# Environmental Protection Report

## BACTERIAL QUALITY OF THE BATHING WATERS AT SEATON, CORNWALL, AND OF THE RIVER SEATON

July 1992
TWU/92/12
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**BACTERIAL QUALITY OF THE BATHING WATERS AT SEATON, CORNWALL AND OF THE RIVER SEATON**

**TECHNICAL REPORT NO. TWU/92/12**

## SUMMARY

At Seaton (Cornwall), there have been exceedances of the mandatory levels of E Coli within the bathing waters on at least one occasion every year since 1986. If, during a bathing season, more than 5% of samples exceed the mandatory levels, then the beach will fail to comply with the EC Bathing Water Directive. Seaton failed in 1986 and 1988.

Examination of the routine bathing water sample analyses since 1986 indicates that the Seaton crude outfall is probably the prime cause of failure, with the River Seaton a secondary cause (see Fig. 1). Also, the E.Coli levels in samples collected from the River Seaton at the beach exceed bathing water standards on 39% of occasions.

South West Water Services Ltd (SWWSL), who operate the crude outfall, have a proposal to treat the sewage from Seaton (and from Downderry to the east) at a new Sewage Treatment Works to be constructed about 1.5 km up the river.

A 15-hour intensive survey of the bacterial quality of the river from above Hessenford to the beach was carried out in September 1991 by the Tidal Waters Investigation Unit. This survey highlighted a consistent input of bacteria at Hessenford, an un-sewered village about 4 km upstream of Seaton. From the data collected, it has been concluded that even if all inputs from Hessenford were to be removed, the river would still have no capacity for additional discharges containing bacteria of concentrations exceeding the bathing water standards, since the background levels in the river would continue to exceed bathing water standards for a significant proportion of the time.

The survey also highlighted periodic inputs of bacteria below Hessenford, which require further investigation.

It is recommended that various actions be taken by the Tidal Waters Officer and Quality Regulation Officer in order to understand further the nature and source of bacterial inputs to the river, and to ensure that the bacterial quality of the river can be improved.

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Oceanographer
July 1992

## CONTENTS

# 1. INTRODUCTION

Crude sewage from Seaton, Cornwall is currently discharged through a short outfall near to the low water (LW) mark at Seaton, whilst the River Seaton runs across the beach at Seaton (see Fig. 1). Both of these are close to the the EC bathing water sampling line and are sources of microbiological contamination. At Seaton, there have been exceedances of the mandatory levels of E Coli within the bathing waters on at least one occasion every year since 1986. If, during a bathing season, more than 5% of samples exceed the mandatory levels, then the beach will fail to comply with the EC Bathing Water Directive. Seaton failed in 1986 and 1988. Both the outfall and the river are likely to contribute to the failure of the bathing waters.

South West Water Services Ltd (SWWSL), who operate the crude outfall, have a proposal to treat the sewage from Seaton (and from Downderry to the east) at a new STW to be constructed about 1.5km up the river. The location of the proposed discharge to the river is shown on Figure 1.

The NRA have reservations regarding the capacity of the River Seaton to accept any further bacterial loading, since it discharges directly into the bathing waters at Seaton. The Tidal Waters Officer requested the Tidal Waters Investigation Unit to undertake a survey of the bacterial quality of the River Seaton, with a view to establishing further the present bacterial quality of the river.

This report presents the routine data, and conclusions drawn from them. It also discusses the results of the investigative survey, and uses both data sources to reach conclusions regarding the capacity of the river to accept further bacterial loadings.

## 2. LOADINGS

### 2.1. Present Crude Outfall and River Seaton

First order estimates of the E.Coli loading from the river at the beach and the outfall are as follows:

#### a) Seaton Crude Outfall

The deemed consent gives a volume of $411 m^3$/day (most likely an over-estimate), which at $10^7$ E.Coli/100ml gives circa $4.6 \times 10^8$ E. Coli/second.

#### b) River Seaton

Figure 12 shows the level of E.Coli in the River Seaton at the beach plotted against river flow. This indicates that there is no correlation between concentration and flow, and hence loading will be proportional to flow. At a typical value of river flow of 0.3 cumecs (Q80), which is the value measured on the intensive survey, and a concentration of 2000/100ml, the loading down the river is circa $6 \times 10^6$/second.

Hence, as a first order estimate, the loading from the outfall is probably at least an order of magnitude greater than that from the river, although the variations in both will be large.

### 2.2. Proposed Sewage Treatment Works

SWWSL have given a figure of $455 m^3$/day for the DWF into the proposed STW. This includes future population growth. With secondary treatment giving an assumed E.Coli concentration of $10^6$/100ml, this results in a loading of $5 \times 10^7$/second.

## 3. ROUTINE DATA - SOURCES OF POLLUTION AT SEATON BEACH

Routine samples from both the bathing water and the river have been collected since 1986. Levels of Total Coliforms in the bathing water have exceeded 10,000 (the mandatory limit) on 6 occasions, whilst levels of E.Coli have exceeded 2,000 on 11 occasions.

Levels of Total Coliforms and E.Coli in the river regularly exceed the Mandatory bathing water limits, with maxima of 169,000 in 1988 (or >20,000 in 1986) for Total Coliforms and 33,000 in 1991 (or >20,000 in 1986) for E.Coli. The Mandatory limit for E.Coli was exceeded on 39% of sampling occasions.

Since the river and outfall both discharge to the sea very close to the EC sampling line, it is almost inevitable that both contribute to bathing water failures.

The routine data to 13/07/91 for both the bathing water and river are presented in Appendix 1, along with relevant information such as rainfall and river flow. A number of graphs have been drawn up from this data. The object of these graphs is to give some indication of the sources of bacterial contamination (restricted to E.Coli).

Figure 2 shows the levels of E.Coli (on a log scale) in the bathing water samples plotted against wind direction. Note that on the log scale, the EC mandatory limit for E.Coli is 3.3. This demonstrates that all the failures for E.Coli have occurred when the wind is in the sector SW through West to North (the EC sampling line is to the east of both the river and the outfall).

Figure 3 shows the levels of E.Coli in the bathing water samples plotted against salinity of the samples. Whilst there is a large spread, there is a tendency for high levels of E.Coli to occur over a range of salinities from nearly fully saline to values as low as 15 psu. This might be taken to imply that the source of the E.Coli could be from the river and/or the outfall.

Figure 4 shows the levels of E.Coli in the bathing water plotted against an estimate of the levels which would have been found had all the E.Coli been derived from the river, with no die-off. This estimated value is based on the salinity of the sample and the concentration of E.Coli in the river. For example, if the salinity indicates that the Freshwater Fraction of the sample is 0.2, then the estimated value is 0.2 x the concentration in the river. Figure 4 shows a reasonable correlation, tending to demonstrate the importance of the river in causing failure. However, at high levels of measured E.Coli (>3.3 on the log scale) 9 of the 10 points lie below the line of correlation. This demonstrates that the actual levels were higher than the expected levels by up to 2 orders of magnitude. This implicates the outfall as the prime cause of failure.

Note that there are many inter-correlations which can confuse the interpretation of routine data. For example, salinities will tend to be lower at times of high rainfall, but the loading from the outfall may also increase with rainfall. This could lead to the perhaps erroneous conclusion that the river is the dominant cause of failure. Further, more detailed, analysis of routine data might isolate the sources somewhat, but there will always be an element of doubt.

Tracer studies might help to indicate the relative contributions of the river and the outfall.

## 4. INTENSIVE BACTERIAL SURVEY OF RIVER SEATON

### 4.1. Survey Details

This survey took place on 26th and 27th September 1991. It was designed to assess the current quality of the River Seaton from a point above Hessenford to the beach at Seaton (see Fig.1).

Levels of Total Coliforms (TC), E.Coli (EC), and Faecal Streptococci (FS) were measured hourly at five sites from 0530 26th September to 0730 27th September. The five sites are labelled Sites 1 to 5 on Figure 1. In addition, a spore tracer, B. Globigii, was used to determine the time of travel from Hessenford to the proposed new STW location and to the beach at Seaton.

River flows were gauged by the NRA hydrometrics section at each of Sites 1 to 5, with the following results:

Site 1 - 0.28 cumecs
Site 2 - 0.33 cumecs
Site 3 - 0.31 cumecs
Site 4 - 0.34 cumecs
Site 5 - 0.04 cumecs (tributary)

The above flows in the River Seaton correspond approximately to the Q80 value. During the survey there was some light drizzle, but the river flow is believed to have remained fairly constant. Figure 5 shows the flow duration curve for the River Seaton at Trebrownbridge, about 2.5km above Hessenford.

Figure 6 shows the results of the time of travel survey. The tracer was injected over a period of 1 minute at the bridge at Hessenford. The graph shows that the tracer reached the site of the STW in about 2½ hours and the beach at Seaton in about 6 hours. Thus, the time of travel from the proposed STW site was about 3½ hours under the conditions of flow prevailing.

## 4.2. Survey Results

Figures 7 to 11 show time-series plots of the levels of EC, TC, and FS at Sites 1 to 5. The levels are plotted on a log scale, with the EC mandatory bathing waters limit of 2000 for EC plotted for comparison (log 2000 = 3.3).

The geometric mean, maximum and minimum values for EC are given below:

| | **Geometric Mean** | **Maximum** | **Minimum** |
|---|---|---|---|
| Site 1 | 1640 | 4100 | 640 |
| Site 2 | 3010 | 8300 | 450 |
| Site 3 | 2670 | 5800 | 1300 |
| Site 4 | 2430 | 4700 | 600 |

Levels and flows at Site 5 (tributary) were both about an order of magnitude lower than in the main river.

From the above tabulation, it might be concluded that levels of E.Coli increased by a factor of about 2 between Sites 1 and 2, due to inputs of sewage at Hessenford, and thereafter decayed slowly towards the sea. However, a closer look at the data reveals a more complicated situation.

Table 1 shows the E.Coli concentrations at each of the four main river sites, adjusted for time of travel. The times in Column 1 are the times of sample collection at Site 1. Thus, against the time 0630, the data for Sites 1, 2, 3 and 4 relate to samples collected at 0630, 0730, 0930 and 1230 respectively. This enables a direct comparison of levels in the same 'body' of water as it moves down the river.

Alongside the spot values, the 3-hour running mean E.Coli level has also been calculated. This is useful for three reasons:-

i) It reduces the impact of variability inherent in spot samples and in microbiological analyses.

ii) Any inputs become smeared over a considerable distance as they move downstream.

iii) It ensures that any values compared encompass any error in time of travel.

Between the data for each site there is a column which indicates the change in 3-hour mean E.Coli levels between the two sites. Where the change is less than 10%, the value has been omitted.

It is clearly seen that between Sites 1 and 2 (i.e. through Hessenford), levels increase by 10% or more on all occasions except one. The amount of increase varies from 200 to 4040/100ml, with a mean (arithmetic) of 1610. The largest increases are between 1830 and 2130. The mean increase, at a flow of 0.3 cumecs in the river, gives an average input through Hessenford of $5 \times 10^6$ E.Coli/second.

Whilst the mean values at Sites 2, 3 and 4 indicate gradual decrease, the actual values shown in Table 1 show a more complex picture. There are actually significant periods of time when levels increase between Sites 2 and 3 and between Sites 3 and 4. The pattern does not appear to be random. Between Sites 2 and 3 there is an average increase of 650 over the period 1230 to 1930 (including adjustments for time of travel) and an average increase of 1380 over the period 2330 to 0230.

Similarly, between Sites 3 and 4 there is an average increase of 550 over the period 1030 to 1530, and an average increase of 1200 over the period 2230 to 0330. There is a marked similarity in the patterns between Sites 2 and 3 and Sites 3 and 4.

There are also periods when decreases are significant, and quite consistent with normal patterns of bacterial mortality, predation and sedimentation. For example, between Sites 2 and 3 there is an average decrease of 56% over each 2 hour period from 1830 to 2330. Note that the river flows between high banks, and is fairly heavily wooded. Therefore, the impact of sunlight on the mortality of the bacteria will be limited.

If there are times when decreases in bacterial concentration are of this order, then for an increase in bacterial levels, the input must be larger than the simple arithmetic increase. Hence, the increases referred to above are quite significant.

## 5. CAPACITY OF THE RIVER SEATON FOR PROPOSED STW EFFLUENT - BACTERIAL LOADING

### 5.1. Present Capacity

At present, based on the routine data, E.Coli levels in the River Seaton at the beach exceed bathing water standards 39% of the time. This means that there is no capacity at present for any increase in bacterial loading to the river. It is, in fact, essential that measures be taken to reduce the loading in the river.

Therefore at present, any discharge to the river would need to have bacterial levels reduced to bathing water standards, in order to avoid any further deterioration.

### 5.2. Capacity if Inputs at Hessenford were Removed

Hessenford is an un-sewered village and causes some considerable loading to the river, as demonstrated by the intensive survey. The findings of a survey of Hessenford carried out in March 1992 by the NRA are given in Appendix 2. This highlights the situation with respect to a number of properties, but it is believed that there are a number of other properties for which the situation was not defined.

It has been suggested that, if the inputs from Hessenford could be largely removed, then there would be new capacity generated for the assimilation of the load from the proposed STW. To assess the impact of removing inputs at Hessenford, the data collected on the intensive survey have been used in conjunction with the routine data. It has been assumed that the input of E.Coli at Hessenford is $5 \times 10^6$/second, the average value measured in the intensive survey.

From the routine data, using the levels of E.Coli in the river at the beach and the river flow, the E.Coli loadings at the beach have been calculated. From these, the value of $5 \times 10^6$, (the average input at Hessenford), has been subtracted, and then the resulting E.Coli concentration calculated. This gives an estimate of the number of E. Coli which would have been found in the river at Seaton had the inputs from Hessenford been removed. Thus, it is possible to estimate the number of exceedances of the bathing water standard for E.Coli in the river. The results of this exercise are summarised below:-

**Low Flows (<0.4 Cumecs)**
5 samples from 53 (9%) would exceed 2000/100ml.
**Medium Flows (0.4 to 0.7 Cumecs)**
7 samples from 37 (19%) would exceed 2000/100ml/
**High Flows ($\geq$ 0.7 Cumecs)**
7 samples from 12 (54%) would exceed 2000/100ml.
**All Flows**
19 samples from 103 (18%) would exceed 2000/100ml.

This very simple calculation shows a reduction in the EQS exceedance rate from 39% to 18%. However, there is a wide margin of error on this result, for at least two reasons:

i) The routine data shows that rainfall is very significant, in that of the 19 exceedances of EQS predicted, 13 would occur when significant rainfall (a total of $\geq$ 5.0mm) fell on the day of sampling and the day before. This is despite the fact that such rainfall events occurred only 26% of the time. Thus, it seems probable that the input at Hessenford during such events is currently greater than the $5 \times 10^6$/second assumed, so more should have been removed, resulting in a less frequent exceedance of EQS.

ii) Because die-off between Hessenford and the beach has been ignored, the reduction in E.Coli at the beach has been over-estimated, so the number of exceedances of EQS has been under-estimated.

Based on this very approximate estimate, it seems the River Seaton at the beach would continue to contain levels of E.Coli in excess of the bathing water standards for a significant proportion of the time. It must be concluded that there is unlikely to be capacity for further discharges into the river at concentrations exceeding bathing water standards, even with complete removal of inputs at Hessenford.

Further survey work, under conditions of heavy rainfall, would give some further information, but it is unlikely to be conclusive.

## 6. CONCLUSIONS

(a) Examination of routine data indicates that the River Seaton contributes towards elevated levels of bacteria at the EC sampling point, although it seems likely that the major contributor to failures is the outfall. However, to ensure compliance across the whole of the designated bathing water area, the bacterial quality of the River Seaton requires improvement.

(b) The time of travel from the site of the proposed STW to the beach is about 3½ hours under Q80 flows.

(c) There is a significant input of bacteria to the river as it passes through Hessenford. Hessenford is un-sewered, and properties discharge either directly to the river or into septic tanks.

(d) There is evidence of periodic inputs of bacteria below Hessenford, which at times are quite significant.

(e) From the routine data, levels of E.Coli in the River Seaton at Seaton exceeded bathing water standards on 39% of occasions from 1986 to 1991. It has been estimated (using a number of simple assumptions) that this would be reduced to 18% if all inputs at Hessenford were removed. Therefore, even with the complete removal of inputs at Hessenford, there would be no capacity for increased E.Coli concentrations in the river at Seaton.

(f) Rainfall is a very significant factor with respect to high bacterial levels in the River Seaton.

## 7. RECOMMENDATIONS AND ACTIONS

(a) Due consideration should be given to the impact of any new discharges into the River Seaton on the bacterial quality of that river at the beach.
**ACTION: Tidal Waters Officer/Quality Regulation Officer.**

(b) Improvements to the sewerage system at Hessenford should be sought.
**ACTION: Tidal Waters Officer**

(c) Further survey work is required to investigate the causes of bacterial inputs below Hessenford.
**ACTION: Tidal Waters Officer.**

(d) Further survey work under wet weather conditions is required to assist in understanding more fully the impact of rainfall on inputs to the river.
**ACTION: Tidal Waters Officer.**

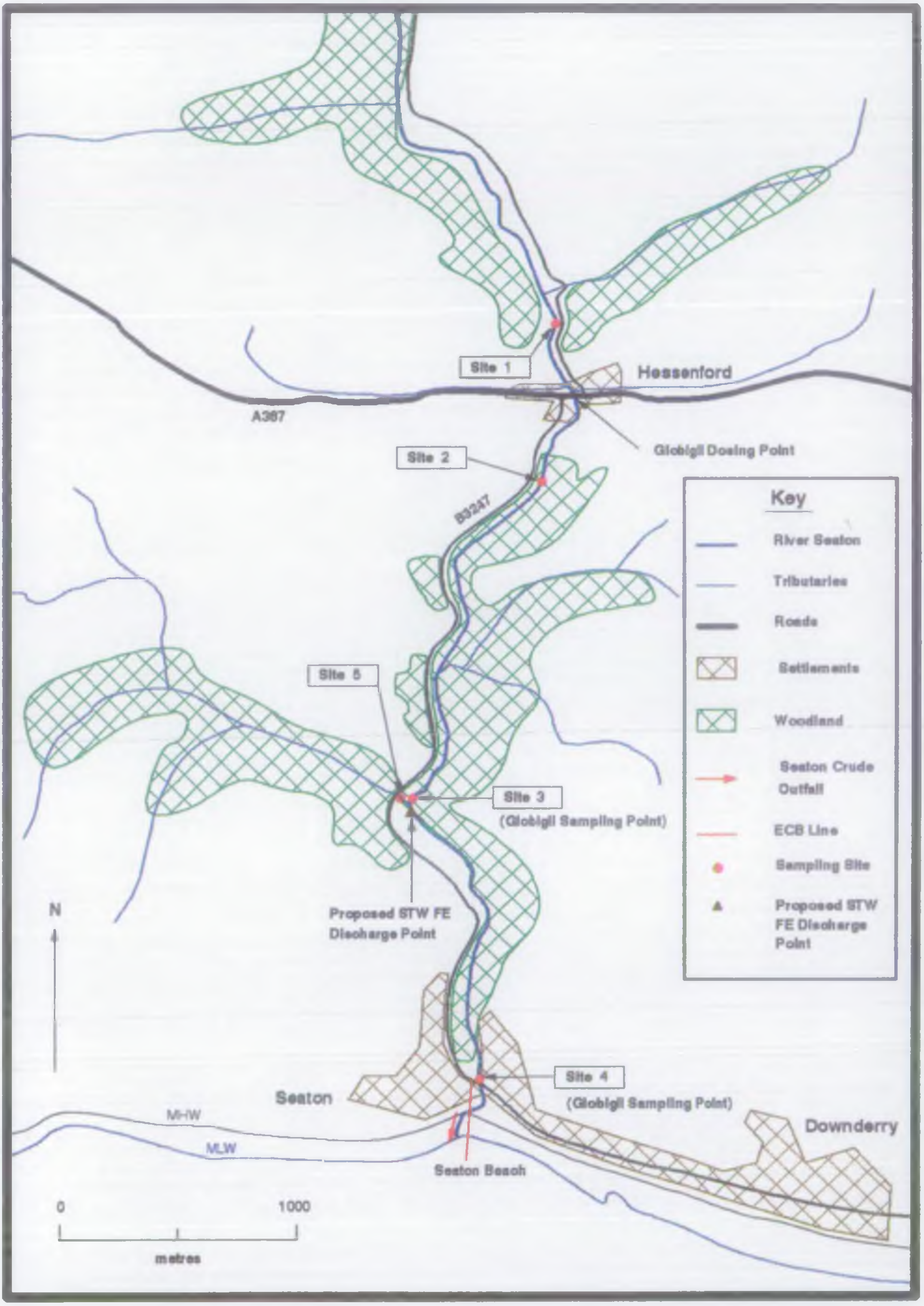
Site 1
Hessenford
A387
Globigii Dosing Point
Site 2
B3247
Key
River Seaton
Tributaries
Roads
Settlements
Woodland
Seaton Crude Outfall
ECB Line
Sampling Site
Proposed STW FE Discharge Point
Site 5
Site 3
(Globigii Sampling Point)
Proposed STW FE Discharge Point
N
Site 4
(Globigii Sampling Point)
Seaton
MHW
MLW
Seaton Beach
Downderry
0
1000
metres

Fig. 1

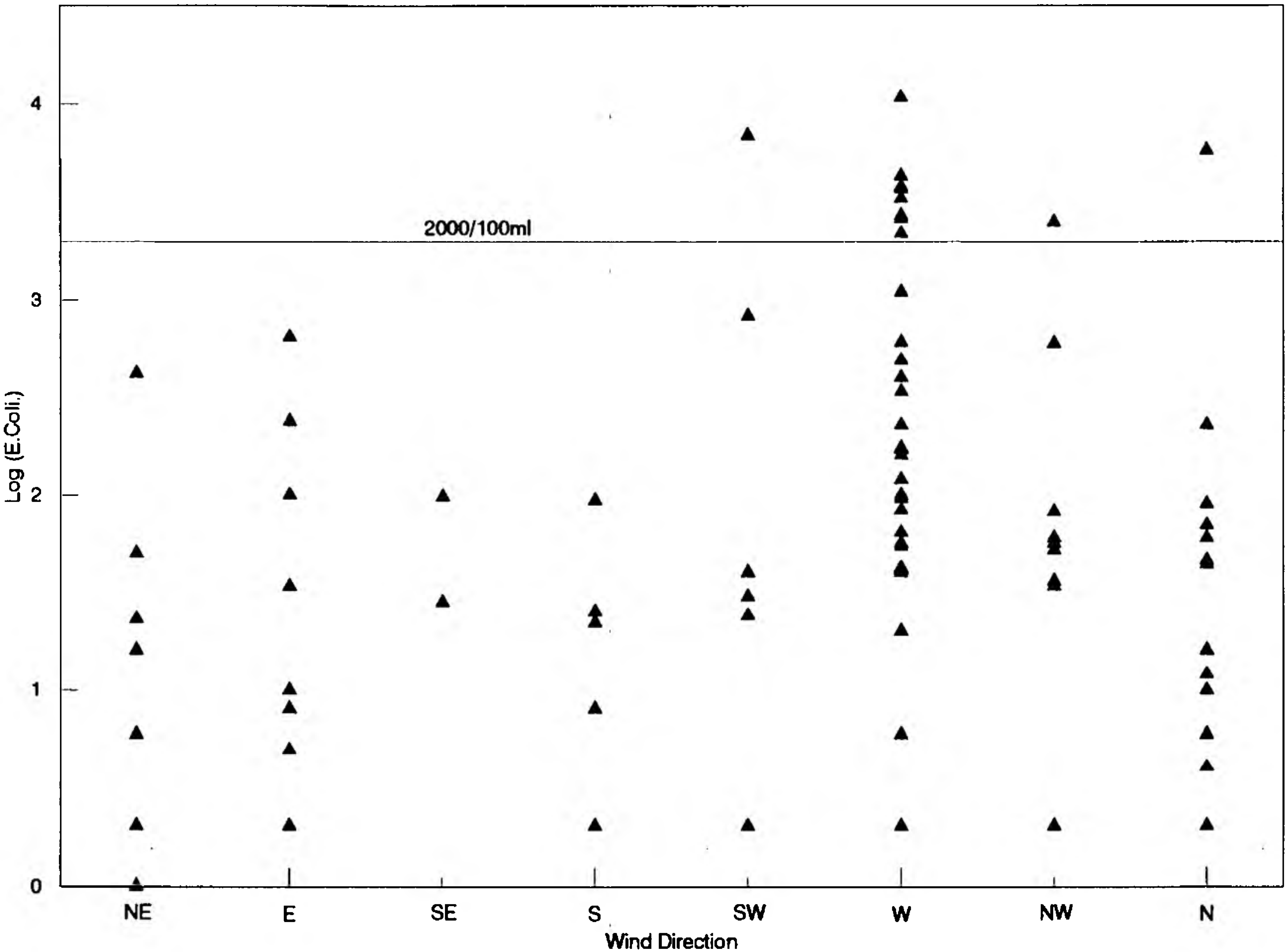

**Figure 2 : Routine Beach Water Samples - E.Coli Concentrations For Different Wind Directions**

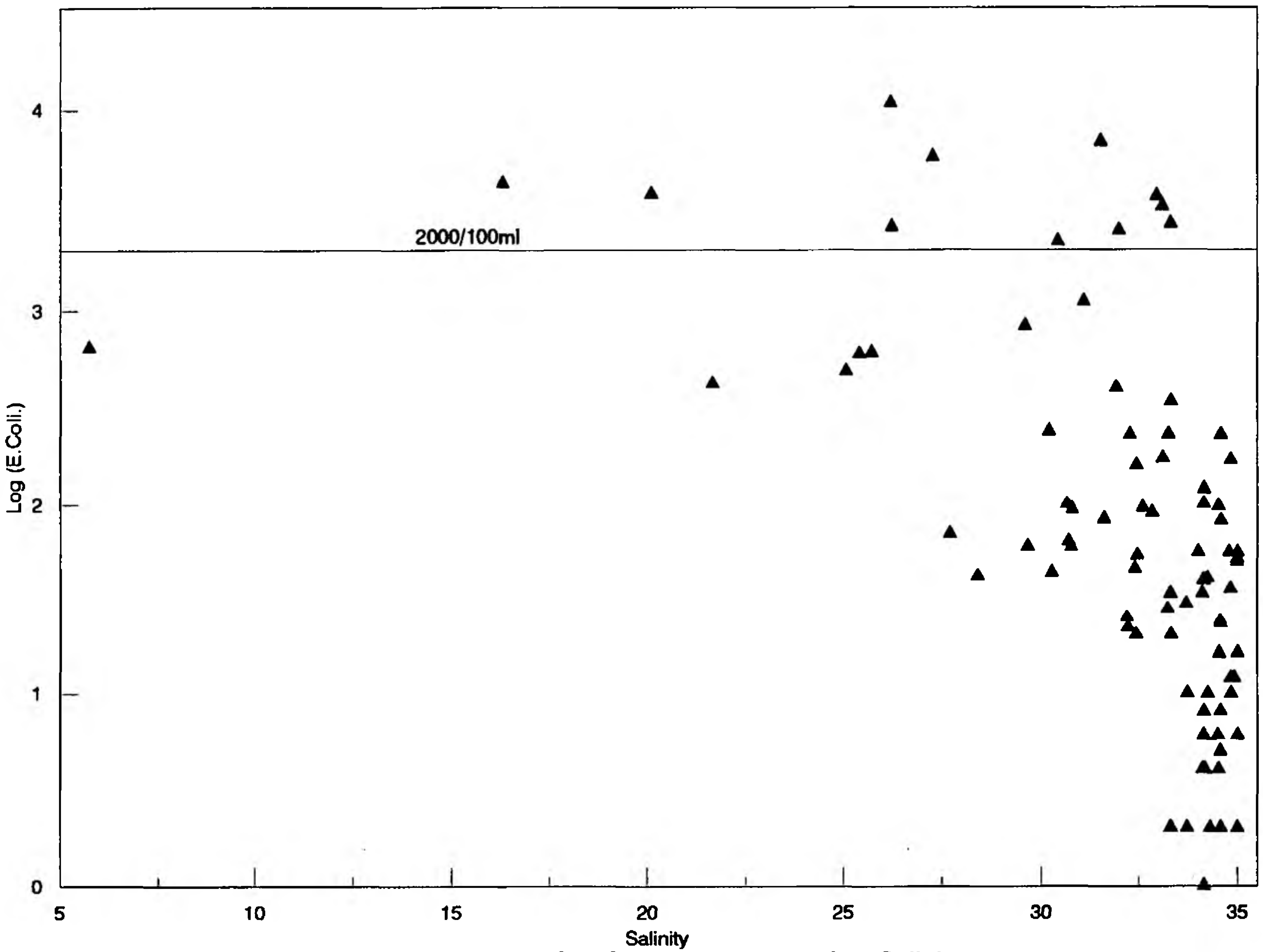


**Figure 3 : Routine Beach Water Samples - E.Coli Concentrations Against Salinity**

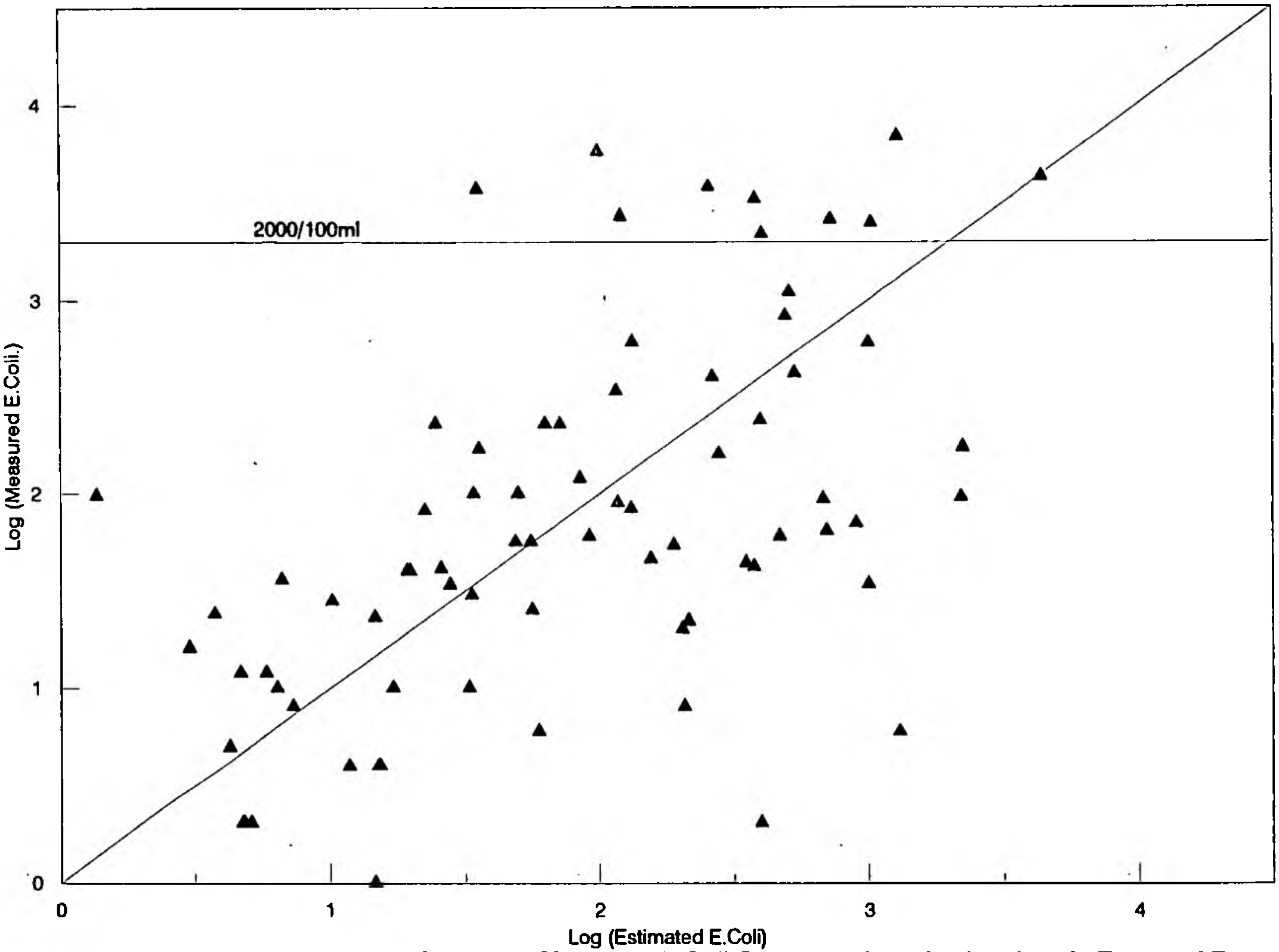


**Figure 4 : Routine Beach Water Samples - Measured E.Coli Concentrations Against Levels Expected From Freshwater Fraction and Concentrations in the River.**

# RIVER SEATON AT TREBROWNBRIDGE

## FLOW DURATION CURVE 1973-1990

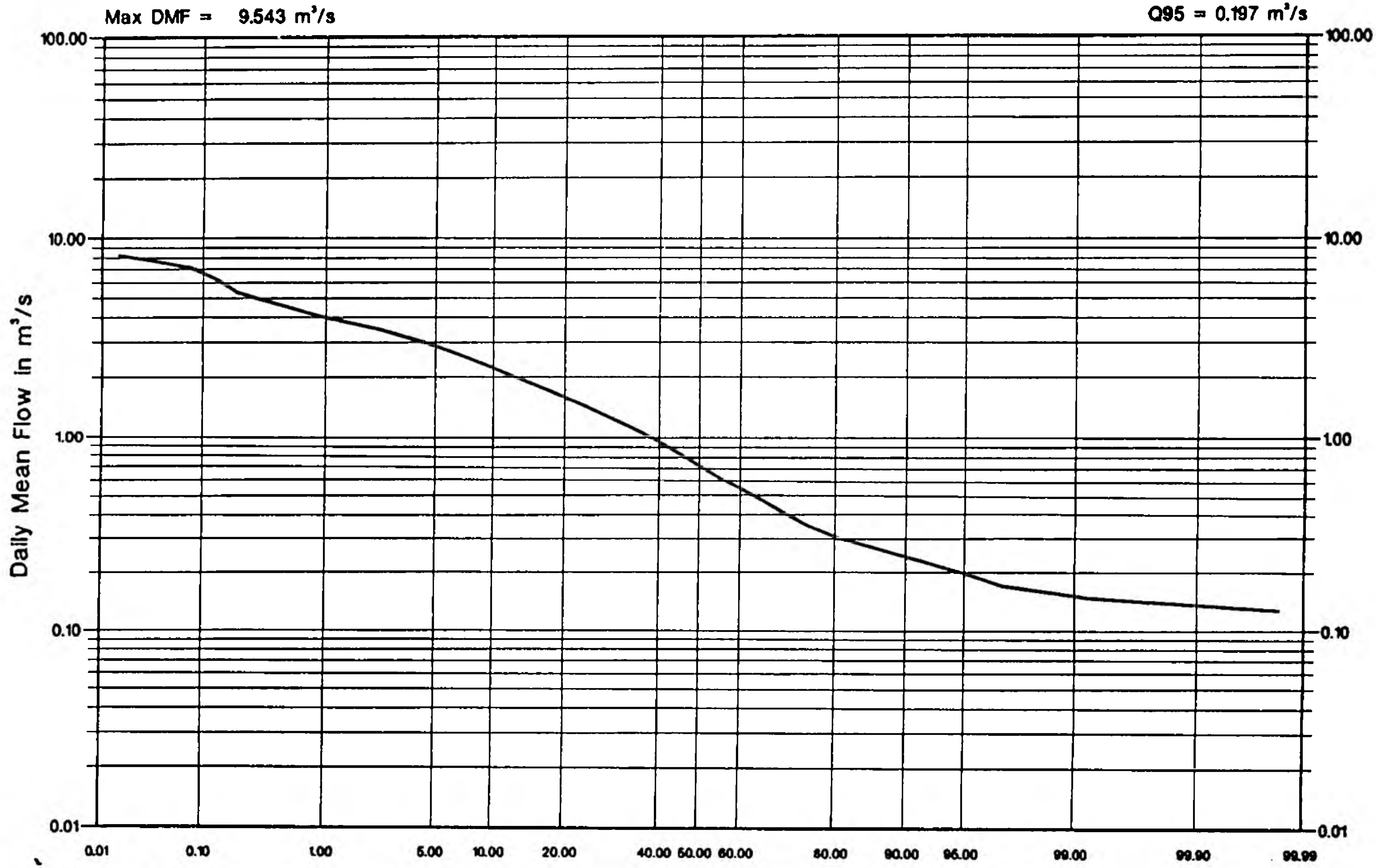


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Figure 5: Percentage of Time Flow Exceeded (Normal Probability Scale)

24-JUN-91

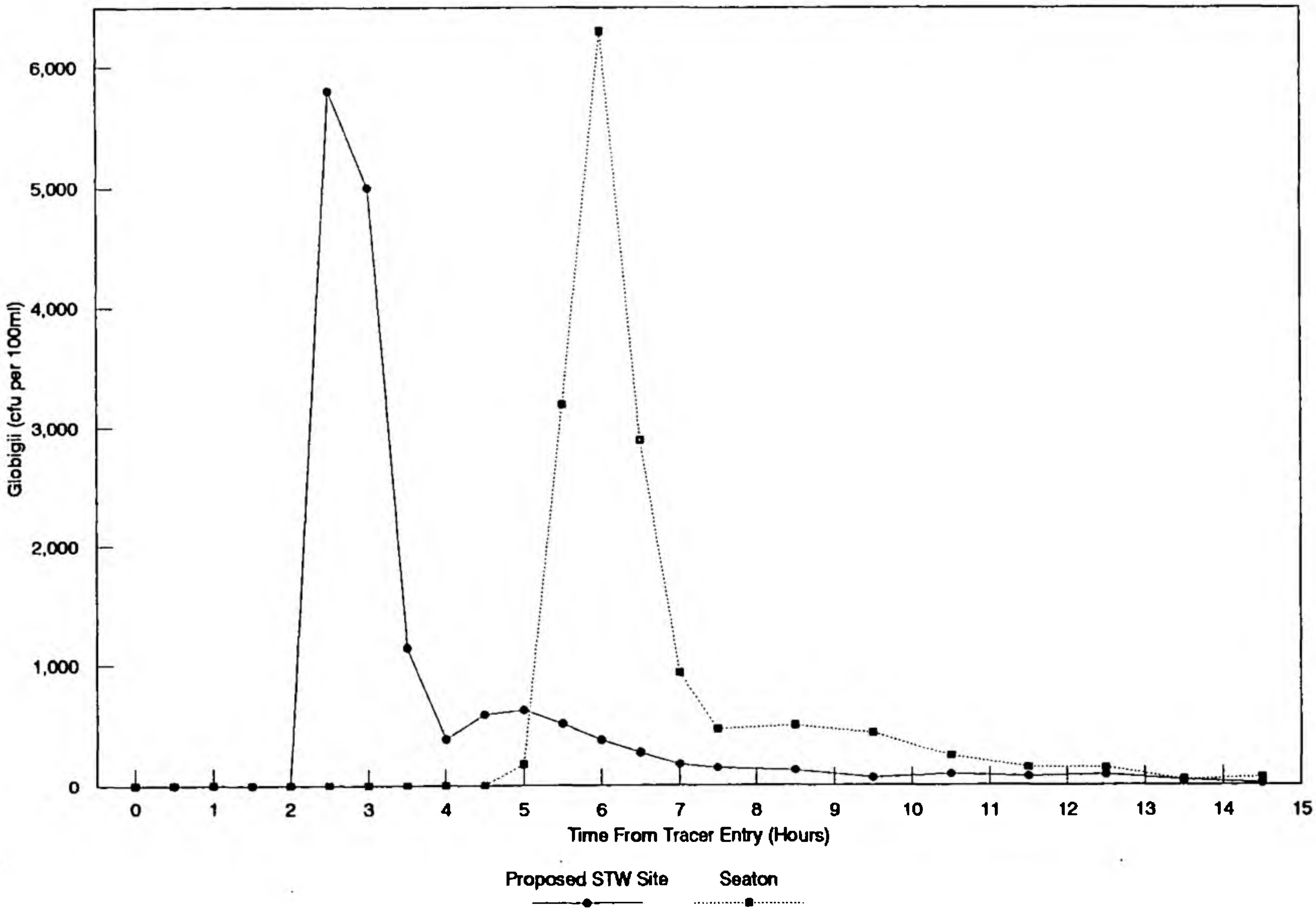


**Figure 6: Time of Travel - River Seaton**

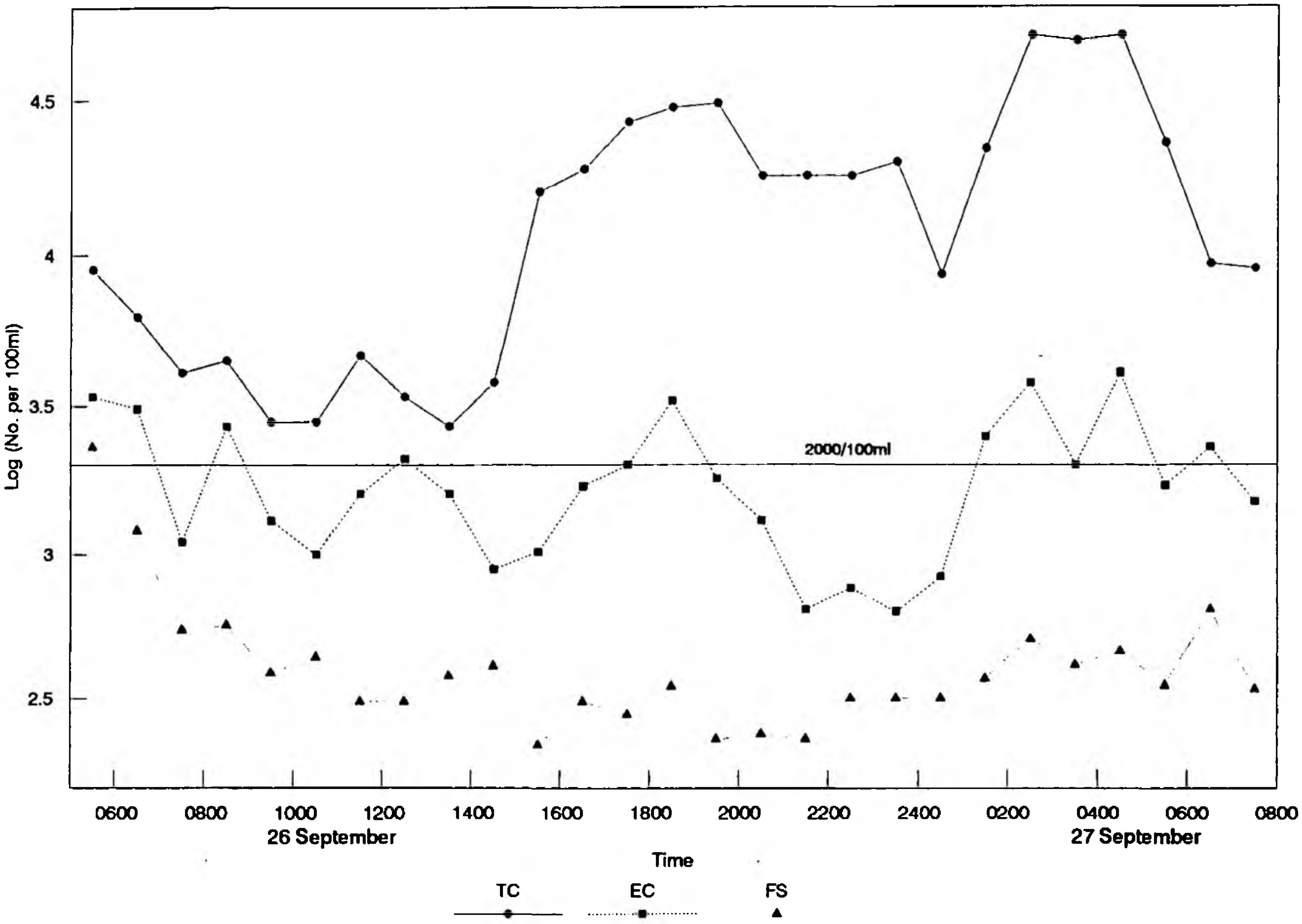


**Figure 7: Intensive Survey: Bacterial Concs at Site 1 (above Hessenford)**

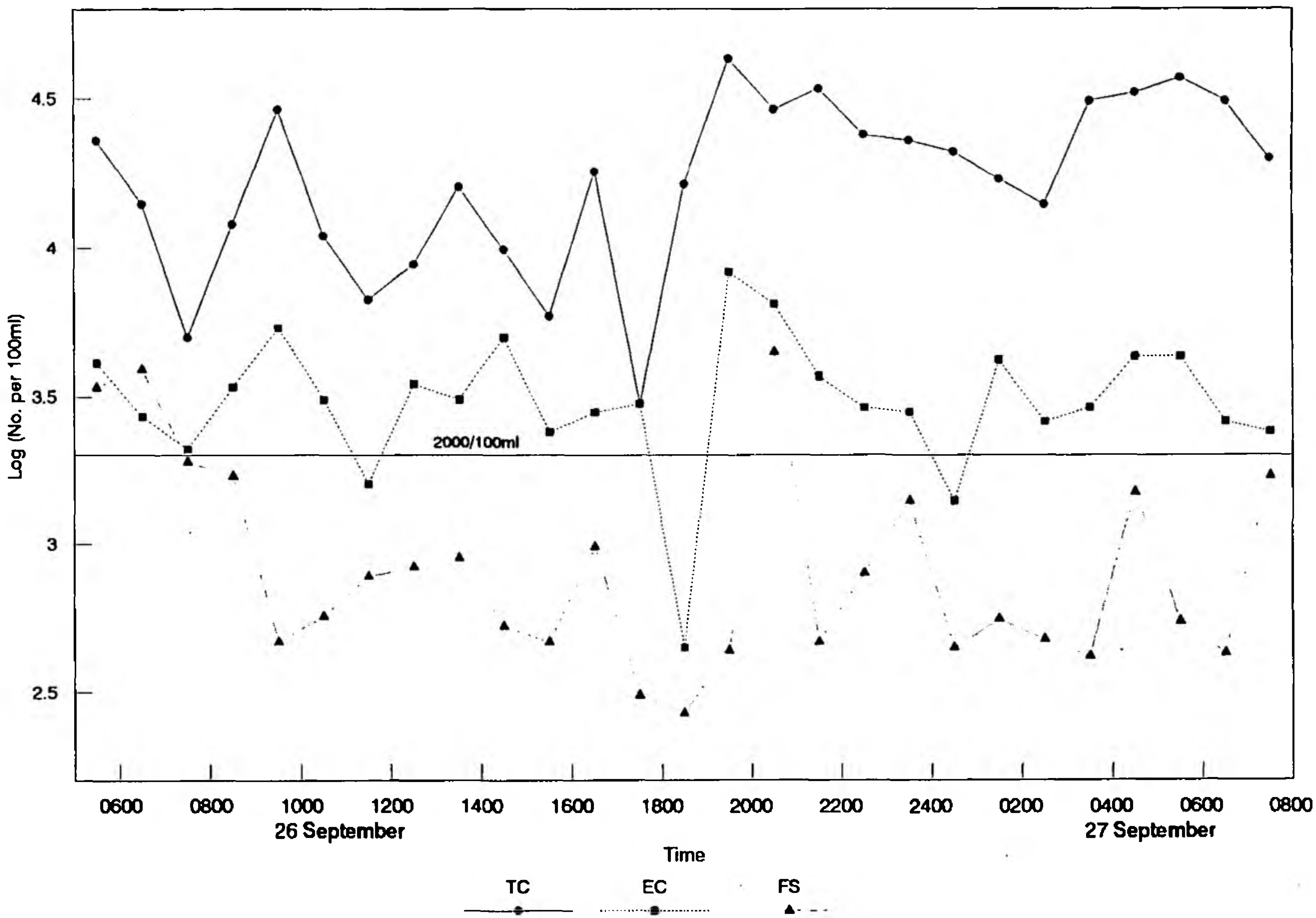


**Figure 8: Intensive Survey: Bacterial Concs at Site 2 (below Hessenford)**

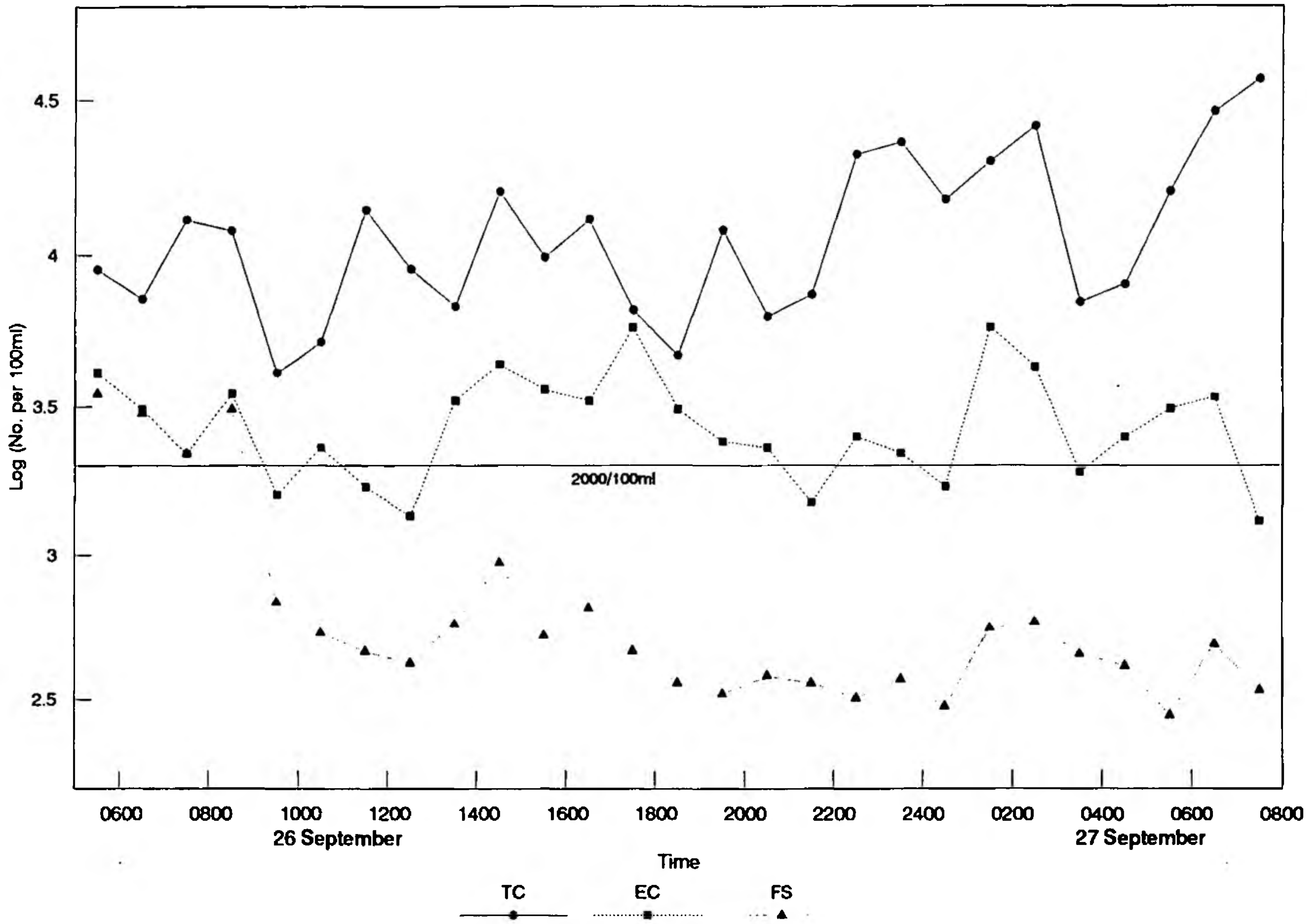


**Figure 9: Intensive Survey: Bacterial Concs at Site 3 (Proposed STW Site)**

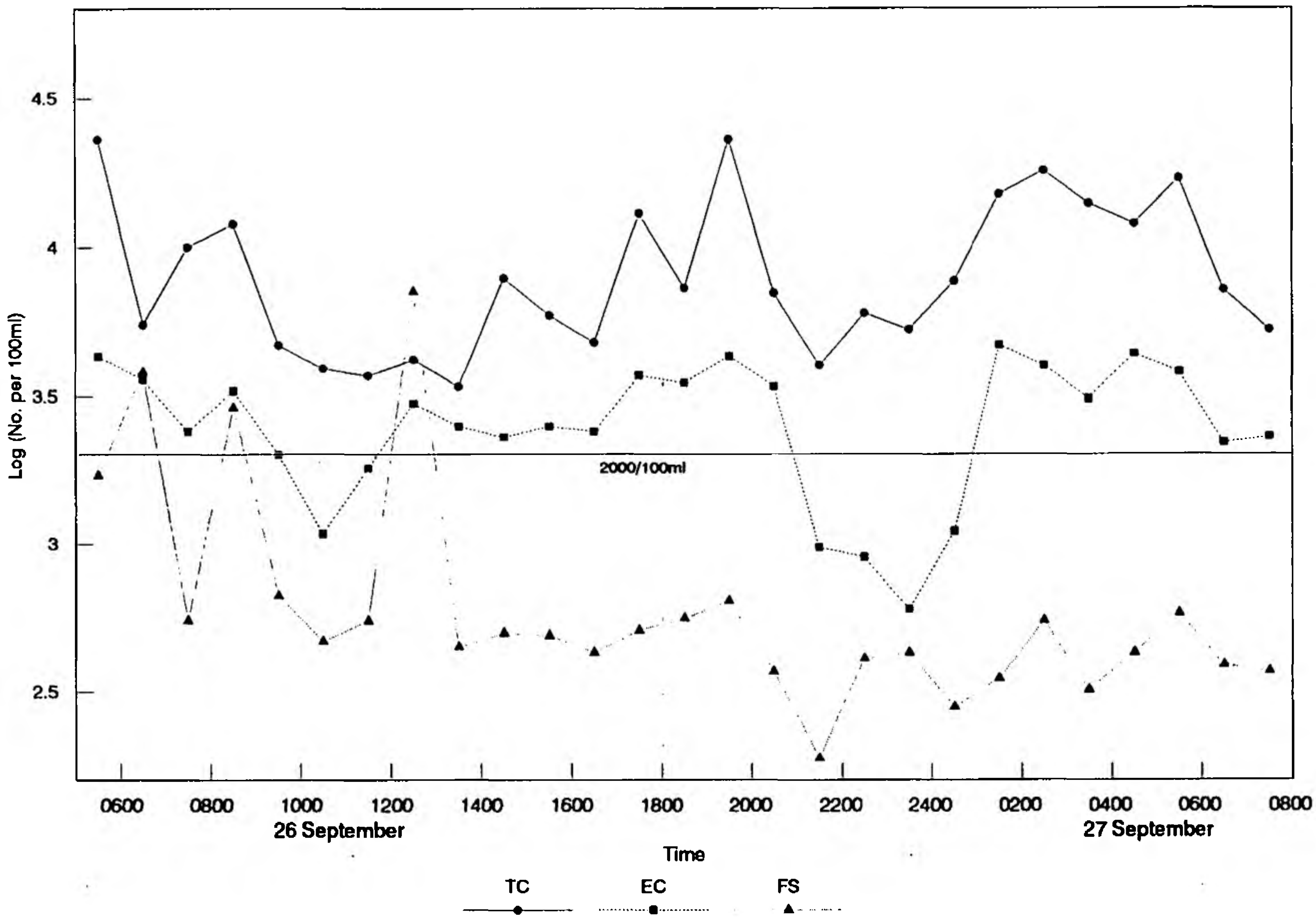


**Figure 10: Intensive Survey: Bacterial Concentrations at Site 4 (Seaton)**

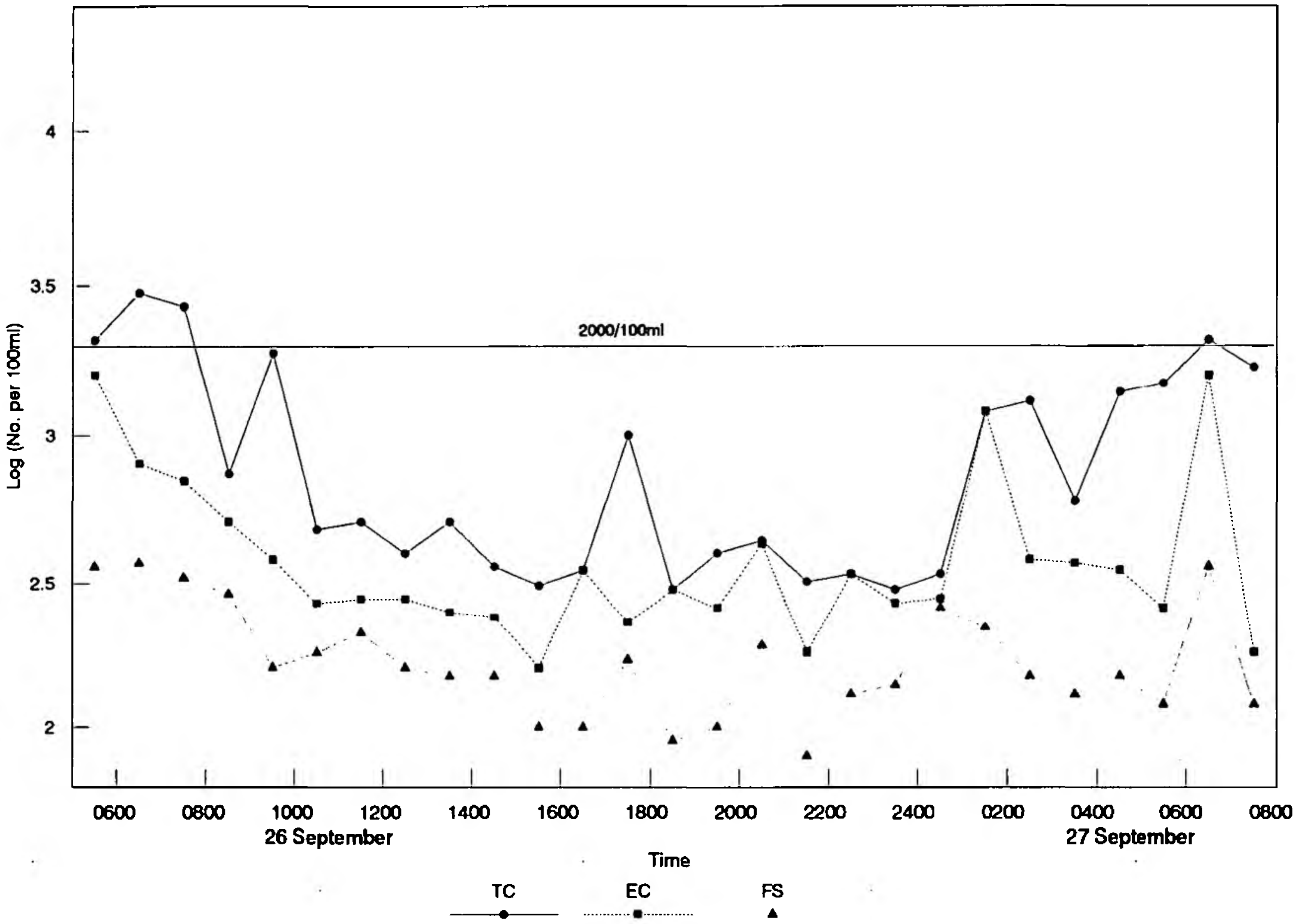


**Figure 11: Intensive Survey: Bacterial Concentrations at Site 5 (Tributary)**

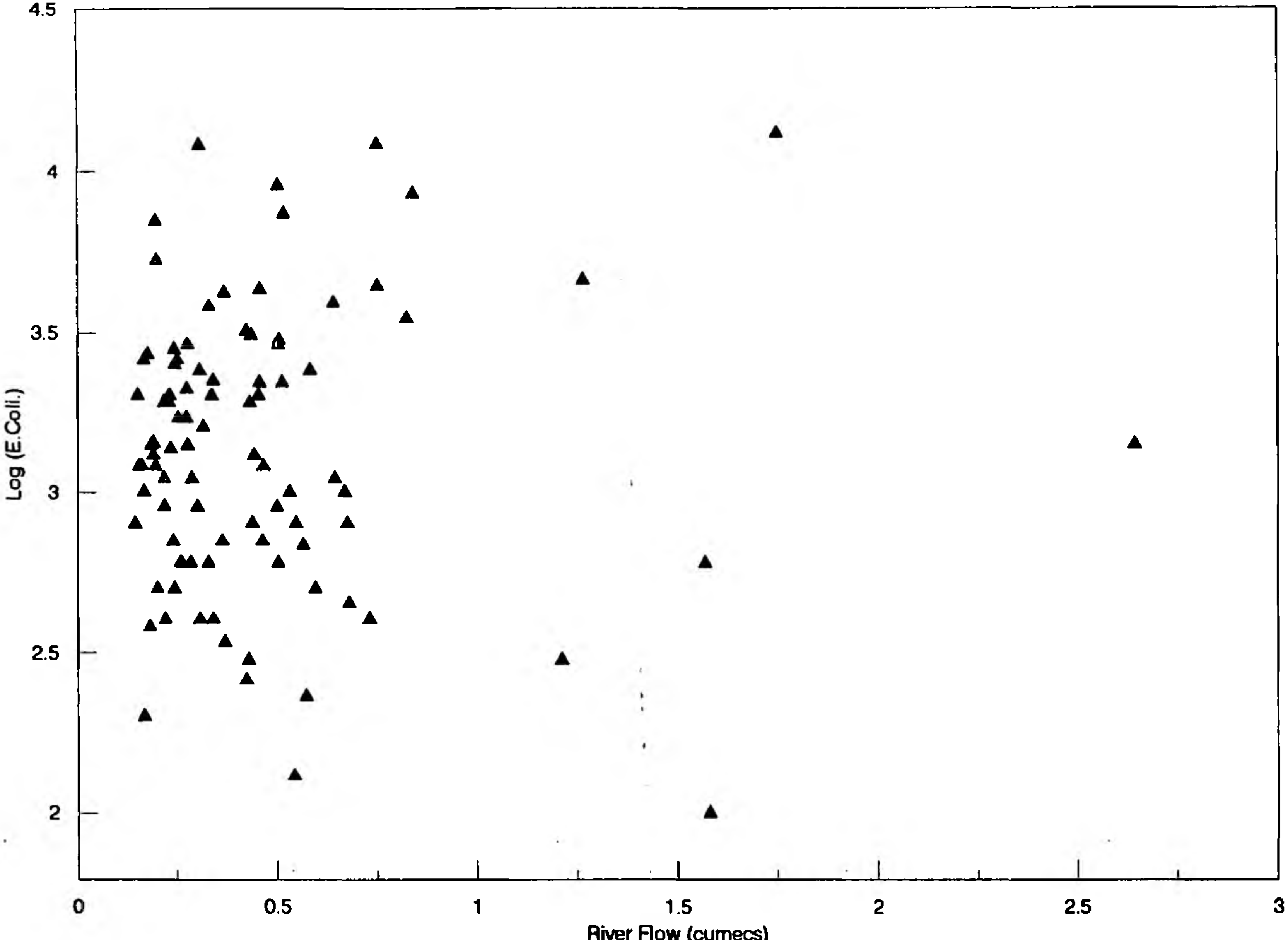


**Figure 12 : Routine River Samples - E.Coli Concentrations Against River Flow**

| Time at Site 1 | Site 1 Spot Value | Site 1 3 hr Running Mean | Change in 3 hr mean from Site 1 to Site 2 (blank if <10%) | Site 2 Spot Value | Site 2 3 hr Running Mean | Change in 3 hr mean from Site 2 to Site 3 (blank if <10%) | Site 3 Spot Value | Site 3 3 hr Running Mean | Change in 3 hr mean from Site 3 to Site 4 (blank if <10%) | Site 4 Spot Value | Site 4 3 hr Running Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2330 | | | | | | | | | | 4300 | |
| 0030 | | | | | | | | | | 3600 | 3430 |
| 0130 | | | | | | | | | | 2400 | 3300 |
| 0230 | | | | | | | 4100 | | | 3300 | 2570 |
| 0330 | | | | | | | 3100 | 3130 | -1000 | 2000 | 2130 |
| 0430 | | | | 4100 | | | 2200 | 2930 | -1300 | 1080 | 1630 |
| 0530 | 3400 | | | 2700 | 2970 | - 540 | 3500 | 2430 | - 470 | 1800 | 1960 |
| 0630 | 3100 | 2530 | | 2100 | 2730 | | 1600 | 2470 | | 3000 | 2430 |
| 0730 | 1100 | 2300 | 1330 | 3400 | 3630 | -1760 | 2300 | 1870 | 730 | 2500 | 2600 |
| 0830 | 2700 | 1700 | 2270 | 5400 | 3970 | -2190 | 1700 | 1780 | 650 | 2300 | 2430 |
| 0930 | 1300 | 1670 | 1700 | 3100 | 3370 | -1250 | 1350 | 2120 | 280 | 2500 | 2400 |
| 1030 | 1000 | 1300 | 1430 | 1600 | 2730 | | 3300 | 3020 | | 2400 | 2870 |
| 1130 | 1600 | 1570 | 1160 | 3500 | 2730 | 1020 | 4400 | 3770 | - 570 | 3700 | 3200 |
| 1230 | 2100 | 1770 | 2100 | 3100 | 3870 | | 3600 | 3770 | | 3500 | 3830 |
| 1330 | 1600 | 1530 | 1970 | 5000 | 3500 | 730 | 3300 | 4230 | - 500 | 4300 | 3730 |
| 1430 | 890 | 1170 | 2230 | 2400 | 3400 | 670 | 5800 | 4070 | -1180 | 3400 | 2890 |
| 1530 | 1020 | 1200 | 1530 | 2800 | 2730 | 1040 | 3100 | 3770 | -2010 | 970 | 1760 |
| 1630 | 1700 | 1570 | 510 | 3000 | 2080 | 540 | 2400 | 2600 | -1780 | 900 | 820 |
| 1730 | 2000 | 2330 | 1590 | 450 | 3920 | -1850 | 2300 | 2070 | -1200 | 600 | 870 |
| 1830 | 3300 | 2370 | 2710 | 8300 | 5080 | -2980 | 1500 | 2100 | | 1100 | 2130 |
| 1930 | 1800 | 2130 | 4040 | 6500 | 6170 | -4100 | 2500 | 2070 | 1200 | 4700 | 3270 |
| 2030 | 1300 | 1250 | 3120 | 3700 | 4370 | -2240 | 2200 | 2130 | 1800 | 4000 | 3930 |
| 2130 | 650 | 880 | 2250 | 2900 | 3130 | | 1700 | 3230 | 600 | 3100 | 3830 |
| 2230 | 770 | 690 | 1680 | 2800 | 2370 | 1560 | 5800 | 3930 | | 4400 | 3770 |
| 2330 | 640 | 750 | 2050 | 1400 | 2800 | 1200 | 4300 | 4000 | - 530 | 3800 | 3470 |
| 0030 | 840 | 1330 | 1400 | 4200 | 2730 | | 1900 | 2900 | | 2200 | 2770 |
| 0130 | 2500 | 2380 | 850 | 2600 | 3230 | - 730 | 2500 | 2500 | | 2300 | |
| 0230 | 3800 | 2770 | 500 | 2900 | 3270 | | 3100 | 3000 | | | |
| 0330 | 2000 | 3300 | 530 | 4300 | 3830 | -1300 | 3400 | 2530 | | | |
| 0430 | 4100 | 2600 | 1130 | 4300 | 3730 | | 1300 | | | | |
| 0530 | 1700 | 2700 | 400 | 2600 | 3100 | | | | | | |
| 0630 | 2300 | 1830 | | 2400 | | | | | | | |
| 0730 | 1500 | | | | | | | | | | |

Note: Times are corrected for Time of Travel, and are only correct for Site 1. For correct times at Sites 2, 3 and 4, add 1,3 and 6 hours respectively to the Site 1 time.

Table 1. E.Coli Concentrations (per 100ml) during Intensive Survey

## APPENDIX 1

## ROUTINE DATA

Sampling History For SEATON BEACH, Cornwall (ECB0450) & R.SEATON (R13A005)

| Date | Time (local) | HW (local) Whitsand Bay | wrt HW | Sal. | Adj. Sal. | Beach Bacteria Data | | | | | | Stream A Bacteria Data | | | | | | R. Seaton (DMF ml/s) Trebrownbridge (SX25F06 | | | *****Rainfall (mm/day)***** Tregastick (RF375396) | | | Hours of Sunshine | Cloud Cover | Wind Dir. | Wind Dir. Octal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | T.coli | E.coli | F.Strep | Log (TC) | Log (EC) | Log (FS) | T.coli | E.coli | F.Strep | Log (TC) | Log (EC) | Log (FS) | Day-2 | Day-1 | Day | Day-2 | Day-1 | Day | | | | |
| 13/05/86 | 0.04 | | 0 | 30.13 | 25.07 | 1790 | 490 | | 3.253 | 2.690 | | | | | | | | 0.706 | 0.720 | <0.675 | 5.3 | 1.1 | 0.3 | 5.2 | 2 | 225 | 6 |
| 20/05/86 | 12.35 | 15.37 | -3 | | 0.00 | | | | | | | 7400 | 300 | | 3.869 | 2.477 | | 1.366 | 1.312 | 1.210 | 0.1 | 0.2 | 4.0 | | | | |
| 27/05/86 | 11.00 | 9.28 | 2 | 31.74 | 33.31 | 20 | 2 | | 1.301 | 0.301 | | | | | | | | 0.931 | 0.885 | 0.846 | 0.1 | 0.4 | 1.3 | 6.1 | 1 | 225 | 6 |
| 10/06/86 | 11.30 | 8.19 | 3 | 24.96 | 26.19 | >20000 | 10700 | | | 4.029 | | >20000 | >20000 | | | | | 0.592 | 0.973 | 0.747 | 2.6 | 33.5 | 7.7 | 7.9 | 2 | 225 | 6 |
| 24/06/86 | 11.45 | 8.34 | 3 | 28.92 | 31.11 | 3300 | 1100 | | 3.519 | 3.041 | | 15000 | 4600 | | 4.176 | 3.663 | | 1.367 | 1.406 | 1.265 | 2.3 | 13.1 | 1.3 | | 8 | 225 | 6 |
| 08/07/86 | 12.00 | 7.30 | 5 | 30.53 | 32.43 | 352 | 20 | | 2.547 | 1.301 | | | | | | | | 0.734 | 0.700 | 0.669 | 0.0 | 0.4 | 0.0 | 6.0 | 6 | 225 | 6 |
| 22/07/86 | 11.30 | 7.34 | 4 | 33.35 | 35.00 | 30 | 6 | | 1.477 | 0.778 | | 8300 | 4300 | | 3.919 | 3.633 | | 0.479 | 0.470 | 0.457 | 0.2 | 0.0 | 0.0 | 5.8 | 6 | 225 | 6 |
| 05/08/86 | 11.15 | 6.31 | 5 | 31.74 | 33.31 | 800 | 340 | | 2.903 | 2.531 | | 15200 | 2400 | | 4.182 | 3.380 | | 0.582 | < 0.575 | 0.583 | 2.1 | 1.2 | 14.9 | 5.1 | 6 | 225 | 6 |
| 19/08/86 | 11.15 | 6.31 | 5 | 29.32 | 30.77 | 400 | 60 | | 2.602 | 1.778 | | 13200 | 3900 | | 4.121 | 3.591 | | 0.647 | 0.755 | 0.641 | 7.4 | 8.8 | 0.0 | 7.7 | 6 | 315 | 8 |
| 02/09/86 | 11.25 | 5.23 | 6 | 19.14 | 20.09 | 11200 | 3800 | | 4.049 | 3.580 | | 6900 | 600 | | 3.839 | 2.778 | | 1.788 | > 1.657 | 1.567 | 0.0 | 0.5 | 2.7 | 1.0 | 7 | 225 | 6 |
| 16/09/86 | 11.30 | 17.45 | -6 | 32.54 | 34.15 | 18 | 8 | | 1.255 | 0.903 | | 1300 | 8500 | | 3.114 | 3.929 | | 0.929 | 0.924 | 0.839 | 3.3 | 3.9 | 0.0 | 6.4 | 3 | 45 | 2 |
| 30/09/86 | 11.30 | 16.15 | -5 | 32.95 | 34.16 | 70 | 40 | | 1.845 | 1.602 | | 2600 | 800 | | 3.415 | 2.903 | | 0.575 | 0.557 | <0.547 | 0.0 | 0.1 | 0.0 | 2.9 | 6 | 180 | 5 |
| 08/10/86 | 13.46 | 9.18 | 4 | | 0.00 | | | | | | | 9500 | 1200 | | 3.978 | 3.079 | | 0.481 | 0.474 | 0.464 | 0.1 | 0.0 | 0.1 | | | | |
| 14/10/86 | 11.00 | 16.31 | -6 | 32.54 | 34.56 | 76 | 24 | | 1.881 | 1.380 | | 3500 | 300 | | 3.544 | 2.477 | | 0.440 | 0.436 | 0.427 | 0.4 | 0.3 | 0.2 | | 8 | 180 | 5 |
| 22/10/86 | 10.35 | 8.40 | 2 | | 0.00 | | | | | | | >20000 | 12100 | | | 4.083 | | 0.520 | 0.755 | 0.748 | 2.5 | 21.2 | 5.2 | | | | |
| 11/05/87 | 10.30 | 4.40 | 6 | 23.78 | 25.70 | 2010 | 610 | 106 | 3.303 | 2.785 | 2.025 | 3600 | 500 | | 3.556 | 2.699 | | 0.574 | 0.559 | 0.595 | 0.0 | 0.0 | 5.3 | | 8 | 225 | 6 |
| 21/05/87 | 10.20 | 13.33 | -3 | 32.54 | 34.31 | 10 | 2 | 2 | 1.000 | 0.301 | 0.301 | 1140 | 260 | | 3.057 | 2.415 | | 0.467 | 0.437 | 0.424 | 0.0 | 0.0 | 0.0 | | 1 | 45 | 2 |
| 03/06/87 | 10.15 | 10.29 | 0 | 32.71 | 34.15 | 1140 | 120 | 18 | 3.057 | 2.079 | 1.255 | 19600 | 3500 | | 4.292 | 3.544 | | < 0.407 | 0.522 | 0.822 | 4.3 | 12.5 | 26.5 | | 4 | 225 | 6 |
| 16/06/87 | 10.45 | 10.25 | 0 | 33.35 | 35.00 | 16 | 2 | 0 | 1.204 | 0.301 | | 15500 | 2200 | | 4.190 | 3.342 | | 0.506 | 0.596 | 0.511 | 0.0 | 4.9 | 0.3 | | 4 | 270 | 7 |
| 29/06/87 | 10.25 | 8.34 | 2 | 31.74 | 34.14 | 380 | 40 | 18 | 2.580 | 1.602 | 1.255 | 5800 | 800 | | 3.763 | 2.903 | | 0.481 | 0.464 | 0.437 | 2.6 | 2.4 | 0.0 | | 8 | 225 | 6 |
| 09/07/87 | 11.10 | 17.04 | -6 | 26.93 | 28.40 | 124 | 42 | 9 | 2.093 | 1.623 | 0.954 | 14000 | 2000 | | 4.146 | 3.301 | | 0.343 | 0.337 | 0.337 | 0.0 | 0.0 | 0.0 | | 6 | 225 | 6 |
| 22/07/87 | 11.30 | 16.19 | -5 | 31.74 | 33.31 | 35 | 20 | 2 | 1.544 | 1.301 | 0.301 | 13300 | 4200 | | 4.124 | 3.623 | | 0.406 | 0.385 | 0.368 | 0.0 | 0.1 | 0.0 | | 7 | | |
| 04/08/87 | 10.30 | 12.37 | -2 | 32.54 | 34.15 | 21 | 1 | 1 | 1.322 | 0.000 | 0.000 | 6400 | 600 | | 3.806 | 2.778 | | > 0.316 | 0.304 | 0.285 | 2.5 | 0.0 | 0.0 | | 1 | 0 | 1 |
| 13/08/87 | 12.17 | 9.46 | 3 | 32.54 | 34.15 | 550 | 100 | 17 | 2.740 | 2.000 | 1.230 | 18300 | 1400 | | 4.262 | 3.146 | | 0.290 | 0.274 | 0.277 | 6.3 | 1.6 | 0.4 | | 8 | 225 | 6 |
| 27/08/87 | 11.30 | 8.19 | 3 | 34.17 | 35.00 | 220 | 50 | 23 | 2.342 | 1.699 | 1.362 | 8900 | 1900 | | 3.949 | 3.279 | | 0.239 | 0.241 | 0.230 | 2.4 | 0.3 | 0.0 | | 4 | 0 | 1 |
| 09/09/87 | 10.30 | 7.59 | 3 | 30.93 | 32.46 | 302 | 54 | 19 | 2.480 | 1.732 | 1.279 | 12900 | 2600 | | 4.111 | 3.415 | | 0.273 | 0.251 | 0.252 | 0.2 | 0.6 | 2.3 | | 2 | 225 | 6 |
| 22/09/87 | 10.25 | 6.13 | 4 | 31.74 | 33.31 | 10100 | 2700 | 340 | 4.004 | 3.431 | 2.531 | 34400 | 2500 | | 4.537 | 3.398 | | 0.232 | 0.235 | 0.245 | 0.1 | 1.6 | 6.0 | | 1 | 225 | 6 |
| 09/05/88 | 12.25 | 12.28 | 0 | 28.52 | 35.00 | 16 | 2 | 10 | 1.204 | 0.301 | 1.000 | 5800 | 1100 | | 3.763 | 3.041 | | 0.687 | 0.665 | 0.643 | 1.2 | 0.0 | 0.0 | 3.7 | 6 | 315 | 8 |
| 19/05/88 | 12.15 | 8.50 | 3 | 30.73 | 34.11 | 30 | 4 | 2 | 1.477 | 0.602 | 0.301 | 5100 | 600 | | 3.708 | 2.778 | | 0.521 | 0.513 | 0.501 | 0.0 | 0.2 | 0.0 | 10.7 | 4 | 315 | 8 |
| 04/06/88 | 12.04 | 9.35 | 2 | 30.53 | 32.84 | 640 | 90 | 7 | 2.806 | 1.954 | 0.845 | 20600 | 1900 | | 4.314 | 3.279 | | 0.448 | 0.450 | 0.431 | 1.1 | 4.7 | 0.0 | 8.0 | 6 | 315 | 8 |
| 15/06/88 | 12.10 | 7.16 | 5 | 28.33 | 30.66 | 676 | 100 | 25 | 2.830 | 2.000 | 1.398 | 3500 | 400 | | 3.544 | 2.602 | | 0.357 | 0.344 | 0.341 | 0.0 | 0.0 | 0.0 | 1.4 | 8 | 45 | 2 |
| 20/06/88 | 12.10 | 10.07 | 2 | 32.54 | 34.36 | 2 | 0 | 3 | 0.301 | | 0.477 | 6200 | 1600 | | 3.792 | 3.204 | | 0.325 | 0.320 | 0.316 | 0.0 | 0.0 | 0.0 | 11.0 | 3 | 225 | 6 |
| 28/06/88 | 10.50 | 5.11 | 6 | 32.14 | 34.14 | 13 | 6 | 2 | 1.114 | 0.778 | 0.301 | 6700 | 2400 | | 3.826 | 3.380 | | 0.405 | 0.321 | 0.307 | 13.1 | 0.2 | 0.0 | 5.9 | 8 | 0 | 1 |
| 01/07/88 | 15.35 | 20.14 | -5 | 30.13 | 32.00 | 4300 | 2500 | 122 | 3.633 | 3.398 | 2.086 | 74000 | 12000 | | 4.869 | 4.079 | | 0.295 | 0.344 | 0.306 | 0.1 | 6.3 | 1.9 | 9.3 | 4 | 270 | 7 |
| 06/07/88 | 11.30 | 11.49 | 0 | 24.96 | 32.44 | 1010 | 160 | 58 | 3.004 | 2.204 | 1.763 | 20000 | 3800 | | 4.301 | 3.580 | | 0.315 | 0.349 | 0.331 | 0.3 | 5.8 | 0.1 | 10.8 | 2 | 225 | 6 |
| 13/07/88 | 11.16 | 6.16 | 5 | 23.78 | 26.22 | 4000 | 2600 | 1040 | 3.602 | 3.415 | 3.017 | 9300 | 2900 | | 3.968 | 3.462 | | 0.402 | 0.393 | 0.501 | 0.1 | 7.1 | 9.3 | 4.5 | 7 | 225 | 6 |
| 25/07/88 | 12.34 | 14.52 | -2 | 29.32 | 31.93 | 5200 | 400 | 115 | 3.716 | 2.602 | 2.061 | 78000 | 3000 | | 4.892 | 3.477 | | 0.548 | 0.525 | 0.504 | 0.9 | 7.5 | 0.1 | 2.9 | 7 | 225 | 6 |
| 31/07/88 | 10.36 | 8.31 | 2 | 32.34 | 34.78 | 100 | 56 | 22 | 2.000 | 1.748 | 1.342 | 11000 | 9000 | | 4.041 | 3.954 | | 0.521 | 0.510 | 0.502 | 0.0 | 0.4 | 0.6 | 1.2 | 7 | 225 | 6 |
| 04/08/88 | 13.10 | 11.18 | 2 | 32.54 | 35.00 | 48 | 16 | 1 | 1.681 | 1.204 | 0.000 | 169000 | 2000 | | 5.228 | 3.301 | | 0.473 | 0.459 | 0.453 | 0.0 | 0.0 | 0.0 | 2.6 | 8 | 0 | 1 |
| 11/08/88 | 10.30 | 6.06 | 4 | 26.54 | 30.43 | 5600 | 2200 | 682 | 3.748 | 3.342 | 2.834 | 10700 | 3100 | | 4.029 | 3.491 | | 0.407 | 0.411 | 0.435 | 0.0 | 1.6 | 6.2 | 0.1 | 8 | 225 | 6 |
| 22/08/88 | 12.43 | 12.47 | 0 | 23.78 | 29.59 | 1970 | 830 | 2190 | 3.294 | 2.919 | 3.340 | 17300 | 3200 | | 4.238 | 3.505 | | 0.462 | 0.431 | 0.422 | 0.3 | 0.0 | 2.3 | 3.1 | 7 | 180 | 5 |
| 01/09/88 | 10.25 | 10.06 | 0 | 29.32 | 31.54 | 22900 | 6900 | 3350 | 4.360 | 3.839 | 3.525 | 114000 | 13000 | | 5.057 | 4.114 | | 0.508 | > 1.335 | >1.750 | 5.9 | 36.8 | 1.1 | 4.9 | 7 | 180 | 5 |
| 12/09/88 | 11.23 | 7.29 | 4 | 25.35 | 27.27 | 13300 | 5800 | 730 | 4.124 | 3.763 | 2.863 | 6500 | 450 | | 3.813 | 2.653 | | 0.737 | 0.704 | 0.679 | 0.1 | 0.0 | 0.0 | 3.8 | 7 | 315 | 8 |
| 17/09/88 | 10.35 | 9.10 | 1 | 30.13 | 34.54 | 66 | 16 | 0 | 1.820 | 1.204 | | 1290 | 230 | | 3.111 | 2.362 | | 0.603 | 0.591 | 0.572 | 0.0 | 0.0 | 0.0 | 6.9 | 7 | 315 | 8 |
| 29/09/88 | 12.25 | 9.00 | 3 | 28.52 | 32.27 | 470 | 230 | 22 | 2.672 | 2.362 | 1.342 | 8500 | 800 | | 3.929 | 2.903 | | 0.856 | 0.725 | 0.676 | 15.1 | 6.2 | 0.4 | 9.4 | 7 | 315 | 8 |
| 12/10/88 | 12.35 | 7.26 | 5 | 18.38 | 21.65 | 1530 | 420 | 202 | 3.185 | 2.623 | 2.305 | 7900 | 1400 | | 3.898 | 3.146 | | 2.413 | > 3.036 | 2.643 | 6.5 | 22.7 | 1.6 | 4.6 | 4 | 0 | 1 |
| 17/10/88 | 10.45 | 9.34 | 1 | 29.72 | 34.52 | 258 | 98 | 48 | 2.412 | 1.991 | 1.681 | 12800 | 100 | | 4.107 | 2.000 | | 1.849 | 1.675 | 1.579 | 0.0 | 0.0 | 0.0 | 0.0 | 8 | 90 | 5 |

| Wind spd (BS) | Stream Fraction |
|---|---|
| 5 | |
| | 2.477 |
| 4 | |
| 5 | |
| 4 | 2.709 |
| 2 | |
| 1 | |
| 2 | 2.064 |
| 1 | 2.673 |
| 2 | 2.408 |
| 2 | 2.315 |
| 4 | 1.283 |
| | 3.079 |
| 1 | 0.572 |
| | 4.083 |
| 5 | 2.123 |
| 5 | 0.707 |
| 5 | 1.927 |
| 3 | |
| 1 | 1.294 |
| 1 | 2.577 |
| 0 | 2.307 |
| 2 | 1.164 |
| 2 | 1.532 |
| 5 | |
| 1 | 2.276 |
| 3 | 2.082 |
| 4 | |
| 2 | 1.183 |
| 3 | 2.070 |
| 2 | 1.695 |
| 1 | 1.469 |
| 2 | 1.771 |
| 3 | 3.012 |
| 3 | 2.444 |
| 4 | 2.862 |
| 3 | 2.420 |
| 3 | 1.743 |
| 2 | |
| 1 | 2.608 |
| 2 | 2.694 |
| 4 | 3.109 |
| 3 | 1.998 |
| 2 | 0.479 |
| 3 | 1.795 |
| 1 | 2.728 |
| 4 | 0.134 |

Sampling History For SEATON BEACH, Cornwall (ECB0450) & R.SEATON (R13A005)

| Date | Time (local) | HW (local) Whitsand Bay | wrt HW | Sal. | Adj. Sal. | Beach Bacteria Data | | | | | | Stream A Bacteria Data | | | | | | R. Seaton (DMF ml/s) Trebrownbridge (SX25F06 | | | *****Rainfall (mm/day)***** Tregastick (RF375396) | | | Hours of Sunshine | Cloud Cover | Wind Dir. | Wind Dir. Octal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | T.coli | E.coli | F.Strep | Log (TC) | Log (EC) | Log (FS) | T.coli | E.coli | F.Strep | Log (TC) | Log (EC) | Log (FS) | Day-2 | Day-1 | Day | Day-2 | Day-1 | Day | | | | |
| 08/05/89 | 10.40 | 8.48 | 2 | 33.35 | 33.73 | 10 | 2 | 4 | 1.000 | 0.301 | 0.602 | 3190 | 130 | 56 | 3.504 | 2.114 | 1.748 | 0.564 | 0.554 | 0.542 | 0.0 | 0.0 | 0.0 | 14.0 | 1 | 135 | 4 |
| 17/05/89 | 13.00 | 16.40 | -4 | 30.97 | 32.20 | 194 | 25 | 13 | 2.288 | 1.398 | 1.114 | 5500 | 700 | 74 | 3.740 | 2.845 | 1.869 | 0.473 | 0.468 | 0.462 | 0.0 | 0.2 | 0.0 | 5.6 | 8 | 135 | 4 |
| 02/06/89 | 10.25 | 5.05 | 5 | 5.50 | 5.74 | <1070 | 650 | 100 | | 2.813 | 2.000 | 10 | 0 | 8 | 1.000 | | 0.903 | < 0.345 | 0.349 | 0.337 | 1.4 | 0.3 | 2.1 | 8.3 | 5 | 45 | 2 |
| 15/06/89 | 13.05 | 15.39 | -3 | 29.40 | 30.19 | 1310 | 240 | 21 | 3.117 | 2.380 | 1.322 | 34400 | 2900 | 3110 | 4.537 | 3.462 | 3.493 | 0.304 | 0.289 | 0.278 | 0.0 | 0.0 | 0.0 | 12.8 | 2 | 45 | 2 |
| 23/06/89 | 10.30 | 9.25 | 1 | 34.08 | 35.00 | 4 | 2 | 4 | 0.602 | 0.301 | 0.602 | 11000 | 2800 | 562 | 4.041 | 3.447 | 2.750 | 0.249 | 0.248 | 0.244 | 0.0 | 0.0 | 0.0 | 15.0 | 2 | 315 | 8 |
| 28/06/89 | 12.54 | 13.48 | -1 | 33.35 | 34.00 | 244 | 56 | 53 | 2.387 | 1.748 | 1.724 | 12600 | 1700 | 320 | 4.100 | 3.230 | 2.505 | 0.276 | 0.248 | 0.254 | 7.8 | 0.0 | 0.8 | 0.4 | 8 | 270 | 7 |
| 11/07/89 | 10.45 | 11.42 | -1 | 34.74 | 34.52 | 2 | 4 | 2 | 0.301 | 0.602 | 0.301 | 4100 | 1100 | 289 | 3.613 | 3.041 | 2.461 | 0.232 | 0.218 | 0.216 | 0.0 | 0.0 | 0.0 | 7.2 | 8 | 315 | 8 |
| 15/07/89 | 10.20 | 15.53 | -6 | 34.08 | 34.18 | 5 | 4 | 2 | 0.699 | 0.602 | 0.301 | 8300 | 500 | 151 | 3.919 | 2.699 | 2.179 | 0.208 | 0.199 | 0.199 | 0.0 | 0.0 | 0.0 | 14.9 | 1 | 315 | 8 |
| 19/07/89 | 12.30 | 7.14 | 5 | 34.65 | 34.83 | 25 | 10 | 0 | 1.398 | 1.000 | | 8500 | 1300 | 228 | 3.929 | 3.114 | 2.358 | 0.192 | 0.190 | 0.189 | 0.0 | 0.0 | 0.0 | 14.5 | 1 | 45 | 2 |
| 25/07/89 | 10.15 | 11.19 | -1 | 32.06 | 32.23 | 176 | 22 | 23 | 2.246 | 1.342 | 1.362 | 8700 | 2700 | 213 | 3.940 | 3.431 | 2.328 | 0.180 | 0.172 | 0.175 | 0.0 | 0.0 | 0.1 | 9.6 | 1 | 135 | 4 |
| 31/07/89 | 12.55 | 18.08 | -5 | 30.05 | 30.27 | 352 | 44 | 37 | 2.547 | 1.643 | 1.568 | 17100 | 2600 | 282 | 4.233 | 3.415 | 2.450 | 0.179 | 0.176 | <0.166 | 0.9 | 0.0 | 1.2 | 7.2 | 4 | 315 | 8 |
| 06/08/89 | 10.10 | 9.22 | 1 | 34.41 | 34.92 | 33 | 12 | 3 | 1.519 | 1.079 | 0.477 | 5300 | 2000 | 122 | 3.724 | 3.301 | 2.086 | 0.157 | 0.155 | <0.150 | 0.0 | 0.0 | 0.0 | 11.7 | 1 | 315 | 8 |
| 09/08/89 | 12.05 | 10.45 | 1 | 33.52 | 34.25 | 109 | 41 | 68 | 2.037 | 1.613 | 1.833 | 6400 | 1200 | 218 | 3.806 | 3.079 | 2.338 | 0.154 | > 0.321 | 0.194 | 0.0 | 0.0 | 22.4 | 6.7 | 5 | 225 | 6 |
| 15/08/89 | 10.40 | 5.13 | 5 | 32.38 | 33.09 | 5900 | 1300 | 37 | 3.771 | 3.519 | 1.568 | 25000 | 7000 | 2510 | 4.398 | 3.845 | 3.400 | 0.217 | 0.265 | 0.196 | 14.3 | 10.9 | 0.2 | 10.0 | 4 | 225 | 6 |
| 21/08/89 | 12.35 | 9.36 | 3 | 33.76 | 34.83 | 114 | 36 | 32 | 2.057 | 1.556 | 1.505 | 5100 | 1400 | 312 | 3.708 | 3.146 | 2.494 | 0.179 | 0.179 | 0.184 | 0.0 | 1.6 | 0.0 | 12.0 | 2 | 270 | 7 |
| 31/08/89 | 10.35 | 7.00 | 4 | 33.35 | 34.57 | 52 | 23 | 9 | 1.716 | 1.362 | 0.954 | 16800 | 1200 | 173 | 4.225 | 3.079 | 2.238 | 0.157 | 0.160 | 0.160 | 0.0 | 0.8 | 0.0 | 10.3 | 5 | 0 | 1 |
| 14/09/89 | 10.15 | 5.47 | 4 | 33.11 | 34.83 | 520 | 170 | 8 | 2.716 | 2.230 | 0.903 | 15700 | 7400 | 162 | 4.196 | 3.869 | 2.210 | 0.153 | 0.160 | >0.517 | 0.4 | 3.6 | 39.0 | 0.0 | 8 | 225 | 6 |
| 19/09/89 | 12.03 | 9.15 | 3 | 33.11 | 34.57 | 270 | 230 | 101 | 2.431 | 2.362 | 2.004 | 5700 | 2000 | 510 | 3.756 | 3.301 | 2.708 | 0.386 | 0.263 | 0.232 | 0.9 | 2.6 | 0.0 | 8.9 | 3 | 225 | 6 |
| 28/09/89 | 0.03 | | 0 | 33.11 | 34.83 | 22 | 12 | 3 | 1.342 | 1.079 | 0.477 | 8500 | 1200 | 218 | 3.929 | 3.079 | 2.338 | 0.161 | 0.165 | 0.152 | 0.0 | 0.0 | 0.0 | 8.0 | | | |
| 09/10/89 | 10.10 | 12.37 | -2 | 33.68 | 34.26 | 15 | 10 | 8 | 1.176 | 1.000 | 0.903 | 4200 | 800 | 262 | 3.623 | 2.903 | 2.418 | 0.151 | 0.147 | <0.143 | 0.2 | 0.1 | 0.1 | 5.5 | 7 | 315 | 8 |
| 01/05/90 | 10.19 | 11.21 | -1 | 32.54 | 34.56 | 35 | 5 | 4 | 1.544 | 0.699 | 0.602 | 960 | 340 | 96 | 2.982 | 2.531 | 1.982 | 0.382 | < 0.370 | 0.369 | 0.0 | 0.0 | 0.0 | 0.7 | 1 | 45 | 2 |
| 10/05/90 | 13.45 | 19.14 | -5 | 26.54 | 29.65 | 640 | 60 | 25 | 2.806 | 1.778 | 1.398 | 14500 | 600 | 160 | 4.161 | 2.778 | 2.204 | 0.328 | 0.326 | 0.329 | 0.2 | 2.0 | 0.0 | 8.8 | 6 | 270 | 7 |
| 16/05/90 | 10.20 | 10.29 | 0 | 31.33 | 33.70 | 158 | 30 | 8 | 2.199 | 1.477 | 0.903 | 4100 | 900 | 112 | 3.613 | 2.954 | 2.049 | 0.342 | 0.313 | 0.302 | 7.9 | 0.7 | 0.1 | 12.3 | 5 | 180 | 5 |
| 25/05/90 | 13.50 | 19.28 | -6 | 33.35 | 34.57 | 2 | 8 | 6 | 0.301 | 0.903 | 0.778 | 7200 | 600 | 64 | 3.857 | 2.778 | 1.806 | 0.264 | 0.266 | 0.259 | 0.0 | 0.0 | 0.0 | 10.8 | 4 | 135 | 4 |
| 01/06/90 | 10.20 | 12.51 | -3 | 31.33 | 34.12 | 168 | 34 | 20 | 2.225 | 1.531 | 1.301 | 400 | 1100 | 2090 | 2.602 | 3.041 | 3.320 | 0.285 | 0.283 | 0.287 | 0.0 | 0.0 | 0.6 | 3.0 | 8 | 270 | 7 |
| 09/06/90 | 13.45 | 19.30 | -6 | 31.33 | 32.09 | 20 | 0 | 3 | 1.301 | | 0.477 | 1800 | 500 | 207 | 3.256 | 2.699 | 2.316 | 0.272 | 0.253 | 0.244 | 4.2 | 0.5 | 0.0 | 6.4 | 5 | 315 | 8 |
| 17/06/90 | 10.40 | 12.54 | -2 | 34.57 | 35.00 | 8 | 2 | 0 | 0.903 | 0.301 | | 14300 | 1700 | 204 | 4.155 | 3.230 | 2.310 | 0.240 | 0.236 | 0.274 | 0.0 | 0.0 | 9.6 | 0.6 | 8 | 180 | 5 |
| 25/06/90 | 12.55 | 8.32 | 4 | 32.54 | 32.94 | 8900 | 3700 | 664 | 3.949 | 3.568 | 2.822 | 4400 | 600 | 190 | 3.643 | 2.778 | 2.279 | 0.288 | 0.276 | 0.262 | 0.5 | 1.7 | 0.4 | 0.0 | 8 | 225 | 6 |
| 02/07/90 | 10.25 | 13.40 | -3 | 30.13 | 32.41 | 188 | 46 | 2 | 2.274 | 1.663 | 0.301 | 6800 | 2100 | 258 | 3.833 | 3.322 | 2.412 | 0.362 | 0.327 | 0.275 | 9.2 | 0.2 | 0.0 | 11.8 | 5 | 315 | 8 |
| 12/07/90 | 12.45 | 9.31 | 3 | 33.76 | 33.01 | 2 | 0 | 1 | 0.301 | | 0.000 | 4200 | 400 | 142 | 3.623 | 2.602 | 2.152 | 0.311 | 0.301 | 0.308 | 0.0 | 0.0 | 0.0 | 14.3 | 1 | 90 | 3 |
| 18/07/90 | 10.05 | 14.42 | -5 | 35.39 | 34.60 | 2 | 0 | 2 | 0.301 | | 0.301 | 5700 | 700 | 163 | 3.756 | 2.845 | 2.212 | 0.263 | 0.267 | 0.242 | 0.0 | 0.0 | 0.0 | 13.8 | 1 | 90 | 3 |
| 27/07/90 | 12.45 | 9.58 | 3 | 30.13 | 31.62 | 374 | 84 | 64 | 2.573 | 1.924 | 1.806 | 910 | 1360 | 900 | 2.959 | 3.134 | 2.954 | < 0.218 | 0.219 | 0.234 | 0.0 | 2.8 | 0.0 | 8.3 | 3 | 225 | 6 |
| 06/08/90 | 10.35 | 6.46 | 4 | 32.14 | 33.73 | 42 | 10 | 6 | 1.623 | 1.000 | 0.778 | 7500 | 900 | 700 | 3.875 | 2.954 | 2.845 | 0.232 | 0.231 | 0.218 | 0.0 | 0.0 | 0.0 | 13.9 | 2 | 315 | 8 |
| 14/08/90 | 12.45 | 11.45 | 1 | 32.95 | 34.58 | 32 | 2 | 5 | 1.505 | 0.301 | 0.699 | 2500 | 400 | 91 | 3.398 | 2.602 | 1.959 | 0.217 | 0.209 | 0.221 | 0.0 | 0.1 | 4.8 | 6.9 | 7 | 225 | 6 |
| 22/08/90 | 10.25 | 7.57 | 2 | 34.57 | 34.59 | 150 | 82 | 21 | 2.176 | 1.914 | 1.322 | 4100 | 1900 | 196 | 3.613 | 3.279 | 2.292 | 0.234 | 0.226 | 0.216 | 0.0 | 0.0 | 0.0 | 3.0 | 8 | 270 | 7 |
| 30/08/90 | 13.55 | 13.10 | 1 | 33.35 | 35.00 | 168 | 52 | 6 | 2.225 | 1.716 | 0.778 | 15000 | 5300 | 2050 | 4.176 | 3.724 | 3.312 | 0.181 | 0.271 | 0.198 | 2.1 | 10.7 | 0.2 | 5.5 | 5 | 270 | 7 |
| 07/09/90 | 10.15 | 8.18 | 2 | 32.54 | 35.00 | 140 | 56 | 11 | 2.146 | 1.748 | 1.041 | 5800 | 380 | 418 | 3.763 | 2.580 | 2.621 | 0.194 | 0.181 | 0.179 | 1.2 | 0.1 | 0.0 | 2.4 | 8 | 270 | 7 |
| 13/09/90 | 12.45 | 12.52 | 0 | 30.13 | 33.22 | 20 | 28 | 17 | 1.301 | 1.447 | 1.230 | 3500 | 200 | 186 | 3.544 | 2.301 | 2.270 | 0.171 | 0.166 | 0.166 | 0.0 | 0.0 | 0.0 | 10.7 | 1 | 90 | 3 |
| 19/09/90 | 10.15 | 6.55 | 3 | 30.53 | 33.25 | 890 | 230 | 56 | 2.949 | 2.362 | 1.748 | 2070 | 1420 | 630 | 3.316 | 3.152 | 2.799 | 0.158 | 0.168 | 0.189 | 0.0 | 4.2 | 0.0 | 7.7 | 2 | 315 | 8 |
| 25/09/90 | 13.35 | 9.36 | 4 | 34.57 | 34.59 | 2 | 0 | 2 | 0.301 | | 0.301 | 2600 | 1000 | 168 | 3.415 | 3.000 | 2.225 | 0.197 | 0.168 | 0.165 | 4.2 | 2.3 | 0.0 | 7.4 | 2 | 90 | 3 |

| Wind spd (BS) | Stream Fraction |
|---|---|
| 2 | 0.675 |
| 2 | 1.748 |
| 2 | |
| 0 | 2.600 |
| 1 | |
| 3 | 1.686 |
| 0 | 1.176 |
| 1 | 1.070 |
| 2 | 0.803 |
| 1 | 2.330 |
| 1 | 2.545 |
| 0 | 0.666 |
| 3 | 1.408 |
| 4 | 2.582 |
| 0 | 0.820 |
| 1 | 1.164 |
| 1 | 1.551 |
| 3 | 1.389 |
| | 0.761 |
| 1 | 1.230 |
| 2 | 0.626 |
| 2 | 1.963 |
| 2 | 1.525 |
| 3 | 0.863 |
| 2 | 1.443 |
| 2 | 1.619 |
| 2 | |
| 2 | 1.547 |
| 1 | 2.192 |
| 1 | 1.358 |
| 2 | 0.904 |
| 2 | 2.118 |
| 1 | 1.514 |
| 2 | 0.681 |
| 2 | 1.348 |
| 3 | |
| 3 | |
| 2 | 1.006 |
| 6 | 1.852 |
| 4 | 1.069 |

Sampling History For SEATON BEACH, Cornwall (BCB0450) & R.SEATON (R13A005)

| Date | Time (local) | HW (local) Whitsand Bay | wrt HW | Sal. | Adj. Sal. | Beach Bacteria Data T.coli | E.coli | F.Strep | Log (TC) | Log (EC) | Log (FS) | Stream A Bacteria Data T.coli | E.coli | F.Strep | Log (TC) | Log (EC) | Log (FS) | R. Seaton (DMF m3/s) Trebrownbridge (SX25F06 Day-2 | Day-1 | Day | *****Rainfall (mm/day)***** Tregestick (RF375396) Day-2 | Day-1 | Day | Hours of Sunshine | Cloud Cover | Wind Dir. | Wind Dir. Octal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 03/05/91 | 10.30 | 8.51 | 2 | 33.30 | 33.30 | 24 | 2 | 4 | 1.380 | 0.301 | 0.602 | 1300 | 400 | 135 | 3.114 | 2.602 | 2.130 | > 0.791 | 0.753 | 0.730 | 0.0 | 0.0 | 1.3 | 5.8 | 5 | 0 | 1 |
| 11/05/91 | 9.22 | 4.07 | 5 | 30.80 | 30.80 | 106 | 94 | 6 | 2.025 | 1.973 | 0.778 | 1300 | 680 | 76 | 3.114 | 2.833 | 1.881 | 0.607 | 0.582 | 0.565 | 0.0 | 0.0 | 0.0 | | 7 | 135 | 4 |
| 20/05/91 | 10.20 | 11.30 | -1 | 27.70 | 27.70 | 200 | 70 | 21 | 2.301 | 1.845 | 1.322 | 1500 | 900 | 109 | 3.176 | 2.954 | 2.037 | 0.500 | 0.522 | 0.499 | 0.4 | 0.1 | 0.0 | | 6 | 315 | 8 |
| 25/05/91 | 14.00 | 13.38 | 0 | 34.50 | 34.50 | 6 | 6 | 2 | 0.778 | 0.778 | 0.301 | 10300 | 1300 | 94 | 4.013 | 3.114 | 1.973 | 0.454 | 0.447 | 0.442 | 0.0 | 0.0 | 0.0 | | 4 | 315 | 8 |
| 04/06/91 | 10.30 | 10.38 | 0 | 30.70 | 30.70 | 114 | 64 | 23 | 2.057 | 1.806 | 1.362 | 3700 | 700 | 120 | 3.568 | 2.845 | 2.079 | 0.376 | 0.354 | 0.362 | 0.0 | 1.7 | 6.7 | | 4 | 225 | 6 |
| 09/06/91 | 14.10 | 15.56 | -2 | 32.60 | 32.60 | 286 | 96 | 40 | 2.456 | 1.982 | 1.602 | 23000 | 2200 | 840 | 4.362 | 3.342 | 2.924 | 0.406 | 0.455 | 0.455 | 0.0 | 9.6 | 3.0 | | 4 | 225 | 6 |
| 20/06/91 | 10.20 | 12.51 | -3 | 33.10 | 33.10 | 294 | 174 | 16 | 2.468 | 2.241 | 1.204 | 4900 | 2230 | 404 | 3.690 | 3.348 | 2.606 | 0.340 | < 0.336 | 0.341 | 0.0 | 4.7 | 3.3 | | 1 | 225 | 6 |
| 26/06/91 | 12.55 | 18.22 | -5 | 25.40 | 25.40 | 2800 | 600 | 61 | 3.447 | 2.778 | 1.785 | 6400 | 1000 | 474 | 3.806 | 3.000 | 2.676 | 0.680 | 0.649 | 0.669 | 2.6 | 2.6 | 8.9 | | 6 | 270 | 7 |
| 02/07/91 | 10.25 | 9.40 | 1 | 33.30 | 33.30 | 74 | 34 | 4 | 1.869 | 1.531 | 0.602 | 3300 | 1000 | 130 | 3.519 | 3.000 | 2.114 | 0.575 | 0.551 | 0.529 | 1.6 | 1.3 | 0.1 | | 7 | 45 | 2 |
| 13/07/91 | 13.20 | 7.52 | 5 | 16.30 | 16.30 | 10500 | 4300 | 352 | 4.021 | 3.633 | 2.547 | 12000 | 4400 | 610 | 4.079 | 3.643 | 2.785 | 0.748 | 0.738 | 0.751 | 3.8 | 6.1 | 1.6 | | 8 | 225 | 6 |

| Wind spd (BS) | Stream Fraction |
|---|---|
| 4 | 2.602 |
| 3 | 2.833 |
| 2 | 2.954 |
| 3 | 3.114 |
| 2 | 2.845 |
| 6 | 3.342 |
| 3 | 3.348 |
| 4 | 3.000 |
| 2 | 3.000 |
| 3 | 3.643 |

**APPENDIX 2**

**SEWERAGE SURVEY, HESSENFORD**

**UNSEWERED AREAS - HESSENFORD**

The drainage problems in Hessenford are unfortunately not straight forward as the discharges are largely via communal septic tanks serving four or five properties. The findings of a survey carried out on 12 March 1992 are as follows:-

| | |
|---|---|
| Copley Arms<br>Copley Cottage | St Austell Brewery owned, both having direct discharges to River Seaton |
| The Garage<br>The Shop<br>Copley View<br>Old School House<br>Church Hall | Shared septic tank discharging to River Seaton downstream of Church Hall Gardens. |
| Number 1 Fuschia Cottage<br>Number 2 Fuschia Cottage<br>Number 1 Fore Street<br>Number 2 Fore Street<br>Hessenford Farm (Vacant)<br>Derelict House next door | Shared tank at rear of Number 2 Fuschia Cottage immediately next to culverted stream but no obvious connection. |
| Greenbank Cottage<br>Honeysuckle Cottage<br>New Property no name | Shared tank in garden of Greenbank Cottage discharging at present to be fixed when builder has finished at Copley Arms. |
| Church Hill Cottage | Mr Day direct discharge to culverted stream. |
| The Bungalows Bed & Breakfast | 2 Caravans on property with direct discharge to River Seaton and possible septic tank to land drain. |

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