Spit, Karitane and Shelly beaches and a beach monitoring report shall be prepared by a suitably qualified expert in coastal processes annually for the first 5 years from the date of the commencement of this permit and thereafter once every 5 years. The beach monitoring report shall provide an assessment of the rate and extent of sediment accumulation at the beaches in Blueskin Bay and the effect of disposal activity on beach health. Where this report identifies any potential adverse erosion effects potentially attributable to disposal activities, the adaptive management process outlined in Condition 20 shall be commenced.

#### Kai Tahu Engagement

18. The consent holder shall work with representatives of the local hapu, iwi and the East Otago Taiapure Committee as part of the “Manawhenua Consultation Group” (MCG) established under Project Next Generation consents<sup>22</sup>.
- (i) The purpose of the MCG shall be to facilitate consultation between Manawhenua and Port Otago Ltd on capital and maintenance dredging and disposal activities.
  - (ii) The MCG shall have the following functions:
    - (a) To facilitate consultation on the design and implementation of the cultural monitoring programme, including the development of cultural health indicators for key species of importance to Kai Tahu;
    - (b) To receive and review the monitoring data and reports from the cultural, physical and biological monitoring undertaken as part of Project Next Generation, and this consent. If necessary, technical expertise shall be made available by the consent holder to interpret the monitoring data;
    - (c) On an ongoing basis to evaluate the cultural impacts of Project Next Generation, and maintenance dredging, on Otago Harbour and the Te Tai o Arai Te Uru (Otago Coastal Marine Area);
    - (d) To make recommendations to the consent holder on appropriate changes to the cultural monitoring framework to ensure that it delivers timely focused results for the improved management of the project.
  - (iii) Proposed changes to the monitoring and/or dredging and disposal operation in response to recommendations of the MCG shall be reasonably considered by the consent holder and implemented to the extent practicable.
  - (iv) The MCG shall be given an opportunity to comment on all proposed adaptive management measures before the consent holder finally considers them. Any adaptive management recommendation shall be submitted to the consent authority to ensure that it complies with the conditions of consent.

---

<sup>22</sup> ORC consent reference numbers 2010.193 - 2010.200 and 2010.202 – 2010.203

- (v) The consent holder shall, in complying with the notification requirements of this consent to the consent authority, or when monitoring or research activities are being planned, or when results are to be submitted in accordance with this resource consent, invite the MCG to a meeting to discuss any matter and share this information prior to submitting the information to the consent authority. The information shall be provided to the MCG sufficiently in advance of the meeting so that the MCG has time to review and consider it.
- (vi) Notwithstanding clause (v) the consent holder shall, at least once per calendar year, invite representatives of the consent authority and the MCG to a meeting to discuss any matter relating to the exercise and monitoring of this consent. At this time the consent holder shall, in addition to any matters relating to the exercise and monitoring of this consent, use its best endeavours to inform the MCG of the likely dredging to be undertaken in the following year.
- (vii) The consent holder shall keep minutes of the meetings held in accordance with clause (v) and (vi) and shall forward them to all attendees.
- (viii) The meetings required by clause (v) and (vi) need not occur if the MCG notifies the consent holder (for clause (v) and (vi)) and the consent authority (for clause (vi)) that the meeting is not required.
- (ix) The consent holder shall provide final copies of the reports prepared in accordance with these conditions to the MCG concurrently with them being submitted to the consent authority.
- (x) The MCG shall be serviced by the consent holder.
- (xi) All members of the MCG shall use their best endeavours to resolve all issues before it. If any matter remains unresolved then the consent holder shall refer each unresolved matter to its Board immediately and the Board shall take all practicable steps to resolve any outstanding issues with Kaumatua including (if necessary) appointment of an independent mediator.

#### Working Party

19. The consent holder shall continue to work with the Working Party established as a condition of former maintenance disposal consents (2000.472 and RM 11.153.01) which includes representatives of Te Runanga Otakou, Kati Huirapa Runanga ki Puketeraki, Surfbreak Protection Society, South Coast Board Riders Association, Department of Conservation and Otago Regional Council. The Working Party shall meet at least annually to discuss and review the annual monitoring report, and other reports required by this permit.

#### Adaptive Management

20. If required by Conditions 9, 10, 15 and 17 the consent holder shall commence the adaptive management process. This will include, but not be limited to, convening the Working Party to evaluate monitoring results. The Working Party should evaluate all available monitoring results and information and agree actions to remedy any observed effects that fall outside the objectives listed below:
- (i) That beaches within Blueskin Bay have an adequate supply of sand such that beach health is not adversely affected by disposal activity;
  - (ii) That disposal activity does not adversely affect surfing amenity at the Aramoana Spit and Whareakeake surf breaks; and
  - (iii) Ecological effects on functioning and diversity of ecosystems beyond the disposal ground boundaries are avoided.

Once actions are agreed by the Working Party, Port Otago will implement those actions and, if appropriate, initiate any agreed supplementary monitoring regime to evaluate the consequences of the remedial action. Details of any adaptive management carried out shall be included in the annual report submitted to the consent authority.

21. In the event of any dispute, disagreement or inaction arising between the consent holder and the Working Party on adaptive management actions or monitoring required by Condition 20, the matter shall be referred in the first instance to the Compliance Manager, Otago Regional Council to determine a process for resolution of the dispute, disagreement or inaction.

If a resolution cannot be agreed within 10 working days of requesting Council assistance, the matter may be referred to an independent appropriately qualified expert, appointed by the Council, setting out the details of the matter to be referred for determination and the reasons the parties do not agree. The qualified expert shall be appointed within 20 working days of the Council giving notice of their intention to seek expert determination. The expert shall issue a decision on the matter within 40 working days of their appointment.

The decision of the qualified expert is binding on the consent holder and shall be implemented.

#### Reporting

22. The consent holder shall provide a summary report to the consent authority, Working Party and MCG every 12 months and no later than the anniversary of the date of from the commencement of this permit. This report shall include but not be limited to the following:

- (i) Results of monitoring and reporting completed in the previous 12 months,
- (ii) The monitoring work programme for the next 12 months,
- (iii) Recommendations on any adaptive management required for any adverse effects that have arisen over the previous 12 months that are attributable to disposal activities.

#### General

23. During the exercise of this consent, the consent holder shall take all practicable precautions to protect public safety at all times.

24. The consent holder shall ensure that no fuel or oils enter into the coastal marine area as a result of these works. This shall include the maintenance of machinery at all times to prevent leakage of fuel or oil into the coastal marine area. In the event of contamination, the consent holder shall instigate remedial action and shall notify the consent authority as soon as practicable.

25. The consent authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within three months of each anniversary of the commencement of this consent for the purpose of:

- (i) ensuring that the monitoring regime is appropriate; or
- (ii) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; including but not limited to:
  - (a) the effects of the exercise of this consent on the ecology and water quality of the near shore and offshore areas; or
  - (b) the effects of the exercise of this consent on surf breaks of national significance identified in the NZCPS (2010); or

- (c) the appropriate mitigation of the environmental effects of the activity having regard to the available deposition technology.

# 11. Conclusion

Port Otago Limited (Port Otago) is seeking a new replacement coastal permit for existing permit RM 11.153.01 to allow for the continued disposal into the sea of up to 450,000m<sup>3</sup> per year of dredged material. The disposal of dredged material is proposed to continue to occur at the currently consented sites, subject to some modification and extension to the boundaries of two of the three sites. A term of 35 years is sought for this consent.

In the event that an extension to the disposal sites sought is not approved, then Port Otago is seeking as an alternative, the renewal of existing coastal permit RM 11.153.01, subject to the terms and conditions of this existing permit.

This application seeks the ability to continue to dispose of dredged material to sites which are specifically recognised for this activity within the Regional Plan. Consent is sought for a 35-year term on the basis that the known effects of the activity are now well understood and suitable consent limits and robust monitoring are recommended to manage any unforeseen adverse effects on the coastal environment. A 35-year consent term is appropriate in recognition of the considerable investment associated with Port Otago's facilities and business. Furthermore, there is a need for long-term certainty over the future environmental management of an essential operational activity required to be carried out by Port Otago, both for the port company and the wider community and key stakeholders interested in and affected by the disposal of dredged material.

The adverse effects of the proposal can be adequately managed so they will be no more than minor, taking into account the specialist reports prepared for this application, which are based on monitoring undertaken over the last 15 years. The activity has a number of positive effects also.

The proposal is consistent with the objectives and policies of the relevant planning documents.

The proposal represents sustainable management as defined in Part 2 of the RMA. The coastal processes are stable and no Section 6 or 7 matters will be adversely affected by the continued disposal activity. The consent conditions provide for ongoing engagement with iwi, consistent with the Part 2 requirements of the RMA. Accordingly, the application meets the requirements of the RMA.

Consent should be granted subject to appropriate conditions of consent as set out in Section 10 of this report.

# References

- Kai Tahu Ki Otago Ltd. (May 2010). *Cultural Impact Assessment Project Next Generation Otago Harbour*.
- Lusseau, D. (1999). *A Review of Dredging Activities in Otago Harbour and their Relocation: 1899 – 1998*.
- MetOcean Solutions Ltd. (August 2015). *Port Otago Maintenance Dredging Disposal Studies - Simulations of dredge disposal plumes and associated deposition at the proposed new Heyward Point disposal ground*.
- MetOcean Solutions Ltd. (June 2016). *Port Otago wave and sediment dynamics study – recommendations on the long term strategy for inshore dredging disposal*.
- NIWA. (April 2016). *Blueskin Bay inshore dredged sediment disposal – assessment of ecological effects*.
- NIWA. (April 2016). *Port Otago inshore dredging disposal programme - Recommendations for long-term ecological monitoring*.
- NIWA. (October 2015). *Benthos of inshore Blueskin Bay – monitoring effects of dredged sediment disposal*.
- Otago Regional Council. (2001). *Regional Plan: Coast for Otago*.
- Ryder Consulting Limited. (2015). *Dunedin Citu Stormwater Compliance Monitoring Report*.
- Shore Processes and Management Ltd. (July 2015). *Long-term shoreline change analysis, Otago Harbour entrance to Karitane*.
- Shore Processes and Management Ltd. (May 2011). *Port Otago maintenance dredging consents - physical coastal environment*.
- Shore Processes and Management Ltd. (September 2015). *Beach profile surveys and morphological change, Otago Harbour entrance to Karitane May 2014 to June 2015*.
- URS New Zealand Limited. (2012). *Assessment of Environmental Effects: Dunedin City Council Marine Stormwater Discharges*.



GHD

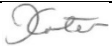
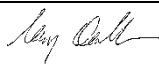
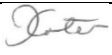
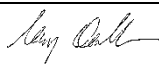
GHD Building  
226 Antigua Street, Christchurch 8011  
T: 64 3 378 0900 F: 64 3 377 8575 E: chcmail@ghd.com

© GHD 2016

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

G:\51\32601\Technical\AEE\Dredging disposal application 29.4.16.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1.0	Mary O'Callahan	Janice Carter		Mary O'Callahan		29.04.16
2.0	Mary O'Callahan	Janice Carter		Mary O'Callahan		28.06.16

[www.ghd.com](http://www.ghd.com)

