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EC - CHCH
FILE REF: PAIC/192
DOCUMENT No.:
14 MAR 2008
~~23773~~ 23773
ACTION
INFO
P McGurgan

13 March 2008

Shelley Washington
Lyttelton Harbour Issues Working Party
Environment Canterbury

Attention: Shelley Washington

Dear Shelley

LYTTELTON SEABED CONTAMINATION. INTERIM MANAGEMENT PLAN

This letter relates to an area of seabed contaminated by historic boat maintenance activities at the dry dock located in Lyttelton inner harbour. Your organisation has been identified by us as having an interest in the management of this contamination.

The area adjacent to the dry dock has been extensively investigated, both through chemical analysis of sediment samples and through toxicity studies and a marine survey. The results of these investigations have shown that although a defined area of sediment is contaminated above relevant guideline values, the impact of this contamination is acceptable/tolerable. The decision has therefore been reached to manage the sediment in place. This decision will be reviewed in the future, as defined in the *Lyttelton Seabed Contamination Interim Management Plan* (ECan 2008), which is enclosed for your information.

Cultural values have been considered in deriving this conclusion, in the form of production of a cultural impact assessment.

Implementation of the plan is the joint responsibility of Lyttelton Port of Christchurch, the Department of Conservation and Environment Canterbury.

Yours sincerely

Helen Davies

Helen Davies
CONTAMINATED SITES TEAM LEADER
HMD

Encl. *Lyttelton Seabed Contamination Interim Management Plan* (ECan 2008). Report No. R08/10.

Our Ref: IN7C/735
Your Ref:
Contact: Helen Davies
helen.davies@ecan.govt.nz

Lyttelton Seabed Contamination

Interim Management Plan

Report No. R08/10
ISBN 978-1-86937-756-4

Helen Davies

February 2008

Environment Canterbury
Your regional council

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ISBN 978-1-86937-756-4

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DOCUMENT CONTROL

Site identification	Lyttelton Inner Harbour, Lyttelton Lot 6 DP 67082 Valuation Number 2380000100G See Figure 1
Site owner/administrator	Department of Conservation (on behalf of New Zealanders)
Site occupier	Lyttelton Port of Christchurch
Version:	1
Date:	27 February 2008
Produced by:	Environment Canterbury
Date of implementation:	February 2008
Date for review:	February 2018 (or earlier)

Acknowledgements

This plan has been based on studies conducted by various organisations. In particular, the plan has used feedback from URS NZ Ltd, and their role is acknowledged.

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1.0 BACKGROUND

A dry dock and a patent slip, located within Lyttelton port, have been in operation since construction in the 1880s.

The results of investigative work have shown that the seabed is contaminated with elevated levels of several metals, tributyl tin (TBT) and organics near the dry dock area of the Inner Harbour. The studies indicate that the highest concentrations of contaminants occur in the immediate vicinity of the dry dock area and extend outward to approximately 60 – 80 metres offshore. While contaminants have been found both in other areas of the Inner Harbour and outside the Inner Harbour, the concentrations of constituents of concern outside the close proximity of the dry dock have generally been reported to be less than applicable guidelines. The average depth of contamination has been interpreted to extend to between 0.5 and 0.7m below seabed level (URS 2002). The contaminants of concern are presented in Table 1. The extent of contamination above the ANZECC ISQG High guideline values (ANZECC & ARMCANZ 2000) for all contaminants analysed is shown in Figure 1.

Table 1. Contaminants of concern, Lyttelton inner harbour seabed

Contaminant	Range (mg/kg)	ANZECC 2000: ISQG – Low (mg/kg)	ANZECC 2000: ISQG – High (mg/kg)
TBT	<0.001 – 51.9	0.0005*	0.07
Copper	10 - 7340	65	270
Lead	15 - 1160	50	220
Mercury	0.11 - 22	0.15	1
Zinc	66 - 3340	200	410
Total LPAH	<0.3 – 51.65	0.552	3.16
Total HPAH	0.96 – 42.62	1.7	9.6
Total DDT	0.002 – 0.177	0.0016	0.046
DDE	0.012 – 0.03	0.0022	0.027
Total PCB	<0.01 - 80	0.023	-

*MfE/MSA (1999) disposal at sea criteria

Toxicity tests have been performed on sediments taken from the patent slip and graving dock area and other locations in the Inner Harbour and outside the Inner Harbour (NIWA 1997). The results of the tests confirm that sediments from sites nearest the graving dock are significantly more toxic to the test species than the control sediment samples. In fact, the toxicity testing on samples obtained closest to the graving dock exhibited amphipod mortality rates of 100%. (URS 2002)

However, management of the sediment contamination in place is currently considered acceptable for at least the short term, due to the following:

- Assuming the available sediment quality data is comparable, on average, levels of contamination in the dry dock appear to have decreased substantially since 1995, when Cawthron (2006) sampled at the same locations.
- A bioaccumulation study (Cawthron 2006) has found that the concentrations of trace metals in fish and mussel tissue were below the applicable FSANZ (2004) food guidelines. Likewise, the edible portions of biota sampled also contained levels of organotins below the WHO allowable daily intake values (IPCS 2001).
- The human health risk through consumption of fish caught recreationally has been assessed in Cawthron (2006) as being "very small" and furthermore, access to the Inner Harbour waterfront is highly restricted and hence there is little opportunity for recreational fishing in close proximity to the dry-dock.
- Sediments at both the dry-dock site and the inner harbour reference site have been shown to have low species richness, with the dominant species being of an opportunistic nature, indicating that the benthic community may remain limited within the inner harbour irrespective of what remediation works were completed in the vicinity of the dry dock.
- Elevated concentrations of contaminants not related to the dry-dock activities such as polychlorinated biphenyls (PCBs) and contaminants not exclusively related to dry-dock activities such as polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH) were identified during the sampling conducted by Cawthron in 1995. The presence and distribution of these contaminants suggests that the continued operation of other contaminant sources such as stormwater drains and the general port activities could result in adverse biological effects within the inner harbour irrespective of any remedial works in the vicinity of the dry-dock.
- Management of sediment in-situ is tolerable to Ngāti Wheke ki Rāpaki, although it does not meet their long term strategic objectives (Couch 2006).

The sediment will be managed by Environment Canterbury, the Department of Conservation and Lyttelton Port of Christchurch. These organisations have the following roles associated with the area of contaminated sediment:

- The Department of Conservation is responsible for managing the seabed on behalf of New Zealanders.
- Lyttelton Port of Christchurch occupies the site with port activities and structures in the inner harbour area. Additionally, Lyttelton Port of Christchurch is the current owner of the graving dock and patent slip (the structures from which the historic contamination was sourced).
- Environment Canterbury has responsibility for monitoring of water and sediment quality in Canterbury.

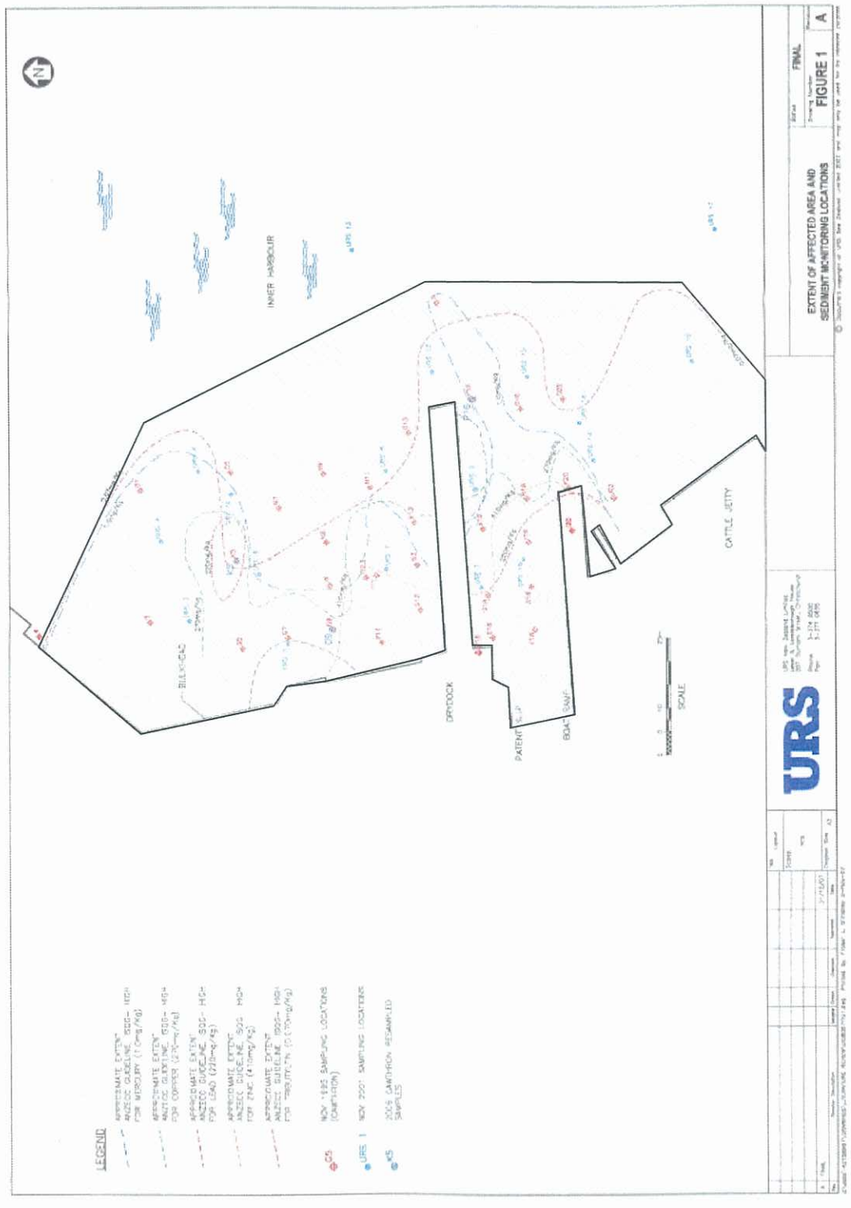

Figure 1. Lyttelton seabed contamination plumes and 'contaminated zone' (shaded) (from URS 2007 and URS 2002)

2.0 OBJECTIVES OF THE PLAN

This Interim Management Plan has been prepared in order to manage adverse effects of contaminated sediments associated with the area shown in Figure 1, to minimise disturbance of the sediments and to ascertain that the area of contamination is not extending. Management of the current discharge from current activities at the dry dock is not addressed in this plan and is covered in resource consent conditions (CRC064165).

The potential for exposure to contaminants via any development within, or adjacent to this area is not addressed in this Plan. This includes dredging and any development of the Western Inner Harbour that may impact or be impacted by the contaminated sediment. The risks associated with these activities need to be addressed through specific site management plans (see Section 4.0).

The term of this plan is ten years (until 2018), at which time a plan for longer term management of the sediment will be produced and implemented.

3.0 RISK SUMMARY

3.1 Background

This section briefly outlines the exposure routes for contaminants based on current use of the area with impacted sediments.

The assessment of Lyttelton Inner Harbour sediments has identified concentrations of copper, mercury, lead, zinc and TBT in excess of the ISQG High value (ANZECC & ARMCANZ 2000) in the area around the dry dock. Toxicity studies have shown these sediments to be toxic to benthic biota (URS 2002).

3.2 Exposure Pathways

For contaminants to present an unacceptable level of risk, there has to be a complete pathway for exposure to these contaminants. The exposure pathways identified for the contaminated sediments are:

1. Direct uptake of contaminants by benthic biota (including bottom feeding fish) and consequential degradation of these communities;

2. Direct uptake of contaminants by benthic biota (including bottom feeding fish) and introduction to the food chain and subsequent human consumption;

3. Direct uptake of contaminants by benthic biota (including bottom feeding fish) and introduction to the food chain and consequential degradation of these communities;

4. Transport of contaminated sediments to the outer harbour leading to potential deposition in recreational waters and direct human contact (dermal or ingestion).

3.3 Nature of risk

Based on the data collected it is anticipated that the risk to human health from the contaminated sediments is low. Direct contact with the sediments is unlikely and sediment transport studies have shown that although it is possible for movement of sediments to the outer harbour, this will not take place in the short term or on a large scale (OCEL 1998).

Management of the sediment contamination in place is currently considered acceptable for at least the short term due to the reasons set out in Section 1.0.

3.4 Cultural considerations

In addition to the exposure pathways detailed in Section 3.2, Te Hapū o Ngāti Wheke Rapāki believe management of the contaminated sediment in place will have a significant impact on the long-term cultural strategies of the tangata whenua of Whakaraupo / Lyttelton harbour requiring ongoing liaison (but acknowledging the impact is tolerable in the shorter term). This has been assessed and reported in the Cultural Impact Assessments of Te Hapū o Ngāti Wheke Rapāki (Couch 2003, 2006).

Consideration of cultural impact is required prior to any work in this area, and this includes consultation with iwi. In addition, the final version of this plan, all updates to it and the annual monitoring report should be forwarded to Te Hapū o Ngāti Wheke Rapāki and Te Rūnanga o Ngāi Tahu.

4.0 GENERAL PROTECTION MEASURES

4.1 Dredging

The 'contaminated zone', as indicated by the shaded area in Figure 1, shall not be dredged without a specific management plan to address control of the movement of contaminants and appropriate disposal of dredged material. These plans shall be produced by the party undertaking the activity, and provided to Lyttelton Port of Christchurch and Environment Canterbury for approval. Any dredging in the 'contaminated zone' will be reported in the annual monitoring report.

5.0 MONITORING

5.1 Discharge consents

Activities within a 200m radius of the dry dock with current consents issued by Environment Canterbury are monitored by Environment Canterbury Environmental Protection Officers. An annual summary related to any non-compliance with consent conditions, or other matters relevant to contamination of the seabed from current activities, and actions to address identified consent issues will be produced by Environment Canterbury.

5.2 Sediment quality

5.2.1 Monitoring rationale

The appropriateness of long-term management of the contaminated sediments *in situ* is dependant in part on confirmation that the area of sediment containing contaminants at concentrations exceeding the ANZECC ISQG High values is not extending. On this basis, the sediment quality sampling has the objective of confirming this.

Decreases in concentration observed at a given sampling location are thought to be due to dispersion of the contaminated sediment and/or mixing with less contaminated sediments during periods of re-suspension, combined with a reduced source of contaminants from the dry-dock.

In order to confirm that the dispersion and/or mixing processes discussed above are not resulting in any significant change in the extent of the contaminated sediments, it is

proposed to monitor a number of locations currently outside the zone where sediments containing contaminants exceeding the ANZECC ISQG High values have been recorded.

The proposed monitoring locations (5) are presented in Figure 2, along with the locations of previous sediment sampling and the interpreted areal extent of exceedance of the ANZECC ISQG High values for the contaminants of concern.

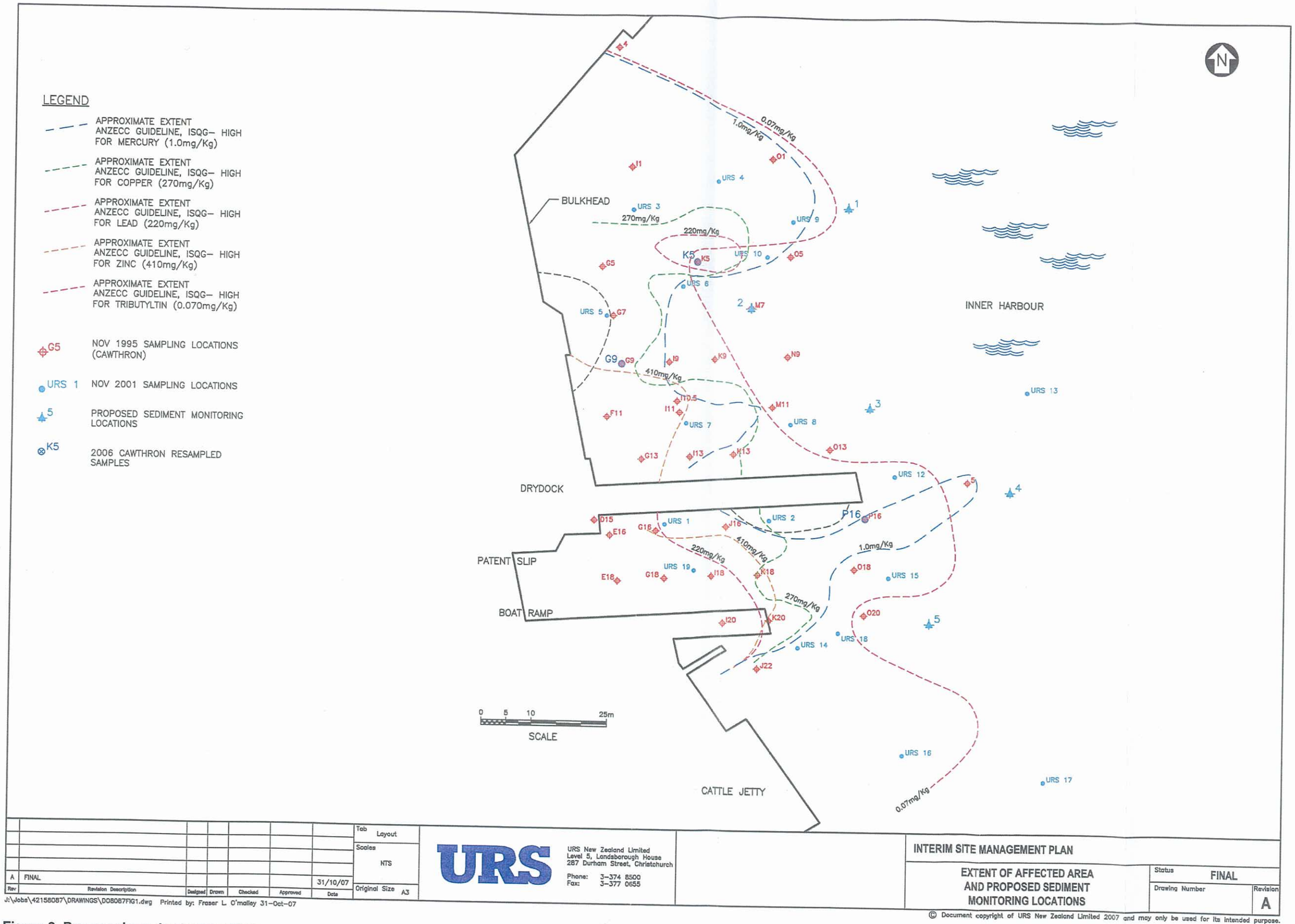

Figure 2. Proposed monitoring locations

5.2.2 Monitoring methods and sampling programme

5.2.2.1 Sampling locations

The five approximate sample locations are shown on Figure 2. It is considered appropriate that due to the objectives of the sampling and compositing method proposed, repeat samples in following years can be collected within 2m of the initial sample location.

5.2.2.2 Sample depth and sampling method

It is recommended that the sampling method employed should enable an undisturbed core or box grab sample to be obtained. From this, the upper 2cm of sediment will be segregated for preparation of a composite sample which will be submitted for analysis. Each sample submitted for analysis should be prepared by compositing sediment from three individual samples taken approximately 0.5m apart. Sampling shall be undertaken by an appropriately qualified and trained person.

5.2.2.3 Sampling frequency

Sediment sampling should be undertaken on an annual basis for the first five years at which time a review of the data and need for further sampling will be undertaken. All sampling is to be undertaken during the months of February or March. If the initial sampling identifies one or more sampling locations where the ANZECC ISQG High values are exceeded then alternative monitoring locations need to be identified and re-sampled to ensure that an appropriate baseline exists against which subsequent sampling rounds can be compared.

5.2.2.4 Sample analysis

All samples should be analysed for copper (Cu), mercury (Hg), lead (Pb), zinc (Zn) and tributyltin (TbT) to an appropriate limit of detection. Samples should be analysed by an appropriately accredited laboratory, and samples shall be transported to the laboratory under chain of custody.

5.2.2.5 QA/QC

A duplicate sample will be submitted from one of the five composite samples collected during each sampling round.

5.2.3 Reporting

An annual report shall be completed within 6 weeks of receipt of analytical reports from the laboratory. The monitoring report should provide a location plan presenting the sampling location and a table documenting the GPS co-ordinates of the sampling location. Each report should present the analytical results in tabular and graphical form, such that any spatial or

temporal trends can be identified. Comparison of the analytical results should also be made with the relevant sediment quality guidelines (currently ANZECC & ARMCANZ 2000).

The report should include an assessment of any trends in contaminant concentrations and comment on the apparent stability of the contaminant concentrations (or otherwise).

6.0 IMPLEMENTATION OF THE PLAN & REPORTING

Environment Canterbury, Lyttelton Port of Christchurch and the Department of Conservation take responsibility for implementation of this plan as detailed in Table 2 below.

Reporting will be conducted annually.

Table 2. Implementation of the Interim Management Plan

Item		Responsible Party	Contact name
1	Production of specific dredging management plans, as required, and approval of these plans by Environment Canterbury and Lyttelton Port of Christchurch	• Party conducting dredging activity • Environment Canterbury • Lyttelton Port of Christchurch	• Contaminated Land Team Leader • Mike Day
2	Co-ordination of annual reporting subcomponents, and collation into single report, finalised and distributed by the end of May each year	• Environment Canterbury	• Contaminated Land Team Leader
3	Reporting of incidents related to the 'contaminated zone', and associated responses	• Environment Canterbury	• Contaminated Land Team Leader
4	Reporting of dredging activity undertaken in the 'contaminated zone'	• Lyttelton Port of Christchurch	• Mike Day
5	Production of report on discharge consents within 200m of the dry dock	• Environment Canterbury	• Contaminated Land Team Leader
6	Production of report on sediment quality sampling	• Environment Canterbury • Department of Conservation • Lyttelton Port of Christchurch	• Contaminated Land Team Leader • Bryan Jensen • Mike Day
7	Identification of the need for an update to the Interim Management Plan	• Environment Canterbury • Department of Conservation • Lyttelton Port of Christchurch	• Contaminated Land Team Leader • Bryan Jensen • Mike Day
8	Liaison with Te Hapū o Ngāti Wheke Rapāki	• Lyttelton Port of Christchurch	• Mike Day
9	Applications to the Ministry for the Environment's Contaminated Sites Remediation Fund, if appropriate	• Environment Canterbury	• Contaminated Land Team Leader

The annual report will be provided to the following parties:

1. Environment Canterbury
2. Department of Conservation
3. Lyttelton Port of Christchurch
4. Te Hapū o Ngāti Wheke Rapāki and Te Rūnanga o Ngāi Tahu
5. Lyttelton Harbour Issues Working Party

7.0 COMMUNITY RELATIONS

In addition to distribution of the annual report as indicated in Section 7.0, each annual Monitoring Report will be available in .pdf format on the Environment Canterbury website (contaminated sites pages). Each report will also be available in hard copy, on request.

8.0 REVIEW PERIOD

This Monitoring and Management Plan will be reviewed as required.

The term of this plan is ten years (until 2018), at which time a plan for longer term management of the sediment will be implemented.

9.0 REFERENCES

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