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DEVON AREA INTERNAL REPORT

INVESTIGATIONS OF DISCHARGES INTO THE RIVER LEMON AT NEWTON ABBOT

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**INVESTIGATION OF TYPES AND LOCATIONS OF
DISCHARGES INTO THE RIVER LEMON, NEWTON ABBOT.**

1. INTRODUCTION.

The River Lemon rises at the foot of Haytor Quarry and flows in a westerly direction through the town of Newton Abbot, before joining the River Teign at the head of the estuary.

Some sections of the river running through the town have been culverted, and for the purpose of this investigation these sections were deemed to be unsafe under the constraints of the Health and Safety policy, and therefore no investigations were carried out on these sections.

2. TERMS OF REFERENCE.

2.1. OBJECTIVES.

In November 1994 Robert Harwood (Senior Water Quality Officer) replied to a letter from Mr Keith R. Stokes-Smith (The Lord of Newton Abbot) explaining the Authorities position on reducing the pollution risks posed to the River Lemon by discharges into it.

In this letter Mr Harwood stated that he would arrange for an investigation into the number, type and location of discharges into the river, so he could examine the findings, and see if any improvements could be made to the quality of the river.

The Devon Area Investigation Team were requested to carry out this investigation, which was duly commenced in April 1995.

The area under investigation starts at a point where the River Lemon reaches Newton Abbot and ends at the confluence of the Lemon and River Teign. It was sub divided into three sections (Figure 1).

Sections one and three were walked on several occasions during the summer in an attempt to identify the numerous discharges, and to ascertain their effect on the water quality.

2.2. PROJECT TEAM.

T.Cronin (Project Leader)
N.Hicks (Project Technician)



3. METHODS.

3.1. OBSERVATIONS.

Section 1.

From the confluence with the River Teign at N.G.R. SX 869 717 to the road culvert in the centre of Newton Abbot at N.G.R. 861 715 (Figure 1).

This section was walked on four occasions. April 26 1995, May 05 1995, June 14 1995 and August 11 1995.

Section one is the lowest of the three designated sections, and due to its proximity to the River Teign estuary, is tidally influenced. The algal growth (detritus) that has been observed in this section is indicative of the brackish nature of the water.

The river substrate in the lower reaches of this section is composed of a mixture of silt and fine gravels. Small industrial units are situated on the banks of the water course while slightly higher up the section there is a predominance of roads and domestic dwellings close to the river bank. The substrate in the higher reaches changes from silt and gravel to a man made concrete bed.

Numerous pipes that appear to be storm drains were observed in this section, ranging from 6 inches to 3 feet in diameter, the position of these pipes are indicated in Figure 2, and photographs in Appendix A.

Section 2.

The culverted section of the river from N.G.R. SX 861 715 to N.G.R. SX 857 713 (Figure 1).

Due to the constraints of the Health and Safety policy, it was felt that this underground section of the river should not be walked, however samples of the river water were taken from upstream and downstream of the culvert (Table 1, sites 2 and 1) in an attempt to ascertain if any spurious discharges were occurring that may have an adverse effect on the water quality.

Section 3.

Upstream of the culvert at N.G.R. SX 857 713 to the playing fields at N.G.R. SX 851 708 (Figure 1).

The sides of both banks in this section are approximately 8 feet high and are fabricated from stonework. The substrate of the river is a mixture of concrete and block work. The south bank is bordered by a car park, private dwellings and some small industrial units. The north bank has a path which runs along its length, this path has some industrial units situated behind it.

This section has been inspected on four separate occasions, April 26 1995, May 05 1995, June 14 1995 and August 11 1995.

On one of these occasions (August 11 1995) three pipes at different sites were found to be discharging. Samples of these discharges were taken, the full results of which are shown in Table 1. as sites 4,7,10 and their location are shown in Figure 3, again as sites 4,7,10. The pipes are depicted in Appendix A plates 9,12,14.

4. PHOTOGRAPHY.

Photographs were taken of a selection of pipes which are shown in Appendix A, the majority of these pipes would appear to be storm drainage from the roads running parallel to the river.

A map showing the location of the pipes photographed is shown in Figure 2.

5. SAMPLING.

Eleven samples were collected on August 11 1995 the results are shown in Table 1. and their positions are shown in Figure 3.

All samples taken were analysed for standard sanitary and bacteriological determinands.

Sites 4,7,10 are samples of pipes that were found to be discharging at the time, with the remaining samples being upstream and downstream samples of these discharges to show any impact the discharges may be causing to the water quality.

6. DISCUSSION.

The results of the chemical samples taken during the survey (Table 1) show a level of high quality, commensurate with that of a class 1 river on the River Ecosystem scale. In fact the previous two years data (1993 and 1994) show that the River Lemon has achieved results equivalent to that of a class 1 river.

The results for 1995 have yet to be calculated, however there is no reason to assume that the RE classification will drop below that of class 1.

Observations were made of flounders in the lower reaches of the Lemon, and more importantly the presences of trout in both the upper and lower stretches would tend to support the high quality of the water indicated by the chemical data.

The results for the bacteriological sampling could be an area of concern with very high levels of total coliforms found at various sites during the survey (Table 1).

As a very general rule of thumb it can be said that a ratio between *E.coli* and Faecal strep. (*E.col* / *F.strep*) of greater than 4 would indicate human contamination, and a ratio less than 1 would be indicative of animal contamination.

It must be stressed that this can only be used as a very crude guideline, however it is interesting to note that apart from site 1 and site 7 (Table 1 and Figure 3) all ratios are below 3, this would tend to indicate that most bacteriological contamination of the sites sampled could be attributed to some form of agricultural or animal contamination.

One area of concern with the bacteriological results are the very high levels of the total coliforms. It would appear that the relationship with the faecal strep is unusually high, it must not be assumed that this is indicative of any form of faecal contamination, as there are other reasons why this may be so.

It is possible that the coliforms measured are of an extremely robust strain and the faecal streps. may have a faster die off rate, this would have made the initial relationship between the two far more meaningful.

It has also been found that high coliform levels have been measured where discharges are made from specific industries, for example paper making or the pharmaceutical industry. In these cases the coliforms found have been of a specific strain.

Only an A.P.I. identification system method of analysis can determine if the coliforms found are of one specific strain or a composite nature.

Total coliform and E.coli levels in the river at site 11 appear to be high (241000 and 2000), this could possibly be due to the East Oghwell S.T.W. (N.G.R. SX 8392 7064) although as previously stated the ratio between E.coli and F.strep of 4 or more would be more indicative of human contamination. As this ratio is 2.2 further investigation would be needed to identify the exact cause of the high values.

Of the discharges sampled (site 10) does not appear to adversely effect the water quality of the Lemon, however at site 8, upstream of the second discharging pipe the level of total coliform has risen to <300000 per 100ml, this may be indicative of a point source contamination somewhere between these two sites.

The discharge from site 7 shows high levels of both total coliform and E.coli (121000 and 20000 respectively), and must be seen as a contributing factor to the high levels found at both sites 6 and 5.

The discharge from site 4 is of quite good quality, and the overall quality of the river appears to gradually improve as it proceeds to the confluence with the River Teign.

Although a number of potential discharge points were identified the majority of these are surface run off pipes. The pipes that were found to be discharging in the drought conditions prevalent during the investigation, are thought to be spring water.

The oil stain from the pipe in photographs 11 and 12 (Appendix A) appear to be dry and it is difficult to determine how long ago the discharge took place, it is possible that the discharge was a one off incident.

Both chemical and bacteriological results from upstream and downstream of the culvert, show that on the day of sampling nothing was entering the water course throughout the section that caused a deterioration of the water quality.

7. RECOMMENDATIONS.

If further work is required on the River Lemon in and around Newton Abbot, then it would be necessary to evaluate the impact of East Ogwell S.T.W. to ascertain the baseline loadings of the river before it enters Newton Abbot.

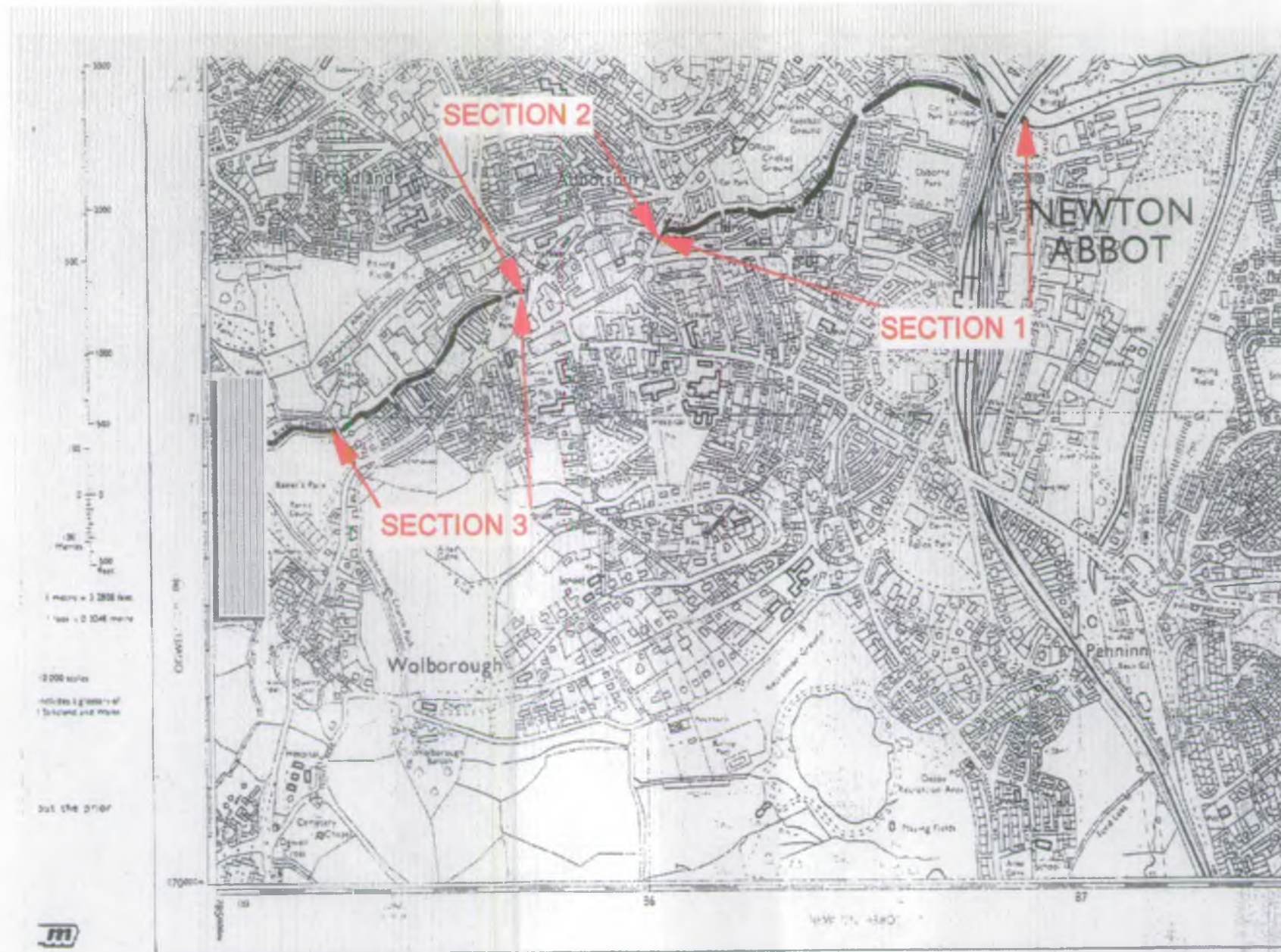
A more detailed investigation into the potential for discharges to be made into the river from the numerous pipes identified, would be needed to build up a more detailed picture. This would need to be done during a period of wet weather.

The spring water discharging from pipes found during this survey would need to be traced.

Bacteriological samples would need to be analysed, using the A.P.I. method for identification of coliform type, this would allow us to determine with more accuracy the potential sources

Figure 1

Map showing sections investigated.



Map showing positions of photographs.

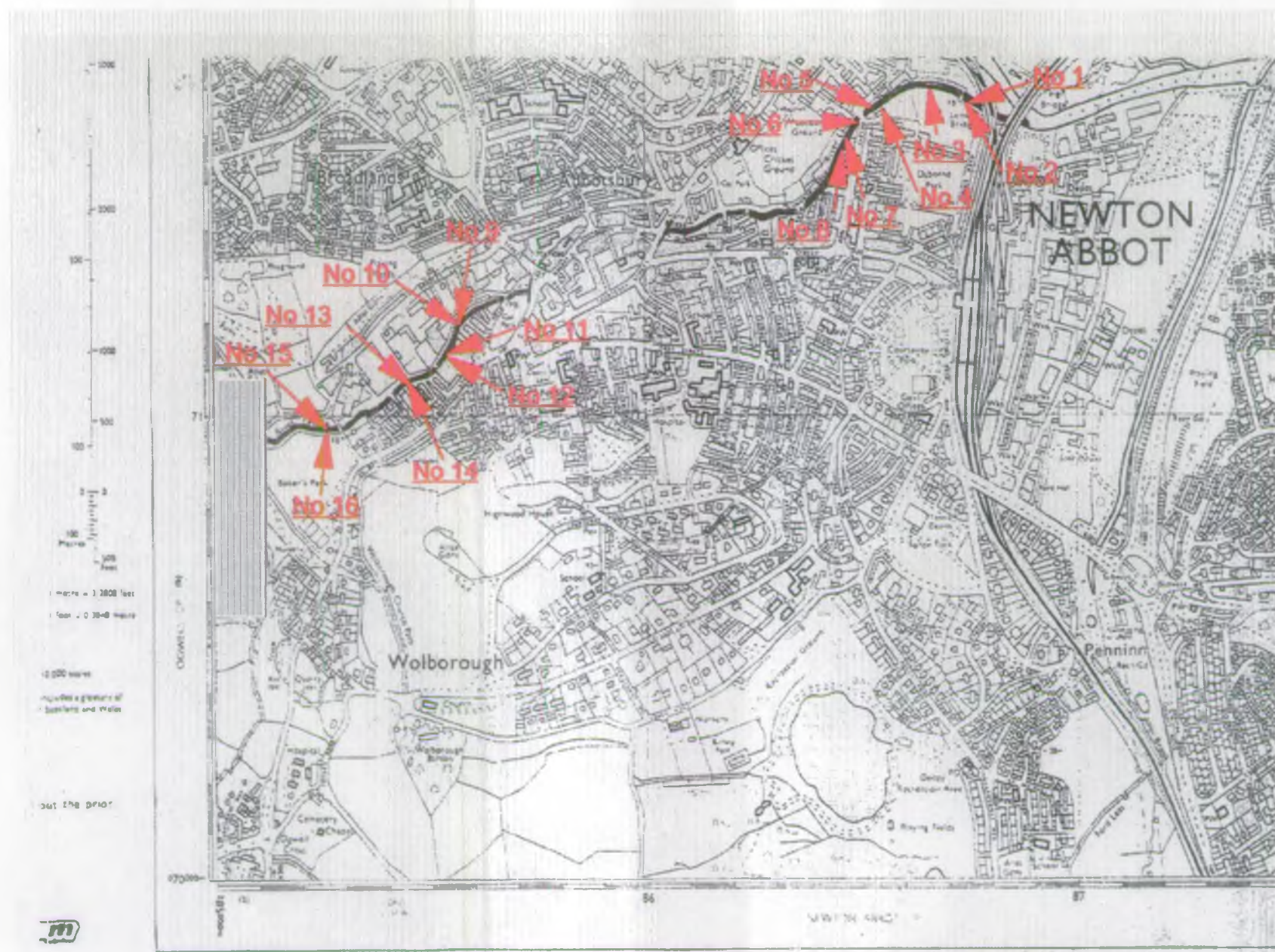


Figure No 3

Map showing the results & chemical samples taken on 11.8.95.

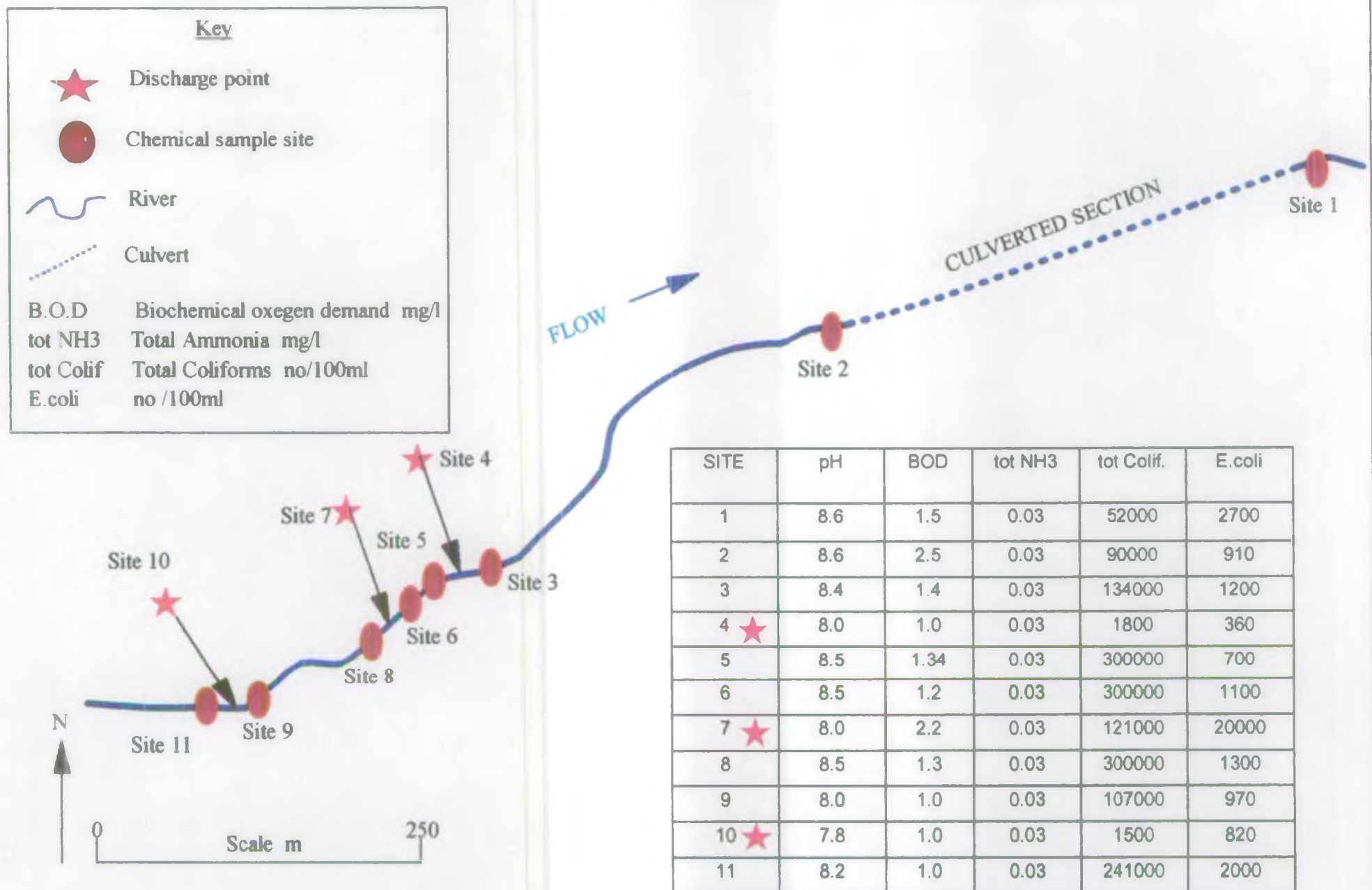


TABLE 1

CHEMICAL AND BACTERIOLOGICAL RESULTS FROM RIVER LEMON SAMPLES

SITE DESCRIPTION	ITE No.	DATE	TIME	pH	OND	TURB FTU	COLOUR HAZEN	BOD ATU	COD MGL	AMMONIA MGL	ITROGEN MGL	NITRATE MGL	NITRITE MGL	CHLORIDE MGL	ORTHO P MGL	ILICATE MGL	ULPHATE MGL	F.STEP NO/100 ML	COLIFORMS NO/100 ML	E.COLI NO/100 ML
U/S OF PARK DISCHARGE	11	11/08/95	13:00	8.2	356	2	5	1	14	0.03	3.4	3.3	0.007	20	0.11	7	13	900	241000	2000
PARK DISCHARGE	10	11/08/95	13:05	7.8	355	3	5	1	12	0.03	3.2	3.2	0.004	20	0.07	7	12	700	1500	820
D/S PARK	9	11/08/95	13:15	8	355	3	5	1	12	0.03	3.3	3.2	0.005	20	0.09	6.9	12	770	107000	970
U/S OF FORD DISCHARGE	8	11/08/95	13:19	8.5	352	2	5	1.3	12	0.03	3.3	3.2	0.008	21	0.11	5.9	18	410	300000	1300
FORD DISCHARGE	7	11/08/95	13:25	8	390	9	5	2.2	12	0.03	2.9	2.8	0.048	21	0.29	8.5	23	260	121000	20000
D/S FORD DISCHARGE	6	11/08/95	13:30	8.5	354	2	5	1.2	12	0.03	3.3	3.2	0.009	20	0.11	6	16	470	300000	1100
U/S OF COUNCIL YARD	5	11/08/95	13:40	8.5	352	2	5	1.4	12	0.03	3.3	3.2	0.009	21	0.11	5.9	15	350	300000	700
COUNCIL DISCHARGE	4	11/08/95	13:45	8	352	2	5	1	12	0.03	3.1	3	0.005	21	0.07	6.8	14	660	1800	360
D/S OF COUNCIL DISCHARGE	3	11/08/95	14:00	8.4	351	5	6	1.4	14	0.03	3.3	3.2	0.008	21	0.01	6	15	420	134000	1200
U/S OF CULVERT	2	11/08/95	14:05	8.6	350	2	6	2.5	12	0.03	3.3	3.2	0.009	21	0.1	5.6	15	380	90000	910
D/S OF CULVERT	1	11/08/95	14:10	8.6	354	2	5	1.5	12	0.03	3.3	3.2	0.01	22	0.11	5.7	14	560	52000	2700

APPENDIX A

DESCRIPTION OF PHOTOGRAPHS TAKEN OF THE DISCHARGES INTO THE RIVER LEMON.

PLATE NUMBER	DESCRIPTION
1 AND 2	A LARGE STORM FLAP ON THE RIGHT HAND BANK.
3	A HOLE IN THE BANK ALLOWING WATER TO DRAIN FROM BEHIND BANK.
4 AND 5	TWO TEN INCH STORM DRAINS.
6	TEN INCH STORM DRAIN LEACHING OCHRE DEPOSIT.
7	STORM DRAIN FROM ROAD.
8	FOUR INCH PLASTIC PIPE FROM DOMESTIC PROPERTY.
9 AND 10	DISCHARGE FROM A STORM FLAP.
11 AND 12	FOUR INCH TERRACOTTA PIPE WHICH APPEARS TO HAVE HAD A DISCHARGE OF OIL.
13	DRAIN FROM UNDER AN INDUSTRIAL PREMISES.
14	WHAT APPEARS TO BE A BRICK MANHOLE IN BED OF RIVER.
15 AND 16	DISCHARGE FROM STORM FLAP.

PHOTO No 1



PHOTO No 2



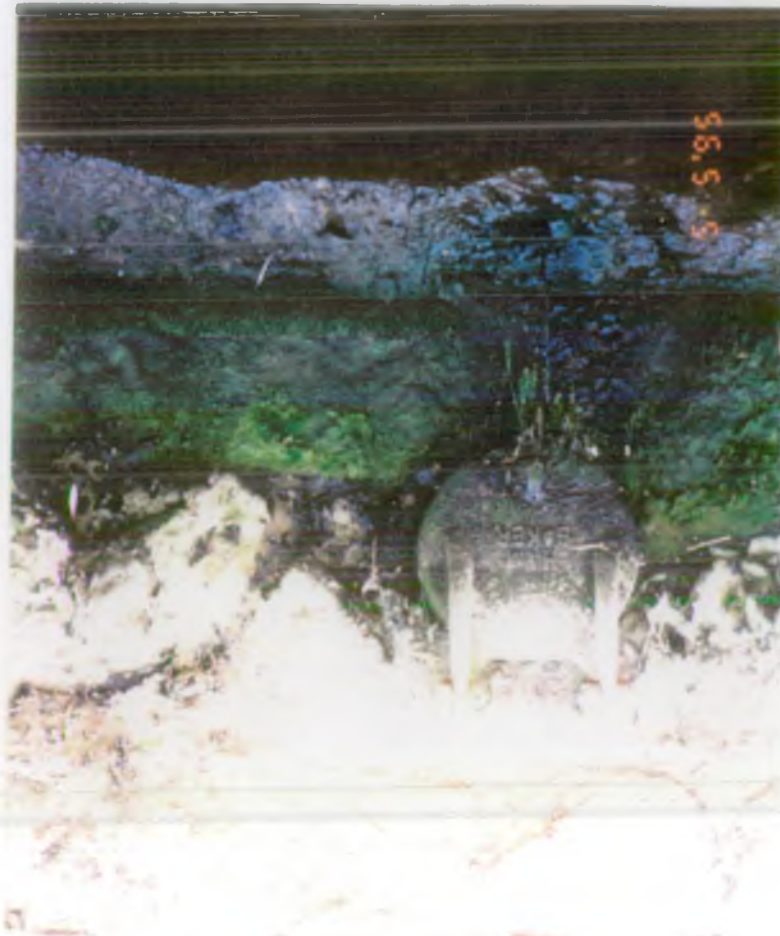


PHOTO No 4



PHOTO No 3



PHOTO No 5



PHOTO No 6

PHOTO No 7



PHOTO No 8



PHOTO No 9



PHOTO No 10



PHOTO NO 11



PHOTO No 12



PHOTO No 13



PHOTO No 14



PHOTO No 15



PHOTO No 16

