EA-South West Box 4

ENVIRONMENT AGENCY

River Avon, Bath

- Aesthetic Study of Riverbanks Through the Urban Area of Bath

NWI/99/159-a

Final Report
North Wessex Investigations Team
February 2000

HO

ENVIRONMENT AGENCY

Information Services Unit

Please return or renew this item by the due date

Due Date

SUMMARY

The public's awareness of the environment around them has increased greatly over recent years. They are far more likely to report incidents of pollution and form action groups to campaign for their local area. The general public will assess the quality of a river primarily on its aesthetic appearance rather than its chemical content.

Residents and users of the River Avon downstream of Bath have long complained about accumulations of litter and debris affecting the banks and over hanging trees. A number of aesthetic surveys were therefore performed to assess the scale of the problem and identify the likely sources of the litter and debris.

Much of the litter was found to arise from those who live along the river or those who visit the river and surrounding areas. There was also the potential for waste to escape from industrial sites along the river front. Sewage debris from the many combined storm overflows through Bath and some misconnections into small watercourses was also found in the River Avon.

CONTENTS

1.0 INTRODUCTION

The awareness of the general public to pollution and its consequences has improved greatly in recent years. The public are now far more likely to complain and create action groups to protect their local environment. An area where this is most evident is the river environment.

The aesthetic appearance of a river and its surrounding area (banks and associated recreational areas) gives the public their initial impression and will be used by them to judge whether the river is polluted or not. The public perception of water quality within a river may be based solely upon the aesthetic appearance and ignore any improvements that have been made to the chemical quality of the river.

All aspects of appearance are used to judge the aesthetic quality of a river and the surrounding area. These can include the presence of litter and debris, oil films and slicks on the surface, water colour and clarity, foams, the excessive growth of algae and smell. Some of this can be the result of natural processes within the river or originate from the surrounding flora but much is the result of human influence upon the river via discharges, litter dropping or flytipping.

This report concentrates on the aesthetic quality of the River Avon through Bath and in particular litter and Sewage Related Debris (SRD) found along the banks and in over-hanging trees. It will attempt to identify sources and quantify their impact upon the river.

A further study will concentrate on identifying which Combined Sewer Overflows (CSO's) are potential sources of sewage debris and quantifying the different debris types to asses their potential influence upon the river.

2.0 TYPES OF RIPARIAN LITTER

Litter in its many forms, from industrial waste to SRD, crisp packets to shopping trolleys, motor vehicles to fishing tackle, can be offensive and is often a persistent form of pollution in the river environment. What is defined as offensive is down to personal interpretation, but items such as SRD, drinks cans and waste food are usual candidates. Much of this material is persistent in nature, i.e. it does not degrade easily and will remain in the environment for very long periods of time. It can exert a wide range of effects on the river ecosystem and human activities associated with it.

Litter can enter the environment from a number of sources including poor storage of industrial materials and wastes, littering by users of the river and surrounding area, sewage discharges, vandalism and fly tipping and also natural debris from vegetation around the river.

Litter is a problem on any river that comes into contact with man and can remain so for many miles downstream even affecting the marine environment where the river discharges to the sea.

2.1 Household, Tourist and Industrial litter

Litter from human activities is frequently found around riverbanks and suspended within the water column. This can include fast food wrappers, drinks cans, paper, plastic bags and containers, glass bottles and plastic sheeting. The most common occurrence of this litter is related to urban conurbation's and tourist areas. It is unfortunate that many people think nothing of dropping litter from bridges and eating areas around rivers.

Where watercourses pass through urban areas they are subject to poorly contained litter being blown into the water and surrounding vegetation. Litter can also be discharged via Combined Sewer Overflows (CSO's) along with sewage and can be washed into the river during heavy rain events and flooding. It may also be flytipped into the river.

Carparks are frequent sources of litter in rivers as they are often located close to riverbanks. They are commonly used for eating fast food and the wrappers disposed of out of the window along with drink cans and the contents of the ashtray. Many carparks are not regularly tidied or cleaned and rubbish bins, if provided, often join the litter in the river.

Much of the litter is comprised of plastic which, because of its versatility, has increased in use dramatically over the past twenty years. Plastics have a wide range of uses in domestic and industrial environments. Plastics are extremely durable, inexpensive and lightweight so they have replaced many of the more traditional materials.

When the plastic item has been used and discarded it can persist in the environment for many years, creating a hazard for wildlife and reducing the aesthetic quality of the river. This discarded plastic can accumulate in rivers and marine environments.

Plastics are made up of long tightly bound chains of hydrocarbons which the micro-organisms that are capable of breaking down paper-based products cannot penetrate. The plastics break down at a much slower rate in water than when exposed to air. When plastic does break down it only reduces to smaller pieces. This slow break down results in smaller and smaller fragments and eventually fibres.

2.2 Sewage Related Debris (SRD)

Large amounts of sewage related debris can enter the watercourse from three main sources; (i)crude sewage discharges as a result of blockages and pump failures, (ii)discharges from Combined Sewer Overflows (CSO's) and (iii)bad connections within the system.

SRD consists of sanitary towels and backing strips, tampon applicators and residue, cottonbud sticks, faeces, condoms, grease balls and rags.

The large quantities of SRD identified in the river environment are due to a number of factors.
1.) Sanitary protection products are increasingly made of, or incorporate, plastics which float, so they are more visible and persist within the environment. 2.) Some systems are old and unable to deal adequately with new and increased demands placed upon them by industry and new residential developments. 3.) Sewer maintenance is not adequate to maintain optimum capacity within the system. 4.) The toilet is traditionally used as a 'wet bin' within the bathroom by the British public.

2.3 Medical wastes

This type of waste is increasing in occurrence due to increased use within a growing drug culture. Other sources can be attributed to the increased use of disposable materials and flytipping.

2.4 Natural Debris

All rivers are subject to natural debris. Twigs, branches and limbs from overhanging trees, wind blown debris and dead animals may be found in the river.

A problem arises when the material accumulates either by a natural obstacle or a manmade one. It can rapidly become an eyesore and mix with other floating debris greatly increasing the perceived extent of litter at a particular location. It may smell and if released becomes a hazard to waterborne traffic.

3.0 AIMS AND OBJECTIVES

This project is related to the River Avon through Bath and is in response to long-term problems in this catchment.

For many years the inhabitants of the villages downstream of Bath on the River Avon have complained of litter and debris along the banks and suspended from overhanging trees. The inhabitants of Kelston, Saltford, Swineford and Bitton as well as users of the river for leisure activities have complained of large amounts of plastic sheeting material, general litter, natural debris and SRD trapped along the banks and in overhanging branches. The complaints are for most part, justifiable and understandable.

The River Avon through Bath is subject to two manmade controls on flow, Pulteney Weir and Sluice and Twerton Sluice. These devices control the level of the river through Bath restricting any changes in height. The sluice gates are natural collection points for floating debris from upstream.

Residents who live downstream of the city claim the problem originates within the city, whilst those in the city say much of the debris originates in communities further upstream. It was the intention of this study to try and identify the source of much of this debris.

This report relates to the first part of the study, which was an aesthetic survey along the banks of the River Avon from Lam Brook on the upstream side of Bath to New Bridge on the downstream side.

4.0 PROCEDURE

To gain an overview of the problem the banks were initially walked from Lam Brook to New Bridge. Litter and possible sources were noted and photographs taken (**Appendix I**). Specific counts were not made but an overall impression was gained to enable more detailed surveys to be targeted to give meaningful results. A general view of Bath and the area surveyed is shown in **Map 4.1**.

Any industrial premises that appeared to have containment problems were noted and reported to Environment Protection staff, so they could be subject to closer scrutiny from a site visit and advised on better waste handling procedures.

A more detailed litter survey was taken at four specific sites, once in spring and once in late summer/early autumn. This was to give an indication of any seasonal variation within the make up of the litter and debris found. The four sites used in the survey are identified in **Table 4.1**

Table 4.1- Stretches of the River Avon used for detailed litter survey

Map ref.	Site name	Survey area
ST 763 6615	Grosvenor Bridge	100 metres downstream
ST 744 6475	Stainer Rd Bridge	100 metres downstream
ST 7205 6525	Murco Garage	100 metres downstream
ST 687 6735	The Shallows, Saltford	100 metres downstream

Maps of each survey area are in **Appendix II**.

The width of the area surveyed varied between sites, as it took into account the area from which dropped litter could easily reach the river if assisted by a gentle wind. At most sites the area surveyed was about five metres wide, but at Saltford the left-hand bank was surveyed for eight metres. The form used to record findings also noted flow and weather conditions and left space for sampler's comments to note further important information that may be of relevance. An example of the survey form is in **Appendix II**.

At each site the occurrence of gross, general, sewage derived, harmful and accumulations of litter were noted for each bank and within the water if visible. The definition of each litter type is: -

4.1 Gross Litter

A gross litter item is one were at least one dimension is greater than 30 cms. Typical items were shopping trolleys, motor vehicle part or whole, plastic sheet, road cones and some garden refuse. Sacks of garden refuse were counted as one item.

4.2 General Litter

General litter items included all small household items, including cans and bottles, food packaging paper etc. and other items that are smaller than 30 cms.

4.3 Sewage Derived Litter

Sewage derived litter items included, feminine hygiene products, cotton buds, contraceptives, toilet paper and rag and faeces (of human origin).

4.4 Harmful Litter

Items that were dangerous in nature, for example, broken glass, discarded syringes and needles, other sharp metal items.

4.5 Accumulations

Collections of litter and debris, either dumped or around an obstacle in the water stream.

5.0 FINDINGS

5.1 General Survey of River Avon Through Bath

Pulteney Weir and Twerton Sluice divide the River Avon through Bath into three stretches, these stretches are very convenient for classifying the banks.

5.1.1 Lam Brook to Pulteney Weir

This stretch of the River Avon begins at Lambridge on the upstream outskirts of Bath where the Lam Brook enters the Avon and finishes at Pulteney Weir and Sluice in the centre of Bath. The northern bank is a mixture of sports fields and residential areas. For much of the residential area the banks are tree lined. The banks from Pulteney Bridge to Pulteney Weir are clad in Bath stone. Much of the southern bank is again residential and tree lined but above Cleveland Bridge the banks are less developed and for much of the stretch entirely undeveloped.

It was very difficult to survey much of this section from the bank because of the nature of the land use, i.e. residential. The stretches that were surveyed indicated light to moderate deposits of waste caught in the flora along the banks. This waste consisted of plastic (bags, small sections of sheet etc), SRD and general litter.

The plastic waste and SRD was concentrated at the upstream end of the survey area. The general litter was concentrated at Pulteney Weir and sluice where the riverbanks are freely accessible to the public and tourists. There was some litter along the banks around the housing estate at Grosvenor Bridge as this area is also used recreationally. There was evidence of dumped and wind blown debris from the estate reaching the banks.

The majority of the debris found at Pulteney sluice was of natural origins; mainly wood fragments, branches and other debris from the flora around the banks. This mixed with a considerable amount of localised general litter to produce an unsightly area. There was no visible SRD amongst this debris.

5.1.2 Pulteney Weir to Twerton Sluice

This stretch of the River Avon is the most heavily used in the Bath area running from the tourist areas around Pulteney Weir, skirting the southern edge of the city shopping area through residential and light industrial areas to the sluice at Twerton. For long stretches the banks are shuttered with steel or concrete piles with only relatively small pockets of 'natural' bank area. The Kennet and Avon canal joins the river upstream of the Churchill Bridge and a towpath runs the entire length of the river on at least one bank.

With the banks shuttered and only limited vegetation reaching the water, this stretch appeared to be relatively free of debris. This section of the river varies very little in height between dry and wet weather, so there was very little litter caught in overhanging branches. One of the most obvious areas of suspended debris was around the Twerton storm tank outfall (up and downstream) where brambles hang to the water level. There was also SRD caught on a mooring line across the outfall pipe (see photo).

Along the shuttered sections various flora have established a toehold and where growth fell beneath the surface of the water there was evidence of SRD and plastic attached to it. The same occurred in the more natural bank areas and there were some accumulations on the surface in relation to waterline branches and larger pieces of debris.

The sluice at Twerton was an area of the river that collected debris and again the accumulation contained a large proportion of natural waste and general litter. Larger items of plastic and debris along with SRD were also found. Much of the suspended debris within the water column seems to pass over the sluice without being caught.

This section of the river contains a large number of sewer overflows and river outfalls, a number of which had SRD concentrations associated with them. The worst of these were the Locksbrook system, Windsor Villas, Norfolk Crescent and Twerton Storm Tanks. The outfall at Norfolk Buildings did not appear to have sewage debris but a large amount of general litter associated with it (see Map).

There was general litter along the bankside paths where there were few, if any, litter bins. There were a number of litter hotspots along this stretch of the river, including the area around Churchill Bridge at the southern end of the city centre. This consisted of mainly wind blown litter and fast food wrappings. At many of the other hotspots there was a large number of alcohol cans amongst the litter.

Other possible sources of debris along this stretch were Sainsbury's (bags, general litter and trolleys) and a timber yard on Lower Bristol Rd which backs onto the river (treated timber pieces and plastic sheet).

5.1.3 Twerton Sluice to New Bridge

This stretch of the River Avon commences at the Environment Agency operated sluice at Twerton Depot and ends at New Bridge on the downstream outskirts of Bath. The banks are planted with over hanging trees and shrubs with a footpath running along the northern bank. Also on the northern bank there is a marina at New Bridge and an industrial estate that backs onto the river. There is also a small car park located at the Twerton end of the stretch, which has a mobile burger van. The southern bank is not so developed as the northern bank, with mainly vehicle storage yards and a petrol station on the narrow strip of land between the river and the Lower Bristol Road.

The banks and over hanging flora in this stretch of the river were heavily fouled to a height of about 1.5 to 2 metres above the water level. The litter in the branches consisted of large sheets of plastic draped from one tree to the next, smaller fragments of plastic including supermarket bags, sacking, fast food packaging and general litter. There was also a considerable amount of sewage debris evident, some in a state of deterioration and some of a fresher vintage. There was also paper-based waste amongst the undergrowth along the banks.

Because the majority of the material suspended from the banks was plastic based there was no way of knowing how long it has been there. Plastics do not decompose in the environment and only UV in the sunlight will weaken the structure of these materials. The situation becomes progressively worse as debris accumulates over time.

The plastic in the branches is only exposed to direct sunlight during the winter/spring months, being shielded during the summer months by the canopy of leaves on the trees. Though protected from direct sunlight the plastic and debris was still very visible to walkers and river users.

There was evidence of some larger materials being dumped into the river (e.g. motor scooter, shopping trolleys and pallets) and, although submerged these were clearly visible from the bank. The river had a noticeable amount of natural debris (branches and broken limbs of trees) on the water surface along the southern bank in particular, and this was an area where litter accumulated.

The industrial units along the north bank appeared to have waste containment programmes in operation. On the day of the survey there was no visible waste in the yards of the units and each unit had at least one covered dumpster. This does not discount the possibility of deliberate (vandalism) or accidental release of litter into the river environment from these units. The footpath along this stretch is not as heavily used as others as it is dirt based rather than tarmac. There was diffuse litter along its length although no major accumulations. A likely point of entry for general litter into the river was the small parking area at the Twerton end of this bank, where there was a burger van during the morning/early afternoon period and evidence of flytipping.

It was very noticeable that there were no litter bins and only one dog waste bin along this section of path.

The southern bank is steep and tree lined, with little access for the general public. There were two very obvious places where litter could enter the river; the Murco petrol station, and part of the Morris Minor operation both along the Lower Bristol Road. The Murco petrol station had covered dumpsters and waste containment areas but these were not being used successfully and large amounts of mixed litter had been flytipped down the bank (see photos). The Morris Minor Centre appeared in part to be used as a scrap yard and although a covered dumpster was in evidence large amounts of scrap material had been allowed to drop down the bank to the river (see photos).

5.2 Detailed Litter Survey

5.2.1 Grosvenor Bridge, spring survey

The spring survey at Grosvenor Bridge indicated that most of the litter counted within the survey area originated in the local area and mainly from residents of that area. The banks in proximity to the Grosvenor footbridge were subject to some dumping of garden and household waste. There was also evidence of litter being blown from the local housing estate and ending up in the river environment. There was only a small amount of debris (general and sewage based) that appeared to have been deposited via the river. There was a storm overflow upstream and some evidence that some of the debris may have originated further upstream. The amounts of litter found in the survey are shown in **Table 5.1**

Table 5 .1 Items of litter and debris found at Grosvenor Bridge, spring survey

Litter Type	North Bank	South Bank
Gross	2	1
General	78	61
Sewage Derived	3	2
Harmful	1	-
Accumulations	2	1

5.2.2 Grosvenor Bridge, autumn survey

The autumn survey at Grosvenor Bridge reiterated the original survey in respect to the origins of much of the litter in this area. Even more garden waste had been dumped from the bridge (much of it outside of the survey area, though). A lot of the waste identified in the spring survey was still in evidence, and this had been added to by some dropped litter and also debris around fishing sites. **Table 5.2** shows the litter items counted in the autumn survey.

Table 5.2 Items of litter and debris found at Grosvenor Bridge, autumn survey

Litter Type	North Bank	South Bank
Gross	2	4
General	92	50
Sewage Derived	-	-
Harmful	-	-
Accumulations	2	2

5.2.3 Stainer Road Bridge, spring survey

The spring survey at Stainer Road Bridge indicated that much of the litter in this area had been discarded by users of that area. The Stainer Road Bridge services the Sainburys superstore carparks and much of the litter could be attributed to visitors of that store. Two shopping trolleys from Sainsbury's had been dumped into the river. There were a number of drinks cans amongst the undergrowth along the north bank. The sewage debris identified along the northern bank was in close proximity to the CSO at Norfolk Crescent.

Table 5.3 Items of litter and debris found at Stainer Road, spring survey

Litter Type	North Bank	South Bank
Gross	1	2
General	136	46
Sewage Derived	12	-
Harmful	-	-
Accumulations	-	-

5.2.4 Stainer Road Bridge, autumn survey

The findings of the autumn survey were similar to those of the spring survey, in that the litter originated from users of the towpath. A large proportion of the litter found on the northern bank was alcohol cans. There was also some drugs related paraphernalia in evidence including a syringe. During the summer the sewer associated with the CSO at Norfolk Crescent was jetted out and is now performing much more satisfactorily. There was no sewage debris in this stretch. The litter on the southern bank was almost solely associated with people fishing. There was another shopping trolley in the river.

Table 5.4 Items of litter and debris found at Stainer Road, autumn survey

Litter Type	North Bank	South Bank
Gross	3	3
General	189	72
Sewage Derived	-	-
Harmful	1	1
Accumulations	-	-

5.2.5 Murco garage, spring survey

There were very heavy deposits of litter and debris in this survey area. Unlike the two previous survey areas much of the debris had arrived via the river and was caught in the over-hanging vegetation. Amongst the general litter caught in the branches was a large amount of sewage debris both old and new. There was still a large amount of flytipped waste at the back of the Murco garage and some larger debris and building waste further downstream at the back of the Vanguard Office on the Lower Bristol Road. There were moderate deposits of litter along the path on the North bank.

Table 5.5 Items of litter and debris found at Murco garage, spring survey

Litter Type	North Bank	South Bank
Gross	4	17
General	254	173
Sewage Derived	68	82
Harmful	-	-
Accumulations	2	3

5.2.6 Murco garage, autumn survey

The autumn survey at this site indicated a change in the make-up of the litter. Much of the litter and sewage debris that was suspended from the over-hanging branches had gone and much of what was left was old. There was far more litter along the path and about a third of it was drinks cans (alcohol). Much of the debris around the Murco garage and Vanguard Office was still there.

Table 5.6 Items of litter and debris found at Murco garage, autumn survey

Litter Type	North Bank	South Bank
Gross	2	8
General	196	140
Sewage Derived	27	39
Harmful	-	-
Accumulations	1	1

5.2.7 The Shallows, Saltford, spring survey

Litter at this site was relatively light when compared to the other sites. Much of the litter had arrived via the river and was caught in the vegetation along the bank. There were light sewage deposits in the vegetation with a higher concentration around the Shallows pumping station outfall. There were light litter deposits in the picnic area.

Table 5.7 Items of litter and debris found at Shallows, spring survey

Litter Type	North Bank	South Bank
Gross	1	4
General	20	74
Sewage Derived	7	26
Harmful	-	-
Accumulations	-	-

5.2.8 The Shallows, Saltford, autumn survey

The majority of the litter found on this survey was on the banks and at the picnic area and had originated in that area, not brought from upstream by the river as in the spring. Much of what had originated from the river was old. The northern bank is subject only to light use by fishermen and walkers, and the litter was subsequently very light. On the southern bank, despite the fact there were plenty of rubbish bins and the area is litter picked regularly, there was a large quantity of general litter that had been discarded within the picnic/carpark area. As this bank is open to the river, much of this litter could be wind blown into the river. Again, the majority of sewage debris was related to the outfall at the pumping station, but this was old and had not been discharged over the summer.

Table 5.8 Items of litter and debris found at the Shallows, autumn survey

Litter Type	North Bank	South Bank
Gross	-	3
General	7	103
Sewage Derived	-	12
Harmful	-	1
Accumulations	-	-

6.0 DISCUSSION

From the results of the general survey it is possible to determine the most likely areas of origin for much of the litter and debris that was found in and around the river.

6.1 General Survey

6.1.1 General Litter

The sources of this were diffuse along the whole length of the river through Bath. There was evidence of some litter coming from upstream of Bath but much of the litter originated from people who live on or near to the river, or those who visit areas around the river. For some people who live near the river it is seen as a convenient dumping ground for household and garden waste. In the centre of Bath the river is subject more to localised and windblown litter from tourists and locals who use the riverside path. Fishermen appear to casually discard litter around their sites and the paths seem a haven for night time drinking judging by the very large number drinks cans discarded amongst the undergrowth along the river.

There seems to be a general lack of litter bins along much of the river. If this was resolved some of the stretches along the river may improve, though there is always the risk of these bins being vandalised.

Many of the industrial units along the river appear to have a responsible attitude towards the containment of their waste, though there is always a risk of waste escaping to the river on occasions. There are some sites including the Murco garage and the Morris Minor depot, that need to improve their containment with regard to litter escaping to the river.

The dumping of larger items into the river by vandals is a problem in some places. This is a difficult problem to solve and falls outside the remit of this report.

6.1.2 Sewage Related Debris

From Lam Brook to Pulteney Weir there were light deposits of SRD, much of which originated from the London Road West outfall just upstream of the Lam Brook. There was some evidence of SRD from even further upstream but the point of origin is unknown. There was no evidence of deposits of SRD at Pulteney Weir.

As much of the stretch of river between Pulteney Weir and Twerton is shuttered, the occurrence of SRD was limited. There was some SRD located around sewage outfalls and above the sluice at Twerton.

Below the sluice at Twerton there were large amounts of SRD suspended from waterside vegetation. As there was were heavy deposits of SRD below the sluice at Twerton and very little above Pulteney, its fair to assume that most of the sewage debris originates from sewage outfalls and poor connections between these two points on the river.

6.1.3 Natural Debris

There were deposits of natural debris along the entire River Avon through Bath. It collected in most areas where the river was slowed and was found trapped around vegetation that hung into the water.

Debris also collected above both sluices in very unsightly concentrations. However, these sites could be used as removal points, particularly at Twerton where the Environment Agency has a depot. Unfortunately at present much of the debris is released over the sluice to the detriment of sites further downstream, as the Environment Agency does not take responsibility for removal of the debris.

6.2 Detailed Litter Survey

The more detailed survey of litter and debris reiterated what had been found in the general litter survey. The majority of litter was from localised sources either flytipped or dropped and increased over the summer period as use of the river's amenities increased. SRD was found in high concentrations immediately downstream of Twerton sluice, with the concentration falling by the time the river had reached Saltford. SRD concentrations were higher in the spring than in the autumn at all sites. Much of what was found in the autumn was old and already surveyed in the spring survey. This suggests that much of the debris was deposited during high flow periods in winter/spring. Debris from summer storms appeared in the main to stay within the water column.

7.0 CONCLUSIONS

The majority of the SRD found originated from CSOs and sewer misconnections and were located in the stretch between Pulteney Weir and Twerton Sluice.

The visual impact of litter and debris along the banks was made worse by the lack of maintenance of riverside trees and shrubs. Many had limbs or branches that hung into the water column.

The litter found in the river and on the banks originated from people who use or visit the amenities of the river or live along the river.

The amount of debris in the river downstream of Twerton sluice could be improved if the Environment Agency cleared the debris and litter that collects above the sluice. This is currently being reviewed, although any changes in Flood Defence operations would carry substantial cost and Health and Safety implications.

The lack of litter bins provided by the local authority along the towpath contributes to the amount of litter found on the path. A copy of this report will be forwarded to BANES as a precursor to arranging a meeting to consider this issue further.

Education of the local population on their responsibilities to the river would assist in keeping the area cleaner and encourage others who visit the area to follow suit. This could be initiated by school talks, introduction to the riverbank environment trips, etc.

The majority of industrial sites along the river appear to have a responsible policy on the containment of waste, though there are some exceptions, which are being followed up.

8.0 RECOMMENDATIONS

8.1 Wessex Water controlled CSOs along the River Avon through Bath should be programmed for regular maintenance and scheduled for capital improvement in order to reduce the number of discharges that occur.

8.2 The Environment Agency should consider taking enforcement action against Wessex Water for any discharges from CSOs that breach the consent limits set, or are due to inadequate maintenance.

8.3 The Environment Agency should take responsibility for removing debris and litter from the river at Twerton Sluice.

8.4 Environment Protection staff should initiate discussions with the local authorities, for the provision of litter bins and a regular litter-picking programme for the towpath and other areas close to the river.

8.5 A carefully controlled programme of bank maintenance should be introduced to husband the trees and shrubs along the rivers edge. Material that is dead or that is of little aesthetic value should be removed in order to reduce the accumulation of debris along the banks. **Care should be taken though, not to degrade the aesthetic value of the vegetation along the bank.**

8.6 Areas that are used by the local inhabitants for dumping of household and garden refuse should be cleared and developed to encourage proper use of the area, again this should be raised with the relevant local authority.

8.7 An education policy should be introduced to encourage the proper use of the river environment amongst the inhabitants of Bath. This should be discussed with the Regional Education Officer.

8.8 Experience gained during this investigation should be developed in to a protocol for use in further similar projects.

APPENDIX I

Photographs illustrating the aesthetics of the River Avon, taken in spring 1999

Photo 1 Suspended mixed litter and debris downstream of Twerton Sluice.

Photo 2 Plastic sheet suspended from trees downstream of Twerton Sluice.

Photo 3 Close up of litter and sewage debris collected in branches of tree.

Photo 4 Dumped motor scooter in river.

Photo 5 Debris dumped from the back of Murco garage.

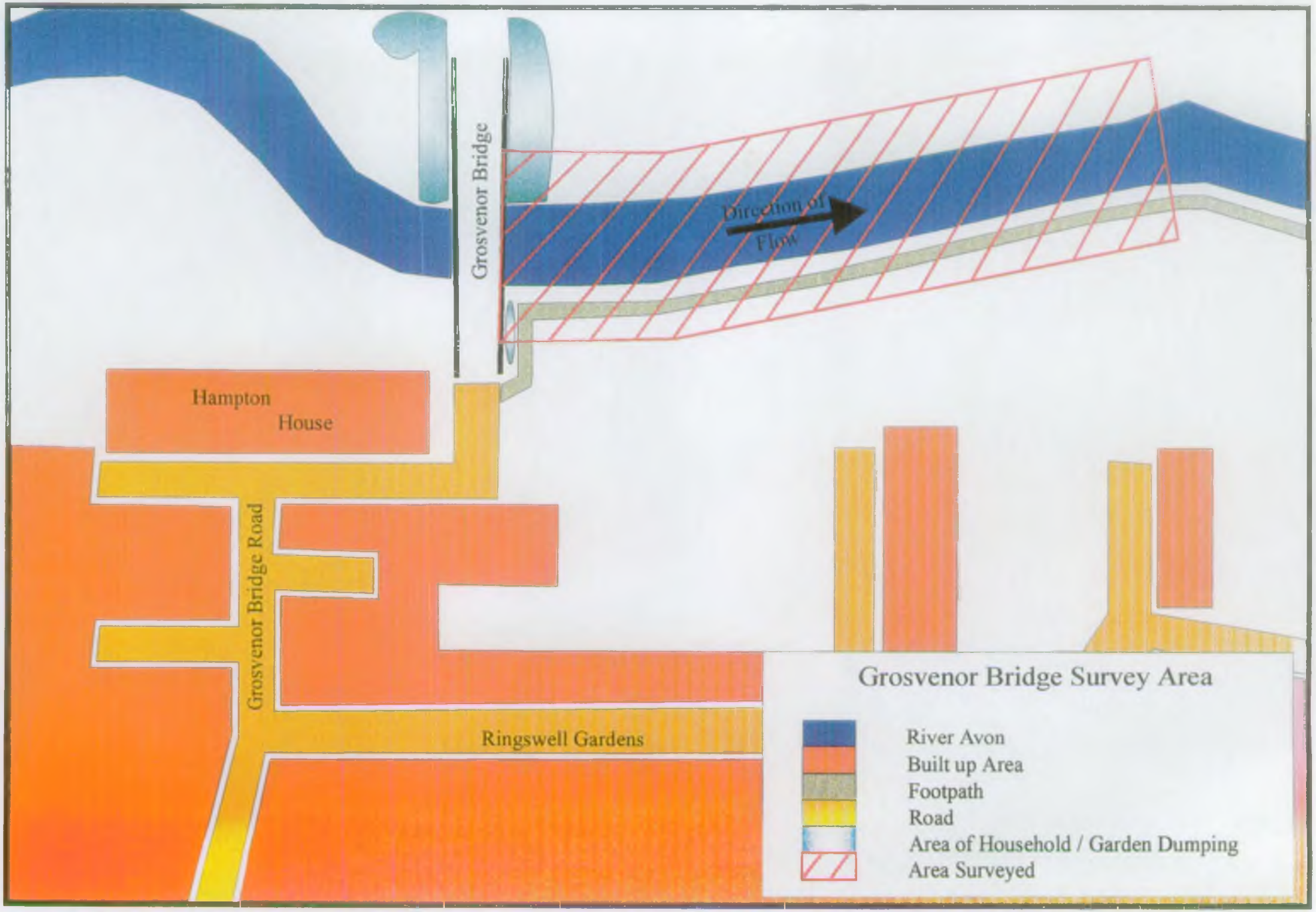
Photo 6 Scrap material dumped from back of Morris Minor depot.

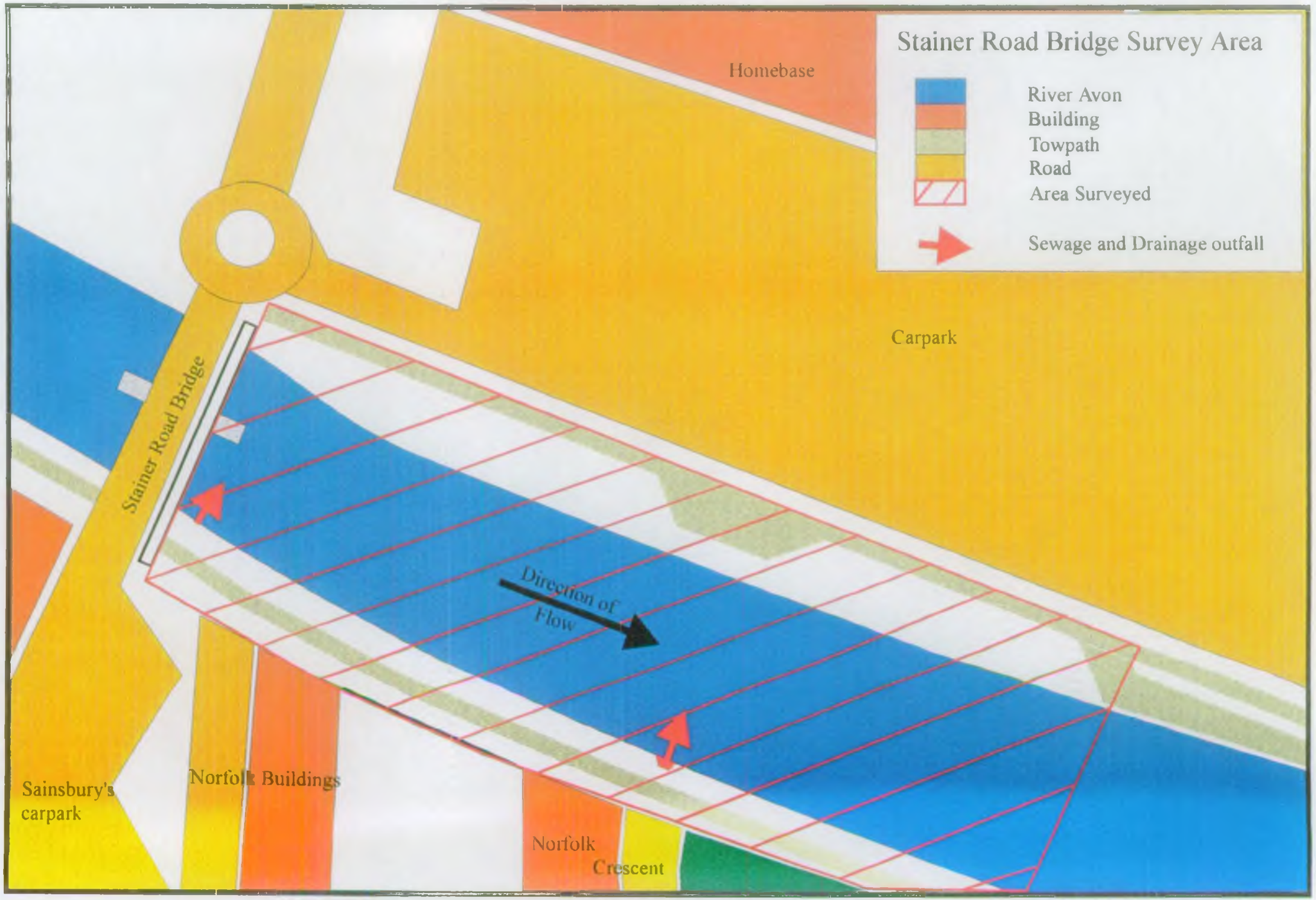
Photo 7 Twerton storm tank overflow pipe with suspended debris.

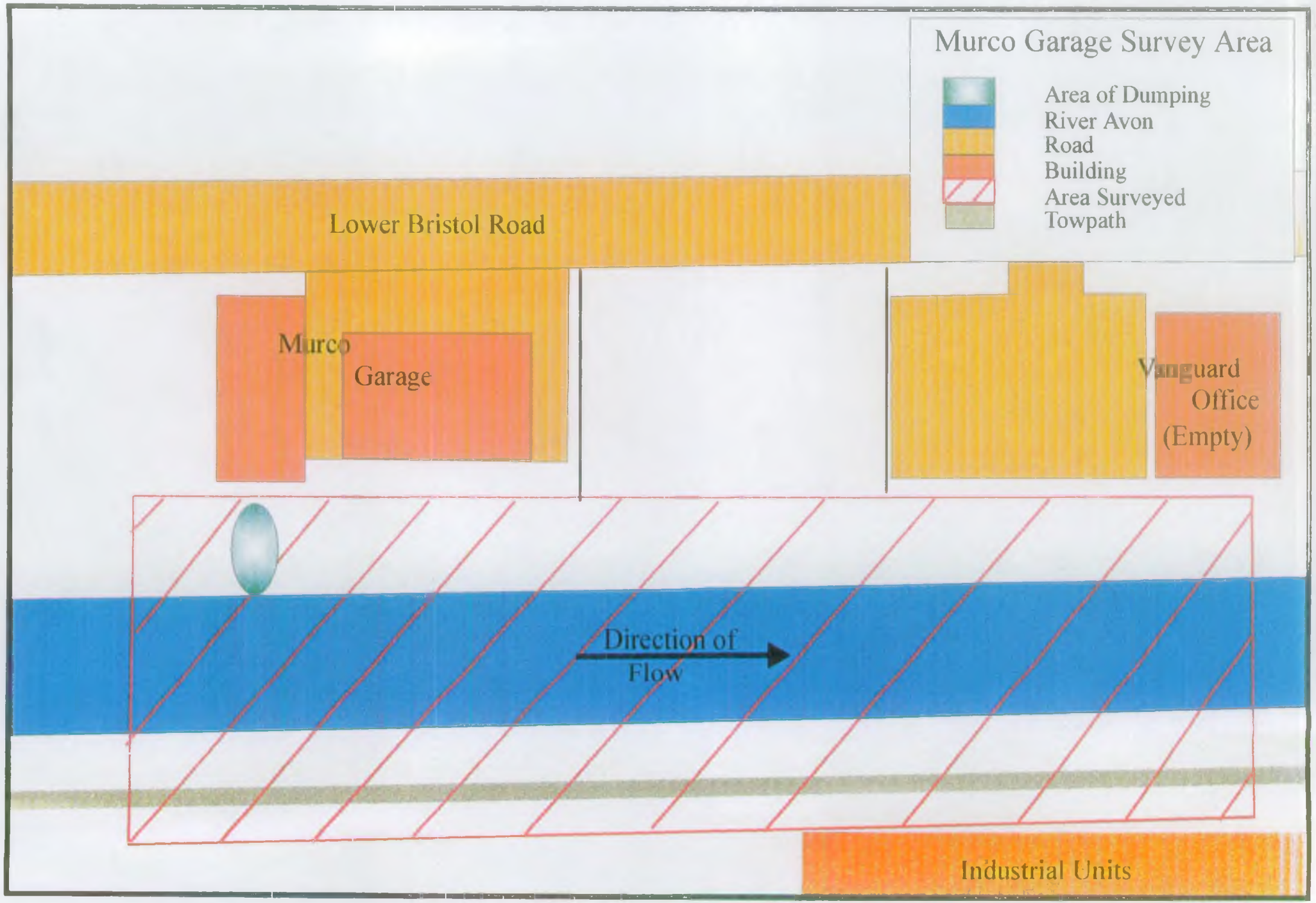
Photo 8 Natural Debris

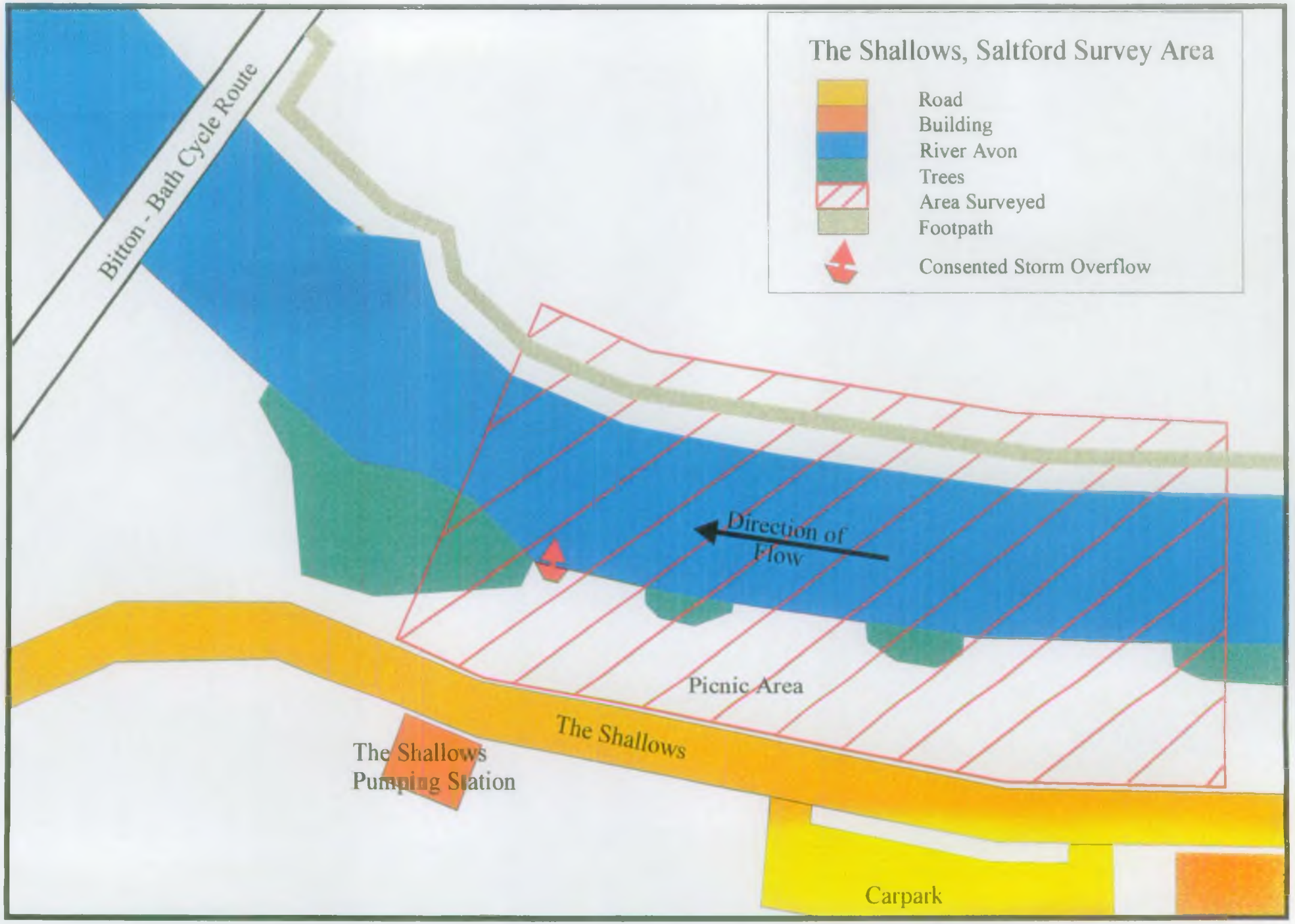
trapped behind Pulteney Sluice

APPENDIX II **Maps of site surveyed in detailed litter survey**


Grosvenor Bridge
Direction of Flow
Hampton House
Grosvenor Bridge Road
Ringswell Gardens
Grosvenor Bridge Survey Area
River Avon
Built up Area
Footpath
Road
Area of Household / Garden Dumping
Area Surveyed


Stainer Road Bridge Survey Area
River Avon
Building
Towpath
Road
Area Surveyed
Sewage and Drainage outfall
Homebase
Carpark
Stainer Road Bridge
Direction of Flow
Sainsbury's carpark
Norfolk Buildings
Norfolk Crescent


Murco Garage Survey Area
Area of Dumping
River Avon
Road
Building
Area Surveyed
Towpath
Lower Bristol Road
Murco
Garage
Vanguard
Office
(Empty)
Direction of
Flow
Industrial Units


The Shallows, Saltford Survey Area
Road
Building
River Avon
Trees
Area Surveyed
Footpath
Consented Storm Overflow
Bitton - Bath Cycle Route
Direction of Flow
Picnic Area
The Shallows
The Shallows Pumping Station
Carpark

APPENDIX III Example of survey form used in detailed litter survey

RIVER AVON THROUGH BATH AESTHETICS SURVEY

Part 1 General Information

Sampler									
Date of Survey				Time Survey					
River									
Stretch of River	From					To			
Grid Reference									
Flow Conditions				High		Normal		Low	
Weather		Dry		Rain		Overcast		Sunny	

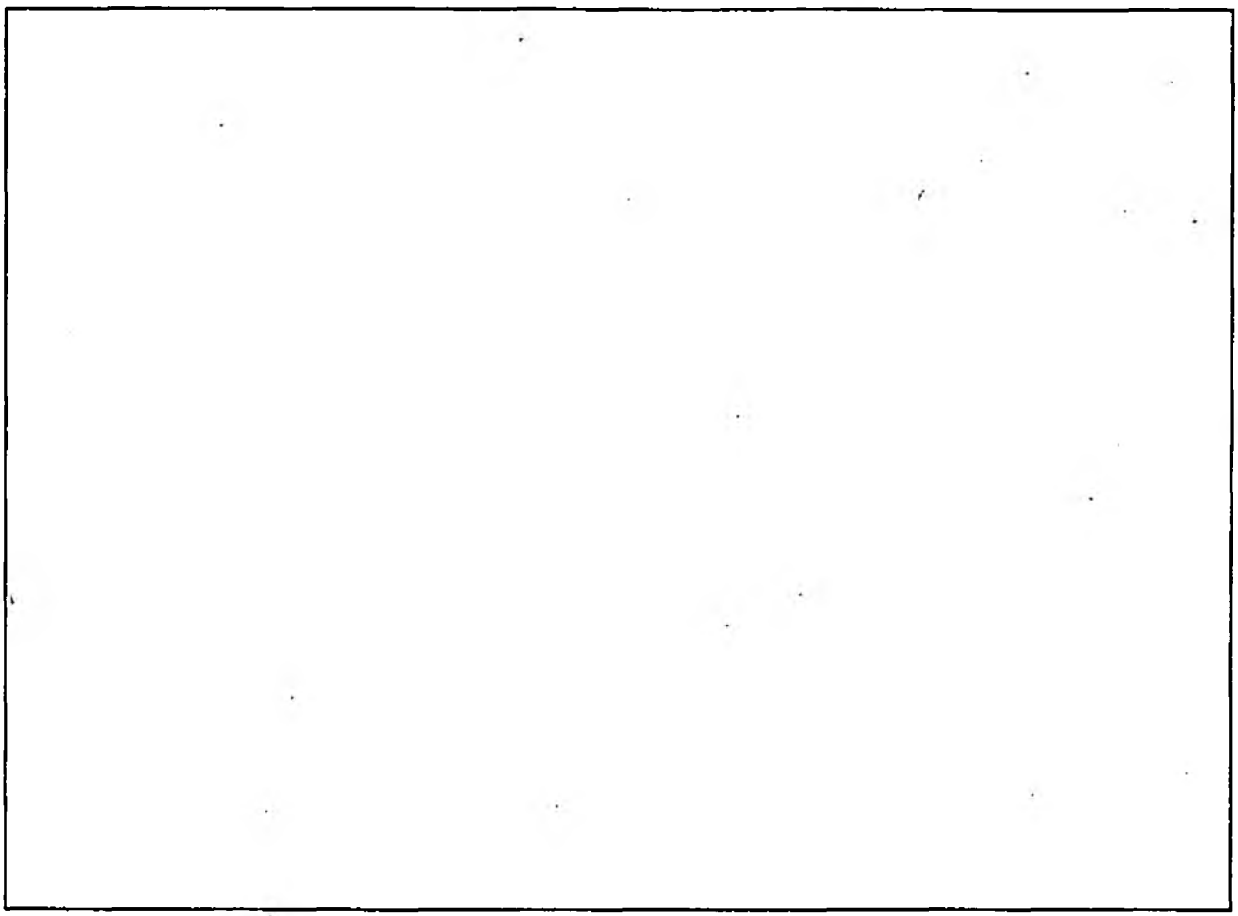
Part 2 Litter and Sewage Debris

Litter Type	Actual Number Present				
	Right Hand Bank	Area Assessed		Left Hand Bank	Area Assessed
Gross					
General					
Sewage Derived					
Harmful Litter					
Accumulations					

Make note of any possible sources, identify possible sources from litter debris and gain photographic evidence.
Take note of photograph number

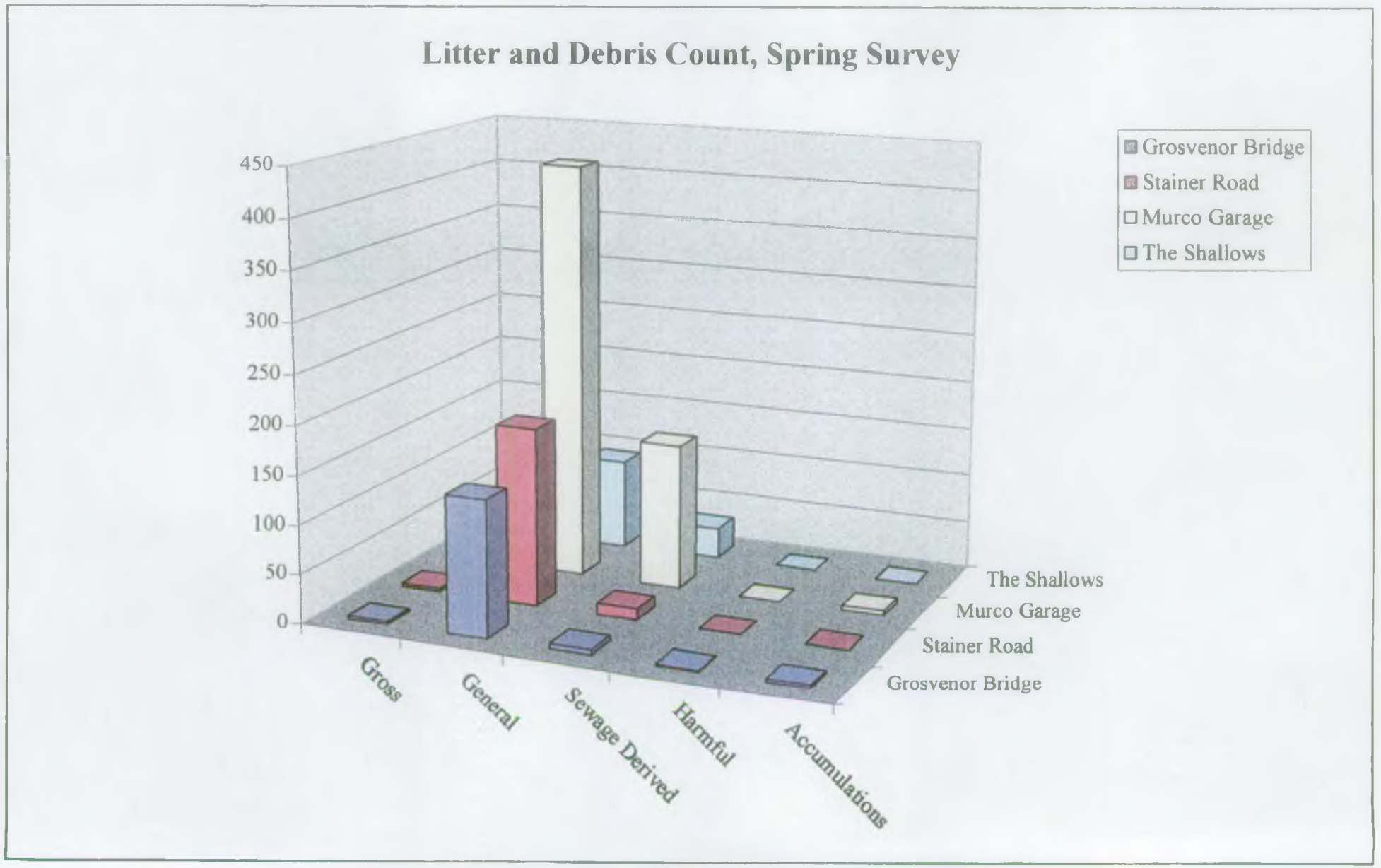
Samplers Comments

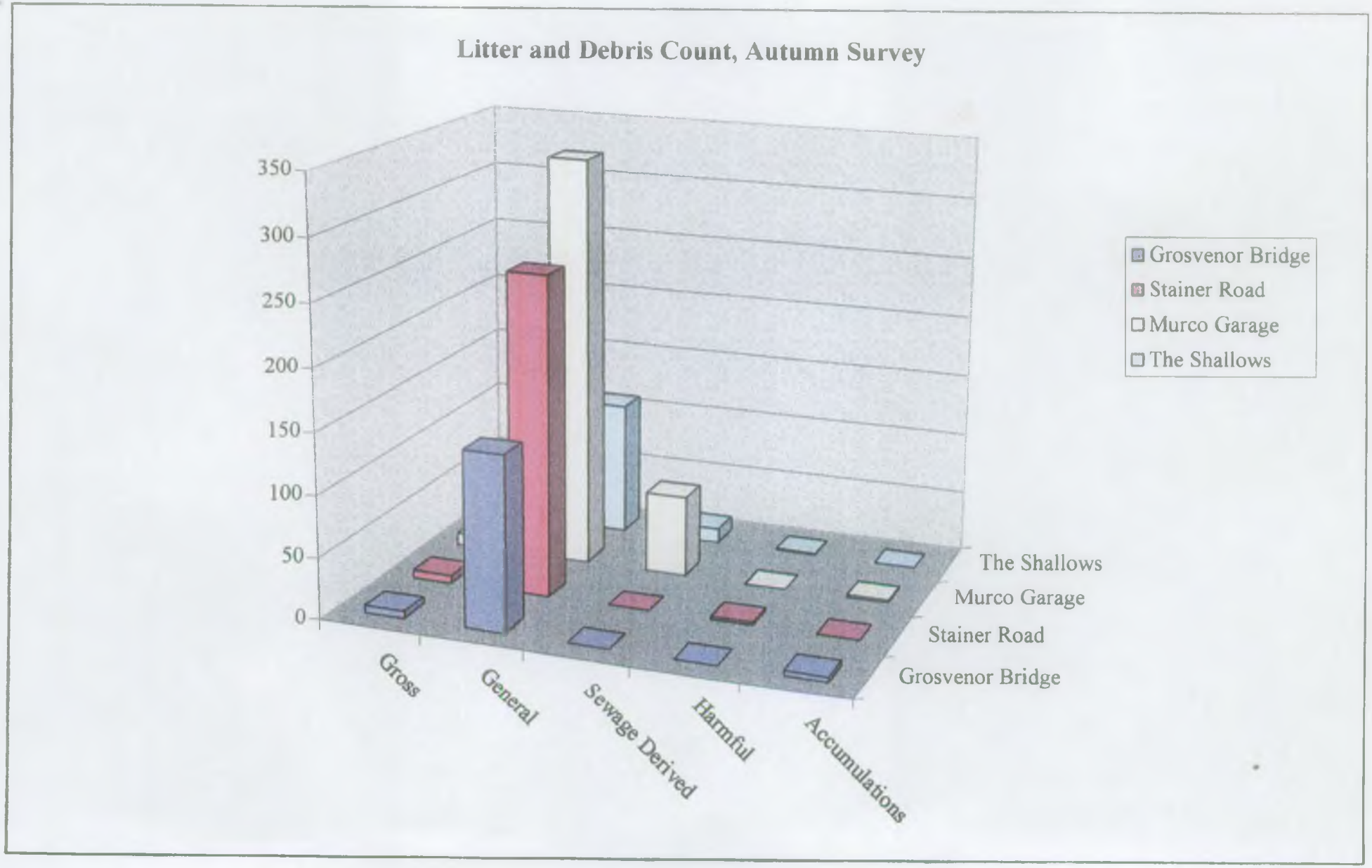
Part 3 Sketch Map of Surveyed Area



Show stretch of river surveyed with start and finish points, important landmarks, points of accumulation along bank, in trees and around weirs also possible sources shown in relationship to litter and sewage accumulations, ie storage yards, CSOs, etc.

APPENDIX IV Graphs of Litter and Debris Survey


Litter and Debris Count, Spring Survey
450
400
350
300
250
200
150
100
50
0
Gross
General
Sewage Derived
Harmful
Accumulations
The Shallows
Murco Garage
Stainer Road
Grosvenor Bridge
Grosvenor Bridge
Stainer Road
Murco Garage
The Shallows


Litter and Debris Count, Autumn Survey
350
300
250
200
150
100
50
0
Gross
General
Sewage Derived
Harmful
Accumulations
The Shallows
Murco Garage
Stainer Road
Grosvenor Bridge
Grosvenor Bridge
Stainer Road
Murco Garage
The Shallows

APPENDIX V References

1 **INTERIM REPORT ON SEWAGE DERIVED AESTHETIC POLLUTION**
- Foundation for Water Research
  March 1993
  Report No.Fr 0339

2 **PUBLIC PERCEPTION OF AESTHETIC POLLUTION**
- Foundation for Water Research
  March 1994
  Report No. Fr 0439

3 **NATIONWIDE BEACH-CLEAN AND SURVEY REPORT - 1997**
- Marine Conservation Society
  1998