



**TO: Infrastructure & Environment Committee**

**ON: 1 December 2009**

**AUTHOR: Stormwater Operations Project Engineer**

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**Summary:**

On 10 February 2009 the Infrastructure and Environment Committee resolved that:

- "2. Council officers carry out the proposed investigations required for desilting the Onepoto lakes and report back to the Infrastructure & Environment Committee in November 2009".
- "3 That Council officers clarify those significant issues in relation to the Chelsea ponds as identified in the report with New Zealand Sugar Limited and then carry out the proposed investigations required for desilting the Chelsea ponds".

This report addresses these resolutions.

**Onepoto lakes** SKM Consultants were commissioned to carry out a study of potential desilting options and associated costs. This report recommends dredging to give a minimum water depth of 1.5 metres with drying and disposal of the silt on site as a cost-effective and relatively non-disruptive option. The cost is anticipated to be of the order of \$620,000. This option balances the costs and risks of dredging against the ongoing operational effectiveness of the ponds to achieve an optimum result as long as monitoring of the lakes and planned maintenance continues. The option will enhance amenity use, improve ecological function and reduce the incidence of weed growth and odour.

This project was not included in the North Shore City Council 2009-24 City Plan.

Further investigations, detailed design and obtaining consents from the Auckland Regional Authority and the North Shore City Council is required before desilting works can commence.

**Chelsea ponds** The required clarification between NSCC and NZS has been completed and some preliminary investigations and remedial works have been carried out. This report also provides an update to the I&E Committee on:

- A. the actions put in place this year to proactively mitigate the sick water fowl problem;
- B. other remedial works and investigations Infrastructure Services has carried out; and
- C. the significant cost implication to Council for mitigating the identified problems.

**Officer's Recommendations:**

- 1. That the report be received.
- 2. The option recommended in the report of dredging the Onepoto lakes to give a minimum water depth of 1.5 metres be approved.
- 3. That Council officers continue the required investigations in 10/11 at a cost of \$56,000 for the Onepoto lakes and \$110,000 for the Chelsea ponds, with the source of funding to be determined through the 10/11 Annual Plan process, and report the results of the investigation to the Auckland Council.

**Links to, and Consistency with:**

Policy		Description of link and the consistency or inconsistency	Reference
(a)	City Blueprint:	A unique and natural environment: strengthening protection for our streams, lakes and beaches.	P15
(b)	City Plan:	Not specifically mentioned.	
(c)	Annual Plan:	Not specifically mentioned.	
(d)	District Plan:	District Plan Change 23	
(e)	Other council strategies/plans:	Not specifically mentioned.	
(f)	Council Policy Manual:	Not specifically mentioned.	

Significance		High	Medium	Low
(a)	Impact [implication x how many people affected]		Medium	
(b)	History of public interest	High		
(c)	Impact on the council budget or capacity		Medium	
(d)	Can the decision, policy or proposal be reversed?	Is a significant project and concerns various park user groups.		
(e)	Describe any alteration of service levels of any council significant activity	None.		
(f)	Describe any impact on any council strategic assets	No significant impact at this stage. However, after implementation of the required remedial works. The Chelsea ponds and Onepoto lakes will provide better amenity use and improved environmental value.		
(g)	Does this decision involve changing the way in which a significant activity is delivered?	No		
(h)	If this is a significant decision, how does it take account of the relationship of Māori to ancestral land, water, sites, waahi tapu, valued flora and fauna, and other taonga?	It is not a significant decision at this stage. However, it will be a significant decision when extra funding is required for carrying out the required remedial works in the future. Resource consents from Auckland Regional Council and North Shore City Council are required. The Department of Conservation and New Zealand Heritage Trust also need to be consulted.		

Community views		
(a)	What information does the council have on community views on this matter?	Reserve Management Plan for the Onepoto Domain. Emails and phone calls to Council since Council purchased the Chelsea park, particularly during last summer.
(b)	What communication and/or consultation has been undertaken?	Meeting with affected volunteer or user groups held to capture their concerns and aspirations about the Onepoto lake condition. No formal consultation has been carried out regarding the Chelsea ponds.
(c)	What consideration has been given to community views on this matter?	One of the reasons for carrying out the investigation was in response to the local community concerns.
(d)	Further consultation is required during the detailed design and consenting processes	

**Auckland Transition Agency Requirements:**

Tick Yes or No to each question		Yes	No
(a)	Does the decision being made -		No
	<ul style="list-style-type: none"> <li>significantly prejudice the reorganisation</li> </ul>		

		<ul style="list-style-type: none"> <li>significantly constrain the powers or capacity of the Auckland Council or any subsidiary of the Auckland Council following the reorganisation</li> </ul>		No
		<ul style="list-style-type: none"> <li>have a significant negative impact on the assets or liabilities that are transferred to the Auckland Council as a result of the reorganisation</li> </ul>		No
(b)	Does this decision impact meet any of the following criteria -	<p><b>For policy development</b></p> <ul style="list-style-type: none"> <li>Adopting a policy required by the Local Government Act 2002</li> </ul>		No
		<ul style="list-style-type: none"> <li>that is significantly inconsistent with, or is anticipated to have consequences that will be significantly inconsistent with, any policy or plan adopted by the existing local authority under the Local Government Act 2002</li> </ul>		No
		<p><b>Funding</b></p> <ul style="list-style-type: none"> <li>to set a rate other than in accordance with its long-term council community plan</li> </ul>		No
		<ul style="list-style-type: none"> <li>to borrow money for a period that extends beyond 30 June 2011</li> </ul>		No
		<p><b>Assets and contracts</b></p> <ul style="list-style-type: none"> <li>to purchase or dispose of assets other than in accordance with its long-term council community plan</li> </ul>		No
		<ul style="list-style-type: none"> <li>to enter into any contract (other than an employment agreement) — <ul style="list-style-type: none"> <li>that imposes, or will continue to impose, any obligation on the existing local authority after 30 June 2011; and</li> <li>the consideration for which is, or is equivalent to, \$20,000 or more</li> </ul> </li> </ul>	Yes	
		<p><b>Council Controlled Organisations</b></p> <ul style="list-style-type: none"> <li>to establish, or become a shareholder in, a council-controlled organisation</li> </ul>		No
		<ul style="list-style-type: none"> <li>to adopt or amend a policy concerning the appointment or remuneration of directors of a council-controlled organisation</li> </ul>		No
		<ul style="list-style-type: none"> <li>to appoint a person as a director of a council-controlled organisation</li> </ul>		No
		<ul style="list-style-type: none"> <li>to agree to, or modify, the statement of intent of a council-controlled organisation</li> </ul>		No

**Background:**

**1. Onepoto Lakes**

**1.1 Background**

Onepoto Domain contains two lakes – an upper lake separated from a lower lake by a shallow weir. The upper lake is fed by two streams from the north and east which have historically deposited large quantities of sediment into the upper lake. The lower lake is also fed by a third stream. The lower lake has a tidal control structure through which it discharges into the main Onepoto stream, or through which saline water from the estuary is allowed to feed back into the lakes. Onepoto domain is widely used by the community and concerns have been expressed about the silt quantities in the lakes and the impact on amenity value.

As requested by the Birkenhead-Northcote Community Board, a report was presented to Council's Infrastructure and Environment Committee on 10 February 2009 regarding the desilting of the Onepoto lakes. The report proposed further investigations in order to develop an appropriate desilting methodology to arrive at a reasonably accurate cost estimate. The Committee resolved:

"2 That Council officers carry out the proposed investigations required for desilting the Onepoto lakes and report back to the Infrastructure & Environment Committee in November 2009".

The proposed investigations have now been completed. The purpose of the investigation was to:

- Identify how much silt needing to be removed from the lakes to meet the Council objectives of:
  - improved lake water quality
  - increased water depth for recreational purposes
  - reduced weed growth and odour
  - enhanced the local ecology and amenity
- Identify an appropriate desilting and disposal methodology and location
- Develop a cost estimate

## **1.2 Investigation results**

### **1.2.1 Volume, distribution and quality of sediments in the Lakes**

The investigation found that sediment depth varies but that the upper lake contains significantly greater quantities. The sediment depth varies depending on location. The centre of the upper lake and the lower lake, immediately below the weir have sediment depths of over one metre. The calculated volume of sediment in the upper lake is 5,010 cubic metres and in the lower lake is 1,250 cubic metres.

Three sediment samples were taken from each lake and analysed. The results indicate that the contaminant concentration in the sediments meets the guidelines for cleanfill disposal and as such can be disposed of to land – ideally on-site if an appropriate location can be found. Discussions with the ARC have confirmed this fact. A resource consent will still be required.

### **1.2.2 Options of pond desilting methodology and associated costs**

The proposed method of desilting the lakes is to isolate them and work on them separately. This has the advantage of having one pond available at all times for stormwater treatment to protect the downstream estuary and help maintain the existing ecology. Incoming base flow can be over-pumped around the working area. Excavated material will be transferred to the adjoining parkland, initially dewatered before disposal. Discussions have taken place with the Council's parks and reserves officers to identify a potential drying site and permanent disposal site.

Two options have been considered. One is to remove all of the sediment. This would meet the Council's objectives outlined above. The other is to only dredge the shallow areas to give a minimum water depth of 1.2 metres. This would give significant amenity enhancement but may not fully meet all of the objectives.

The options of a land based or water based desilting operation have been considered. Depending on the method, material would either be trucked to the drying site or pumped directly from the dredger. Options for dewatering are drying beds or purpose-made fabric drying bags - geobags. The principal advantage of geobags, although time consuming to fill is that they enable a greater height of reclamation to be constructed and are more effective at managing odour.

The disposal options are:

- On site contouring and cover. The preferred disposal area is on the eastern side of the upper lake as shown in Figure 1.
- Removal off site to a managed cleanfill site.
- A combination of the above, depending on the quantities to be removed and whether there is sufficient room on site.

For all options installing sediment forebays is a potential add-on feature to enhance future pond performance and ease of long term maintenance by trapping sediment before entering the lakes. For all options maintenance of the weir and floodgates will be required to ensure their water tightness.

**Figure 1 - Preferred dewatering and disposal area**



The methods considered above can be summarised into the following main options:

Options	Desilt and Disposal	Sediment Volume (m3)	Dewatering	Disposal	Costs
1	Excavator from bank and causeways and truck to off site disposal area	6,260	None	Landfill	\$1.95M
2	Suction dredge and pump to off site disposal area	6,260	Geobag in drying area	Landfill	\$2.15M
3	Suction dredge and pump to on site disposal area	6,260	Geobag in drying area	On site fill and topsoiling	\$1.55M
4	Suction dredge and pump to on-site disposal area	905 (based on 1.2m depth contour)	Geobag in drying area	On site fill and topsoiling	\$0.45M
5	Suction dredge and pump to on-site disposal area	1,778 (based on 1.5m depth contour)	Geobag in drying area	On site fill and topsoiling	0.62M
6	Suction dredge and pump to on-site disposal area	2,789 (based on 1.7m depth contour)	Geobag in drying area	On site fill and topsoiling	0.83M
7	Suction dredge and pump to off site disposal area	905 (based on 1.2m depth)	Geobag in drying area	Landfill	\$0.52M

### 1.3. Option analysis

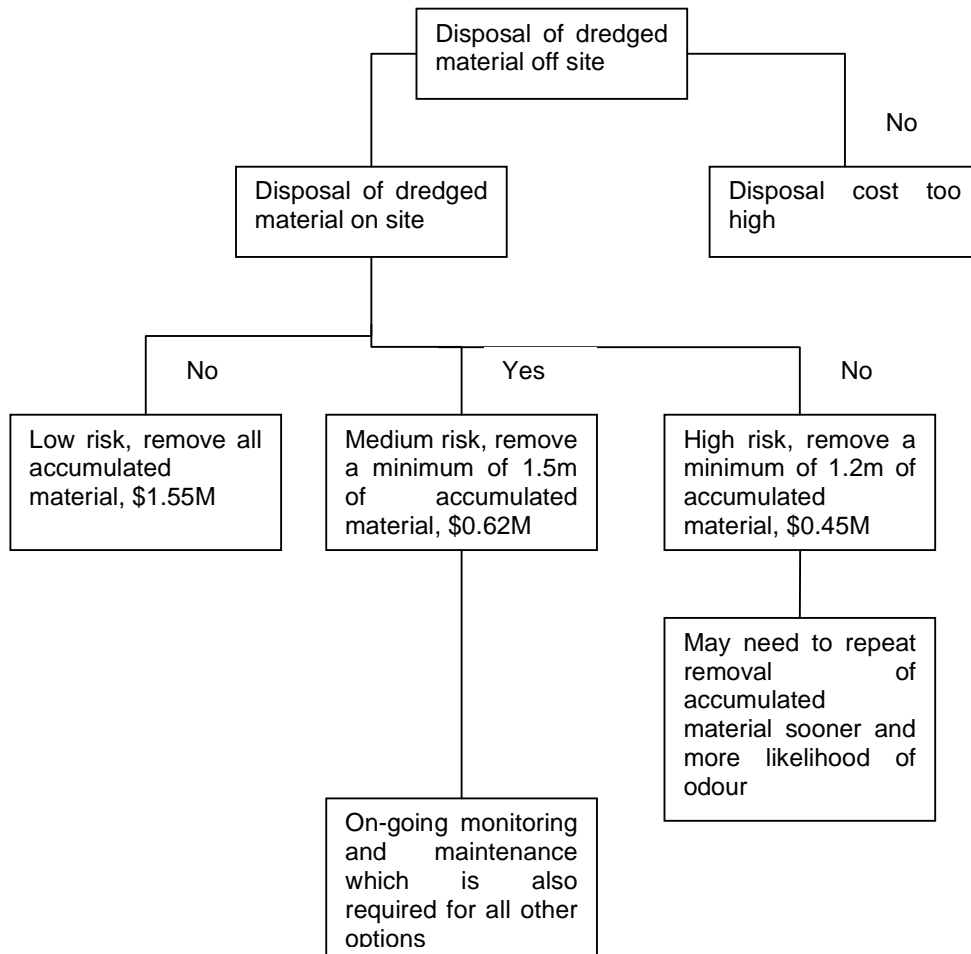
The following factors were considered when we carried out the option analysis:

- Disposal of dredged sediments
- Potential disturbance to the Domain users during desilting operation

- Effectiveness in relation to recreational use, weed and odour control, improvement of amenity, and stormwater treatment
- Risk of not achieving the desired results
- Effects on the stability of lake banks and other structures associated with the lakes
- Cost

Figure 2 shows the selection process. Based on consideration of the above factors, Option 5 (dredging to 1.5 metres and disposing of sediment on site) is the preferred option, as this option best balances the long-term effectiveness, risk, costs, and potential effects on the stability of lake banks.

**Figure 2 Option selection process**



#### 1.4. Further investigations and detailed design

Unlike other stormwater ponds, we need to get consents from the Auckland Regional Council and the North Shore City Council. Detailed design is required to accurately identify quantities and provide information to apply for consents. Landowner consent is required from the Birkenhead-Northcote Community Board. The local community and the Department of Conservation will also need to be consulted. We also need to identify and manage risk. There may be opportunities to optimise/reduce the reclamation area and a post-remediation management plan will need to be developed to cover ongoing saline flushing, pond aeration to minimise and manage any future operational problems.

#### 1.5 Funding

Funding of \$56,000 is required in the 10/11 Annual Plan to carry out detailed design and obtain the required consents. The cost of physical works were not known at the time the North Shore City Council 2009-24 City Plan was prepared and were not included. As the project is proposed to be undertaken in 11/12 and 12/13 the funding for it will need to be considered by the new Auckland Council.

## 1.6. Risks and opportunities

The principal risk to the project is that the pond problems will continue to occur, albeit on a reduced scale. This risk needs to be managed by means of an ongoing maintenance regime to be established at the design stage plus monitoring and trigger points. It is possible that the volunteers who have an ongoing interest in the ponds could undertake some of the monitoring required, assist with local engagement and reduce ongoing costs. It is recommended that the future management plan is developed in consultation with these parties.

As noted above, it is not recommended that the ponds be desilted to their full depth because of the risks of destabilising the structures within the pond such as the weir, surrounding footpath and the footbridge footings. There is a risk that even the extent of sediment removal as recommended in Option 5, to 1.5 metres may still destabilise the structures and this will be investigated at the design stage.

During the silt removal and drying stage there is a risk of complaints from the public and reserve users about short-term loss of amenity, disruption and odour. The dewatering and reclamation site has been chosen to be as far away from the park users as possible but still within the Recreational Reserve designations. The filling will provide a long term amenity by increasing the height of a low-lying area currently subject to water ponding. There will be negative short-term effects particularly as dewatering needs to take place over summer to be effective. Risk of complaints will be minimised by communication and information availability.

## 2. Chelsea Ponds

### 2.1 Background

North Shore City Council (NSCC) purchased the Chelsea Park from New Zealand Sugar Refinery Ltd (NZS) in July 2008. Within the Park are a series of four ponds which were initially constructed for water supply by NZS by damming the Duck Creek between late 1800's and early 1900's. As part of the NSCC purchase agreement, five Auckland Regional Council (ARC) consents relating to these ponds and the closed landfill were transferred to NSCC (NZS still has a consent to extract water from these ponds). The transferred consents require NSCC as consent holder to carry out a large number of investigations, monitoring and remedial works.

Infrastructure Services presented a report to the Infrastructure and Environment Committee (I&E) on 10 February 2009. The report outlined several issues needing to be clarified between NSCC and NZS, and proposed required investigations towards the pond desilting and other significant issues. The I&E Committee resolved, inter alia, as follows:

- “3 That Council officers clarify those significant issues in relation to the Chelsea ponds as identified in the report with New Zealand Sugar Limited and then carry out the proposed investigations required for desilting the Chelsea ponds”.
- “4 That the desilting issue of the Chelsea ponds be considered during the 2012/2027 City Plan process”.

The required clarification between NSCC and NZS has been completed and some preliminary investigations and remedial works have been carried out. This report provides an update to the I&E Committee on:

- A. the actions put in place this year to proactively mitigate the sick water fowl problem;
- B. other remedial works and investigations Infrastructure Services has carried out; and
- C. the significant cost implication to Council for mitigating the identified problems.

### 2.2 Measures taken to prevent sick ducks

Last summer an increased number of sick ducks and other water fowl were identified in these ponds, particularly in the lowest pond (pond 4). The ducks and other water fowl became sick due to avian botulism which was present in the ponds as algal blooms due to the thick sediments with high organic contents in these ponds and exacerbated by increased water temperature in summer. Ducks ingest the toxin when they dabble in the sediments and eat infected insects.

To proactively mitigate the sick duck problem, the following actions have been taken or will be taken:

- 1) Forty barley straw bales were placed in pond 3 and 4 in late September. All bales are equally spaced and adequately secured to avoid drift. Barley straw bales have been used in New Zealand, including elsewhere within North Shore City, with some success to mitigate the algae blooms and botulism problem. Our past experience indicated that the spread of botulism and algae could be marginally better controlled if barley straw bales were placed in a pond a few weeks before the summer season.

- 2) Monitoring of oxygen levels in the lake as an indicator of water quality will continue. The aerators in Lake 3 will be activated on a regular basis as soon as the pond water temperature rises to more than 20°C or the levels of Dissolved Oxygen drop significantly.
- 3) Signage was installed around the Chelsea ponds which remind people to report any sick water fowl to Council's Actionline.
- 4) An inspection, recovery and action plan for sick water fowl has been activated since the beginning of October 2009.
- 5) All sick water fowl will be transported directly to the duck hospital at Rothesay Bay managed by a volunteer. Should this hospital be overwhelmed, sick birds will be transported to the Rosedale Wastewater Treatment Plant.

We sought advice on additional short term measures from the scientists and researchers of New Zealand National Water and Atmospheric Research Institute (NIWA), The University of Auckland and the ARC. They confirmed that NSCC is doing what we can in the short term to mitigate the potential risk to the water fowl in the Chelsea ponds.

### **2.3 Other investigation and remedial works carried out by Infrastructure Services**

Several significant issues have been clarified between NSCC and NZS since February 2009. These issues include control of spills to the ponds, water taking from the ponds by NZS, operation of the aerators and access for on-going maintenance.

Apart from the above clarification, the following investigation or remedial works have also been carried out since February 2009.

- A. Collation and review of relevant information including ARC consents, previous investigation reports and monitoring results.
- B. Preliminary investigations into the quality and quantity of the sediments in the Chelsea ponds. The sediments in pond 3 and 4 are more than one metre thick and the total sediment volume in these two ponds is more than 50,000 m<sup>3</sup>.
- C. Condition assessment of the two culverts underneath the closed landfill and identification of preliminary solutions for repairing the defects which need urgent attention.
- D. Construction of all weather access paths for on-going operation and maintenance of the culvert inlets.
- E. Installation of a separate control box for the three aerators so that the aerators can be controlled by NSCC.
- F. Arrangement of data collection and analysis as required by the ARC consents.
- G. Identification of ARC consent conditions which we will negotiate with the ARC to remove or modify them.

### **2.4 Costs for mitigating the identified major problems or risks**

Several significant environment and risk related issues associated with the Chelsea ponds and the closed landfill were identified in July 2006. Infrastructure Services is currently investigating these issues and possible long term solutions. Due to the complexity of these issues and limited available resources, it is envisaged that another 2-3 years are required to complete the required investigations and develop a long term plan for managing the water quality in the lakes and other consenting risks.

Based on the preliminary investigation results, the following major issues need to be addressed.

#### **A. Stormwater culverts underneath the closed landfill**

Two big stormwater culverts run through the closed landfill and discharge runoff to pond 4. CCTV inspections indicate that these two pipes are in poor condition. One culvert has a partly collapsed section and requires immediate remedial works. The collapsed culvert is located 18 metres from the outlet and is approximately 9.0 metres below the ground surface. In view of the site complexity and the consequences of the culvert being totally blocked, we have identified the repair this part of the culvert as high priority. Other scheduled stormwater renewal projects in the current project list may have to be postponed in order to fund this urgent work. After this urgent repair work is completed, we will investigate a long term solution for these two culverts.

Significant funding will be required for jacking two new culverts. Due to the huge cost implication, other options including pipe lining will be thoroughly investigated and reported back to Council in due course.



## B. Pond desilting

The previously mentioned measures to mitigate the sick water fowl problem are short term solutions only. The accumulated sediments in the ponds are the major contributor for the algae bloom, cyanobacteria and botulism. The long term solution for improved water quality, reduced water fowl fatality, enhanced local ecology and amenity for the Chelsea ponds is to remove or treat the sediments. As the Chelsea Park has been registered as a Heritage Trust asset, it is likely that we have to dump the dredged/excavated sediments off site. Due to the large quantity of sediment accumulated in the ponds, significant funding will be required to remove or treat it. Further investigations are required to explore the best option.

## C. Stability of the closed landfill

Two streams flow into pond 4 through the two culverts underneath the closed landfill as previously mentioned. The closed landfill functions as an embankment. In the event of the culvert inlets being blocked, water has to build up for more than 10 m before spill to pond 4 over the top of the landfill. As the landfill was not properly compacted, its stability under such a scenario needs to be thoroughly investigated, as failure of this landfill embankment could have significant consequences.

## 3. Conclusions

1. Option 5, to dredge the Onepoto lakes to a depth of 1.5 metres minimum, and use of the dredgings to raise an area within the Onepoto Domain is the preferred option at a cost of \$620,000.
2. An ongoing management plan will be prepared for the Onepoto lakes to maintain optimum performance.
3. Proactive measures have been taken to mitigate the sick water fowl problem in the Chelsea ponds.
4. There are a few significant environmental and risk issues associated with the Chelsea ponds and the closed landfill. Significant funding will be required to mitigate these risks after completion of detailed investigation and design.
5. Further investigations are required to scope the problems, possible solutions and associated costs in 10/11 at a cost of \$56,000 for the Onepoto lakes and \$110,000 for the Chelsea ponds. The source of funding will be determined through the 10/11 Annual Plan process, and investigations results reported to the Auckland Council.

	<b>Name and title of signatories</b>
<b>Prepared by</b>	Mohammed Sahim - Stormwater Operations Project Engineer
	<b><u>Confirmation of statutory compliance</u></b> In accordance with section 76 of the Local Government Act 2002, this report is approved as: (a) containing sufficient information about the options and their benefits and costs, bearing in mind the significance of the decisions; and, (b) is based on adequate knowledge about, and adequate consideration of, the views and preferences of affected and interested parties bearing in mind the significance of the decision.
<b>Endorsed by</b>	Steve Singleton - Water Operations Group Manager  Martin van Jaarsveld – Parks Manager
<b>Approved by</b>	Geoff Mason - Infrastructure Services General Manager

**Date:** 18 November 2009