

Millendreath Nearshore Survey (Summer 1995)

Data Report

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Table of Contents

1	Introduction	1
2	Methods	1
	2.1 Drogues	1
	2.2 Dye	1
3	Results	2
	3.1 Drogues	2
	3.2 Dye	2

List of Tables

- 1 Millendreath Drogue Tracks 31 July 1995
 - a Inshore Drogue
 - b Middle Drogue
 - c Offshore Drogue
- 2 Dye Patch Fixing and File Details

List of Figures

- 1 Millendreath an Survey Area
- 2 Millendreath Drogue Tracks 31 July 1995
 - 2.1 Release 1 at HW+3.4 hrs
 - 2.2 Release 2 at HW+4.6 hrs
 - 2.3 Release 3 at HW+6.0 hrs
 - 2.4 Release 4 at HW-4.7 hrs
 - 2.5 Release 5 at HW-3.8 hrs
- 3 Millendreath Dye Releases 31 July 1995
 - 3.1 Release 1, Inner Position at HW+3.37 hrs
 - 3.2 Release 1, Middle Position at HW+3.43 hrs
 - 3.3 Release 1, Outer Position at HW+3.48 hrs
 - 3.4 Release 2, Inner Position at HW+4.70 hrs
 - 3.5 Release 3 Inner Position at HW+5.58 hrs
 - 3.6 Release 3, Middle Position at HW-6.50 hr
 - 3.7 Release 3, Outer Position at HW-6.45 hr
 - 3.8 Release 4 Inner Position at HW-4.60 hrs
 - 3.9 Release 4, Middle Position at HW-4.48 hr
 - 3.10 Release 4, Outer Position at HW-4.50 hr

1 Introduction

A survey was undertaken to investigate the tidal flow regime and the dispersion characteristics of the near shore waters off Millendreath in South Cornwall (figure 1) on 31 July 1995. The objective of the survey was to provide information to assist in establishing a location for the discharge of treated sewage effluent such that the discharge does not impact adversely on the bathing area of Millendreath Beach.

The work was undertaken by Cornwall Area Investigations Team with assistance from Tidal Waters Quality. This report presents the data collected during the survey. Some processing has been carried out in order to aid interpretation but at this stage no recommendations have been made regarding a discharge location.

2 Methods

The survey was undertaken on 31 July 1995 when the tidal range at Devonport was predicted to be 4.0 m. This compares with a mean spring range of 4.7m and a mean neap range of 2.2m. The duration of the survey was from HW+3 to HW-3.5.

The survey day was very hot and sunny. A slight onshore breeze was present all day briefly increasing to $\sim 3\text{ms}^{-1}$ around mid-afternoon.

The techniques employed were drogue releases and qualitative dye tracking. Three locations, nominally 100m, 200m and 300m offshore, in a line running approximately SE from the beach were marked with buoys at the start of the day. Drogue and dye releases were conducted from these locations.

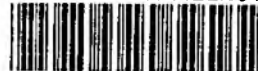
Position fixing was by DGPS and all times in this report are in GMT.

2.1 Drogues

Drogues were released at the marker buoys and fixed at intervals of approximately 30 minutes. Drogues were recovered and redeployed at the marker buoys at intervals of not more than 2 hours during the day. On one occasion the innermost drogue grounded in shallow water and on another it was becalmed in the lee of some rocks. On both occasions it was recovered and redeployed at the buoy.

2.2 Dye

One litre volumes of rhodamine and fluoresceine were released adjacent to the marker buoys. Following release, the visible periphery of each dye patch was logged on the GPS by motoring round the dye patch edges. The movement of the dye patches was also recorded by an observer on shore by sketches and photographs. The time between releases was defined by the time taken for the previous patch to disperse and varied between one and two hours. Patch locations were logged at approximately half hourly intervals.



3 Results

3.1 Drogues

Four releases were undertaken from each of the inner, middle and outer locations although with redeployments essentially six were undertaken from the inner location. Details of the releases are given in table 1. Speeds and directions have been computed from the position data and are given in the same table. The drogue tracks are shown in figures 2.1 to 2.5.

Initially all the drogues moved to the SW essentially parallel to the coast. At about HW+5 the direction reversed and by HW-4.7 they were moving to the NE, again parallel to the coast. Current speeds were low (rarely exceeding 5 cms^{-1}) throughout. There was no significant difference in the nature of the movement at the three sites and the change in direction from SW to NE took place via an onshore turn.

3.2 Dye

Four dye releases were undertaken from each position. However on the second release the constant passage of pleasure craft through the dye patches (a problem throughout the day) resulted in the inner and middle patches becoming too diffuse to track and the outer path breaking up after one definition of the patch edge. On all other occasions the patches were defined twice following release. Problems encountered with the GPS meant that the release positions were not logged for the third release. This was not a problem since the release were adjacent to the marker buoys whose positions were known. Details of the releases are given in table 2 and the movement of the patches is shown in figs 3.1 to 3.10. No quantitative information has been derived from the dye data at this stage. The data used to produce the dye patch definitions are held as ASCII files with file names as shown in table 2.

The movement of the dye was essentially the same as the movement of the drogues, being initially to the SW and finally to the NE. Unfortunately the period of the turn was when the patches were distorted beyond recognition by the boat traffic but none of the dye was seen to move into the area adjacent to the beach. It would seem unwise to comment on the rate of spreading of the patches given the qualitative nature of the survey and the artificial spreading induced by the boats on this occasion. It is unlikely that such a large volume of boat traffic would have been present had the weather been less good.

The movement of the dye as recorded from the boat is corroborated by the sketches made from the shore. These confirm the rapid dispersal of the patches resulting from release 2 and also that no dye was seen to move into the waters immediately adjacent to the beach. The photographs were of limited value during the early and middle parts of the day as the strong sunlight combined with the south facing aspect of the observer resulted in reflection of light from the sea surface masking the images of the dye. Later in the day the photographs show the dye being advected to the NE with the patches becoming elongated.

Table 1: Millendraeth Drogue Tracks 31/7/95

HWS at 08:02 and 20:10

a) Inshore Drogue								
Time (GMT)	Time rel HW (Hours)	East	North	Distance (m)	Time (mins)	Speed (m/s)	Direction (deg T)	Comments
11:24	3.38	227004	53822					D 3 in at buoy
11:42	3.68	226985	53792	35.90	18.00	0.03	211.69	D3
12:03	4.02	226939	53755	58.79	20.83	0.05	231.64	D3
12:27	4.43	226907	53701	63.59	24.33	0.04	210.47	D3 out
12:37	4.59	227027	53805					D3 in at buoy
13:00	4.97	226959	53806	68.03	23.00	0.05	270.26	D3 out
14:04	6.04	227027	53840					D3 in at buoy
14:30	-5.67	227051	53857	29.47	25.83	0.02	53.67	D3 Grounded
14:32	-5.63	227014	53845					D3 Redeployed at buoy
14:58	-5.19	227048	53856	35.66	26.00	0.02	71.29	D3
15:17	-4.88	227049	53877	20.90	19.00	0.02	4.36	D3 out
15:26	-4.72	227016	53830					D3 in at buoy
15:58	-4.19	227044	53874	51.79	32.33	0.03	31.97	D3
16:17	-3.87	227118	53911	83.52	18.83	0.07	63.63	D3 out
16:19	-3.84	227014	53831					D3 in at buoy
16:34	-3.59	227050	53849	39.85	15.00	0.04	62.79	D3 out

Table 1: Millendraeth Drogue Tracks 31/7/95

HWs at 08:02 and 20:10

b) Middle Drogue								
Time (GMT)	Time rel HW (Hours)	East	North	Distance (m)	Time (mins)	Speed (m/s)	Direction (deg T)	Comments
11:28	3.44	227091	53738					D9 in at buoy
11:48	3.77	227081	53713	26.25	19.83	0.02	201.62	D9
12:10	4.14	227063	53676	41.97	22.33	0.03	205.86	D9
12:31	4.50	227045	53637	42.75	21.50	0.03	205.63	D9 out
12:41	4.65	227083	53725					D9 in at buoy
13:04	5.04	227077	53627	98.81	23.50	0.07	183.32	D9
13:09	5.13	227041	53684	67.59	5.33	0.21	328.16	D9 out
14:02	6.01	227095	53737					D9 snagged, released
14:33	-5.61	227093	53788	51.78	31.00	0.03	357.95	D9
14:59	-5.18	227132	53801	41.33	25.83	0.03	72.02	D9
15:18	-4.86	227158	53814	28.75	18.83	0.03	64.32	D9
15:27	-4.71	227151	53823	12.35	9.33	0.02	322.14	D9 out
15:30	-4.65	227098	53731					D9 in at buoy
15:41	-4.47	227136	53754	44.44	10.83	0.07	58.72	D9
16:00	-4.16	227195	53818	86.61	18.50	0.08	42.51	D9
16:32	-3.62	227308	53860	120.79	32.50	0.06	69.51	D9 out

Table 1: Millendraeth Drogue Tracks 31/7/95

HWs at 08:02 and 20:10

c) Offshore Drogue								
Time (GMT)	Time rel HW (Hours)	East	North	Distance (m)	Time (mins)	Speed (m/s)	Direction (deg T)	Comments
11:31	3.49	227176	53664					D19 in at buoy
11:54	3.87	227160	53629	38.22	22.83	0.03	204.29	D19
12:18	4.28	227164	53604	25.39	24.33	0.02	172.85	D19
12:32	4.51	227149	53583	25.62	14.17	0.03	215.81	D19 out
12:43	4.69	227171	53655					D19 in at buoy
13:05	5.05	227172	53603	52.11	21.50	0.04	178.56	D19 out
13:34	5.54	227179	53671					D19 in at buoy
14:01	5.99	227170	53662	12.84	26.83	0.01	221.53	D19
14:34	-5.59	227165	53717	55.51	33.17	0.03	354.73	D19
15:00	-5.16	227166	53724	7.32	25.83	0.00	11.51	D19
15:19	-4.85	227180	53758	36.24	18.50	0.03	21.31	D19
15:28	-4.69	227202	53759	22.76	9.83	0.04	87.03	D19 out
15:29	-4.67	227184	53679					D19 in at buoy
15:40	-4.50	227187	53658	21.56	10.33	0.03	172.16	D19
16:01	-4.14	227269	53702	92.95	21.33	0.07	61.16	D19
16:31	-3.65	227319	53743	64.93	29.83	0.04	50.93	D19 out

Table 2: Dye patch fixing and file details

HWs at and		08:02 GMT 20:10 GMT					
Release position	Release Number	Fix Number	Time of fix (GMT)	Time rel HW (Hrs)	Time since release (Hrs)	Figure Number	File Name
Inner	1	Release pt.	11:24	3.37	0.31 0.67	3.1	Inn_1_0.xyz Inn_1_1.xyz Inn_1_2.xyz
		1	11:42	3.68			
		2	12:04	4.04			
Inner	2	Release pt.	12:37	4.58		no plot	Inn_2_0.xyz
Inner	3	Release pt.	13:37	5.58	0.45 0.98	3.5	no data Inn_3_1.xyz Inn_3_2.xyz
		1	14:04	6.03			
		2	14:36	6.57			
Inner	4	Release pt.	15:34	-4.60	0.60 1.07	3.8	Inn_4_0.xyz Inn_4_1.xyz Inn_4_2.xyz
		1	16:10	-4.00			
		2	16:38	-3.53			
Middle	1	Release pt.	11:28	3.43	0.35 0.72	3.2	mid_1_0.xyz mid_1_1.xyz mid_1_2.xyz
		1	11:49	3.78			
		2	12:11	4.15			
Middle	2	Release pt.	12:41	4.65		no plot	mid_2_0.xyz
Middle	3	Release pt.	13:40	-6.50	0.47 1.05	3.6	no data mid_3_1.xyz mid_3_2.xyz
		1	14:08	-6.03			
		2	14:43	-5.45			
Middle	4	Release pt.	15:41	-4.48	0.40 1.13	3.9	mid_4_0.xyz mid_4_1.xyz mid_4_2.xyz
		1	16:05	-4.08			
		2	16:49	-3.35			
Outer	1	Release pt.	11:31	3.48	0.38 0.80	3.3	off_1_0.xyz off_1_1.xyz off_1_2.xyz
		1	11:54	3.87			
		2	12:19	4.28			
Outer	2	Release pt.	12:44	4.70	0.37	3.4	off_2_0.xyz off_2_1.xyz
1	13:06	5.07					
Outer	3	Release pt.	13:43	-6.45	0.50 1.17	3.7	no data off_3_1.xyz off_3_2.xyz
		1	14:13	-5.95			
		2	14:53	-5.28			
Outer	4	Release pt.	15:40	-4.50	0.37 1.07	3.10	off_4_0.xyz off_4_1.xyz off_4_2.xyz
		1	16:02	-4.13			
		2	16:44	-3.43			

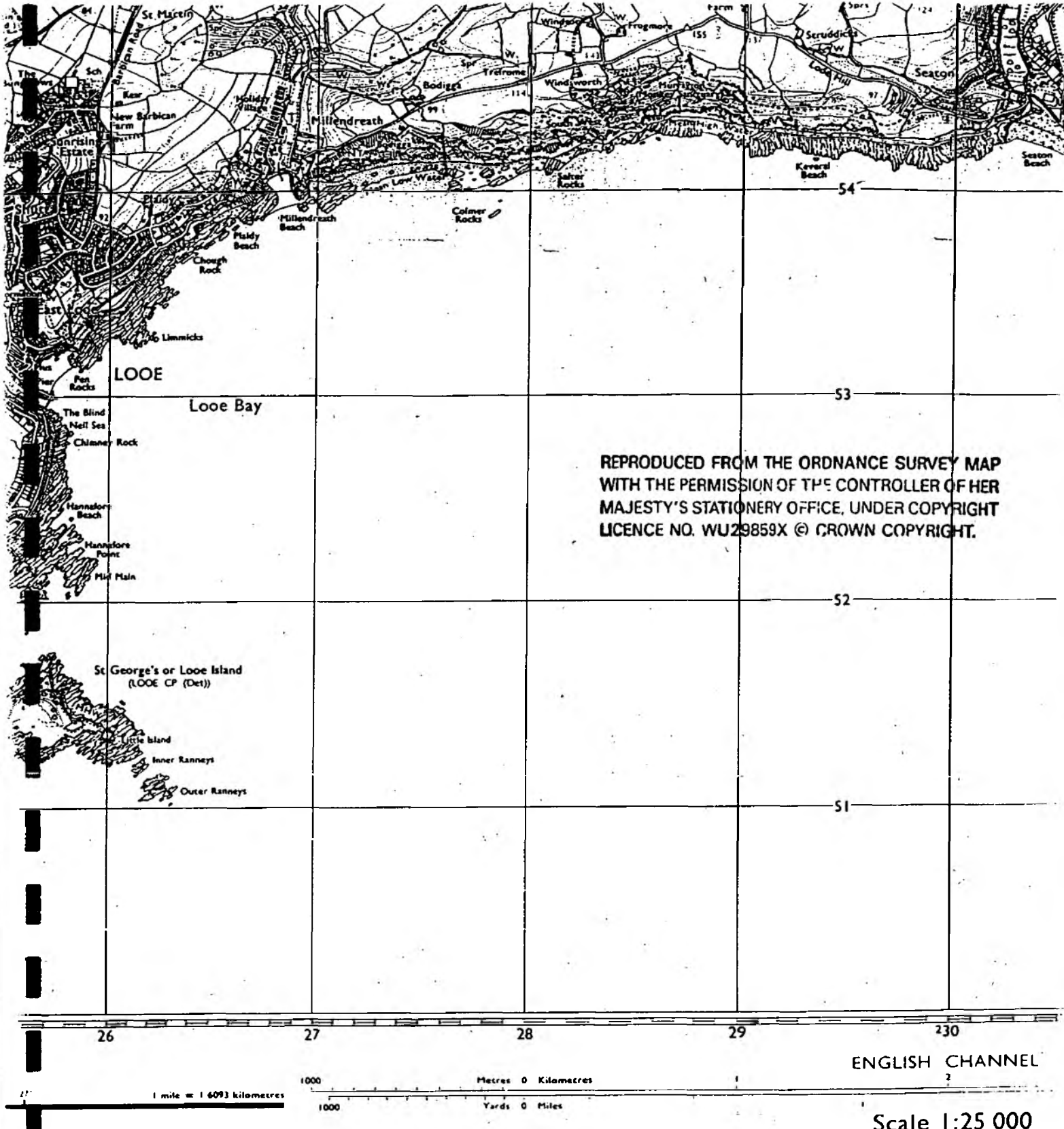


Figure 1: Millendreath and Survey Area

Figure 2.1

Millendreath Drogue Tracks 31 July 1995

H.W.'s at 08:02 and 20:10

Release 1 at approx. H.W. + 3.4 hrs

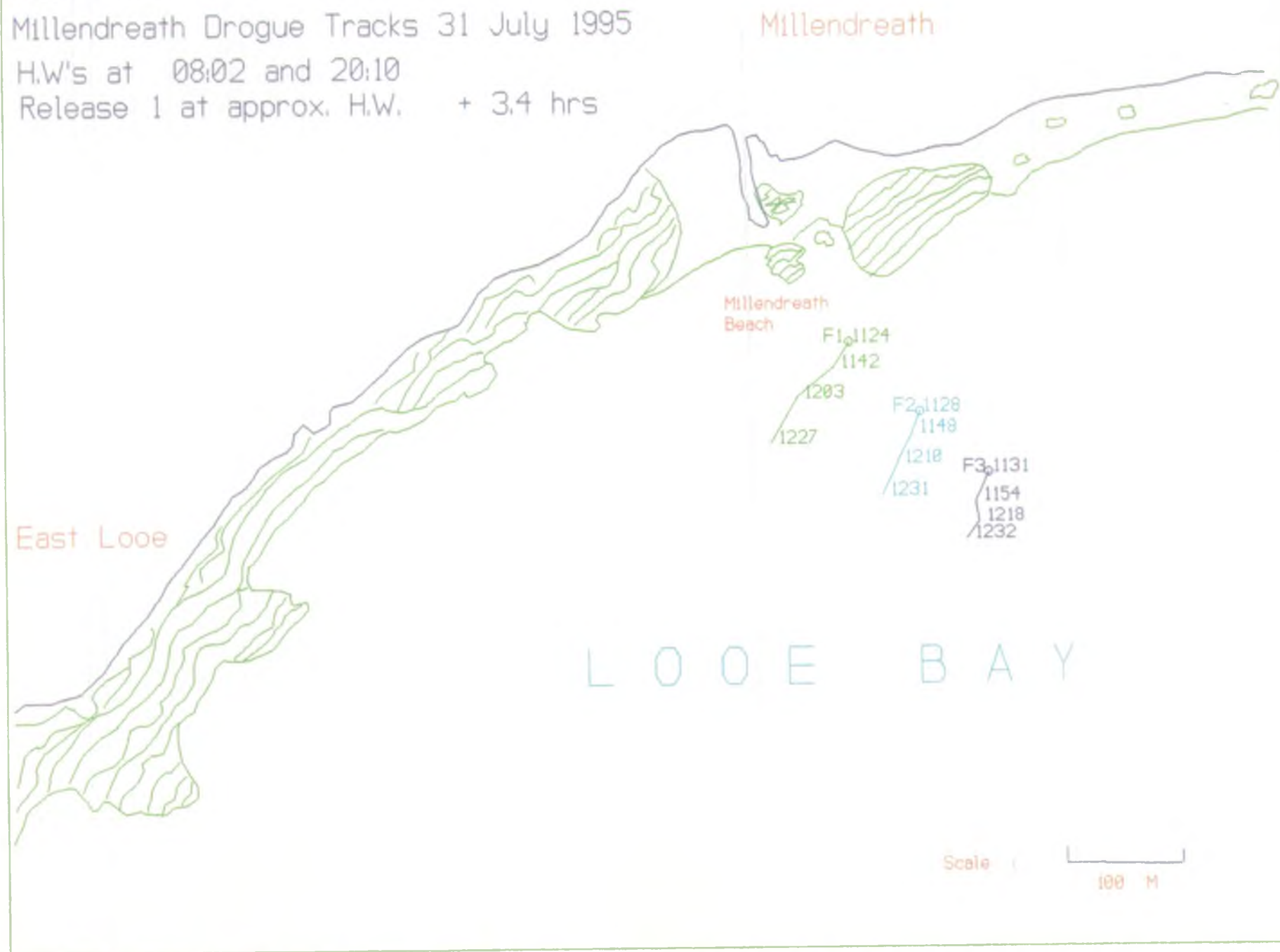


Figure 2.2

Millendreath Drogue Tracks 31 July 1995

H.W.'s at 08:02 and 20:10

Release 2 at approx. H.W. + 4.6 hrs

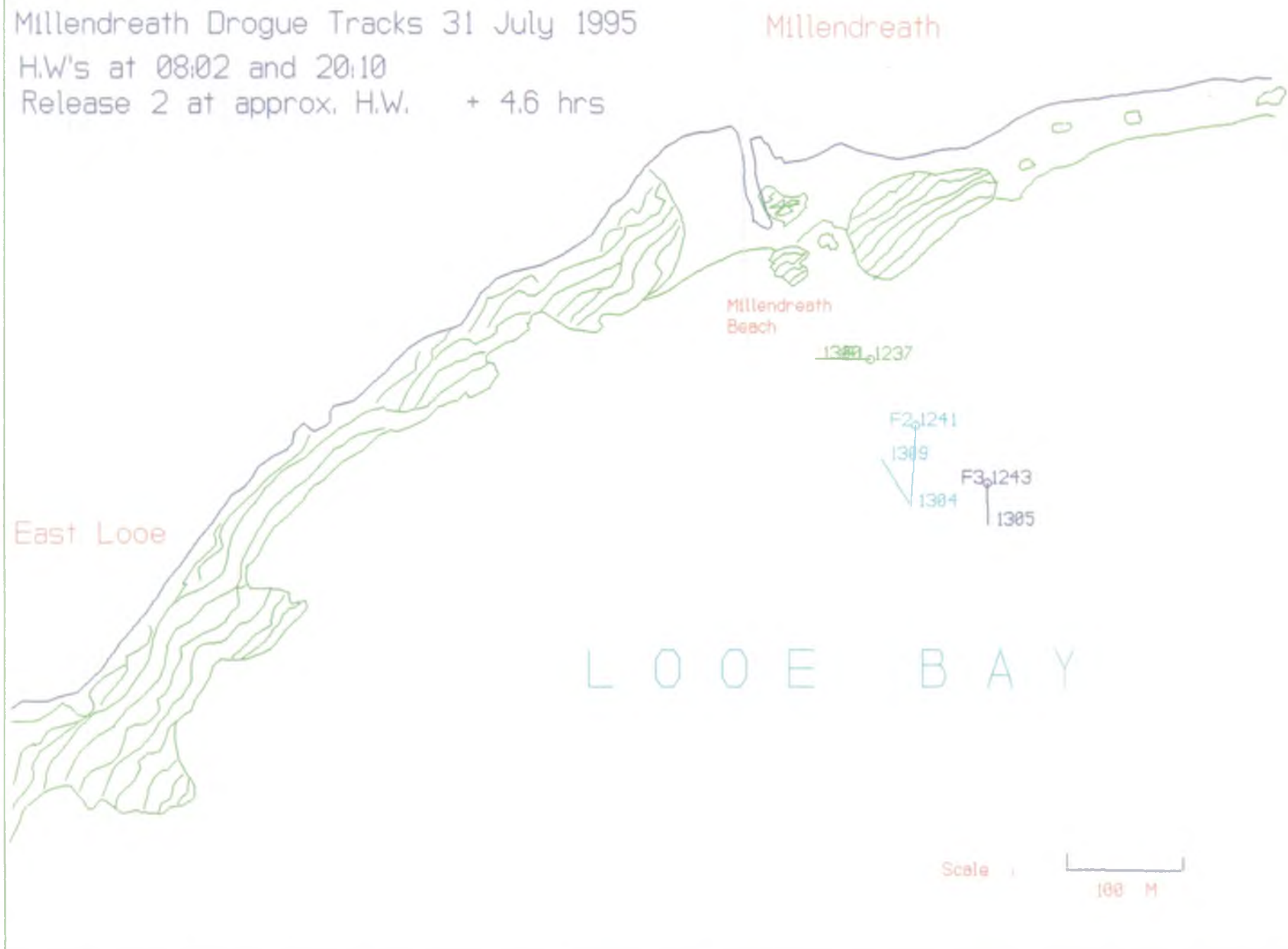


Figure 2.3

Millendreath Drogue Tracks 31 July 1995

H.W.'s at 08:02 and 20:10

Release 3 at approx. H.W. + 6 hrs

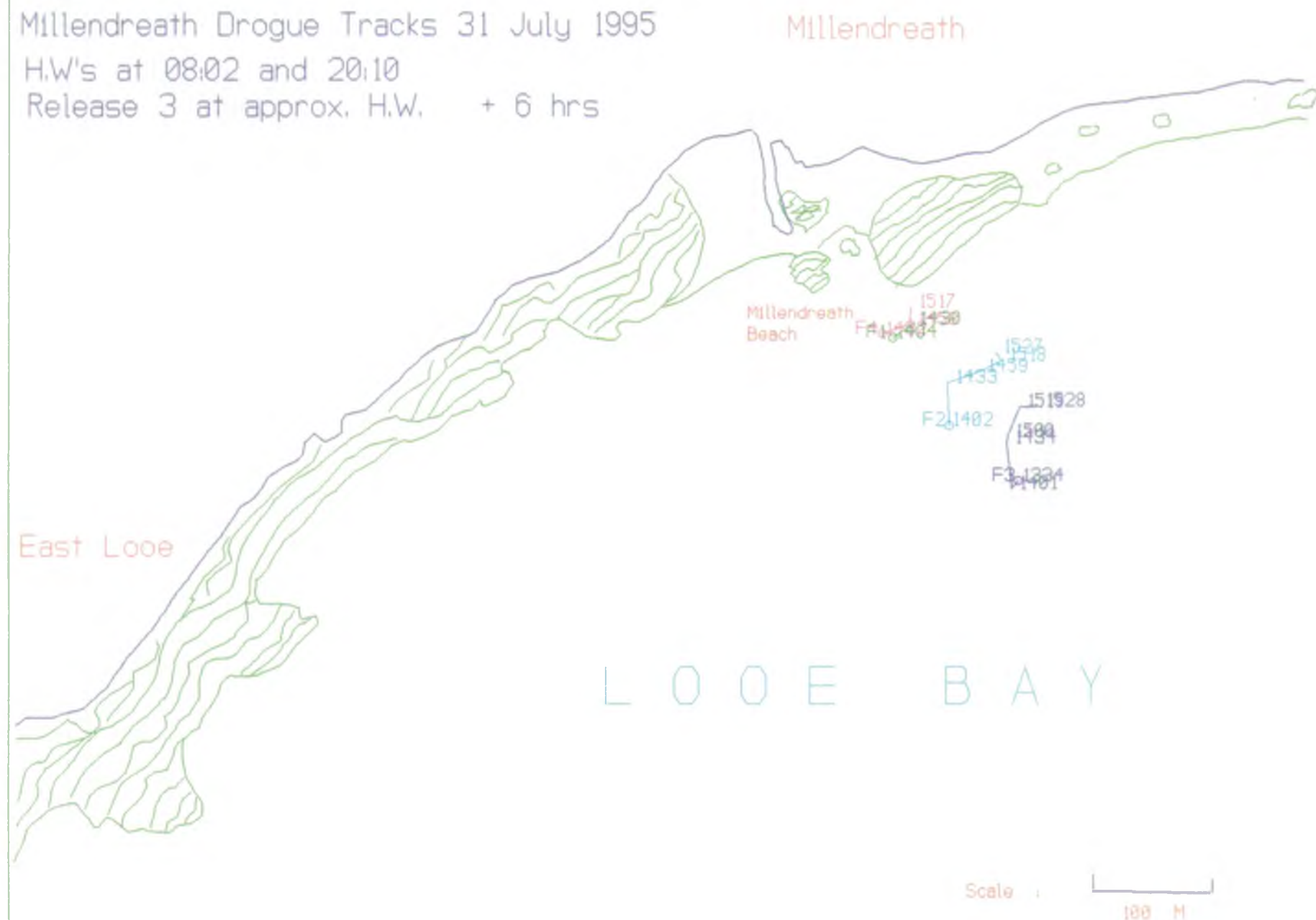


Figure 2.4

Millendreath Drogue Tracks 31 July 1995

H.W.'s at 08:02 and 20:10

Release 4 at approx. H.W. - 4.7 hrs

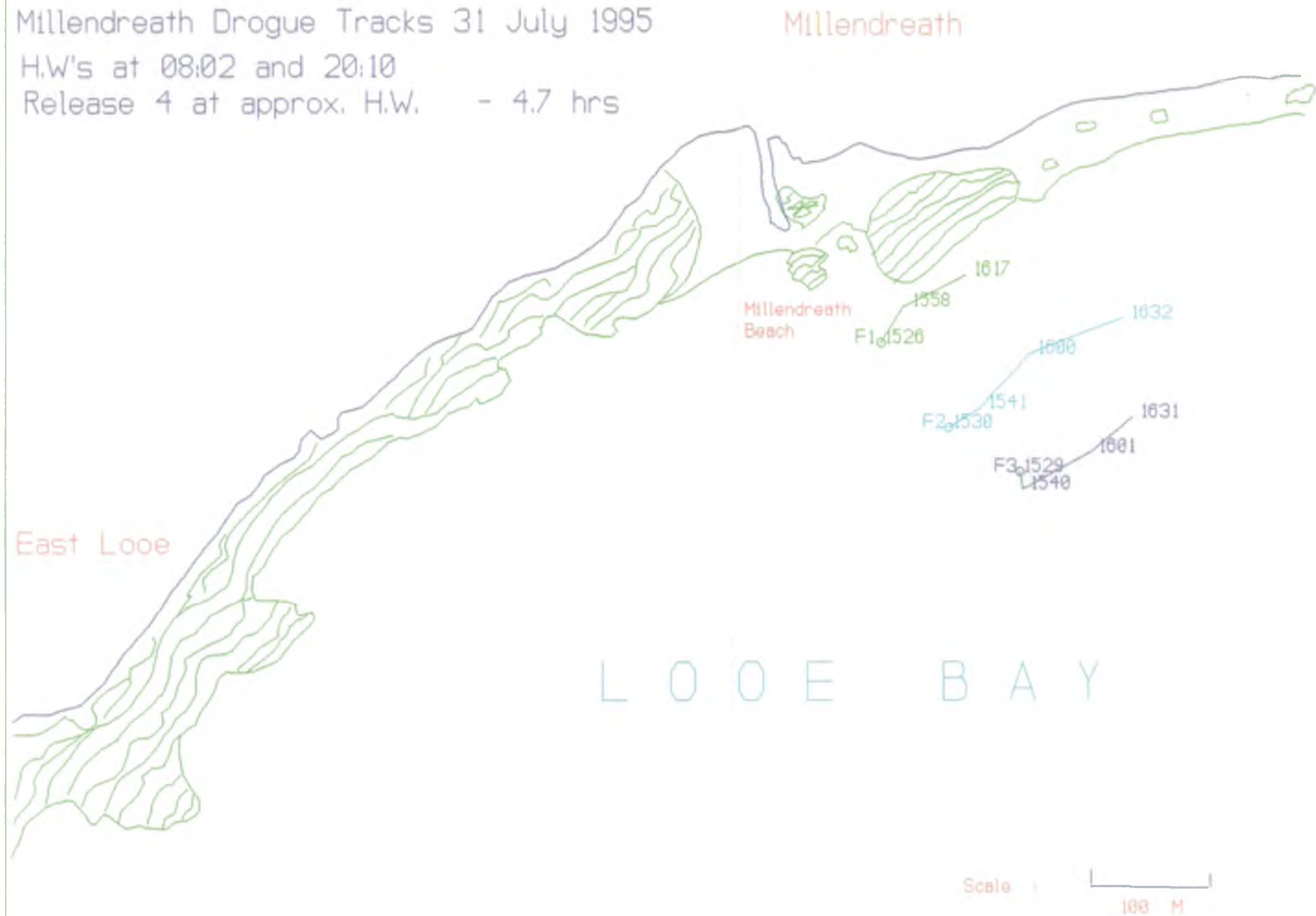


Figure 2.5

Millendreath Drogue Tracks 31 July 1995

H.W.'s at 08:02 and 20:10

Release 5 at approx. H.W. - 3.8 hrs

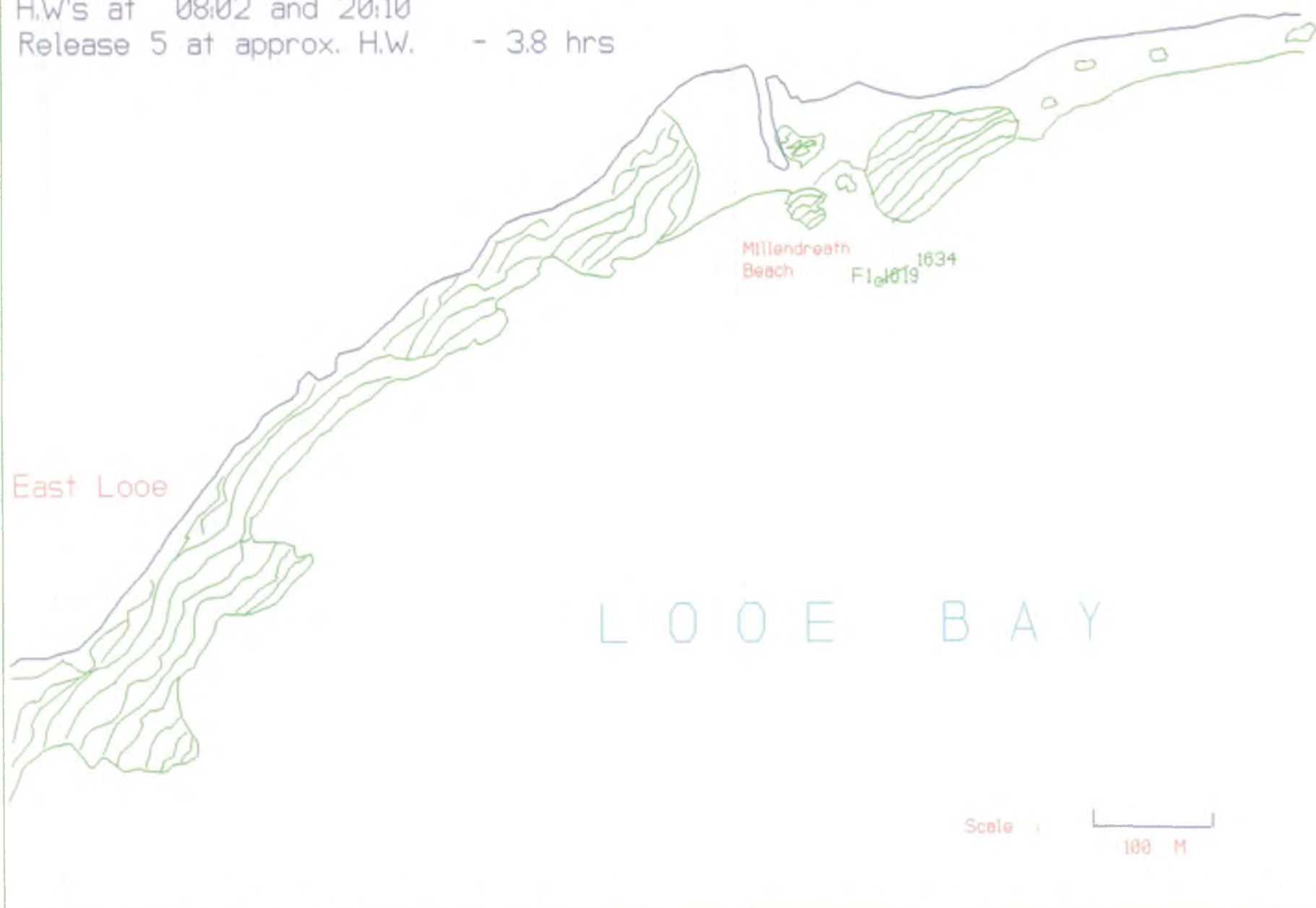


Figure 3.1

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Inner Position

Release 1 at approx. H.W. + 3.37



Figure 3.2

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Middle Position

Release 1 at approx. H.W. + 3.43



Figure 3.3

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Outer Position

Release 1 at approx. H.W. + 3.48

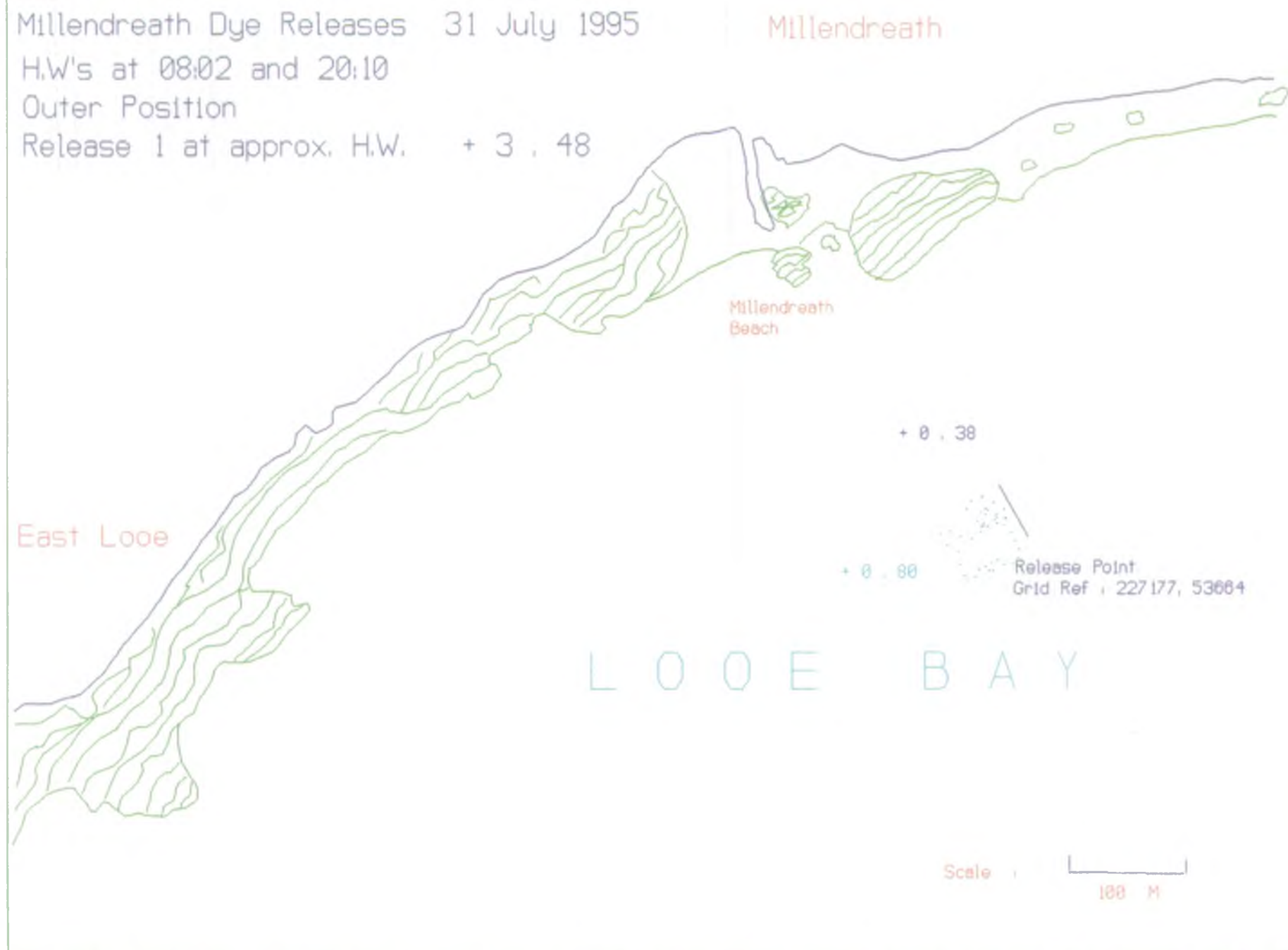


Figure 3.4

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Outer Position

Release 2 at approx. H.W. + 4 . 70

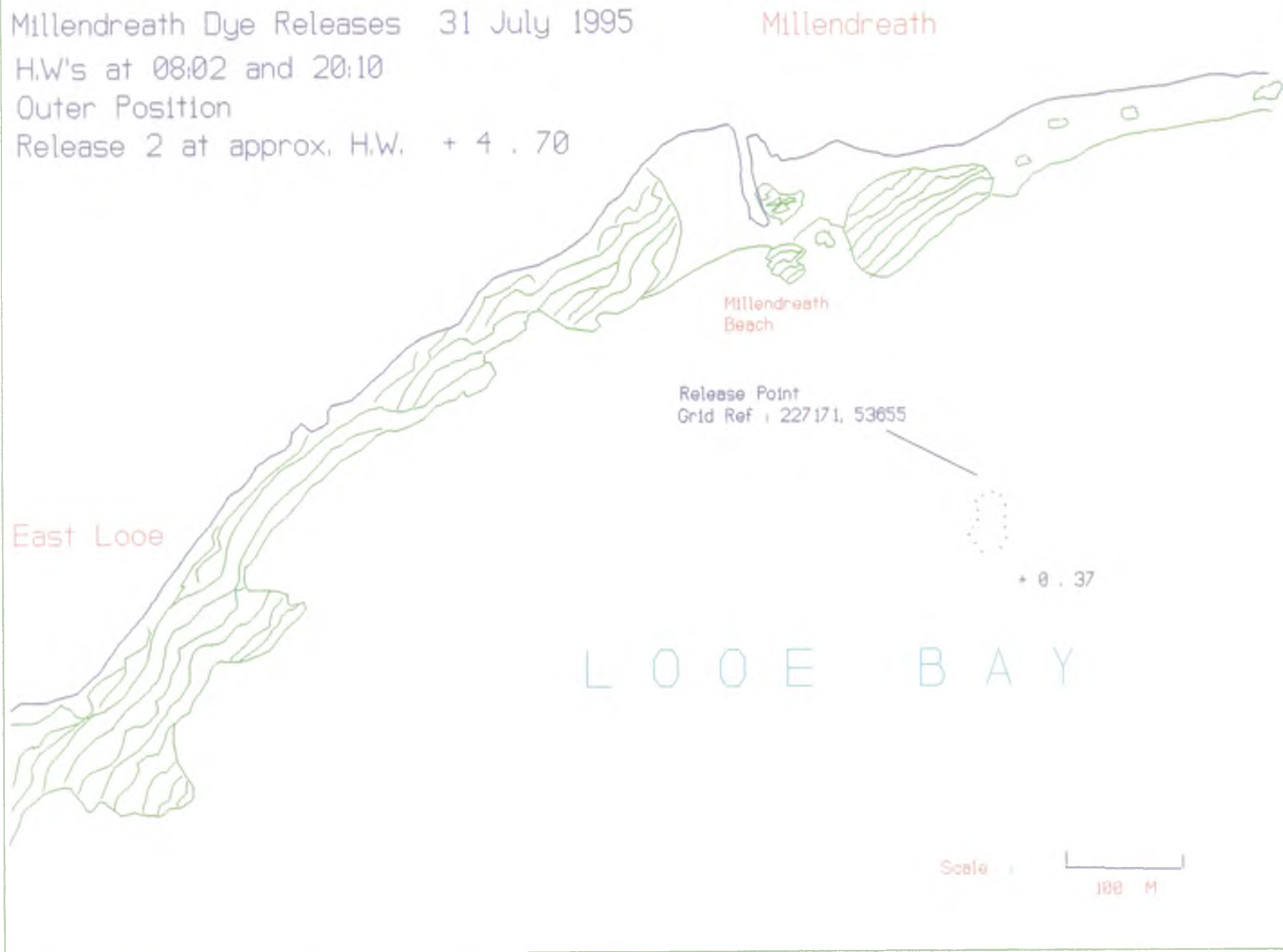


Figure 3.5

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Inner Position

Release 3 at approx. H.W. +5.58

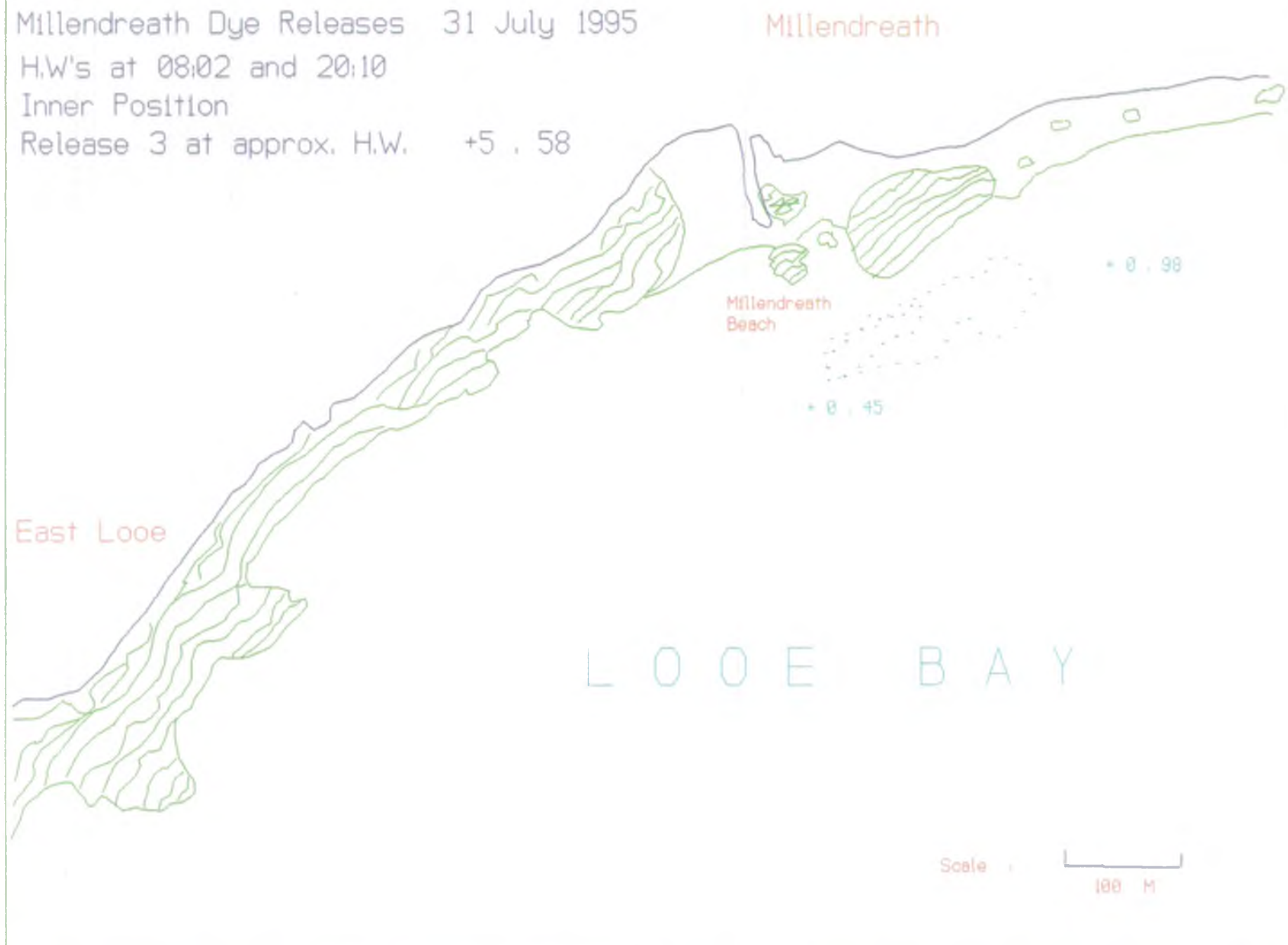


Figure 3.6

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Middle Position

Release 3 at approx. H.W. - 6 . 50

Millendreath

East Looe

Millendreath
Beach

+ 0 . 47

+ 1 . 05

L O O E B A Y

Scale

100 M



Figure 3.7

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Outer Position

Release 3 at approx. H.W. - 6.45

Millendreath



East Looe

Millendreath
Beach

+ 1.17
+ 0.50

L O O E B A Y

Scale

100 M

Figure 3.8

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Inner Position

Release 4 at approx. H.W. - 4.60

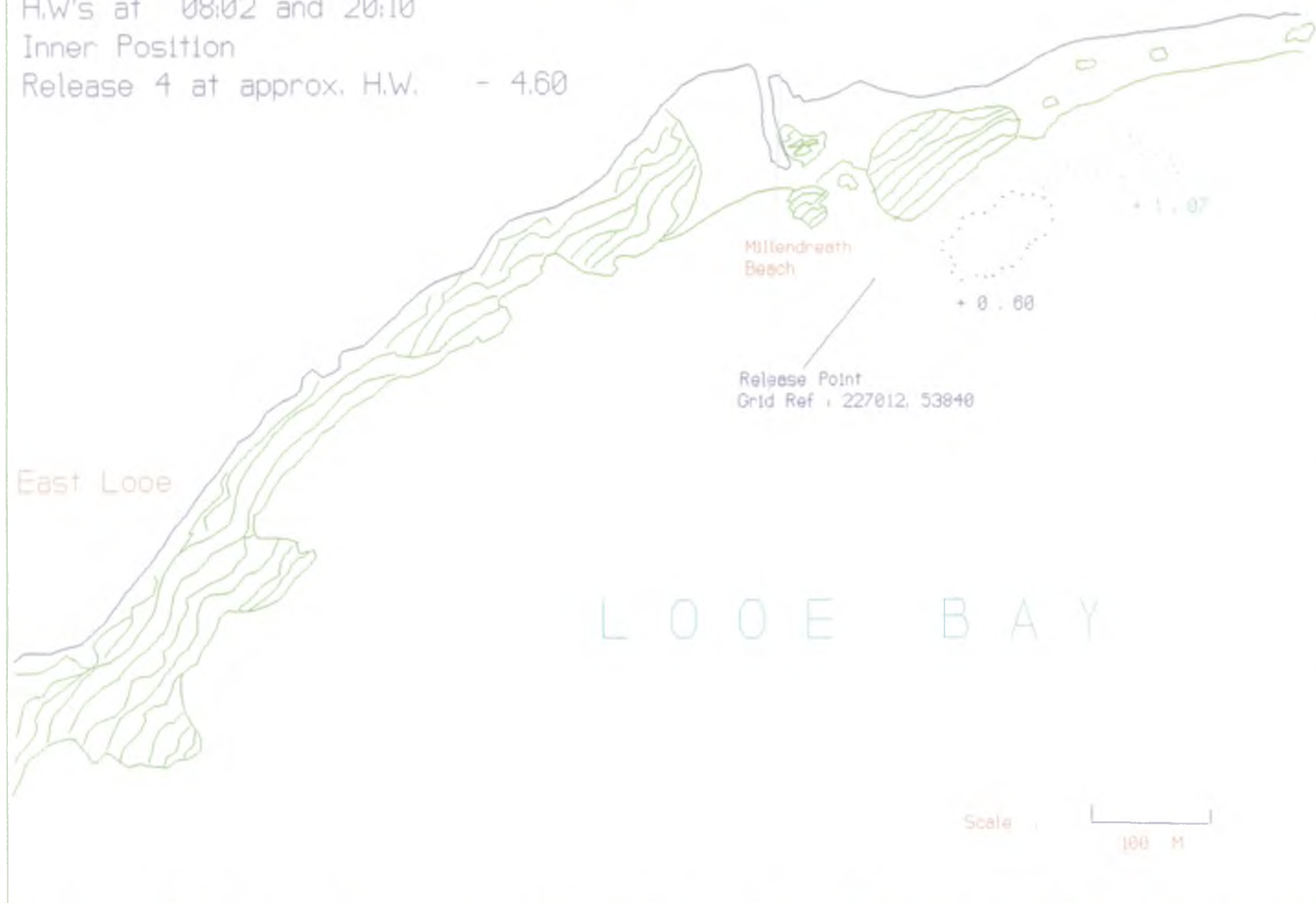


Figure 3.9

Millendreath Dye Releases 31 July 1995

H.W.'s at 08:02 and 20:10

Mid Position

Release 4 at approx. H.W. - 4 . 48

East Looe

Millendreath

Millendreath Beach

Release Point
Grid Ref : 227136, 53756

LOOE BAY

Scale 100 M



Figure 3.10

Millendreath Dye Releases 31 July 1995

Millendreath

H.W.'s at 08:02 and 20:10

Outer Position

Release 4 at approx. H.W. - 4.50



East Looe

Millendreath
Beach

+ 1 . 07

+ 0 . 37

Release Point
Grid Ref : 227188, 53658

L O O E B A Y

Scale 100 M