The Town Pool Weir

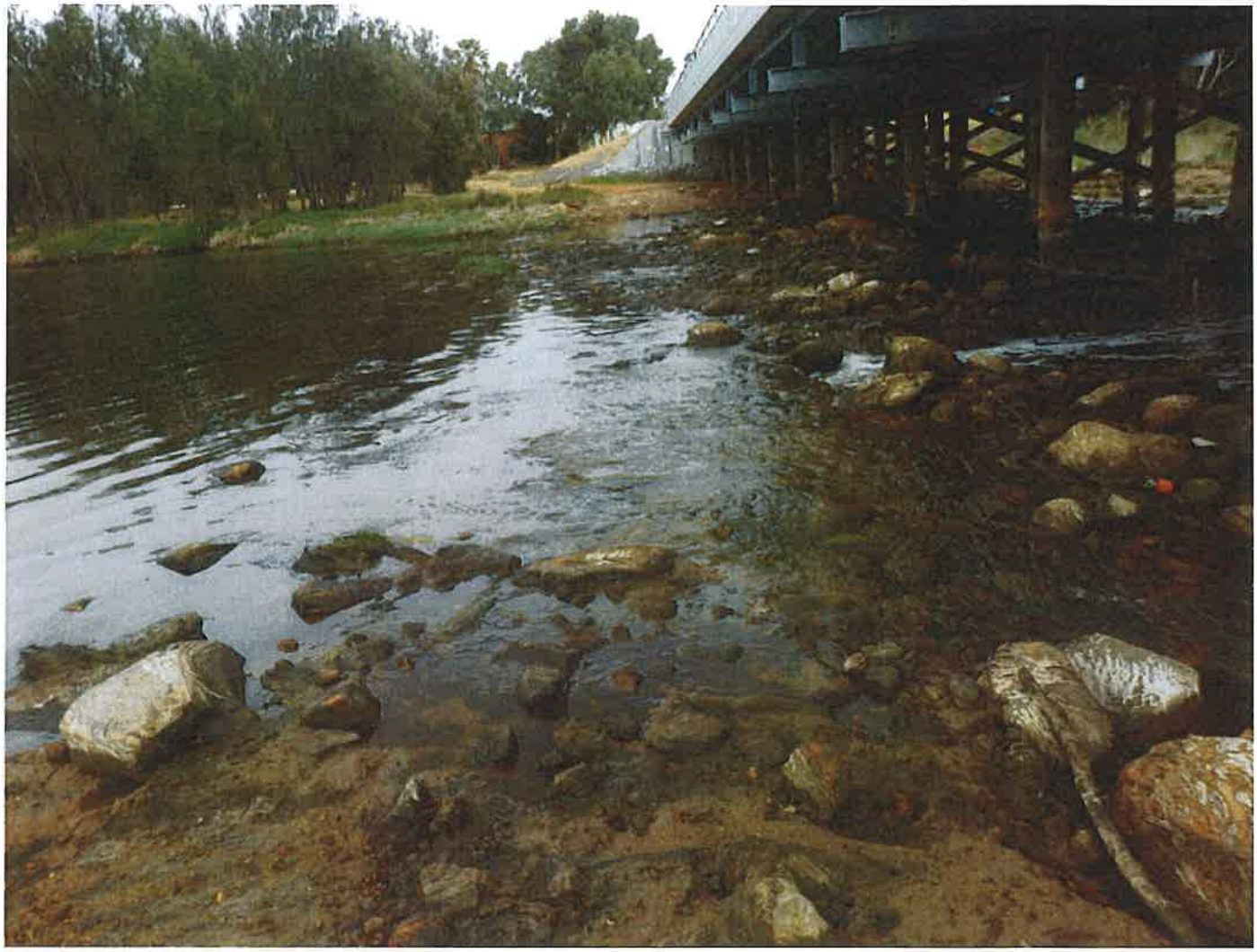

Image by Fred Bremner

09 November 2022

Beverley 6304
9/11/2022
130 Forrest Street

Mr Stephen Gollan
CEO
Shire of Beverley
PO Box 20
Beverley 6304

Dear Steve,

Please accept the following proposal, designed to improve the **health, environmental** and **aesthetic** aspects of the **Avon River Beverley Town Pool.**

Thank you for giving me your time yesterday to view the state of the weir located near the Town Bridge. I also appreciated a visit to the area by our Shire President CR David White some months prior, where we discussed the relationship between the picnic area and future of the pool.

Foreword
We acknowledge the Traditional owners of the land, including the area encompassing this proposal.
Beverley, also known to the Barllardong community as Wergijan, was surveyed in 1843, with the
establishment of the Townsite in 1868 on the banks of the Avon River.
The attached "Foreword" to the book 'Bulldozing the Avon" Parker Print 2015 ISBN No 978-0-646-93510-2, describes the Avon, as it was thought to be, before European settlement in 1829,
Page 99, also attached of the same book, acknowledges our Noongah community and how they managed the riverine vegetation as an important food source, as each tribe moved up and down the river over thousands of years.

In the early days of the town's settlement in 1868, the Beverley pools main use was as a swimming pool with a jetty to the central part of the river, with swimming carnivals being a regular occurrence.
Adopted European methods of agriculture, together with other forms of siltation, for example the rabbit plague, resulted in many of our river pools being lost through siltation from eroded farmland.
Towards the end of summer each year the Beverley pool was no exception, with half the length of the town pool being lost to silt resulting in a foul odor across the town.
The change in agricultural land use practices over the last 50 years, i.e. minimum tillage, has resulted in major reductions in eroded farmland and of great benefit in reducing the silt load in our river systems and their tributaries.

Purpose
To return and maintain the pool at its original depth, as an environmental asset to Beverley, and to assist in the prevention of foul odor caused by Algal blooms occurring in the mid to late summer months.

The Log Wall.
Apart from being an integral part of the picnic area, the wall is an important measure to gauge the depth necessary for the weir to be maintained at its originally surveyed height.
The original surveyed height of the weir, conducted by engineers from the Water and Rivers Commission, was for the maximum height of the river, before it overflowed the weir, to be 10 CM below the top of the Log wall
On the 8/11/2022, even though the river was still overflowing the weir, the rivers height was 60 cm below the top of the log wall.
The resulting loss of this half meter in depth towards the end of each summer increases the likely hood of the problems already mentioned, contributed to by the heating of the shallow water left after the evaporation process.

Cause
1 The cause relating to the loss of the 50 cm previously mentioned, is the sinking of the stone weir into the riverbed over the 30 years since its establishment in 1993.
2 the use of the weir as a roadway, by heavy machinery, to move material during the rebuilding of the Town Bridge some years ago

Recommendation
To raise the rock weir at the Town Bridge 50cm to its original height, by the use of similar material, or as recommended by the Shire engineer.

Benefit
1 Increased depth of the pool will provide cooler water temperature and lower the risk of Algal Blooms during summer months.
2 The Avon River Town Pool, is an important aesthetic and environmental attraction for both residents and visitors to our District.
3 If not addressed the weir will continue to erode and the Town Pool will eventually become the eyesore it was prior to 1993 and a health hazard.

Thank you for receiving this proposal.
Yours Sincerely

Fred Bremner JP

Attached
Beverley Pool Sediment Management Plan 1999
Photos. Dredging of the Town Pool in 1993
Foreword to the book "Bulldozing the Avon"

AVON RIVER MANAGEMENT AUTHORITY

WATER AND RIVERS COMMISSION

1871 SHIRE OF BEVERLEY

DRAFT

BEVERLEY POOL SEDIMENT MANAGEMENT PLAN

MARCH 1999

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1.0 Conclusions and Recommendations

Monitoring has indicated that the rate of sedimentation of Beverley Pool has decreased over the last decade. The surveys of the pool area since 1992 have indicated that the sedimentation rate is relatively low and is estimated to be in the order of 400 m^3/yr. The reduced sedimentation rate should allow any sediment removal or control works to provide longer term benefits. The sources of mobile sediment slugs no longer have a large capacity to continue to supply sediment to the pool (*Rogers, 1996*), however catchment erosion process will provide an ongoing supply.

It is recommended that the protection and enhancement of Beverley Pool consist of implementation of three strategies:

- **removal of the upstream slug of sediment and exposed mobile sediment toe of the island,**
- **construction of a low weir to trap sediment upstream of the pool, and**
- **enhancement of the island and pool foreshores through revegetation.**

Continued surveying of Beverley Pool will provide accurate estimates of sediment movement and form a basis to plan management strategies. These strategies will need to be periodically reviewed in light of ongoing monitoring results.

2.0 Objectives

The Shire of Beverley aim to rehabilitate Beverley Town Pool to enhance the habitat and amenity value of the area for environmental and recreational purposes.

The following objectives were identified by the Shire:

- Reduce sedimentation and stabilise the sand intrusion at the upstream end of the pool.
- Improve the water quality of the pool.
- Maintain the weir located beneath the Vincent Street Bridge.
- Investigate the location, quality and recharge rate of freshwater springs in the area.
- Enhance the overall aesthetics of the area.
- Enhance the habitat value of the area for waterbirds.
- Investigate the introduction of fish into the pool.
- Enhance the recreational value of the area.

The Water and Rivers Commission has prepared this plan on behalf of the Avon River Management Authority and the Shire of Beverley to protect and enhance Beverley Pool. The focus of the plan is management of sedimentation of the pool. The plan is for the river reach from immediately upstream of Beverley Pool to approximately 300 m downstream of the weir.

2.1 Community Consultation Process

A stakeholder analysis should be undertaken to identify organisations and individuals with a special interest in the management of Beverley Pool. This process will be included as part of the River Recovery Plan currently being developed. Stakeholders include recreational users, local aboriginal groups, local landholders and environmental and community groups.

The draft plan should be discussed with and forwarded to all major stakeholders for comment. The management plan should be revised to incorporate stakeholder comments. The Shire of Beverley and ARMA should endorse and adopt the final plan as a guide to management of Beverley Town Pool.

3.0 Background

3.1 The Avon River System

Approximately three-quarters of the Avon's 120,000 km^2 catchment has been cleared for agricultural purposes, resulting in degradation of the river system through rising salinity, eutrophication and erosion. The natural river processes of the Avon River have been dramatically altered. Large amounts of sediments were exposed through the ripping of the riverbed and removal of debris from the river channel during the River Training Scheme that ceased in 1973. The Scheme, instigated to alleviate flooding, resulted in extensive erosion and sedimentation. A major effect is that the larger deep permanent pools along the Avon River have filled or are filling with sediment (*Harris, 1996*). The pools provide important refuge and breeding areas for waterfowl and other fauna as well as being of significant recreational and aesthetic value to the community (*Waterways Commission, 1993*).

The River Training Scheme extended from downstream of Toodyay to Aldersyde, about 40 km upstream of Beverley Pool. This resulted in the river between Toodyay and Beverley typically flowing in a single preferred channel rather than through a series of channels as would have occurred naturally in the braided system. The flow rate of the Avon River is estimated to have increased by more than threefold due to the training scheme and catchment clearing (*Davies, 1997*).

The Avon River above Beverley is a meandering watercourse with a very low gradient. The river is connected to the Yenyenning Lakes. Between Beverley to Toodyay, the grade of the river increases, resulting in faster streamflow and a well defined channel. This section of the river is crossed by numerous rock bars, dykes and associated pools (*Harris, 1996*).

Occasional heavy rainfall events during summer result in the Avon experiencing brief, strong river flows. These events can have major impacts in terms of erosion and sediment movement along the river (*Harris, 1996*).

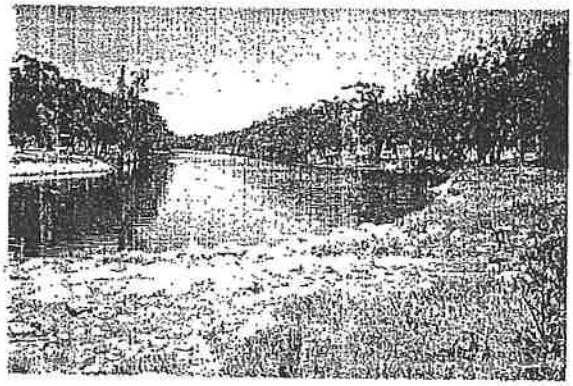
3.2 Beverley Pool

Beverley Pool is a major landscape feature of the town of Beverley, located along the Avon River, approximately 130 km east of Perth. The downstream boundary of the pool is an artificial weir constructed in 1993, immediately upstream of the Vincent Street Bridge.

Beverley Pool lies within Section 14 of the Avon River, defined byARMA as the 21.67 km section from the Vincent Street Bridge to the confluence with Avon River South branch. 58% of the banks and 39% of the bed is stable along this section, which is below the average for the Avon River (*Davies, 1996 & Black, 1997*).

In the late 1980's, earthworks were carried out upstream of the pool. It is believed that these works subsequently led to large quantities of sand moving down the river. The majority of this movement may have occurred during a summer storm flow in 1990. By 1992, a sediment slug encroaching at the upstream end of the pool had advanced to approximately 350 m upstream of the weir. At the current weir location, a sediment dam had partially formed with a scour line on the east side. The reach of the riverbed, approximately 80 m upstream of the bridge, had become silted, resulting in a stagnant shallow pool (photograph 1).

Photograph 1: February 1993 – Sediment weir below bridge and accretion in upstream end of Beverley Pool.

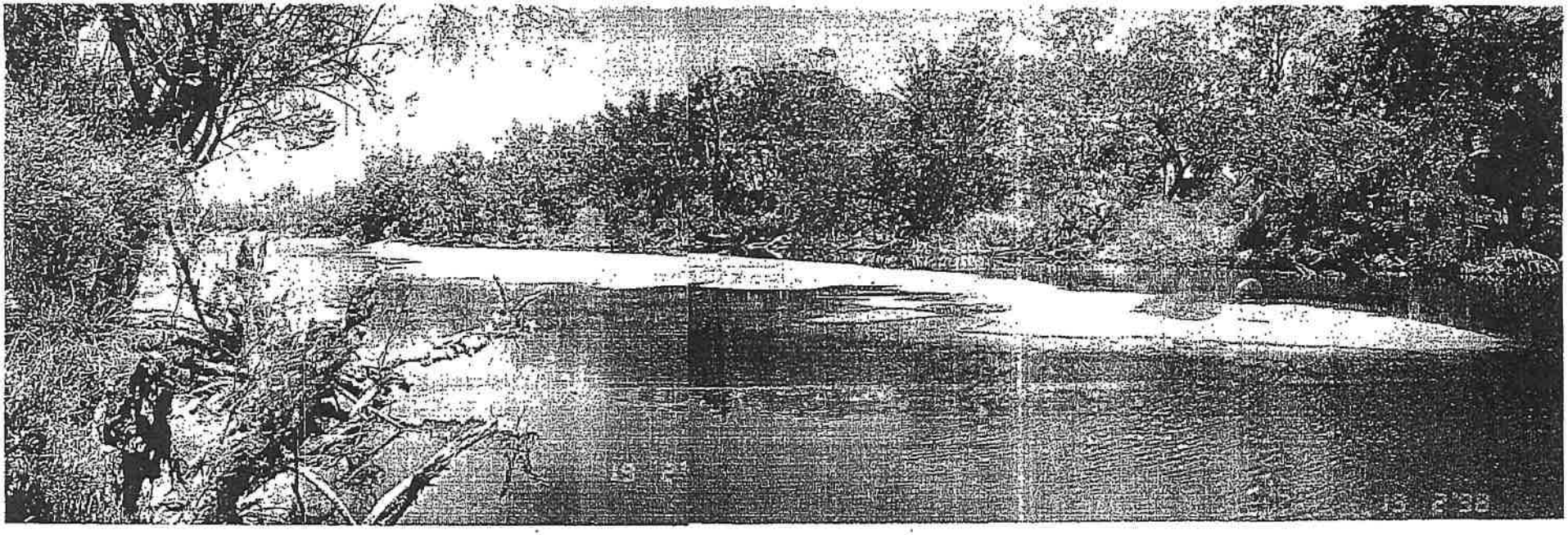


Photograph 2: February 1998 – Depth of excavated area has been maintained. Rock weir beneath road bridge has become stabilised.

In March 1993, the Shire completed excavation of the downstream end of the pool (photograph 2). Approximately 1,600 m^3 of sediment was removed from the shallow 60 m length section of the river upstream of the weir. The area was excavated to a maximum depth of 1.9 m. The objective of deepening the pool was to improve water quality and restore the aesthetic, environmental and recreational value of the area.

4.0 Current Environment

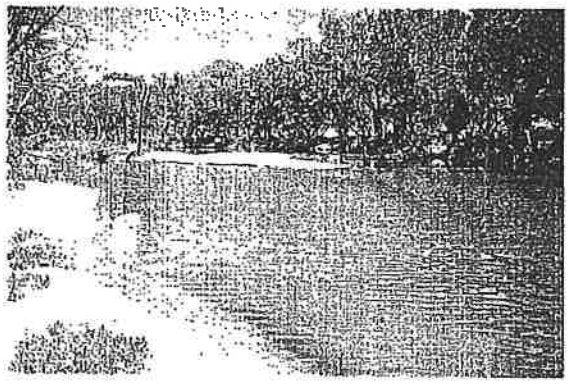
Beverley Pool is approximately 35 m wide and 310 m long (1998 survey results). The pool then forms a narrow low flow channel along the eastern edge of the main channel. A sediment deposit is encroaching the upstream end, partially filling the deeper section of the pool (photograph 3).



Photogrph 3: Beverley Pool February 1998- Sediment slug at the upstream end of the pool

The pool retains water throughout the year and has an average depth of about 2 m during summer.

Vegetation has become established on the island at the upstream boundary of the pool, approximately 450 m upstream of the weir (photograph 4). This island provides significant habitat and attracts birdlife to the area. The downstream end of the island is unvegetated and consists of mobile sediment.



Photograph 4: February 1998: Island at the upstream boundary of the pool.

4.1 Sedimentation

The Avon Pools Survey undertaken in 1996, estimated that the original volume of the pool was 75,000 m^3 during summer, when the water level is approximately one metre lower than the weir, and 90,000 m^3 at overflow level. The pool has lost about 50 per cent of its water storage capacity since European settlement. Approximately 50,000 m^3 of sediment is estimated to have accumulated in the pool since 1960 (an average sedimentation rate of 1390 m^3/yr). This sedimentation has primarily been caused by disturbances to the river channel and in the catchment. The sediment is a mixture of sand, silt and clay along the length of the pool. There are indications that the rate of sedimentation of the pool is decreasing as the system is becoming more stabilised.

4.2 Water quality

Water quality and sediment sampling undertaken as part of the 1996 Avon River Survey found the nutrient concentrations of the water of Beverley Pool were high, but not considered eutrophic. A large store of nutrients were found in the sediment (*Davies, 1996*). Phytoplankton concentrations in Beverley Pool have been high on a number of occasions indicating the elevated nutrient status. Diatom blooms in the pool were recorded in March and October 1995. In January 1996, the first cyanobacteria bloom occurred in Beverley Pool. Algal blooms associated with eutrophication have occurred regularly in the Northam Town Pool, Glen Avon Pool and Brookton Pool in recent years (*ARMA July, 1997*).

Cyanobacteria blooms are potentially harmful to human health and other animals, as well as being detrimental to the ecology of the river (*Hosja, 1996*). Health warnings need to be posted along the river during bloom events. Algal blooms also lead to odour problems and deterioration of the visual amenity of these areas.

4.3 Vegetation

Most of the banks of the pool are stabilised by the remaining narrow strip of remanent vegetation consisting predominantly of *Eucalyptus rudis* and *Casuarina obesa*. There is low regeneration of *Eucalyptus rudis* and moderate regeneration of *Casuarina obesa*. Death of fringing Melaleuca species is occurring due to salinity effects (*Davies, 1996*).

4.4 Aboriginal Heritage Issues

The Avon River is of significant cultural and heritage value to the Aboriginal people. It is recommended to consult with local Aboriginal Elders and the Aboriginal Affairs Department to determine if any proposed development or management actions concerning the Avon River and surrounds at Beverley Pool will have adverse impact on Aboriginal sites or heritage values. By referring all development proposals and management actions to this department, disturbances to any places of Aboriginal Heritage can be avoided. Unauthorised interference of Aboriginal Sites is an offence under Section 17 of the Aboriginal Heritage Act 1972-1980.

4.5 Land Use

The land use of the area is mainly urban. Beverley Pool is currently used for water related recreation and the parkland on the eastern bank is used by the community and tourists for picnicking and other activities.

5.0 Survey Results

5.1 Survey Parameters

A survey of the levels and soundings was carried out in March 1998 of a 480 m reach of the pool area from the weir to upstream of the sediment slug. Levels were taken approximately 5 m apart along cross-sections spaced at 10 m intervals between 0 m and 90 m upstream of the weir, then at 30 m intervals to the upstream boundary of the survey. This survey repeated the surveys undertaken in March 1996 and December 1992, however the extent of these surveys was only to 380 m upstream of the weir. The surveys have been undertaken to ascertain the level of sedimentation occurring in the pool.

5.2 Flow history

The relative nature of the annual flows from 1992 to 1997 is shown on the attached hydrograph. The three winter flows between the December 1992 and March 1996 surveys were low to moderate, with peak flows ranging from 29 to 88 m^3/s. The 1996 winter flow was a sizeable event, estimated to be a 1 in 4 year flood event with peak maximum flows up to 210 m^3/s. It was the largest annual flow since the 1983, 1 in 8 year flood event (*Binnie, 1985*).

5.3 Changes in Bed Level

Table 1 summarises the average changes in bed level in sections of the pool over the period of measurement. Negative values denote the amount the bed has lowered.

TABLE 1: AVERAGE CHANGE IN BED DEPTH OF BEVERLEY POOL

Distance upstream of weir (m)		Dec 92 – Mar 96	Mar 96 – Apr 98	Total Dec 92-Apr 98
10 – 60:	Area excavated in March 1993 (max depth = 1.9 m in summer)	-1.15 m (excavated Mar 93)	- 0.07 m	-1.22 m
60 – 270:	Middle section of pool (max depth = 2.2 m in summer)	(not surveyed in 1996)	(not surveyed in 1996)	0.15 m
270 – 310:	Deep section of pool (max depth = 4.3 m in summer)	0.02 m	0.36 m	0.38 m
310 – 380:	Sediment slug (exposed during summer)	0.05 m	0 32 m	0.37 m
310 – 380:	Low flow channel on eastern side of slug (max depth = 0.8 m in summer)	- 0.06 m	- 0.21 m	- 0.27 m

The attached plots of the pool cross-sections show the changes in bed level. The March 1996 survey indicated that there had been little change in the bed level at both ends of the pool area during the previous three winters. Approximately 90% of the change in bed level along the length of the pool due to river flow most likely occurred during the 1996 winter flow event. During the five year period, there has been no accretion in the area excavated during 1993. Minimal shallowing in the middle section of the pool has occurred. The major increase in bed levels occurred at the upstream end of the pool and in the deep section at around 310 m upstream of the weir. A scour channel has formed around the sediment slug along the eastern bank of the pool.

The long section of the pool is plotted on the attached graph. The greatest change in the profile of the channel is movement of the sediment slug above summer water level. By following the 5 m contour (approximate summer water level) of the sediment slug on the attached survey drawing, it is possible to track the advance of the slug into the pool which is visually apparent. Between December 1992 and March 1996, the slug advanced 9 m into the pool in the centre of the channel. Between March 1996 to April 1998, the slug advanced a further 21 m into the pool. This movement most likely occurred during the 1996 winter flow. The greatest change in the sediment distribution in the pool has occurred mostly above water level where a 30 m advance into the pool over five winters has been observed.

In the deeper reaches of the pool, the rate of infilling has been less dramatic. Between 305 and 310 m upstream of the weir, the rate of advancement of the plume in the middle of the channel has only been about 8 m since December 1992. Greater sedimentation has occurred along the western bank of the pool. Although accretion has occurred at the upstream end of the pool, the maximum depth at the centre of the pool has been maintained.

5.4 Changes in Volume and Sedimentation Rate

During the five winters between 1992 and 1998, a total of 2,600 m^3 of sediment has entered the pool. 2,200 m^3 of sediment has been cut from the pool in this period. The majority of this sediment (approximately 1,600 m^3) was removed during the March 1993 excavation. The remainder of the material represents a redistribution of fill in the pool and scouring of the channel on the eastern side of the sand intrusion at the upstream end of the pool.

The natural net volume of sediment deposited in the pool over the last five winters is about 2,000 m^3. Approximately half of this amount has been deposited in the upstream end of the pool and deposited in the deep section at around 300 m upstream of the weir. The remainder has been deposited evenly in a 15 cm

layer across the middle section of the pool (between 60 and 270 m upstream of the weir). Beverley Pool is mostly being filled by a migrating slug of sediment at the upstream end of the pool, rather than through the process of accretion uniformly along the bed of the channel.

If the average sedimentation rate of 400 m^3/yr continues, the pool will be completely filled with sediment to summer water level by the year 2059 (corresponding to a rate of advancement of the sediment plume of about 5 m/yr). The habitat and amenity value of the pool will be lost long before this date. As rate of the sedimentation is not constant and is largely dependent on the flow regime and the source of mobile sediment, this infilling may occur in a short series of larger flow events or over a longer period of time. The sedimentation rate for the last five years is about one quarter the rate estimated for the thirty years prior to 1992.

The change in the length of the pool since the River Training Scheme is summarised in Table 2.

TABLE 2: CHANGES TO BEVERLEY TOWN POOL LENGTH 1960-1998

	1960[1]	1985[1]	1992[2]	1996[2]	1998[2]
Pool length (m)	444	400	305	331	310
	1960 - 1985	**1985 - 1992**	**1992 - 1996**	**1996 - 1998**	
Rate of decrease in length (m/yr)	1.76	15.0	-8.7	10.7	

[1] Data from Jim Davies and Associates, 1997. Measured from aerial photography
[2] Measured from field surveys

The increase in length of the pool between 1992 to 1996 was due to the excavation in March 1993. The most dramatic increase in the sedimentation rate of the pool occurred in the late 1980's, corresponding to the earthworks that were carried out upstream of the pool and possible subsequent mobilisation of sediment.

The sedimentation rate appears to be less dominated by the flow regime than by disturbance factors. A greater number of flood events (three greater than 1 in 10 year events) occurred during 1960 – 1985 compared to none occurring between 1985 – 1992, although greater sedimentation appears to have occurred during the latter period. A large event (greater than 1 in 25 year flood) has not occurred in the Avon since 1955 so that the response of the system since the training scheme commenced to a large flood event can not be ascertained.

6.0 Management Strategies

Retaining the depth of the river pools is important to maintaining the water quality, habitat value and aesthetics of the pool areas. Deeper water during summer may also assist in creating unfavourable conditions for algal growth. Improvements in water quality will also create greater scope for recreational use of these areas and minimise potential health risks. Water quality and sediment management at Beverley Pool will consequently reduce sedimentation and improve environments downstream of the pool. Integrated water samples should be collected from Beverley Pool in conjunction with sampling from other major water bodies along the Avon River to monitor algal, nutrient and pollutant concentrations (*Hosja, 1996*).

Further research is required to develop long term solutions addressing the problem of sedimentation along the length of the Avon River. Possible strategies include removing sediment at strategic positions along the river, revegetating areas to trap sediment and remodelling the river (*Waterways Commission, 1995*). Monitoring investigations and trialing sediment management techniques are essential to developing successful strategies to control sedimentation of the Avon River pools. In the interim, maintenance of significant river pools by implementing techniques to intercept the sediment upstream or programs undertaken of periodic sediment removal are required to minimise the loss of habitat and amenity.

Mobile sediment slugs are the main contribution of continuing sedimentation of the pools. Sedimentation will also continue to occur due to bank and catchment erosion processes. These sources of sediment need to be stabilised to provide long term maintenance of the pools. However, stabilisation of the river channel between pools is difficult to achieve through natural establishment of vegetation due to the mobile nature of the riverbed (*Davies, 1996*).

Beverley Pool should continue to be monitored and a survey, flow data and visual record of the site maintained. A repeat survey of the channel cross-sections and profile of the pool should be undertaken every few years or following large flow events to assess movement of the bed load and deposition of suspended sediments in the pool. The rate of sedimentation appears to have decreased significantly during the 1990's which may be attributed to the system largely becoming stabilised three decades after cessation of the Training Scheme (*Davies, 1996*). As the sedimentation rate declines, the cost effectiveness of sediment removal increases as longer term benefits will be obtained.

Long term improvement to the water quality of the pool and management of algal bloom problems will require the implementation of catchment wide water quality management strategies. Strategies to reduce

the nutrient, pollution and salinity concentrations of the river are outlined in the ARMA Management Programme and are currently being formulated as part of the river section Recovery Plans. The program includes water quality monitoring to assist in identifying the impacts of changes to catchment use on water quality and the sources of nutrients and other pollutants in the pools.

A range of restoration options and management issues are presented below. The positive and negative impacts of each of the restoration options will need to be considered, as well as the cost and long term benefit of the techniques. Consultation and feedback from the community on possible restoration options for the pool will provide valuable input and support for enhancement of the pool area. Detailed design options, costings, and method and timing of the works will need to be developed and the necessary approvals obtained to advance the preferred strategies to implementation.

6.1 Lowering of the Weir

It was proposed to lower the water level of the pool to minimise flooding of the marsh area at the upstream end of the pool and the resulting odour problem from the stagnant ponds. The stone weir has stabilised and it is not recommended to disturb the structure. Lower water levels in the pool area near the weir may also lead to water quality and aesthetical problems by creating a shallow warm water body in summer.

Further investigation into the cause of the odour problem is required to develop alternative solutions. Possible solutions may include revegetating the marshes, re-contouring the area and sediment removal or filling in the ponds.

6.2 Creation of a Pool Area Downstream of Vincent Street

In January 1996, the Shire proposed to the Commission the concept of creating a water area on the northern side of the Vincent Street Bridge by positioning a second low stone weir further downstream. The proposed works included areas of the bed remaining as islands, with the existing flow areas between the islands being deepened to retain permanent water. A survey of the area extending to 400 m downstream of the existing weir was undertaken in March 1996. Trial excavation of an approximately 2 m deep, 400 m^3 hole downstream of the bridge was carried out by the Shire in May 1996. The hole was excavated to the clay layer and the pool water appeared to be fresh and maintained by groundwater.

The Shire of Beverley's Trails Plan (March 1999) proposes installing a low weir near John Street, approximately 800 m downstream of the existing weir. The downstream weir should be constructed as a riffle structure.

Increasing the length of the permanent pool area through Beverley will improve the visual amenity and provide greater opportunity for recreational use of the area. Construction of the second weir is seen as a priority to complete the circuit of the walk trails network.

The proposal to create other pools in the northern section of the river will need to be further investigated. Installation of the downstream weir may lead to water quality problems due to the creation of a shallow stagnant water body during summer. The pool area may need to be deepened to retain permanent water and improve water quality. The location, quality and recharge rate of freshwater springs will need to be determined. Core samples should be taken along the reach to determine the nature of the sediment, depth to the groundwater table and quality of the groundwater. Following the investigations, a plan for the area will need to be prepared in association with the Water and Rivers Commission.

Works to improve this area are unlikely to interfere with the river flow (*Leaver, 1996*). Excavation works may cause initial water quality problems due to the mobilisation of sediment and release of nutrients, however the effects of this disturbance will be short term. Enhancement of this area is likely to involve significant works and substantial expense.

6.3 Recreation Options

Sediment management and water quality improvements will create opportunity for increased use of the pool area by the community for recreational activities. Installation of a walkway and enhancement of the public open space through the town to the river have been proposed for the area under the Shire of Beverley's Walk Trail Plan. Revegetation or removal of unsightly exposed sediment and decreased odour and surface scums caused by algae will result in a more enjoyable environment.

Recreational sites along the river should be selected with care, properly designed and managed to ensure the river environment is not degraded (*ARMA, February 1999*).

6.4 Maintenance of the Weir

Performance of the weir has been monitored since its installation in March 1993. During this period, there has been no evidence of scour or damage around the bridge piles or to the general area. The weir is currently stable. It is recommended to continue to periodically inspect the weir and carry out maintenance works if and when required.

6.5 Introduction of Fish

The proposal to introduce native species of fish into the pool should be investigated. Pool water quality data (temperature and dissolved oxygen, salinity and nutrient concentrations) will need to be investigated to establish tolerance requirements. Habitat, breeding, feeding and migration requirements will need to be established.

7.0 Restoration Options

7.1 Removal of the Upstream Slug

In June 1996, the Water and Rivers Commission recommended to the Shire of Beverley that the sediment intrusion of approximately 50-60 m in length be removed (*Till, 1996*). Although the 1996 survey of the pool area indicated there had been minimal movement of the sand intrusion at the upper end of the pool during the previous three winters, it was considered that its removal would be beneficial to this section of the river. Controlling sedimentation of the pool is necessary to maintain the habitat for waterbirds as well as the visual amenity of the area for the community.

The 1998 survey indicates that the slug has significantly increased and moved downstream. The survey shows the approximately 100 m long slug is located between 315 and 420 m upstream of the weir (photo 3). Excavating the slug would restore the pool to its former length, prevent intrusion of this sand further into the pool and provide an area for deposition of any further sediment at the upper extremity of the pool. This work could be undertaken in a similar manner to the original excavation near the bridge (by dragline and trucks) or the operation at Gwambygine Pool (by excavator, loaders and trucks) (*Till, 1996*). An option could be to utilise a dredge.

Removal of sediment from the upstream end of the pool will "buy time" in the sedimentation process of the pool. The costs and possible sites to store spoil out of the river channel or dispose of spoil off site would need to be considered. Storage strategies during removal operations should minimise potential impacts on flooding or re-sedimentation of the pool. The time for the sediment to be replaced in the pool will largely be determined by the flow regime and the mobility of upstream sources of sediment. Survey results to date indicate that the sedimentation rate is relatively low and has decreased substantially over the last decade.

Water quality problems may initially be experienced due to the excavation works disturbing the sediment, increasing turbidity and possibly releasing nutrients. The effects of this disturbance will be short term. Removal of sediment from the pool is not expected to impact flooding processes. Any plan to excavate the sediment will need to include measures to minimise potential adverse impacts on the pool environment and fringing vegetation during the works. Public inconvenience and safety risks should also be minimised. Appropriate signage in the vicinity of the works and management of vehicle access in the area should be implemented.

Periodic surveys of the pool area will enable the movement and accretion of sediment to be monitored. This assessment could be use to determine if and when maintenance sediment removal works should be undertaken.

Longer term benefits of sediment removal and a reduction in ongoing maintenance will be obtained if the excavation works are combined with reducing the sediment entering the pool by trapping the sediment upstream.

7.2 Construction of a Sediment Trap

Accretion naturally occurs along the Avon where bed dunes and vegetation exist across the channel forming natural weirs. Constructing a low weir upstream of the southern end of the pool will trap sediment and minimise sedimentation of the main pool area. The trap will assist in stabilisation of the riverbed, creating more favourable conditions for vegetation establishment. Vegetation will provide long term stabilisation by locking the sediment and providing resistance to flow.

The height of the weir should not exceed 0.5 m. The weir would create an upstream trap with a sufficient capacity to restrict the sediment from entering the pool area for several years (depending on the nature of the flow). The design should incorporate habitat design principals so that the weir does not present a barrier to the migration of aquatic fauna. The structure will effect river flow during low flow conditions,

but will have minimal impact on flooding. A program of sediment removal will need to be devised, dictated by the survey estimates of sediment accretion behind the trap. Accretion will need to be monitored and sediment periodically removed for the structure to continue to function as a trap as long as is required to maintain the pool.

There are several options for constructing a sediment trap. Further site inspections are required and additional survey data may need to be obtained to select the site upstream of the island and develop a detailed design of the trap. A rock trap could be trialed, similar to the structure constructed in April 1998 at Burlong Pool. This has a dual use as it can be used as a crossing for a river trail. Alternatively, a gabion weir, a maximum of one basket high, could be installed (*Leaver, 1992*). A less expensive option is to construct a low log wall structure (*Leaver, 1996*). Filter cloth would be required on the upstream face of the wall to trap the silt. A rock apron would need to be placed on the bed, extending for about 2 m downstream of the wall, to prevent scouring. The ends of the wall would require protection with rock. The height of the wall could be raised once the effectiveness of the structure is assessed.

7.3 Stabilisation of the Island

It is recommended that the island at the southern boundary of the pool, 450 m upstream of the weir, be further stabilised by enhancing the existing vegetation. The area should be protected from the public and interference by domestic animals. The unvegetated, mobile sediment at the downstream end of the island (photo 4) should be removed. This work could be undertaken during the excavation of the sediment slug.

The toe of the island could be stabilised by overlaying with matting that allows vegetation to grow through such as "Jutemaster". The matting should be secured into position and the toe overlayed with stone. Alternatively, log walling could be installed around the island to provide erosion protection. Revegetation of the exposed sediment and foreshore areas will further stabilise and enhance the pool. Species suitable to the high saline environment should be selected. Vegetation that provides suitable habitat for birdlife and has good stabilisation properties is recommended. A planting and maintenance regime should be developed.

Waterbird habitat will be improved by providing a variety of environments in the pool area, including the island, shade areas and deep and shallow water (*Waterways Commission, 1995*). The island will provide a suitable habitat for breeding, roosting and feeding for birdlife if undisturbed. By protecting and improving the birdlife habitat, existing populations should be maintained or increased.

8.0 References

1. *Avon River Survey 1996 Volume 5 Avon River Pool Survey*
   Avon River Management Authority
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   Jim Davies and Associates

2. *River Recovery Plan Section Six - Northam*
   Avon River Management Authority
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3. *Avon River Flood Study*
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4. *The Avon an Introduction*
   Harris, T F W 1996

5. *Avon River Management Authority Management Programme: 1997 – 2007*
   Avon River Management Authority
   February, 1999

6. *Management Strategy for the Avon River System*
   Prepared for the Government of Western Australia
   Avon River Systems Management Committee and the Waterways Commission
   January 1993

7. *Northam Town Pool Sediment Management Plan*
   Report to the Northam Town Council
   Avon River Management Authority
   Compiled by Caroline Seal
   Waterways Commission, July 1995

8. *Beverley Trails*
   prepared for the Shire of Beverley by M. Tooby & Associates, March 1999

9. *Burlong Pool Sediment Management Plan*
MP Rogers and Associates Pty Ltd
Water and Rivers Commission
September 1996

10. *Beverley Town Pool*
Internal Memorandum
2 December 1992 File RP.83.048
T.G. Leaver & B. Johnson
Waterways Commission

11. *Field Visit 17 January 1996 – Shire of Beverley - Report*
13 February 1996 File 1239
T.G. Leaver
Water and Rivers Commission

12. *Beverley Town Pool – Avon River*
Letter to Mid West / Avon Region office
25 June 1996 File 1239
B. Till
Water and Rivers Commission

13. *Beverley Pool Phytoplankton Summary: 17 January 1996*
14 Febuary 1996 Report File 1239
V. Hosja & S. Grigo
Water and Rivers Commission

14. *Condition of Section Six*
Avon River Channel Survey: Volume 2
J. Black, March 1997
prepared for the Avon River Management Authority

15. *Report on an Aboriginal Site Survey of Burlong Pool, Shire of Northam*
Prepared for the Water and Rivers Commission
by Yates Heritage Consultants in association with Tamora Pty Ltd
January 1999

Water & Rivers Commission - Regional Services

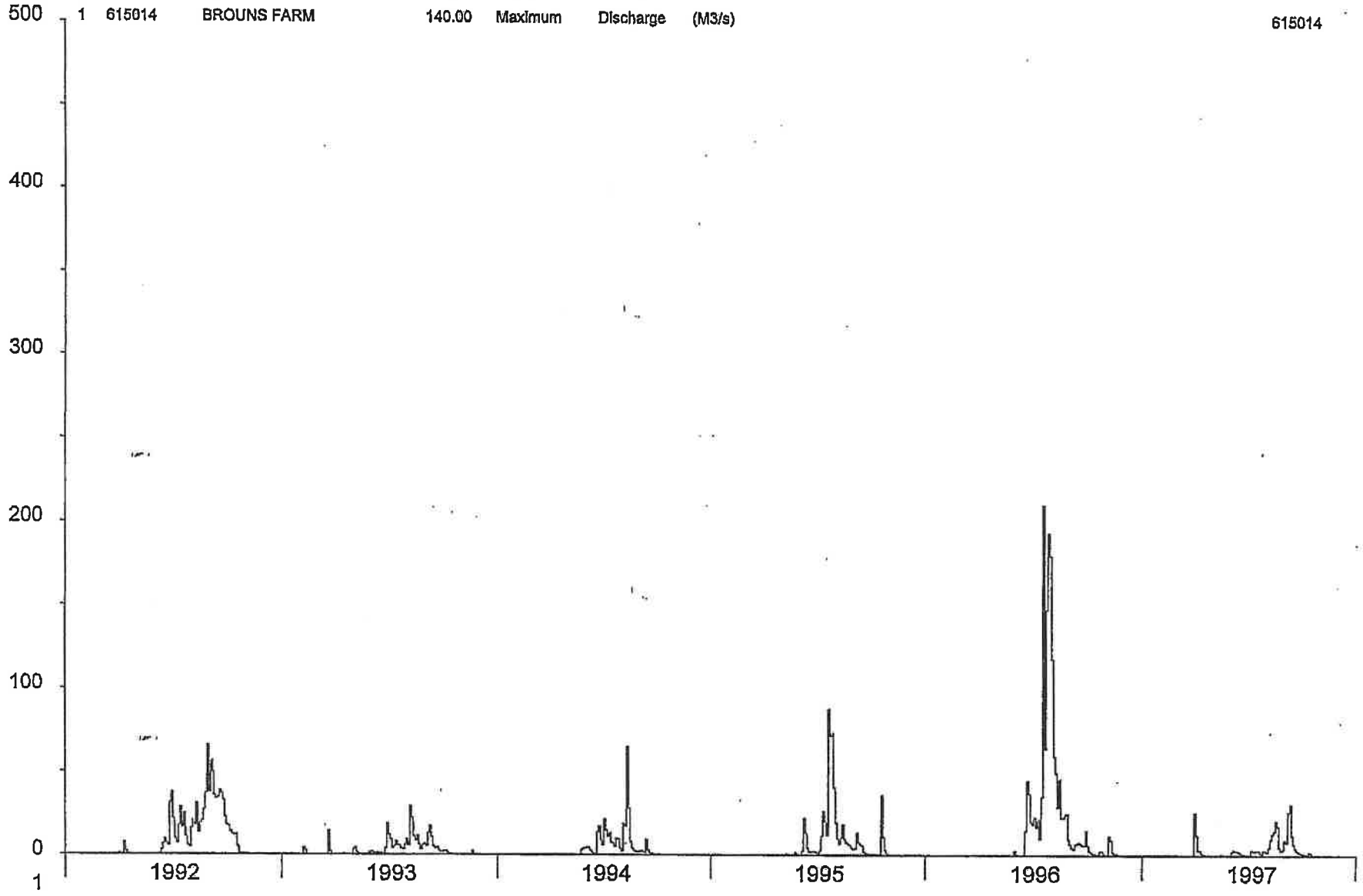
HYPLOT V89 Output 11/11/1998

Period 6 Year Plot Start 00:00_01/01/1992
Interval 3 Day Plot End 00:00_01/01/1998

1992

1 615014 BROUNS FARM 140.00 Maximum Discharge (M3/s)

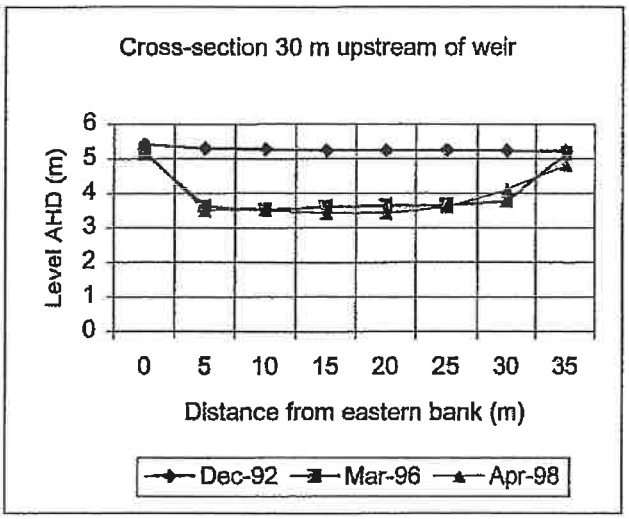
615014

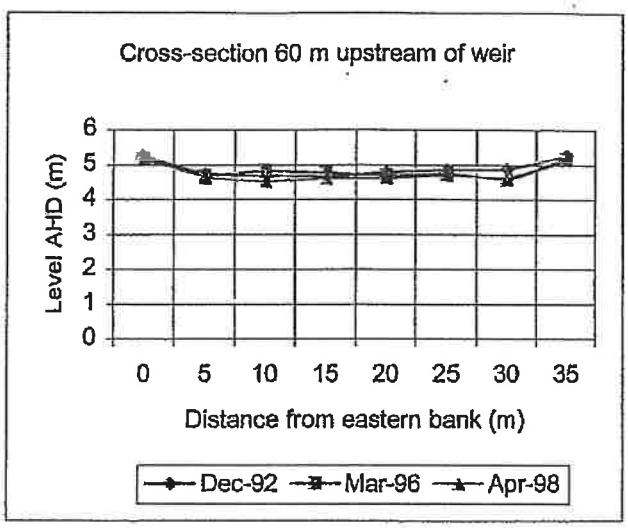


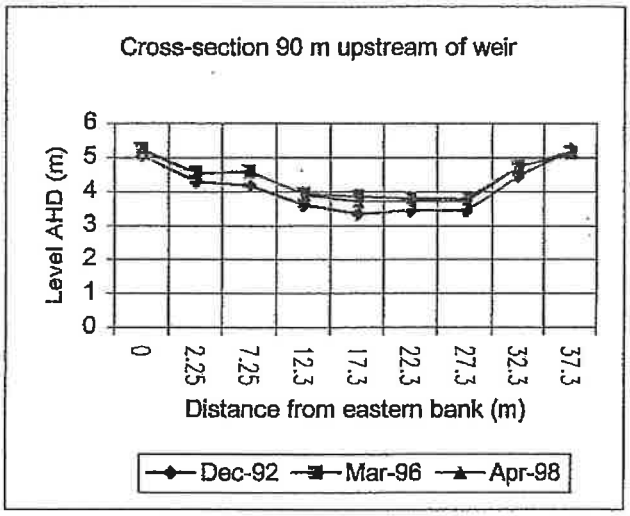
APPENDIX 1: HYDROGRAPH 1992-1997

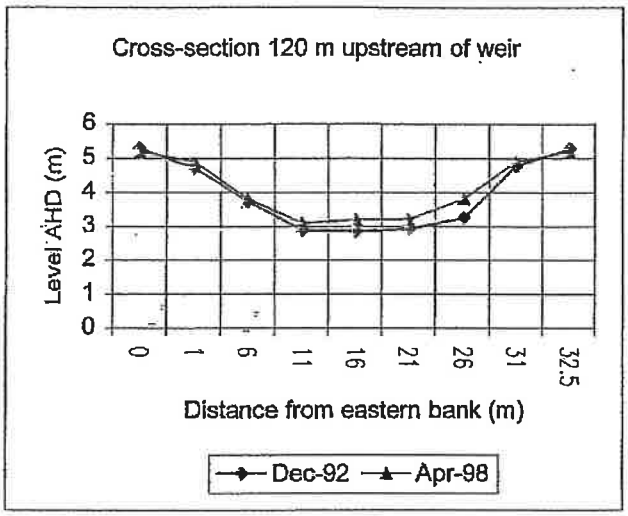
APPENDIX 2

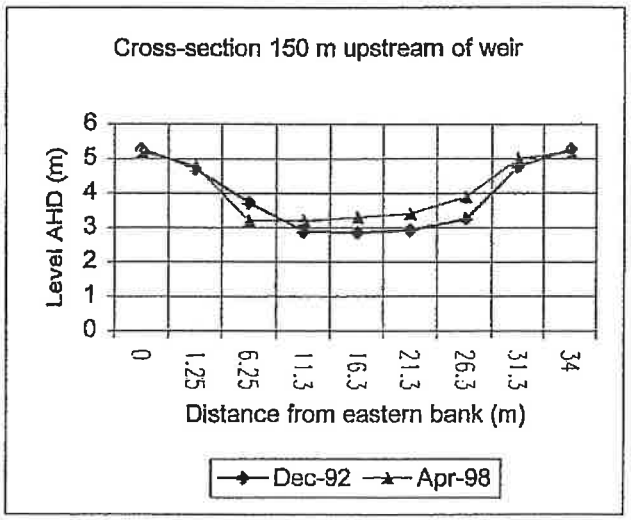
Beverley Pool Cross-Sectional Survey

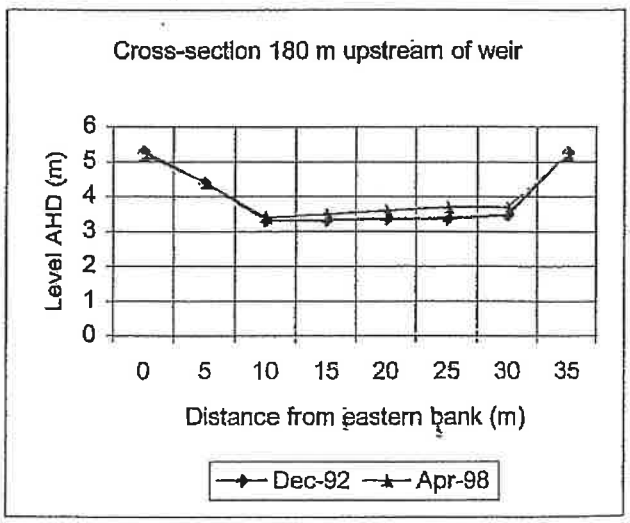




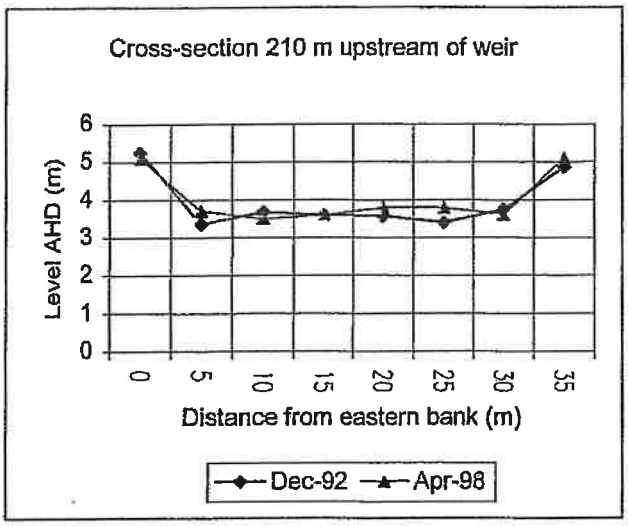


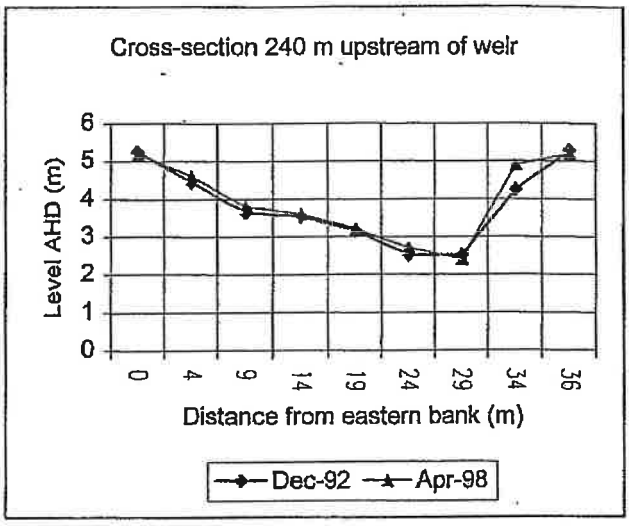


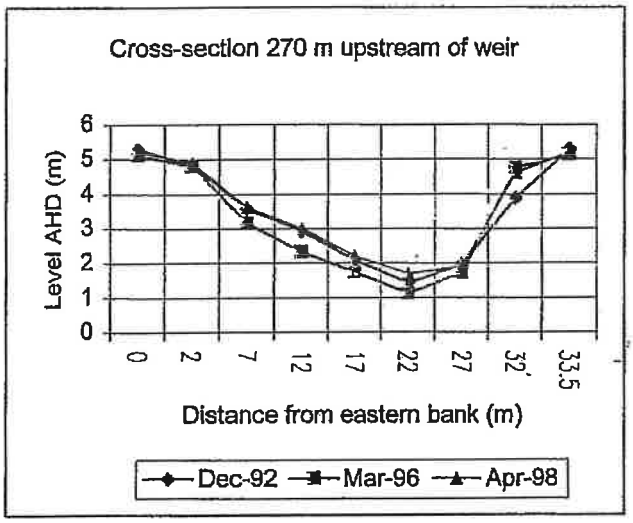


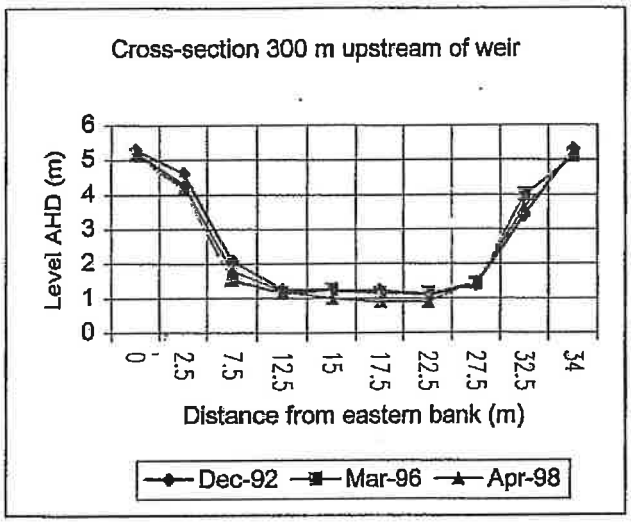


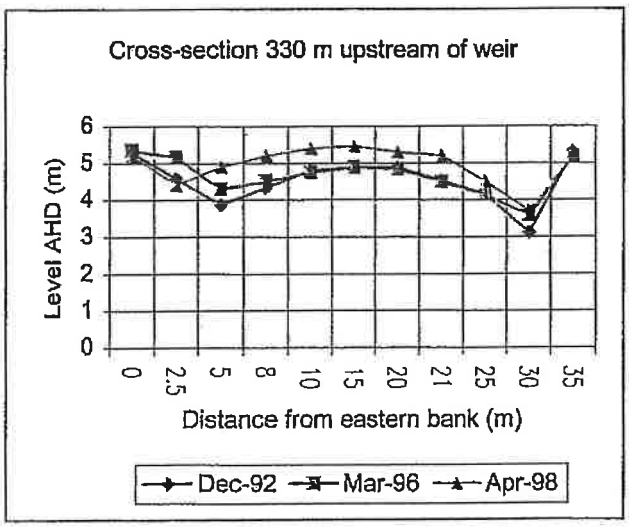
Beverley Pool Cross-Sectional Survey

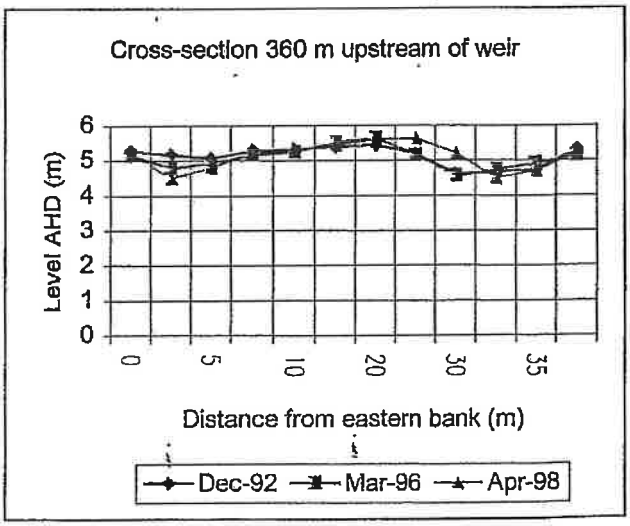




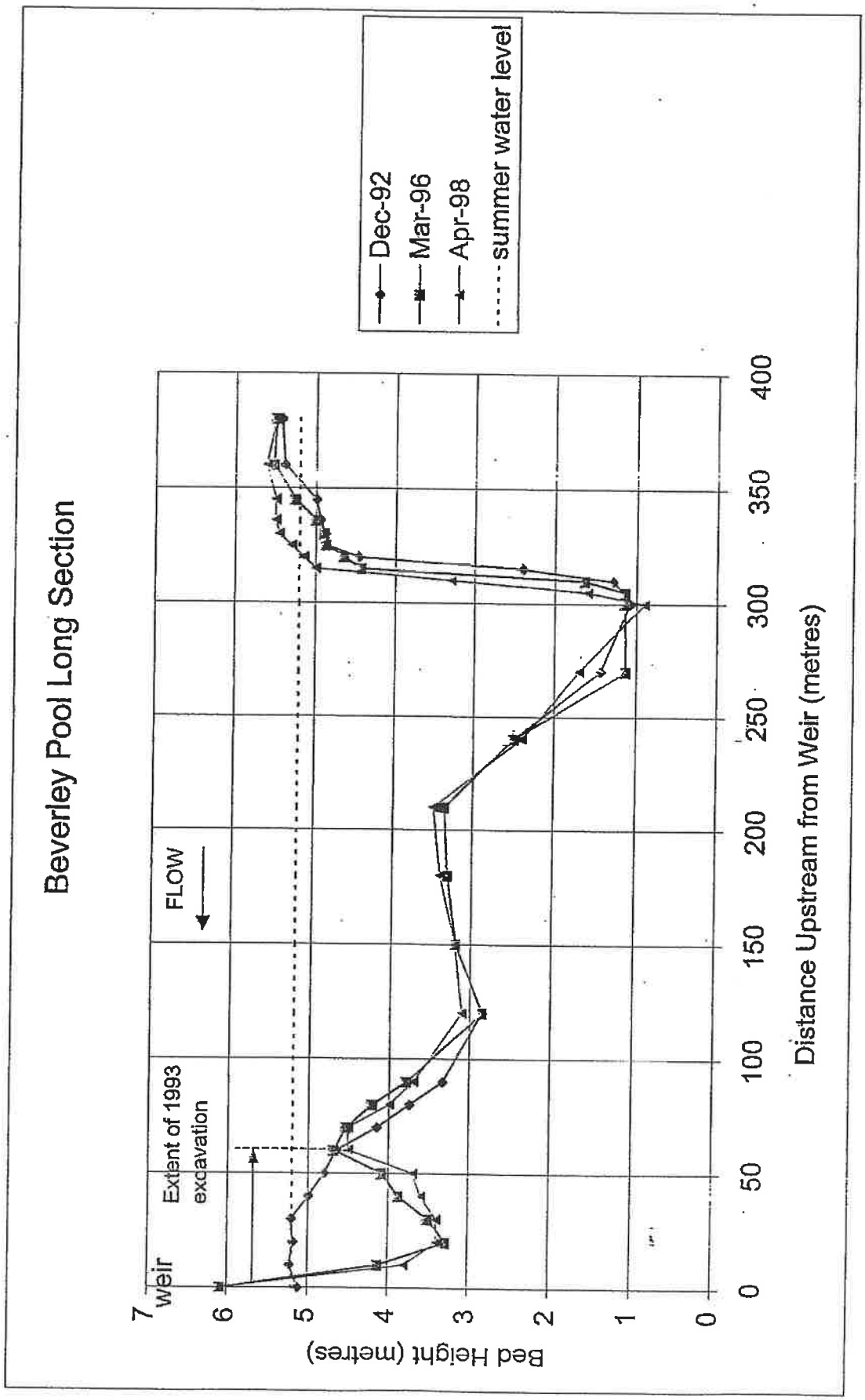








APPENDIX 3


Beverley Pool Long Section
Dec-92
Mar-96
Apr-98
summer water level
FLOW
Extent of 1993 excavation
weir
Bed Height (metres)
Distance Upstream from Weir (metres)
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300
350
400

Approximate Upper Salinity Limits for Animal & Domestic Use

Hot Water Systems 1.6 mS/cm
Human Consumption (Tolerate up to 2.5 mS/cm)

Poultry (Tolerate up to 4.7 mS/cm)
Dairy Cattle (Tolerate up to 5.5 mS/cm)

Showers and Baths (up to 6.2 mS/cm)
Pigs (Tolerate up to 7 mS/cm)

Horses (Tolerate up to 10 mS/cm)

Lambs, Weaners, Breeder Ewes
(Tolerate up to 11 mS/cm)

Beef Cattle (Tolerate up to 15.5 mS/cm)

Adult Sheep 16.5 mS/cm - 22 mS/cm

SALT CONTENT			
uS/cm	mS/cm	ppm	gr/gl
1000	1	550	38.5
2000	2	1100	77
3000	3	1650	115.5
4000	4	2200	154
5000	5	2750	192.5
6000	6	3300	231
7000	7	3850	269.5
8000	8	4400	308
9000	9	4950	346.5
10000	10	5500	385
11000	11	6050	423.5
12000	12	6600	462
13000	13	7150	500.5
14000	14	7700	539
15000	15	8250	577.5
16000	16	8800	616
17000	17	9350	654.5
18000	18	9900	693
19000	19	10450	731.5
20000	20	11000	770
21000	21	11550	808.5
22000	22	12100	847

Salinity meas. Bev River Town Pool 31.11.22

Name:
Date of Salinity Test:
Results: 7 oms c/m

All care has been taken in an effort to provide an accurate reading, however Council shall not be responsible should an error occur.

Salinity is an important property and is a measure of the mass of dissolved salts in a given mass of solution...

Conductivity in Water and/or Soil should be regularly monitored along with pH and oxygen content to account for changes occurring the various seasonal and farming cycles.

Foreword

The Avon River, in days gone by, as it wound its way to the coast through my home town of Beverley in Western Australia, was an idyllic place of nature, where in summer its infrequent pools were shaded by large river gums and sheoaks, while between its pools a variety of riverine vegetation and fallen tree debris covered the dry river bed. During winter its flow was slowed due to the obstructions in the river bed and much of its silt load found its way to the river's flood plain.

As kids we rode our horses along its wooded foreshore, shot the odd duck or two and swam in its pools. Sometimes, although we all went to school in Beverley, we met our mates from neighbouring farms and the Aboriginal community from the locality of Mt Kokeby at the river pool known as the Kokeby pool where we had a flying fox, (rope tide to a high up tree branch).

These thoughts would, I'm sure, be shared by others of my vintage who have lived near and enjoyed one of our many rivers, both large and small, across Western Australia.

Controversy has for many years surrounded the Avon, not so much for its importance as a river, but more because of its geographical location in the landscape. Being approximately 280 km. In length (see fig 2) and having its source at Yealering in the Shire of Wickepin, the Avon is little more than a large creek until it reaches the juncture of the Yenyenning Lakes and the Avon River, an artificially raised dyke known as Qualandary Crossing.

It is from this point that the width of the river's bed increases dramatically, due to the effect infrequent floodwaters from the whole 120,000 sq. klm. catchment. (see fig 1) have when they overflow into the river which in the past have resulted in the flooding of towns and farmland before reaching Walyunga Falls in the Swan Valley where the Avon becomes the Swan River.

It was because of the flooding caused by these unusual rainfall events that over 60 years ago the need was felt to prevent further flooding by removing the fallen trees, logs and other debris from the river bed.

The following letters and documents give a factual account of the Avon River Training Scheme, the History of Qualandary Crossing and the various decisions that have been put in place to manage the Avon River over the last 65 years. Letters included in the following also factually dispel responsibility for the entire silting of the Avon on the implementation of the Avon River Training Scheme

I acknowledge the cultural significance the Avon River System has for both present and past generations of the Noongah community.

I value greatly my friendship with Mr. Robert Atkins and appreciate the advice and assistance given to me during his time with both the Waterways Commission and Swan River Trust

I am grateful for the information provided to me by:

Mrs Margaret Mourach, Resident of Beverley,

Mr Michael Allen and Mr. Bernie Kelly from the Department of Water,

Mr Mark Cugley and Ms Kate Bushby from the Swan River Trust

Mr Greg Warburton from the Shire of Toodyay.

Fred Bremner. 2015

Dredging of The Beverley Town Pool

Apart from the dredging of silt sand from Burlong Pool between Muresk and Northam by a commercial operator, the first project to reclaim a pool in the Avon River was undertaken by the Shire of Beverley by the dredging of the Avon River pool near the Beverley Town centre.

In September of 1988 the following letters were received from the A.R.S.M.C.and the Waterways Commission giving support for the dredging of the Town Pool

Avon River System
Management Committee

C/o Shire of Northam
55 Fitzgerald Street
NORTHAM, 6401
(096) 22 1099

Mr F. Bremner
P.O. Box 90
BEVERLEY, 6304

Dear Fred

RE : BEVERLEY TOWN POOL

This is to formally advise you of the Avon River System Management Committee's endorsement of the project, subject to the obtaining of engineering advice and the approval of the Shire of Beverley and its people, the Water Authority of Western Australia and other concerned departments.

I will now write to the Waterways Commission and request that they provide engineering advice on the proposed works.

As you know, this is to try and establish a prototype design for future use on the Avon.

I will suggest that the Commission contact you in their deliberations.

Yours faithfully

K.J. HIGGS
SECRETARY

14th September, 1988

WATERWAYS COMMISSION

184 ST. GEORGE'S TERRACE,
PERTH, W.A. 6000
TELEPHONE 321 8677

Your Ref.:

In reply please quote: 147.1.5
IP:CK

28 September 1988

Mr F R Bremner
PO BOX 90
BEVERLEY WA 6304

Dear Mr Bremner

RE AVON RIVER - BEVERLEY TOWN POOL

At the last meeting of the Avon River System Management Committee, it was resolved that the Waterways Commission should liaise with you with a view to providing advice and assistance with design and location of the proposed weir at Beverley.

If you care to forward a copy of the plans to Robert Atkins, he will refer them to our engineer for comment.

Yours sincerely

B. N. Hamilton

B H Hamilton
DIRECTOR

It was then not until December 1992 that two engineers from the Waterways Commission, Barry Johnson and Trevor Leaver, made arrangements for a hydrographic survey of the pool.

This work was followed by the dredging program in 1993.

WATERWAYS COMMISSION

PROTECTING OUR WATERWAYS

Our Ref: RP.83.048
Your Ref:
Enquiries: Mr Trevor Leaver

21 DEC 1992

Mr K Byers
Shire Clerk
Shire of Beverley
PO BOX 90
BEVERLEY WA 6306

Dear Mr Byers

AVON RIVER - BEVERLEY TOWN POOL

Further to the site visit of 1st December by Messrs B. Johnson and T. Leaver from the Waterways Commission, and discussion with yourself and Councillors on the above development.

Arrangements were made with you for a hydrographic survey of the river from the traffic bridge to approximately 500 metres up stream, to determine depths of water and profiles.

Probes of the shallow area adjacent to the bridge are also being taken.

When the survey information has been plotted and assessed, I will contact you and arrange to discuss the results with you.

Yours faithfully

W. Till
Director
Engineering, Construction & Maintenance

17 December, 1992

WATERWAYS COMMISSION

PROTECTING OUR WATERWAYS

Our Ref: RP.83.048
Your Ref:
Enquiries: T. Leaver

Mr K Byers
Shire Clerk
Shire of Beverley
PO Box 90
BEVERLEY WA 6306

Dear Mr Byers

AVON RIVER - BEVERLEY TOWN POOL

Further to my letter of 17th December, 1992, attached find a copy of the survey of the river from the traffic bridge to a distance of approximately 380m upstream.

One drawing covers the general water way and the other a detailed survey, including probes, of the area 80 metres upstream of the bridge.

Samples of the material within the shallow area were taken at three points and these indicate silt mixed with some sand.

There are three ways to remove the required material (approx 4000 m^3):

(a) dredge
(b) dragline
(c) hydraulic excavator.

Dredging

This would enable deposition of the material directly into a bunded area, however, problems could be encountered with extensive blockages.

Indicative cost - $30 to 40,000

RB30 Dragline and/or Excavator

Subject to site inspection by operator.
Indicative cost - $25 to 30,000

This has the disadvantage of requiring double handling of material.

Mr Leaver has arranged to discuss the project with Council officers on Thursday 4 February.

Yours faithfully

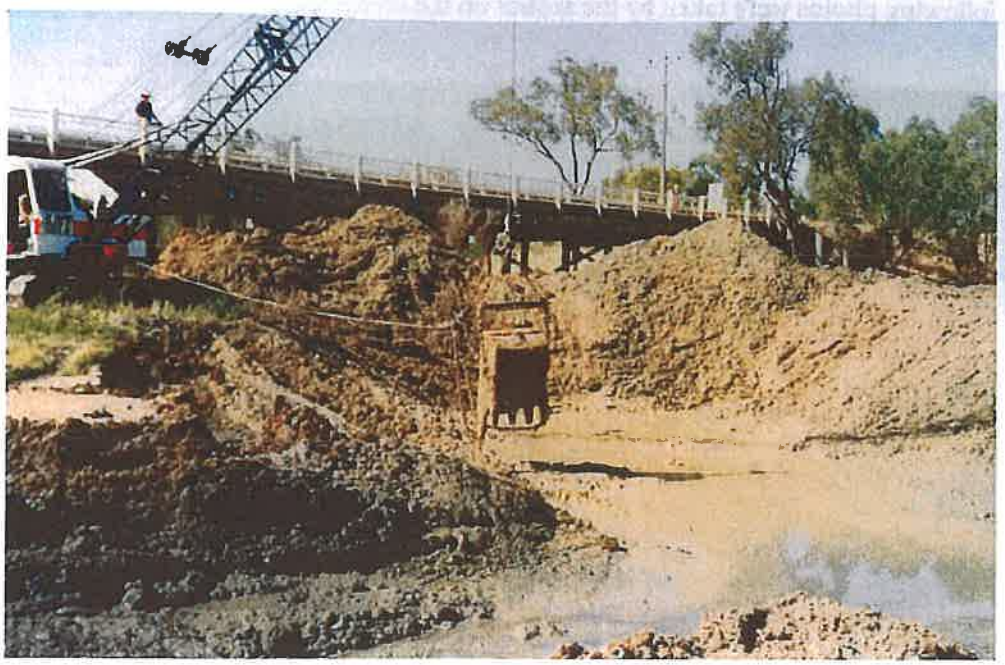
B. Johnson JP

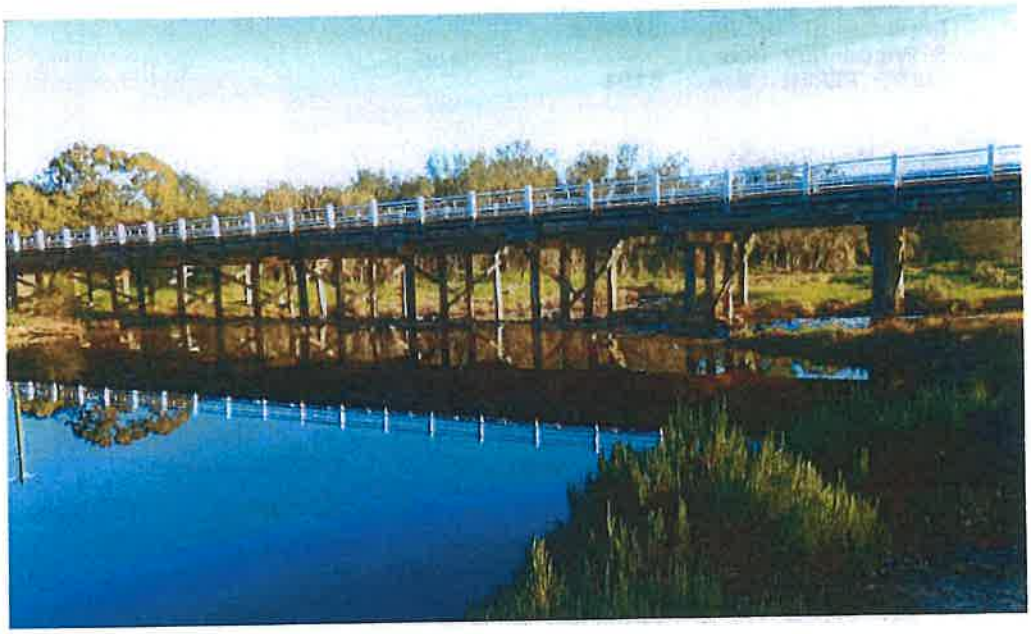
BARRY JOHNSON
A/DIRECTOR - ENGINEERING,
CONSTRUCTION & MAINTENANCE

4 February, 1993

Enc:

The following photos were taken by the author on the completion of the dredging operation.





SHIRE OF BEVERLEY
BEVERLEY, WESTERN AUSTRALIA, 6304

Our Ref: W7.1 (KB:NW)

Your Ref:

All communications to be addressed to
THE SHIRE CLERK,
P.O. Box 20, Beverley, 6304
Office: Telephone (096) 46 1200
Fax (096) 46 1409

23rd July, 1993

Ms. Jan Knight
Decade of Landcare Co-ordinator
Department of Agriculture
3 Baron-Hay Court
SOUTH PERTH W.A. 6151

Dear Ms. Knight,

On behalf of my Council I hearby submit the enclosed application for consideration in the Telecom Landcare Local Government Award and Living Streams Award.

The project undertaken is the reclamation of the Beverley Town Pool which has been transformed from an unsightly river bed into an aesthetically pleasing all year round pool for use by the local community and tourists alike.

Council trust that the judging committee will appreciate the benefits of this venture when examining each proposal.

Should further information be required relating to this undertaking contact can be made with myself on 096 461200.

I sincerely thank you for the opportunity to participate and eagerly await the committee's judgement.

Yours faithfully,

K.L. BYERS
SHIRE CLERK

Enc.

TELECOM LANDCARE LOCAL GOVERNMENT AWARD

BEVERELY TOWN POOL

The concept of developing the Beverley Town Pool on the Avon River was initially proposed by a prominent citizen, Mr. Fred Bremner, in the mid 1980's. At that time and up till recently the area, particularly in summer, was a smelly dried up river bed littered with small stagnant pools which were an ideal breeding ground for mosquitoes.

In June of 1988 a landscape architect Mr. D.W. Hobrough produced a plan to develop a dam with the inclusion of sluice gates. This included reclaiming some of the river for the use of a picnic area and stone pitching the banks. Although the community was enthusiastic and voluntary help available the proposal was too elaborate and beyond financial resources.

The project was then shelved for quite a period until mid 1992 when Council was of the opinion that a toilet block was required in the general vicinity. The simmering desire to enhance the appearance of the river was again rekindled and Council sought assistance from the Waterways Commission to provide some professional advice as to how to convert this idea into a reality.

In the interim Council received a grant from the Commonwealth Government under the Local Capital Works Project Scheme. This additional money provided the stimulus to begin work.

The overall plan was to develop the east bank of the river into a picnic/playground area and to dredge out the silt within the bed of the river to create a pool that would have water in it for the entire year.

The Waterways Commission were employed to provide a profile of the river bed to enable Council to have information as to the amount of silt that had accumulated. The silt build up had been created in the once 4.5 metre deep pool as a result of past practices such as agriculture and the River Training Scheme in the 1960's.

Permission was obtained from the Water Authority and Avon River System Management Committee to reconstruct the river and in February, 1993 approximately 20,000 cubic metres of silt was excavated from the bed. This was achieved by the use of two dragline excavators in ten days. The stabilisation of the foreshore was undertaken by Council employees with the northern end of the pool resembling a weir.

A sum of $55,000 has been allocated for the entire scheme which includes the introduction of toilets, gas barbecues, a childrens playground and picnic facilities.

The Avon's Connection to the Swan River

A history of the Avon River and its catchment would be incomplete if the Avon's ultimate connection to the Swan, Canning River systems were not included. The history of the Swan River is well recorded from settlement in 1829, those records being available to the reader from State Libraries, Museums and Government Agencies etc.

Perth, our Capital City, is recognised globally for its scenic beauty, due mainly the meandering nature of this beautiful river as it winds through our riverside suburbs. It is readily agreed by people interested in the rivers wellbeing that the environmental condition of the Swan has deteriorated in past years. Poor drainage systems from both residential and industrial areas throughout the Metropolitan area, have in the past, heavily polluted the Swan and Canning Rivers, an example being the Bayswater main drain, which drained effluent from industrial factories such as the old fertiliser manufacturing plants, which emptied into the Swan in the Ashfield area.

The Avon River, being the Swan River's major tributary, has also contributed to its decline, mainly as a result of past agricultural land use practices. Continual ploughing and fallowing for weed control on land used for cereal production has resulted in eroded farmland silting our rivers and waterways. The necessity for farmers to use artificial fertilizers to maintain production has resulted in nutrients from those fertilisers polluting our river systems.

Unusual rainfall or cyclonic events have, in the past, resulted in major flooding of the whole river and catchment system, including the Swan River. Flooding as a result of such events has occurred in the years 1862, 1872, 1910, 1917, 1926, 1930, 1943, 1955, 1958, 1963, 1982, 1996 and 2000.

As an example, in February 2000, floodwaters from Cyclone Steve flooded the 120,000 sq km Avon River catchment before inundating the Swan River with 270 gigalitres causing widespread flooding of the river foreshore.

In March/April of that year, the interaction of this water resulted in the creation of algal blooms in the upper reaches of both the Swan And Canning Rivers resulting in large fish losses. A description of this event is contained in the publication by The Swan River Trust, *River Science*, September 2000, article entitled *Summer Surprise: The Swan River blue green algal bloom February 2000.*

There are, however, several varieties of fish to be found in both the Swan and Canning Rivers. Bream and mulloway in the upper reaches of the Swan and flathead, prawns and crabs can be found in the lower reaches of the Canning and Swan Rivers.

For those in the community interested in the Swan River's environment, to be factually informed, we should also recognise the significant environmental improvements, including those in the agricultural industry, which have taken place in recent years. Improved methods of land use are resulting in reduced environmental stress to our waterways, including the Swan Avon catchment.

The introduction of minimum tillage and one pass sowing for cereal production, over an area of land the size of Tasmania, has resulted in farmland erosion almost completely disappearing. Improved and more efficient use of fertilizers has resulted in fewer nutrients entering the waterways.

Restoration work on the Avon River's flood plain and its tributaries, together with the dredging program of silted river pools, initiated by the Department Water (Northam office) and Wheat belt N.R.M. (previously Avon Catchment Council) have improved foreshore vegetation and increased the habitat for marine bird life, which frequent the lovely pools along the River. It is hoped that similar programs can be funded in future years.

From the Swan River's perspective, the Swan River Trust has played a major role in the environmental improvement of both the Swan and Canning Rivers. Planning and management of drainage systems throughout the Metropolitan area have improved and no longer have the environmental impact on our river systems, as was once the case.

Programs to promote water wise gardens and better use of fertilizers have resulted in less nutrients entering the rivers.

Environmental groups such as members of the Canning River Residents Environment Protection Association, Inc have, through their personal effort in repairing river foreshore, recognised the problems faced by the Swan and Canning Rivers, much of which were brought about through man's interference.

The following letter indicates a positive approach from the Swan River Trust.

GOVERNMENT OF WESTERN AUSTRALIA

SWAN RIVER TRUST

Your Ref
Our Ref
Enquiries Peter Adkins – 9278 0915

Mr Fred Bremner
130 Forrest Street
BEVERLEY WA 6304

19 February 2015

Dear Mr Bremner

CONDITION OF THE SWAN CANNING RIVER SYSTEM

Thank you for your enquiry regarding the health of the Swan Canning river system and it was good to meet with you earlier this week.

As discussed when we met, the Swan and Canning rivers and their tributaries face many challenges resulting from human activities, climate and land use change. Despite these challenges the Swan and Canning rivers are in relatively good condition, comparative to other urban river systems around the world.

The management and protection of our Swan and Canning rivers is a complex and ongoing task and the State Government is implementing a wide range of programs to maintain and protect the health of the rivers. The Swan River Trust (the Trust) coordinates an extensive water quality monitoring program of the Swan Canning estuary and its sub-catchments. The Trust also monitors foreshore condition, biological indicators (fish and seagrasses) and community benefit (connection, community use and economic benefit). Many of these indicators, particularly in the lower reaches, are showing positive trends of improvement. Fish communities for example, show an overall improvement in estuarine areas since the mid-2000's, with 29 different fish species recently recorded in near-shore waters.

The Trust works with the local community to promote "RiverWise" behaviour and has developed citizen science programs including a Dolphin Watch program where volunteers have been trained to identify the 20 – 25 resident dolphins that live in the river system. These resident dolphins are top order predators and their presence in the river system provides an indication of system health.

Recently released catchment reports also show a decrease in nutrient concentrations entering our river system over the last five years, although it should be noted that there has been decreased flow in these same years which would have influenced these results.

Whilst we have seen some recent successes, improving the health of the Swan and Canning rivers will continue to present many challenges into the future. It is however hoped that these positive trends continue and the river system can continue to be a highly valued recreational, social and cultural asset to the Western Australian community.

Yours sincerely

Mark Cugley
A/General Manager

What of the future for the Avon River?

Whatever the future holds for the Management of the Avon, it is and will remain a river put in place by nature as a drainage channel for its 120,000 square kilometre catchment, an area the size of Tasmania. It is doubtful that the river will ever be returned to an environment where the marine life of yesteryear [Mudfish, Perch, Flathead and Gilgie will again grace its pools.

However, to lay blame for its current state entirely on the river training scheme is both unfair and not factual.

From the first clearing of land for the development of agriculture through the removal of our native flora, our waterways and river systems have been the receptacle for its eroded and saline affected catchment.

The dedicated members of the many Committees, Boards, Community groups, Government Agencies and individuals who have taken an interest in the rivers wellbeing, have, all in their own way, contributed to an improvement in the river' s environment. Measures implemented over the years include:

Programs to control feral animals and invasive weeds.
Developing bird breeding habitats.
Dredging of river pools in both the Avon and Dale rivers.
Fencing the rivers and tributaries for the protection of riverine vegetation.
The establishment of salt tolerant pasture species in the catchment.

Much can be learnt from our Noongah community with regard to the river's protection from destructive fire, through the cool burning process used to control winter growing grasses (wild oats, etc) and to encourage the germination of native species, particularly now that the river is fenced and with no controlled grazing.

There are those in the community who should have learnt from failed experience that there is no single answer in tackling the scourge of rising ground water and spread of saline affected land.

Lack of cooperation and joint effort between Government agencies, consultants and self interest groups have achieved little in improving the health and productivity of our major assets, the land and river systems.

It is the hope of many that with continuing improvement in land use practices (ie minimum tillage) and management of saline land resulting in less salt and silt, the Avon river, will over time, by itself and the help of a dedicated community, heal much of the harm dealt to it by man's thirst for agriculture since 1829 and who knows, one day it may return to its former splendour.