CAPE Estuaries Programme: Implementation of Selected Components of the Estuary Management Plan (EMP) for the Zandvlei Estuary, Cape Town

TWG on Pondweed Management

The pondweed, *Potamogeton pectinatus*, occurs naturally in Zandvlei and is an important component of the ecosystem, providing habitat for a variety of organisms, reducing nutrient loading and oxygenating the water. However, as a result of the high nutrient conditions, pondweed has been a problem in Zandvlei for many years, at times forming dense mats which restrict boating activities, exacerbate flooding and, when they start to decompose, causing unpleasant odours. The pondweed in Zandvlei has therefore been managed since 1976 by harvesting it using a mechanical harvester. Although the harvesting has been successful at times, there have been occasions when over-harvesting has led to collapses in the population, while at other times the excessive levels of pondweed have hindered recreational use of the estuary, created nuisance conditions and impacted on property values in the area. This situation continues despite the development of harvesting guidelines for the City by Southern Waters in 1999.

The TWG therefore recommends that a new protocol for the management of pondweed in Zandvlei be developed based on the following:

1. Desired outcomes of pondweed management

Given the ecological importance of pondweed, the overall objective of management efforts must be to achieve a sustainable level of pondweed in the system while at the same time preventing the development of conditions which affect the recreational use of the estuary, are a nuisance to residents and affect property values in the area. In other words, the pondweed levels must be sufficient to maintain the ecosystem services it normally provides (including habitat provision, oxygenation and nutrient sink services).

In addition to its ecological functions, Zandvlei has significant aesthetic value and is the primary attraction for the majority of residents in the area. It is used for formal and informal recreational activities - including *inter alia* bird-watching, picnicking, yachting, canoeing, boardsailing, kite-boarding and swimming - as well as a number of events such as the Rotary annual Dragonboat racing fundraiser, Scout regattas and annual Kontiki event, and has recently been used by international canoeing teams for training purposes.

It thus has a variety of socio-economic benefits for the area and needs to be managed accordingly. This includes keeping specified areas clear of pondweed, other nuisance plants and debris which tends to accumulate in some areas, especially the blind canals of the Marina.

The specific proposed outcomes of pondweed management therefore include:

- The areas set aside for recreational activities (see Figure 1) to be kept clear of pondweed to a depth of 0.5m for all canals in the Marina, and to a maximum depth of 1.5m in the main body of the vlei, provided that harvesting in all areas should not go closer than 2m from the banks;

- A healthy pondweed reserve of 30% of the estuary area (see Figure 1) should be maintained;
- An improved understanding of pondweed dynamics in Zandvlei.

2. Achieving the Outcomes

The harvesting guidelines developed in 1999 by Southern Waters recommended a harvesting frequency of 12 times a year in the recreational areas. However, during the period that harvesting was undertaken by City Parks, they worked on a harvesting frequency of 7 times annually (twice in Summer, twice in Autumn, once in Winter and twice in Spring). This approach is generally regarded as having been successful for those periods when these targets were met (i.e. when the harvester was able to complete the required work).

In order to achieve the outcomes described above, it is therefore <u>recommended:</u>

A. For at least the next year, all the areas to be harvested should be cut 7 times;[1]
B. 20% of the pondweed reserve should be harvested once during the course of each year. Such harvesting should be carefully monitored;
C. The harvesting should be implemented according to a reasonably strict rotational schedule (see below) and should be monitored so as to be able to assess the effectiveness of these proposals and to provide a basis for any future adjustments;
D. Clearing within 2m from the banks should be limited to securing access to the central channel and must be undertaken by residents. Requests from residents to use the harvester to cut pondweed within this area should not be entertained;
E. Projects on the monitoring and assessment of pondweed harvesting and growth should be undertaken in collaboration with CPUT.

3. Challenges

<u>Harvesting Requirements</u>

Based on the map in Figure 1, approximately 61.5 ha of Zandvlei (recreational areas including the Marina canals) need to be cut 7 times per year. In addition, 20% of the pondweed reserve area should be cut once a year. The reserve area is approximately 28 ha, which means that 5.6 ha would need to be cut every year. This means that a total of 436.1 ha need to be cut/year.

Assuming a cutting rate of 0.14ha/hour (Southern Waters), this means that 3115 machine hours/year are required to do the job. In addition, provision needs to be made for maintenance and downtime as a result of weather conditions and machine failure. Based on records for the past year, the average number of operational hours achieved by the harvesting machine per day was between 5 and 6 – for periods when the machine was actually functional. However, these records also indicate a downtime of around 20% of the time. On this basis, and assuming a 5-day week, the current complement of 1 harvesting machine and a single driver/operator delivers less than half of the hours required to complete the job (see Table 1). Even if the operating hours are increased to 7 hours/day and the downtime reduced to 10%, the number of hours available could only

[1] This is proposed as a trial period – if successful, it would continue on this basis.

be raised to a little over half of those required. Realistically then, the only option available is to:

- make a second machine and driver available
- have a relief driver so that harvesting is not affected by driver illness and, when necessary, can be extended into weekends or after hours (should the weather be conducive);
- reduce downtime to 5% by improving maintenance and addressing other operational issues (see below).

Table 1: Scenarios for improvement of harvesting success.

	Current scenario **1 machine, 1 driver** **20% downtime**		**Best case scenario** **1 machine, 1 driver** **10% downtime**		**Proposed scenario** **2 machines, 3 drivers** **5% downtime**		
	Days	5.5hrs/day	Days	7 hrs/day	Days	hrs/day	Hrs available
January	21	115.5	21	147	24	14	336
February	20	110	20	140	22	14	308
March	23	126.5	23	161	24	14	336
April	22	121	22	154	22	12	264
May	23	126.5	23	161	23	12	276
June	22	121	22	154	22	10	220
July	23	126.5	23	161	23	10	230
August	23	126.5	23	161	23	12	276
September	22	121	22	154	23	12	276
October	23	126.5	23	161	23	12	276
November	22	121	22	154	24	12	288
December	21	115.5	21	147	22	14	308
Maintenance	-12	-66	-12	-84	-12	9	-108
Downtime	-53	-291.5	-26.5	-185.5	-13.25		-119.25
TOTAL	200	1100	226.5	1585.5	249.75		3166.75
Hours required		3115		3115			3115
Balance		-2015		-1529.5			51.75

Rotational Schedule

Based on the same harvesting rate (0.14ha/hour), the number of hours to complete a single harvest is approximately 440 hours. The number of hours per day available varies from season to season, so the schedule below provides a guideline for planning the rotation of the harvesters. This is based on the proposed scenario – 2 machines and three drivers/operators.

Table 2: Schedule for rotation of the harvesters.

	Month	Days	hrs/day	Harvest	Harvesting Total	Downtime/maintenance
Rotation 1	January	24	14	336		
	February	8	14	112		
	D/M	3				3
				448	448	
Rotation 2	February	11	14	154		
	March	21	14	294		
	D/M	3				3
				448	448	
Rotation 3	April	22	12	264		
	May	14	12	168		
	D/M	3				3
				432	432	
Rotation 4	May	6	12	72		
	June	22	10	220		
	July	14	10	140		
	D/M	5				5
				432	432	
Rotation 5	July	4	10	40		
	August	23	12	276		
	September	11	12	132		
	D/M	3				3
				448	448	
Rotation 6	September	9	12	108		
	October	23	12	276		
	November	5	12	60		
	D/M	3				3
				444	444	
Rotation 7	November	16	12	192		
	December	19	14	266		
	D/M	3				3
				458	458	
					3110	23

Reduction of downtime

As noted above, recent records indicate that there are major logistical problems with the machine breaking down on a regular basis, with downtime reaching around 20% of the operational time. Although the machines are quite old, the static items of the harvesters should have a lifespan of 50 years, and according to the specs should be able to do 10 – 12 hours/day. It has been suggested that the problems arise primarily from a combination of the fact that some of the parts have been incorrectly engineered, while there is also poor maintenance and operating errors. These include:

a) The cutting blades are incorrectly adjusted;

b) The cutting blades used are not appropriate for cutting pondweed. To be efficient, the blades which should be used are those which are normally used to cut rice (which are designed to operate in aquatic conditions) rather than grain/grass which require low levels of moisture to operate effectively. There is a 10-30% increase in cutting efficiency if the correct blades are used;
c) Incorrect cutting blades cause weed to be ripped out rather than cut causing undue load on the harvester's front mechanism;
d) Incorrect forward speed of the harvester in relation to the speed of the cutting blades – causes some of the weed to be ripped out and float away under the machine especially when done in conjunction with the incorrect blades.

In addition, there are a limited number of trained drivers/operators.

4. Management Strategy

In order to overcome these challenges it is recommended that:

F. The second machine should be returned to Zandvlei;
G. The current Zandvlei machine should be re-engineered and maintained to the required specifications;
H. The City should review the current contract for the maintenance of the machines which has had poor results;
I. The City should make provision for the holding of critical spares to reduce downtime;
J. A GPS should be installed on the machine to monitor the time and locations at which the harvester is operating;
K. Simple depth markers should be painted on the arms of the cutter section of the weed harvester to provide a guide to the operator. This should make allowance for the loading of the machine;
L. Additional resources should be provided to Biodiversity Management so that additional drivers can be trained with a view to increasing the efficiency of machine utilisation (increased number of hours/day) and prevent downtime as a result of illness;
M. The possibility of utilising barges to transport cut material from the harvester to the shore should be investigated with a view to increasing the time available for cutting. Such barges should be designed to be able to collect floating rafts of cut weed when these occur;
N. The possibility of using Coastcare teams (or other EPWP resources) to supplement the harvesting programme should be investigated.
O. Proper provision must be made to ensure that harvested material is removed from the banks of the estuary on a timeous basis.

5. Long-term Management Option

Should the protocol outlined above not give rise to a marked improvement in the efficacy of pondweed management in Zandvlei over the next year, consideration should be given to operating and maintaining the machines through a Public Private Partnership. Such an approach would allow for the operational latitude required for the proposed outcomes to be met.