COASTAL OBSERVATION PROGRAMME - ENGINEERING (COPE)

BRAMSTON BEACH AND BRAMSTON BEACH NORTH

MULGRAVE SHIRE

FOR THE YEARS 1981 TO 1987

REPORT NO. C23.1

Beach Protection Authority

June 1988

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ABSTRACT:-

This report provides a summary of primary analyses of COPE data on wind, wave and beach processes observed at Bramston Beach and Bramston Beach North, in the Mulgrave Shire, on the North Queensland coast. The data was recorded by volunteer observers during the period February 1981 to December 1987. The Beach Protection Authority wishes to thank all observers involved in the recording of data at both Cope Stations. For the remainder of the report where applicable, Bramston Beach is stated as Site 1 and Bramston Beach North as Site 2. The information published is considered representative of the long term conditions. Both Site 1 and Site 2 were still active at June 1988.

OTHERS AVAILABLE IN THIS SERIES:-

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Coastal Observation Programme - Engineering (COPE), Currigee - City of Gold Coast, (Report C18.1).

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Coastal Observation Programme - Engineering (COPE), Maroochydore - Maroochy Shire, (Report C20.1)

Coastal Observation Programme - Engineering (COPE), Theodolite Creek - Isis Shire, (Report C21.1)

Coastal Observation Programme - Engineering (COPE), Burleigh Heads - City of Gold Coast (Report C22.1)

REFERENCES:

1. ROBINSON, D.A. AND JONES, C.M.

   Queensland Volunteer Coastal Observation Programme - Engineering (COPE). 3rd Australian Conference on Coastal and Ocean Engineering, Melbourne, April 1977.

2. PATTERSON, D.C. AND BLAIR, R.J.

   Visually Determined Wave Parameters. 6th Australian Conference on Coastal and Ocean Engineering, Gold Coast, July 1983.

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Bramston Beach North - Site 2

1.0 INTRODUCTION

1.1 The Programme

The Beach Protection Authority requires basic data on the behaviour of Queensland's beaches in order to provide well founded advice on coastal management to Local Authorities. The COPE project aims to collect information on wind, waves and beach behaviour in areas where extensive investigations are not practical and where otherwise little or no data exist.

The project is based on the recruitment of volunteer observers who are prepared to record a series of basic parameters once or twice daily for at least a three year period.

1.2 Site Selection

In selecting a site for a COPE station, consideration is given to:-

(a) the general shoreline configuration and the possibility of extrapolation of data to other adjacent beaches;

(b) the distribution of stations along Queensland's coastline;

(c) the need to correlate the COPE data with planned or existing data collection programmes.

1.3 Instrumentation

The COPE observers are supplied with a basic kit of recording instruments including:-

- 30 metre Tape, Wind Meter, Stop Watch, 2.0 metre Measuring sticks, Recording Forms and Fluorescent Dye.

A graduated reference pole is installed on the beach to serve as the base point for all plan measurements and the control for vertical levelling.

1.4 Observers

The majority of COPE observers are volunteers, who may be local business people, local residents or school children. Some stations are operated by Government employees who carry out the observations as part of their official duties.

1.5 Accuracy

Individual observers differ in their subjective assessment of the various parameters recorded as part of the COPE programme. Wave parameters such as type, height, and angle of approach together with surf zone width and the location of the vegetation line all require visual assessment, the accuracy of which will vary from observer to observer and from recording to recording.

Although the Authority is confident that all observers make their observations to the best of their ability and accepts these observations without adjustment, the existence of random and non-random errors in the recorded data is to be expected.

Problems associated with the use of data containing these errors are minimised in two ways. Firstly, regular visits are made to the COPE stations by the Authority's COPE Field Officer to provide a check on any bias introduced into the recordings by incorrect observation procedures. Secondly, it has been found that, with a large number of observations taken on a regular basis, a reasonable assessment can be made of the average climatologies of the observed parameters provided the observation errors are random. A minimum recording period of three years has been adopted for the analysis and publication of the data. Five day moving averages are applied to observations of the various beach width and foreshore slope parameters to smooth out random errors.

For these reasons, the Authority is of the opinion that published COPE data can be used with confidence provided the above inherent limitations are recognised.

1.6 Presentation of Data

The purpose of this report is to present COPE data for the six year period 1981 to 1987 in a useful statistical form. No attempt has been made to interpret the observed data.

If the six year period is representative of the long term average meteorological conditions, the statistics presented on wind, wave and beach movements can be regarded as typical. However, this recording period may be considered too short to be representative in terms of the average occurrence of extreme events such as cyclones and floods, and this should be taken into account when consideration is being given to the influence of such events on trends of long term beach behaviour.

2.0 STATION PARTICULARS

2.1 Location

Bramston Beach and Bramston Beach North are located within Mulgrave Shire and lie approximately 55 kilometres south of Cairns on the North Queensland coast. It is a 12 kilometre stretch of coastline bounded by Rocky Point to the south and Mount Josey to the north. The locations of the Bramston Beach and Bramston Beach North Cope Stations are shown in Figures 1.1. and 1.2.

2.2 Observers

Bramston Beach: This station has been operated by Mr C. Anderson, Mr A. Biggs, Mr B. Fegan, Mr E. Accatino, Mr B. Hyde, Mr G. Feldman and Mr & Mrs K. Eaton during the period February 1981 to December 1987. A gap in data occurred from August 1981 to May 1983. Current observer is Mr C. Anderson with assistance from Mr E. Accatino.

Bramston Beach North: This station has been operated by Mr. A. Biggs, Mr C. Anderson, Mr B. Fegan and Mr E. Accatino during the period February 1986 to December 1987. Current observer is Mr A. Biggs.

2.3 Observed Parameters

Bramston Beach: The observers at this station initially recorded twice daily at 9.00 a.m. and 3.00 p.m. but from May 1983 this was reduced to once daily between 7.00 a.m. and 6.00 p.m.

Bramston Beach North: The observers at this station recorded once daily between 7.00 a.m. and 6.00 p.m.

These stations have recorded:

- Wave Period
- Wave Height
- Wave Direction
- Wave Type
- Surf Zone Width
- Presence of Offshore Bar
- Wind Speed
- Wind Direction
- State of Tide
- Fixed Contour
- Distance to Fixed Contour
- Distance to Vegetation Line
- Sand level at the C.O.P.E. reference pole
- Foreshore Slope
- Longshore Current Speed
- Longshore Current Direction.
- Distance from Shoreline to Dye Patch (recorded from February 1986)

In addition a sand sample was collected at the stations each month, and since March 1984, a profile of the beach has usually been recorded monthly.

2.4 Tidal Information

Tidal information is presented below. Datum is Low Water Datum.

M.H.W.S.	2.20 metres
M.H.W.N.	1.60 metres
M.S.L.	1.32 metres
M.L.W.N.	1.10 metres
M.L.W.S.	0.40 metres

A.H.D. is 1.25 metres above Low Water Datum.

Tidal information was obtained from the 1988 Department of Harbours and Marine Tide Book.

2.5 Description of the Beach

The following characteristics were exhibited by both Site 1 and Site 2:-

- Typical beach slopes: Foreshore slope is in the range 1 in 5 to 1 in 30 (11^{o} - 2^{o}).

- Beach width: Varied from 20 to 50 metres measured from the seaward toe of frontal dune to Low Water Mark over the six year period.

- D50 sand size: 0.55 mm averaged over six years.

Adjoining Landform: Low and narrow frontal beach ridge backed by a distinct swale grading into flatter hind ridge terrain in front of the residential development.

- Vegetation: The frontal ridge and hind ridge areas support open-forest with a dense understorey of shrubs. Ground cover on the frontal ridge includes guinea grass (Panicum maximum), goat's foot convolvulus (Ipomoea pes-caprae), beach grass (Thua involuta) and wedelia (Wedelia biflora). Tree and shrub species present include horsetail she-oak (Casuarina equisitifolia var. incana), hickory wattle (Acacia aulacocarpa), brown salwood (Acacia crassicarpa), silver-leaved tea-tree (Melaleuca dealbata), red ash (Alphitonia excelsa), lolly bush (Clerodendrum inerme), sea almonds (Terminalia app) and coconut palms Cocus mucifera).

2.5.1 Meteorological Events

The following cyclones were recorded by the Brisbane Bureau of Meteorology as having tracks within 500 kilometres of Bramston Beach between February 1981 and December 1987. It is considered that these cyclone events may have had some effect on the condition of Bramston Beach.

Event	Date
Cyclone Freda	25/02/81 - 01/03/81
Cyclone Dominic	07/04/82 - 14/04/82
Cyclone Des	16/01/83 - 19/01/83
Cyclone Ingrid	20/02/84 - 25/02/84
Cyclone Pierre	20/02/85 - 21/02/85
Cyclone Vernon	21/01/86 - 24/01/86
Cyclone Winifred	27/01/86 - 02/02/86
Cyclone Manu	22/04/86 - 27/04/86

2.5.2 Coastal Works

A groyne adjacent to Bramston Beach Road was constructed by Mulgrave Shire Council with work being completed in June 1986. Beach nourishment of approximately 4000 cubic metres of sand was included in the groyne construction project. Sand was placed on the beach for a distance of 180 metres south of the groyne. Further beach nourishment in the vicinity of Bramston Beach North Station took place in July 1987.

2.6 Supervision of Station

The observers were instructed in the recording programme by the COPE Field Officer and the initial instruction period was followed up with visits to the station during the period of recordings presented in this report.

Installation of the reference pole for both stations was carried out by the Mulgrave Shire Council and the Authority wishes to thank the Council for its assistance in all matters associated with the COPE project. Maintenance of the poles is carried out by the Beach Protection Authority's COPE Field Officer.

3.0 DATA

3.1 General

COPE data for each station for the periods stated is presented on the attached figures. The data has been analysed statistically and/or smoothed to reveal long term averages or trends. A brief description of each of the observed parameters is given below with the relevant figure references.

3.2 Wind

The observer recorded the wind speed at the beach using a hand held wind meter at 1.5 metres above beach level. Prior to February 1986 wind direction was estimated to the nearest compass sector. After this time wind direction is recorded in degrees by compass.

A summary of annual wind speed and direction percentage occurrences are shown as a wind rose in Figures 3 and 4. Where applicable, morning and afternoon readings as well as the overall average are shown.

Wind speed was recorded in miles per hour (m.p.h.) rather than knots after February 1986. The recordings are converted back to knots for Figures 3 and 4.

3.3 Waves

The average and maximum breaker height (trough to crest) is usually estimated to the nearest 0.1 metre. From experience the estimate of average breaker height has been found to be comparable with the equivalent deep water significant wave height.

Recordings of maximum wave height and method used to obtain wave height were introduced into the programme from February 1986. Wave type and state of tide were discontinued at this time.

The observers estimate the wave period by recording the time taken for eleven wave crests (the duration of 10 waves) to pass a point.

Wave direction was recorded in degrees of a compass from March 1986. The direction recorded was then converted to a sector (see following paragraph regarding sector system).

The wave direction is estimated as one of five direction sectors indicating the angle to the shoreline alignment from which the waves are approaching the beach. These sectors have been selected as:-

Sector 1	-	0^{o} to 60^{o}
Sector 2	-	61^{o} to 85^{o}
Sector 3	-	86^{o} to 95^{o}
Sector 4	-	96^{o} to 120^{o}
Sector 5	-	121^{o} to 180^{o}

Note: 0^{o} is the beach alignment to the left of the observer when facing seaward, and at the COPE station this direction is approximately 330^{o} true north for both Site 1 and Site 2.

Statistical representations of the observed wave data include:-

(a) the percentage of wave height recordings which exceed any given wave height for all directions combined (Figures 5 and 6).

(b) the percentage occurrence of various combinations of wave heights and periods and directions (Figures 7, 8, 9 and 10).

(c) surf zone width with an indication of the existence or otherwise of an offshore bar (Figure 11 to Figure 22.)

(d) tabulation of the occurrence of various wave heights, periods, types and directions (Tables 1 to 8).

3.4 Longshore Currents

The observer measured the distance parallel to the shoreline that a dye patch in the surf zone moved in one minute. Current direction is either upcoast or downcoast, upcoast being to the left when facing the sea from the beach.

The readings are converted to a velocity which is plotted on a daily basis (Figure 23 to Figure 34). Mean upcoast and downcoast components and the overall annual means are also presented.

3.5 Beach Profile Parameters

Beach profile parameters were measured until 1983 using an Abney level, tape measure and reference pole. These include:

- Distance from reference pole to the fixed contour.
- Elevation of the fixed contour.
- Distance from reference pole to the vegetation line.
- The foreshore slope.

Since 1983 profiles have been recorded using a measuring stick, the reference pole, and a line of sight to the horizon.

Sand level at the reference pole was formally recorded from February 1986 and the measurement of foreshore slope was discontinued at this time.

Changes in these parameters with time indicate how the beach moves in response to varying wave attack. Plots of these parameters are shown in Figure 35 to Figure 42.

3.6 Monthly Beach Profiles

Beach profiles are normally taken at the beginning of each month. However, should the beach undergo appreciable erosion or accretion during the month, then the observer is requested to take another beach profile. Monthly beach profiles are shown in Figure 43 to Figure 48.

TABLE 1

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION OCCURRENCES

Bramston Beach | No. of Observations: 265 | Year 1981

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY													
FEBRUARY	5.1	0.46	70.0	10.0	20.0	-	-	-	55.0	5.0	40.0	-	-
MARCH	5.0	0.45	95.2	3.2	-	-	1.6	-	32.3	14.5	51.6	-	1.6
APRIL	5.2	0.37	31.0	5.2	13.8	48.3	1.7	-	17.2	41.5	37.9	3.4	-
MAY	5.7	0.50	72.6	12.9	-	11.3	3.2	-	-	51.6	45.2	-	3.2
JUNE	5.6	0.25	50.9	-	1.9	47.2	-	1.9	3.8	54.6	34.0	5.7	-
JULY	6.9	0.36	40.0	10.0	-	50.0	-	-	-	80.0	20.0	-	-
AUGUST	-	-	-	-	-	-	-	-	-	-	-	-	-
SEPTEMBER	-	-	-	-	-	-	-	-	-	-	-	-	-
OCTOBER													
NOVEMBER			(NO DATA RECORDED BETWEEN AUGUST 1981 AND MAY 1983)										
DECEMBER													
WHOLE YEAR	5.4	0.40	63.1	6.0	4.9	24.5	1.5	0.4	16.2	38.9	41.5	1.9	1.1

SP - Spilling
PL - Plunging
SP/PL - Combined Spilling and Plunging

TABLE 2

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION OCCURRENCES

Bramston Beach | No. of Observations: 244 | Year 1983

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY	4.6	0.45	51.8	13.8	17.2	17.2	-	-	6.7	10.0	80.0	3.3	-
JUNE	5.3	0.39	-	6.7	23.3	60.0	10.0	-	-	53.3	36.7	-	10.0
JULY	5.6	0.32	-	-	45.2	54.8	-	-	-	48.4	51.6	-	-
AUGUST	5.6	0.37	-	-	53.3	46.7	-	-	3.2	58.1	38.7	-	-
SEPTEMBER	5.0	0.39	-	-	73.3	26.7	-	-	6.7	73.3	20.0	-	-
OCTOBER	4.5	0.32	-	3.2	80.7	12.9	3.2	-	25.8	54.9	16.1	-	3.2
NOVEMBER	4.5	0.30	-	-	90.0	10.0	-	-	10.0	80.0	10.0	-	-
DECEMBER	4.1	0.36	-	-	74.2	25.8	-	-	13.3	30.0	56.7	-	-
WHOLE YEAR	4.9	0.36	6.2	2.9	57.4	31.8	1.7	0.0	8.2	51.1	38.7	0.4	1.6

SP - Spilling
PL - Plunging
SP/PL - Combined Spilling and Plunging

TABLE 3

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION OCCURRENCES

Bramston Beach | No. of Observations: 365 | Year 1984

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	4.7	0.24			87.0	6.5	6.5	-	3.3	80.0	10.0	-	6.7
FEBRUARY	4.5	0.39			75.9	24.1	-	-	-	37.9	62.1	-	-
MARCH	4.7	0.31			64.5	22.6	12.9		6.7	36.7	43.3	-	13.3
APRIL	4.6	0.43			63.3	36.7	-	-	-	36.7	63.3	-	-
MAY	5.1	0.42			48.4	51.6	-	-	-	51.6	48.4	-	-
JUNE	5.1	0.45			46.7	53.3	-	-	-	70.0	30.0	-	-
JULY	5.1	0.33			41.9	51.6	6.5	-	-	87.1	9.7	-	3.2
AUGUST	5.2	0.37			83.9	12.9	3.2	-	3.2	87.1	6.5	-	3.2
SEPTEMBER	4.9	0.37			96.7	3.3	-	-	13.3	83.4	3.3	-	-
OCTOBER	4.2	0.38			74.2	25.8	-	-	12.9	67.7	19.4	-	-
NOVEMBER	4.1	0.39			72.4	27.6	-	-	13.8	48.3	37.9	-	-
DECEMBER	4.1	0.36			90.3	9.7	-	-	29.0	51.6	19.4	-	-
WHOLE YEAR	4.7	0.37	0.0	0.0	70.4	27.1	2.5	0.0	6.9	61.7	29.2	0.0	2.2

SP - Spilling
PL - Plunging
SP/PL - Combined Spilling and Plunging

TABLE 4

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION OCCURRENCES

Bramston Beach | No. of Observations: 304 | Year 1985

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	4.5	0.35	-	-	67.7	29.0	3.2	-	12.9	64.5	19.4	-	3.2
FEBRUARY	4.6	0.46	-	-	75.0	25.0	-	-	14.3	35.7	50.0	-	-
MARCH	5.2	0.41	-	-	64.5	35.5	-		3.2	67.8	29.0	-	-
APRIL	4.9	0.35	-	-	70.0	30.0	-	-	-	60.0	40.0	-	-
MAY	5.3	0.46	-	-	74.2	25.8	-	-	-	58.1	41.9	-	-
JUNE	5.1	0.31	-	-	93.3	6.7	-	-	-	60.0	40.0	-	-
JULY	5.1	0.31	-	-	83.9	16.1	-	-	-	80.6	19.4	-	-
AUGUST	5.3	0.35	-	-	90.3	9.7	-	-	-	90.3	9.7	-	-
SEPTEMBER	5.3	0.31	-	3.3	83.4	13.3	-	-	6.7	80.0	13.3	-	-
OCTOBER	4.6	0.34	-	-	67.7	32.3	-	-	12.9	61.3	25.8	-	-
NOVEMBER	-	-	-	-	-	-	-	-	-	-	-	-	-
DECEMBER	-	-	-	-	-	-	-	-	-	-	-	-	-
WHOLE YEAR	5.0	0.36	0.0	0.3	77.0	22.4	0.3	0.0	4.9	66.2	28.6	0.0	0.3

SP - Spilling
PL - Plunging
SP/PL - Combined Spilling and Plunging

TABLE 5

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE DIRECTION OCCURRENCES

Bramston Beach

No. of Observations: 295

Year 1986

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Direction					
			Wave Direction					
			1	2	3	4	5	Calm
JANUARY								
FEBRUARY	3.0	0.23	40.0	10.0	10.0	30.0	10.0	-
MARCH	5.0	0.43	-	3.2	-	83.9	12.9	-
APRIL	7.7	0.48	-	10.3	10.3	41.5	37.9	-
MAY	7.8	0.34	-	25.9	25.9	44.5	3.7	-
JUNE	7.8	0.33	-	7.1	7.1	67.9	17.9	-
JULY	6.6	0.37	-	33.3	33.3	33.4	-	-
AUGUST	7.5	0.41	13.3	33.3	23.4	30.0	-	-
SEPTEMBER	8.1	0.37	11.1	25.9	37.1	22.2	3.7	-
OCTOBER	4.6	0.47	40.7	48.2	3.7	3.7	3.7	-
NOVEMBER	6.3	0.21	10.0	45.0	10.0	35.0	-	-
DECEMBER	6.8	0.21	9.7	45.1	22.6	19.4	3.2	-
WHOLE YEAR	6.7	0.36	9.3	26.6	17.2	38.3	8.6	0.0

ADMENDMENT

TABLE 6

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND TYPE/WAVE DIRECTION OCCURRENCES

Bramston Beach North | No. of Observations: 313 | Year 1986

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY			(STATION OPENED IN FEBRUARY)										
FEBRUARY	3.6	0.22	CR	CR	CR	CR	CR	30.0	10.0	10.0	40.0	10.0	-
MARCH	5.5	0.50						-	-	9.7	71.0	16.1	3.2
APRIL	6.8	0.56						-	6.7	10.0	53.3	30.0	-
MAY	7.5	0.45						-	16.7	26.7	53.3	3.3	-
JUNE	7.0	0.34						-	23.3	16.7	60.0	-	-
JULY	6.9	0.37						-	25.8	32.3	35.4	6.5	-
AUGUST	6.8	0.33						6.5	19.4	25.8	38.6	9.7	-
SEPTEMBER	6.8	0.32						10.0	43.3	20.1	23.3	3.3	-
OCTOBER	6.2	0.32						6.7	73.4	3.3	13.3	3.3	-
NOVEMBER	6.1	0.30						13.3	30.0	23.4	30.0	3.3	-
DECEMBER	5.8	0.30						26.7	40.0	20.0	13.3	-	-
WHOLE YEAR	6.5	0.37	0.0	0.0	0.0	0.0	0.0	7.0	27.2	18.5	39.3	7.7	0.3

ADMENDMENT

SP - Spilling
PL - Plunging
SP/PL - Combined Spilling and Plunging
CR - Ceased Recording Wave Type

TABLE 7

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE DIRECTION OCCURRENCES

Bramston Beach

No. of Observations: 327

Year 1987

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Direction					
			Wave Direction					
			1	2	3	4	5	Calm
JANUARY	6.5	0.22	16.1	32.3	22.6	22.5	6.5	-
FEBRUARY	6.8	0.32	-	3.6	7.1	78.6	10.7	-
MARCH	6.9	0.30	12.9	6.5	6.5	58.0	16.1	-
APRIL	5.4	0.38	-	-	6.7	93.3	-	-
MAY	5.2	0.32	-	3.2	6.5	90.3	-	-
JUNE	5.2	0.35	-	3.3	6.7	90.0	-	-
JULY	5.0	0.29	-	3.2	3.2	93.6	-	-
AUGUST	6.6	0.35	3.1	18.8	12.5	65.6	-	-
SEPTEMBER	5.9	0.55	-	3.4	10.3	82.9	3.4	-
OCTOBER	4.5	0.55	37.5	41.7	-	20.8	-	-
NOVEMBER	4.2	0.50	30.0	23.3	-	46.7	-	-
DECEMBER	5.0	0.63	6.5	12.9	-	80.6	-	-
WHOLE YEAR	5.6	0.39	8.4	12.3	7.0	69.2	3.1	0.0

ADMENDMENT

TABLE 8

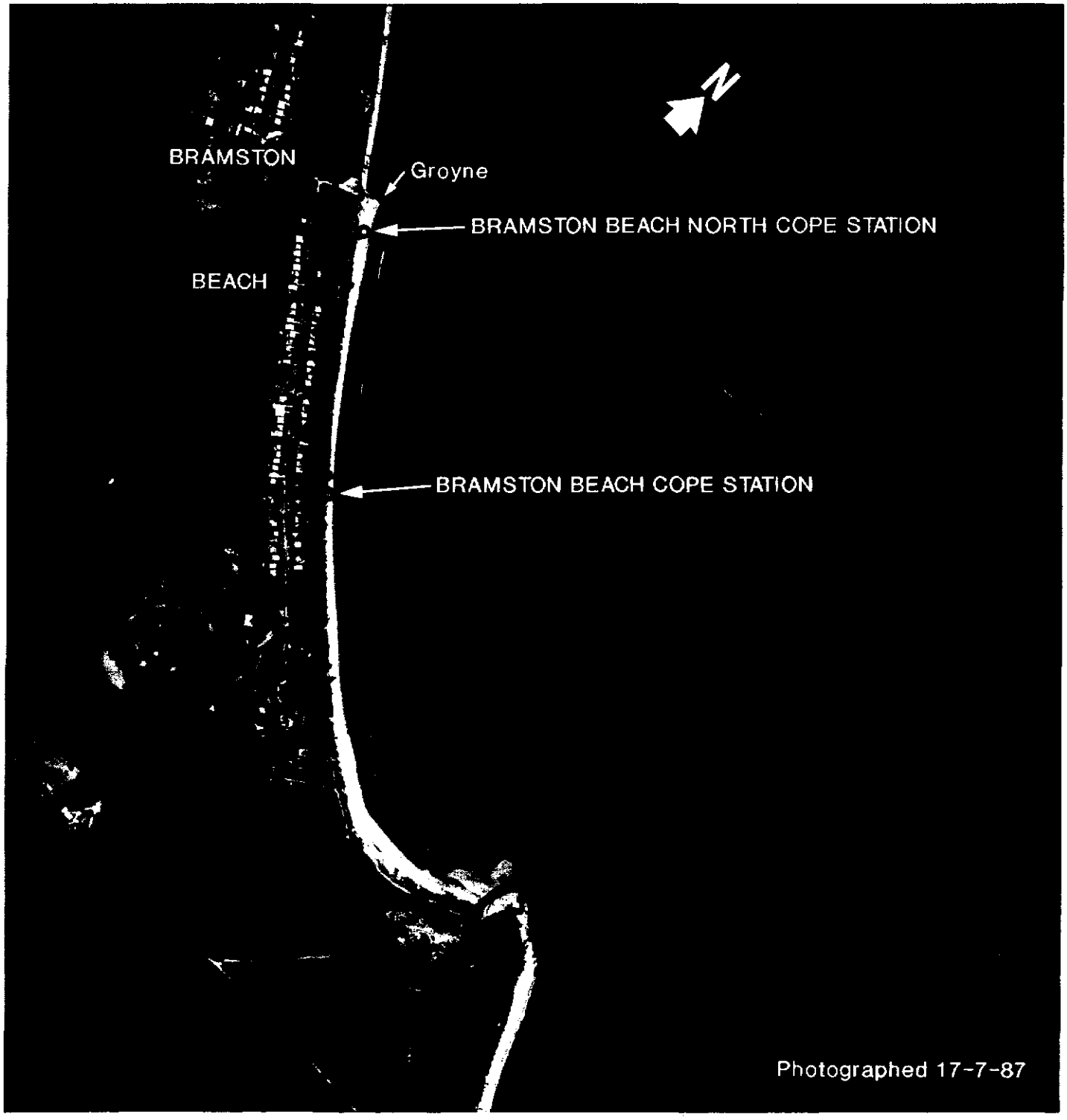
MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE DIRECTION OCCURRENCES

Bramston Beach North | No. of Observations: 358 | Year 1987

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Direction					
			Wave Direction					
			1	2	3	4	5	Calm
JANUARY	5.2	0.20	6.7	50.0	20.0	16.7	-	6.7
FEBRUARY	5.1	0.35	-	-	21.4	64.3	7.1	7.1
MARCH	5.7	0.32	10.0	16.7	10.0	56.7	6.7	-
APRIL	6.1	0.48	-	3.3	6.7	70.0	20.0	-
MAY	6.8	0.39	-	6.7	13.3	70.0	10.0	-
JUNE	6.2	0.39	-	10.7	7.1	75.0	7.1	-
JULY	6.8	0.37	-	3.3	33.3	60.0	3.3	-
AUGUST	6.9	0.34	-	12.9	38.7	45.2	3.2	-
SEPTEMBER	5.8	0.48	-	-	31.0	62.1	6.9	-
OCTOBER	5.9	0.33	22.6	51.6	19.4	6.5	-	-
NOVEMBER	5.4	0.30	6.7	40.0	20.0	33.3	-	-
DECEMBER	4.5	0.40	6.5	12.9	32.3	41.9	6.5	-
WHOLE YEAR	6.0	0.36	4.5	17.6	21.2	49.7	5.9	1.1

ADMENDMENT



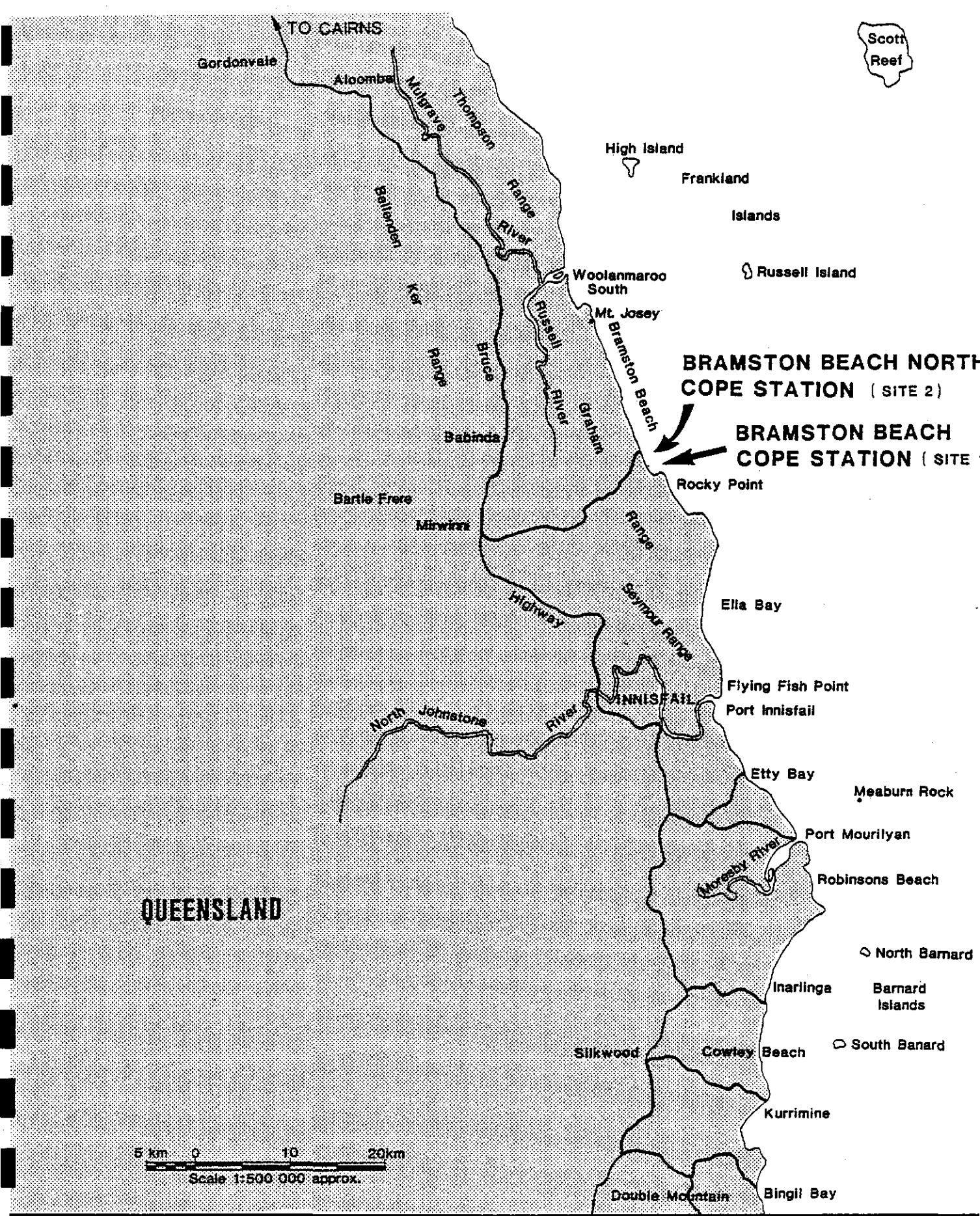
100 0 100 200 300 400 500 metres
Scale 1:12 000 approx.

Beach Protection Authority

SITE PLAN
BRAMSTON BEACH AND BRAMSTON BEACH NORTH COPE STATIONS

COPE
Bramston Beach
Bramston Bch Nth

Figure 1.1
C 23.1



Beach Protection Authority

LOCALITY PLAN

COPE
Bramston Beach,
Bramston Beach Nth.

Figure 1.2

C 23.1

Form No. BE 146

BEACH PROTECTION AUTHORITY OF QUEENSLAND

COASTAL OBSERVATION PROGRAMME – ENGINEERING

COPE

RECORD ALL DATA CAREFULLY AND LEGIBLY

SITE NUMBER	DAY	MONTH	YEAR	TIME
1 2 3 4 5	6 7	8 9	10 11	Record time using 24 hour system 12 13 14 15

(i) WAVE HEIGHT (AVERAGE)

Record the best estimate of the average breaking wave height to the nearest tenth of a metre. **If less than 0.1 record as 0.0 and go directly to Section (ii).** 16 . 17

WAVE HEIGHT (MAXIMUM)

Record the best estimate of the maximum breaking wave height during the entire observation period to the nearest tenth of a metre. 18 . 19

WAVE HEIGHT METHOD

Record the method that you used to obtain wave height.
Record 1 if visual estimate
Record 2 if measured with COPE sticks
Record 3 if measured by COPE pole 20

WAVE PERIOD

Record the time in seconds for eleven (11) wave crests to pass a stationary point just seaward of the surf zone. 21 22 23

WAVE DIRECTION

Determine the direction that the waves are entering the surf zone using the compass provided and record the direction in degrees. 24 25 26

SURF ZONE WIDTH

Record the time in seconds for a wave of average height to traverse the surf zone from break point to final run-up on the beach. 27 28 29

(ii) CURRENT SPEED

Measure in metres the distance that the centre of the dye patch is observed to move during a one (1) minute period; if no long shore movement record 000. 30 31 32

CURRENT DIRECTION

When the observer faces the sea
0 — no long shore movement
L — dye moves to the left
R — dye moves to the right 33

DISTANCE FROM SHORE

Record the distance in metres from the shore to where the current measurements were commenced. 34 35

OFFSHORE BAR

Is an off-shore bar causing the waves to break?
1—yes 0—no 36

(iii) WIND SPEED

Record wind speed to the nearest m.p.h. **If calm record 00 and go directly to Section (iv).** 37 38

WIND DIRECTION

Determine the direction that the wind is *coming from using the compass provided* and record the direction in degrees. 39 40 41

(iv) FIXED CONTOUR ELEVATION

Record the elevation of the fixed contour. 42 . 43

DISTANCE TO FIXED CONTOUR

Record the distance, to the nearest metre, from the reference post to the fixed contour. Distances landward of the reference post are negative.
e.g. 009 measures 9 metres seaward (No sign);
—07 measures 7 metres landward. (Minus sign) 44 45 46

(v) DISTANCE TO THE VEGETATION

Record the distance from the reference post to the average vegetation line. Distances landward of the reference post are negative. 47 48 49

SAND LEVEL AT POLE

Record to nearest tenth of a metre. 50 . 51

(vi) SAND SAMPLE

If sample taken then record 1. Otherwise leave blank. 52

PLEASE PRINT *Please check the form for completeness*

SITE NAME _____ OBSERVER _____

REMARKS: _____

Make any additional remarks, computations or sketches on the reverse side of this form.

(for office use only)
53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

Beach Protection Authority

OBSERVATION FORM

COPE
Bramston Beach
Bramston Beach North

Figure 2.1
C 23.1

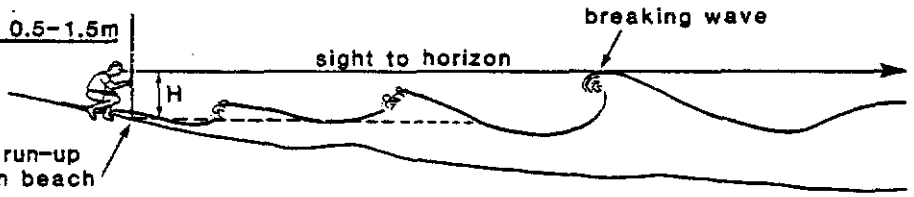
WAVE HEIGHT AND DIRECTION INSTRUCTIONS

METHOD 1 VISUAL ESTIMATION

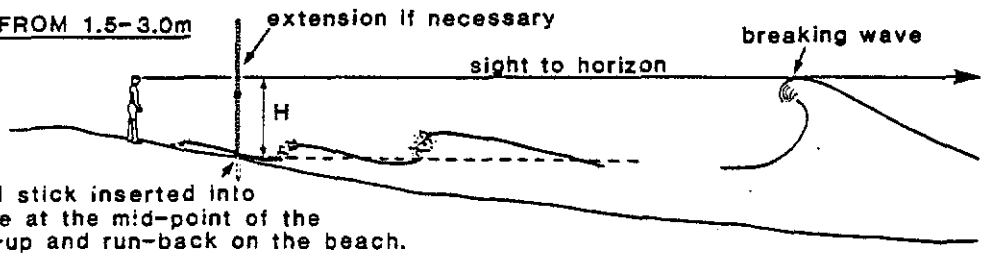
This method should only be used where the waveheights are below 0.5 and it is not practicable to use the preferred Method 2.

METHOD 2

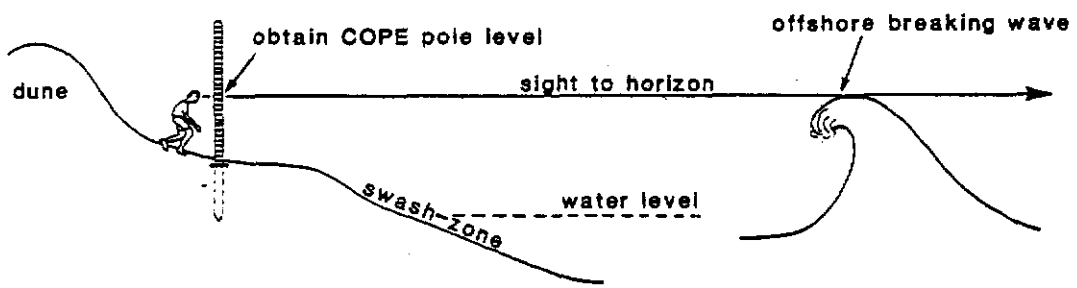
HEIGHTS FROM 0.5-1.5m



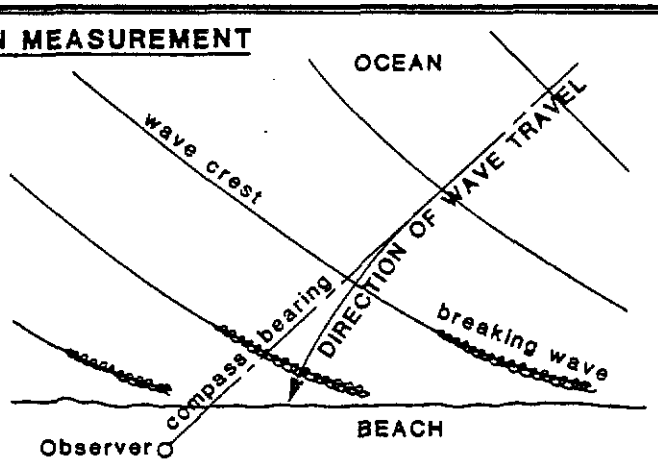
HEIGHTS FROM 1.5-3.0m



METHOD 3 FOR WAVES OVER 3m



WAVE DIRECTION MEASUREMENT



Beach Protection Authority

METHODS FOR RECORDING WAVE PARAMETERS

COPE
Bramston Beach
Bramston Beach North

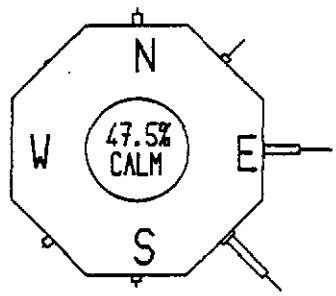
Figure 2.2

C 23.1

COPE - Coastal Observation Programme Engineering

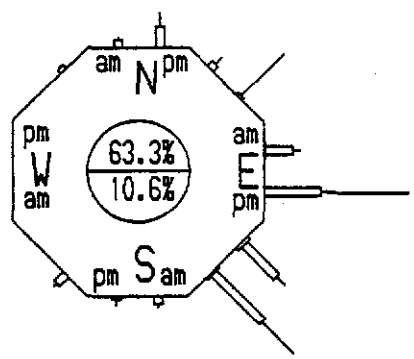
MULGRAVE SHIRE BRAMSTON BEACH 2905

ALL OBSERVATIONS



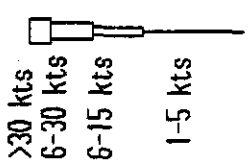
Total No. of Observations : 1791

MORNING - AFTERNOON OBSERVATIONS



NOTES :
Figures in Central Circle Represent Percentage of CALM Observations.
Upper Figure for AM
Lower Figure for PM

LEGEND



No. of Morning Observations : 1254
No. of Afternoon Observations : 537

Mean Time :- Morning Obs : 0910 hrs
Mean Time :- Afternoon Obs : 1513 hrs

SCALE
0 10 20 30 40 50
Percentage

WIND DATA - FEB 1981 to NOV 1987

Beach Protection Authority

WIND DATA

COPE

Bramston Beach

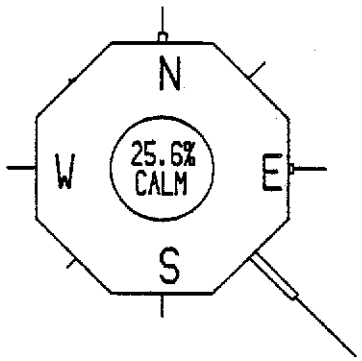
Figure 3

C 23.1

COPE - Coastal Observation Programme Engineering

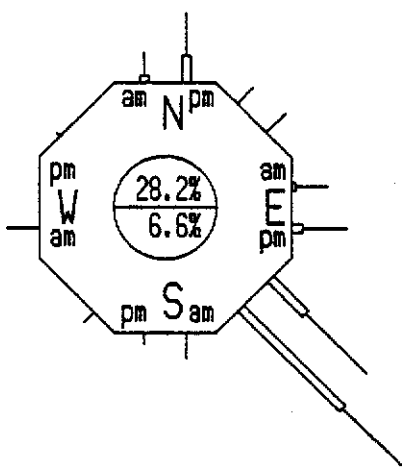
MULGRAVE SHIRE BRAMSTON BEACH NORTH 2908

ALL OBSERVATIONS



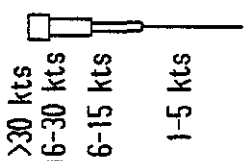
Total No. of Observations : 640

MORNING - AFTERNOON OBSERVATIONS



NOTES :
Figures in Central Circle Represent Percentage of CALM Observations.
Upper Figure for AM
Lower Figure for PM

LEGEND



No. of Morning Observations : 564
No. of Afternoon Observations : 76

Mean Time :- Morning Obs : 0933 hrs
Mean Time :- Afternoon Obs : 1458 hrs

SCALE
0 10 20 30 40 50
Percentage

WIND DATA - FEB 1986 to DEC 1987

Beach Protection Authority

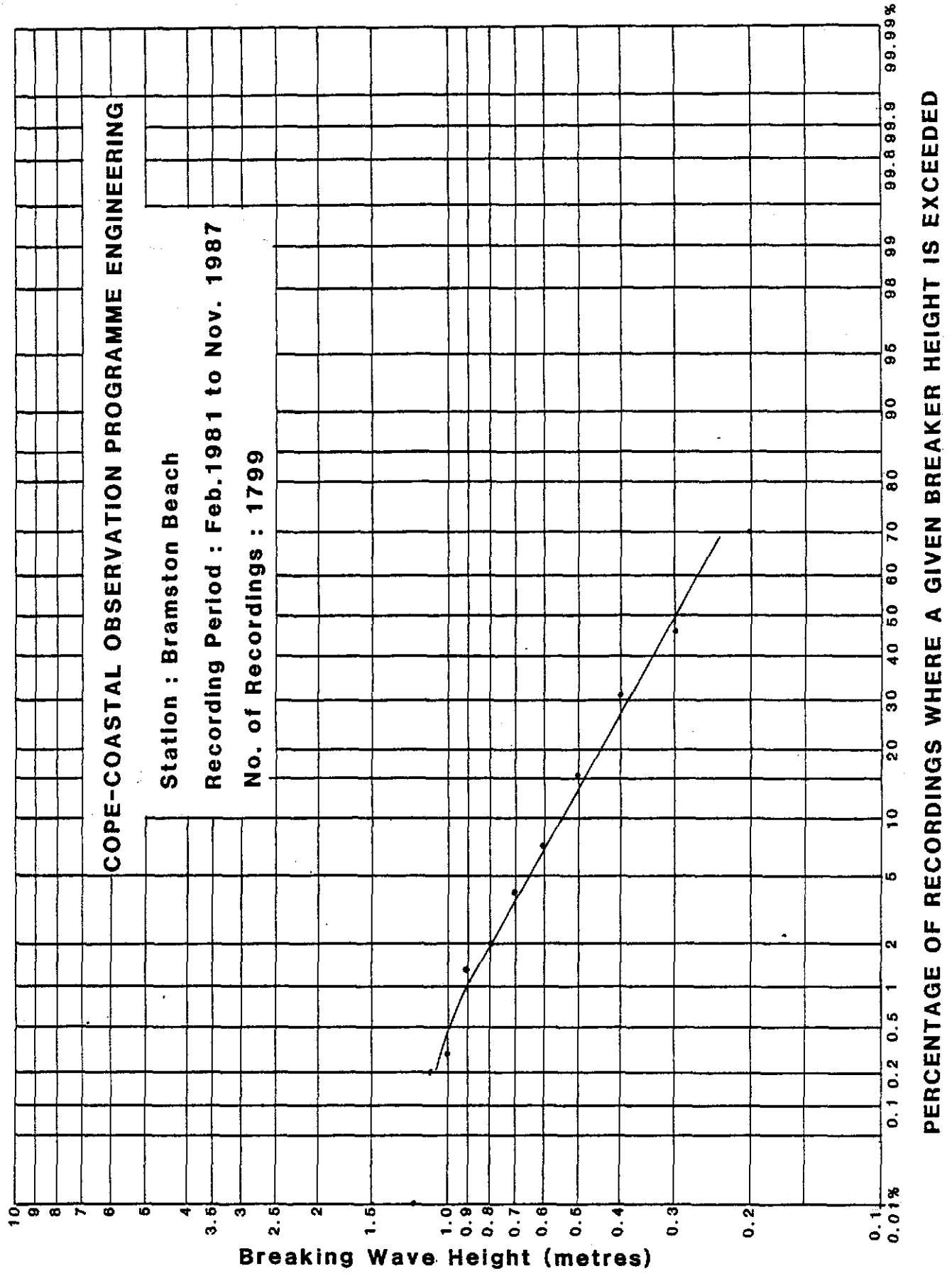
WIND DATA

COPE

Bramston Beach North

Figure 4

C 23.1



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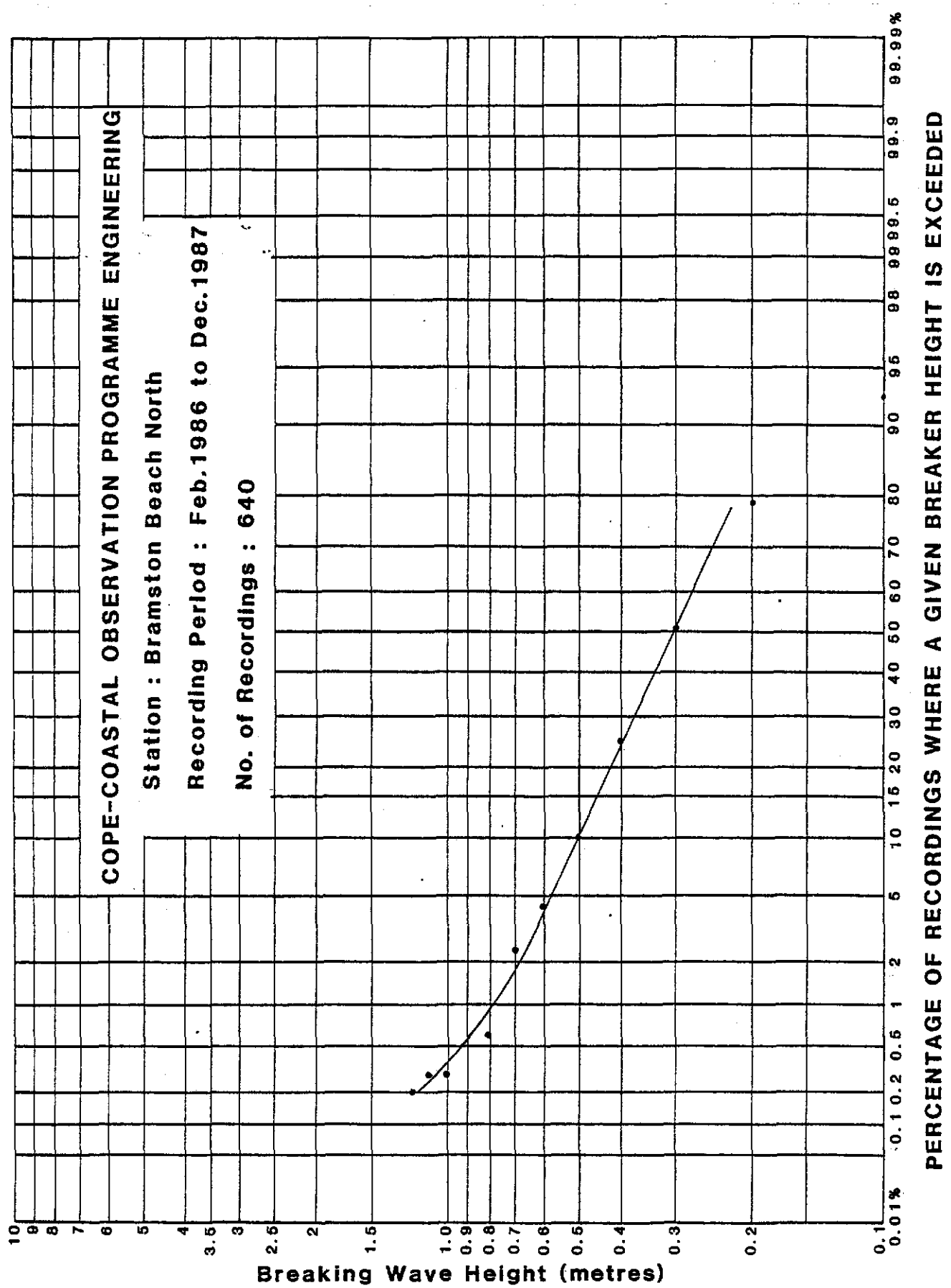
WAVE HEIGHT PERCENT EXCEEDENCE
ALL DATA

COPE

Bramston Beach

Figure 5

C 23.1



Beach Protection Authority

WAVE HEIGHT PERCENT EXCEEDENCE

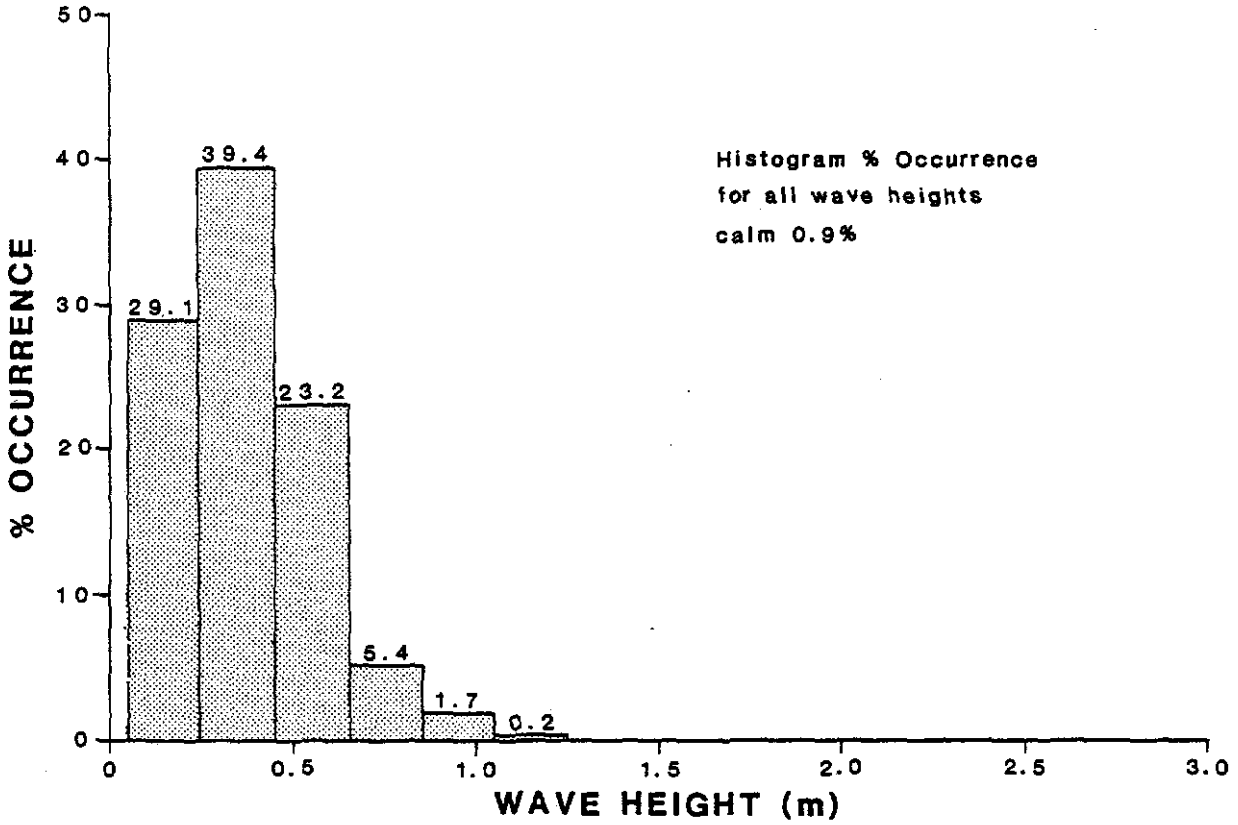
ALL DATA

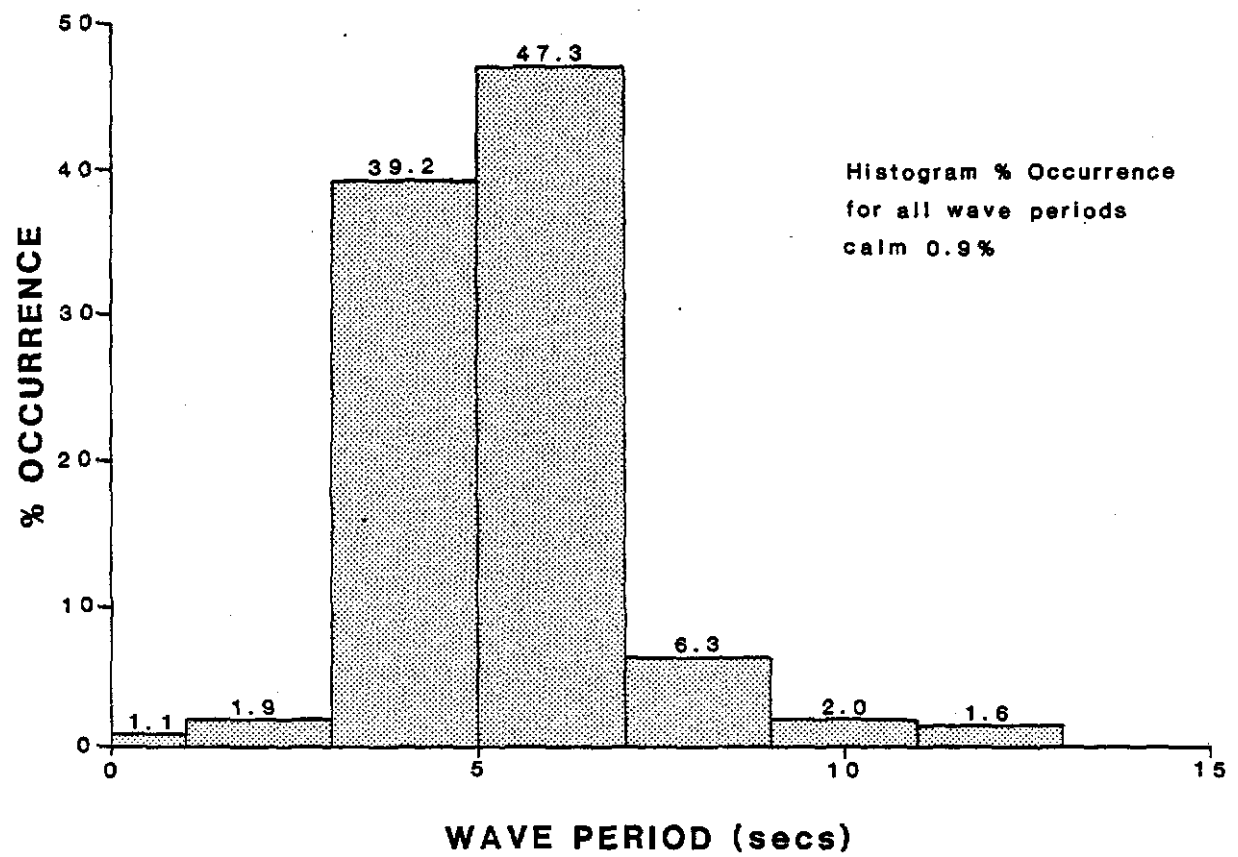
COPE

Bramston Beach North

Figure 6

C 23.1





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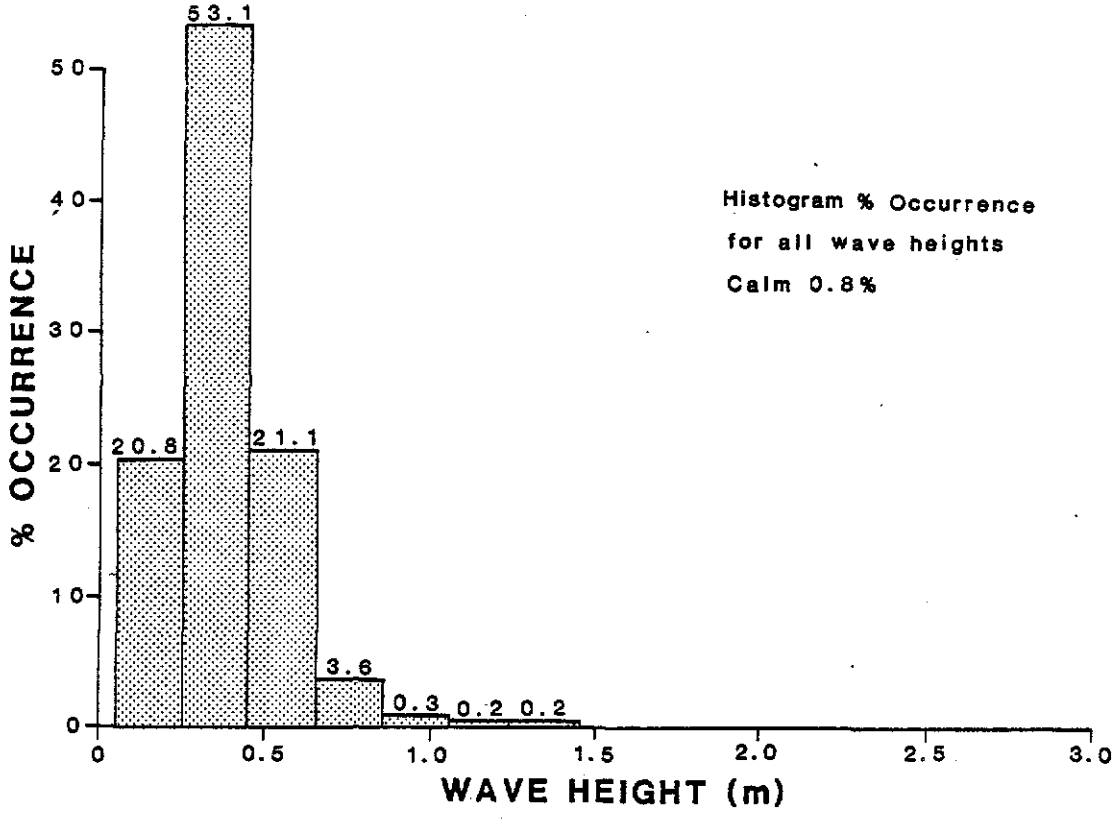
PERCENTAGE OCCURRENCE OF WAVE HEIGHT AND WAVE PERIOD ALL DATA

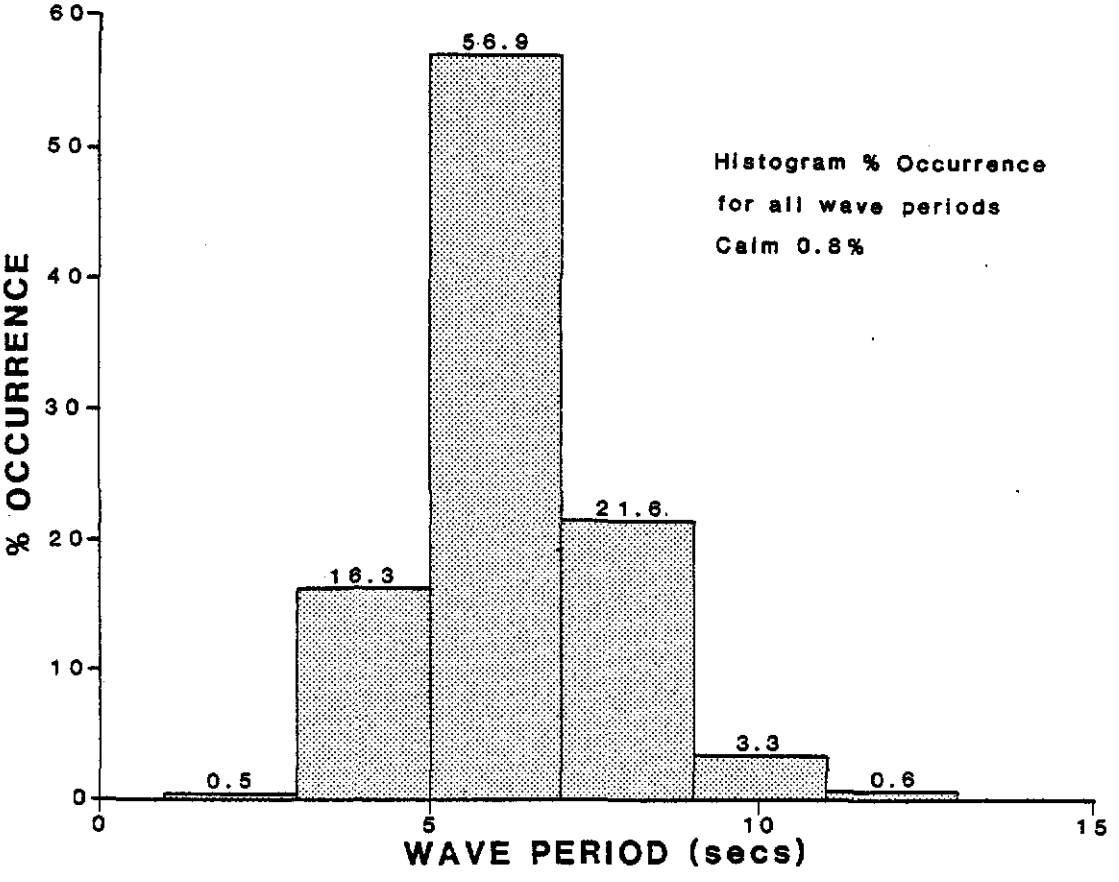
COPE

Bramston Beach

Figure 7

C 23.1





Beach Protection Authority

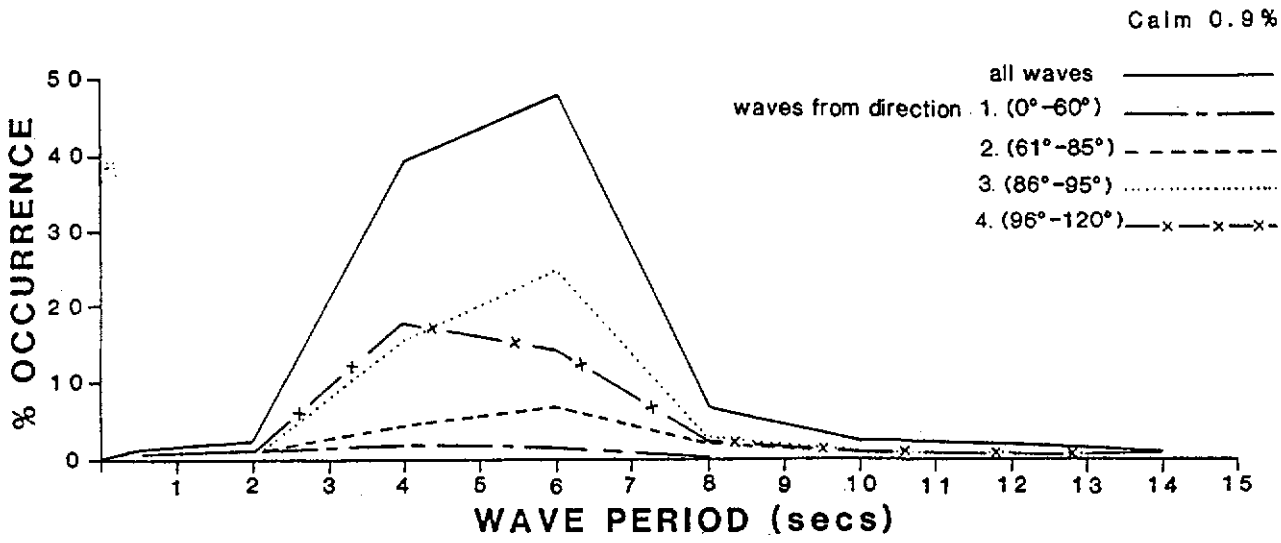
PERCENTAGE OCCURRENCE OF WAVE HEIGHT AND WAVE PERIOD ALL DATA

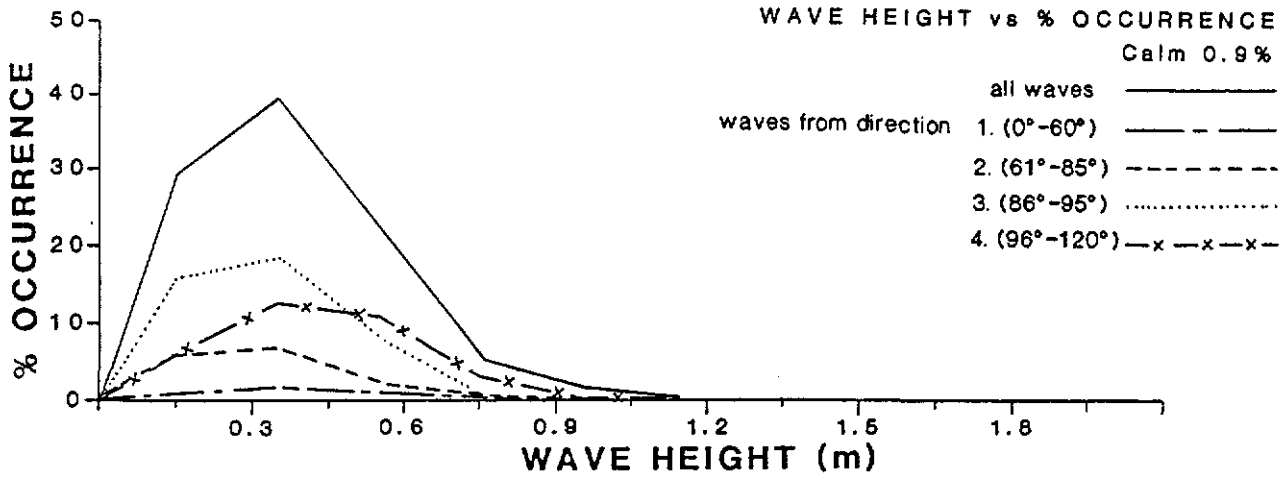
COPE

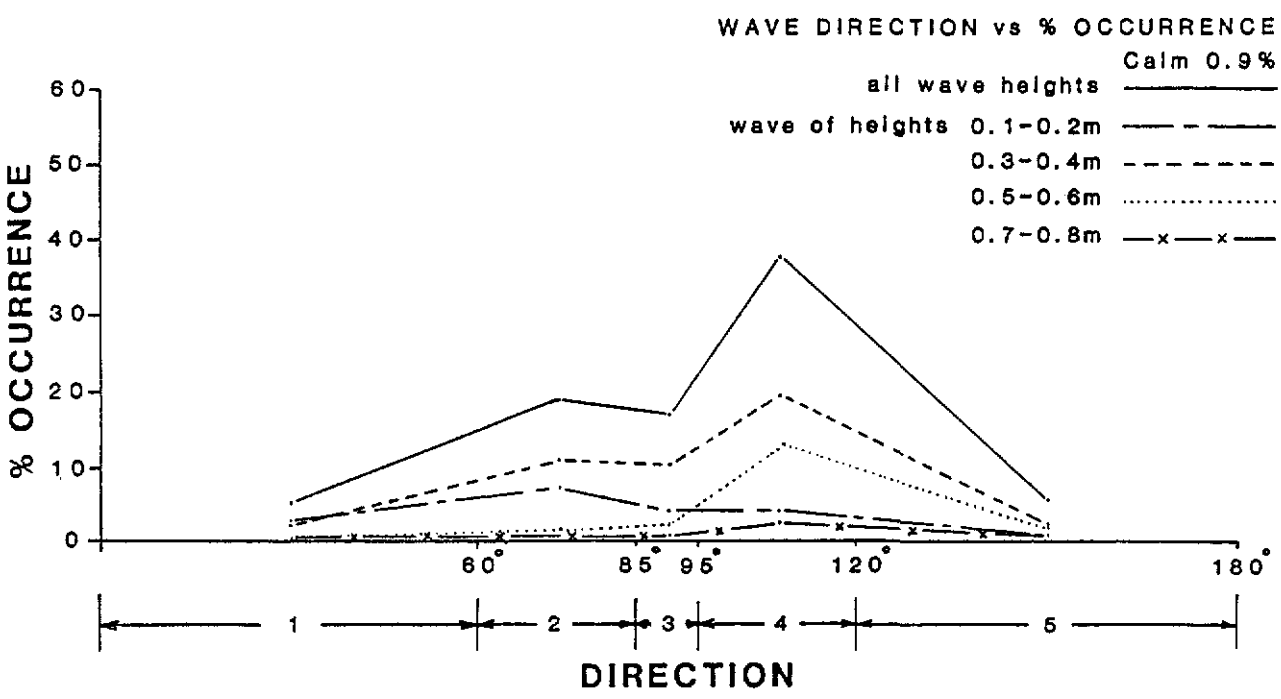
Bramston Beach North

Figure 8

C 23.1







ADMENDMENT

Beach Protection Authority

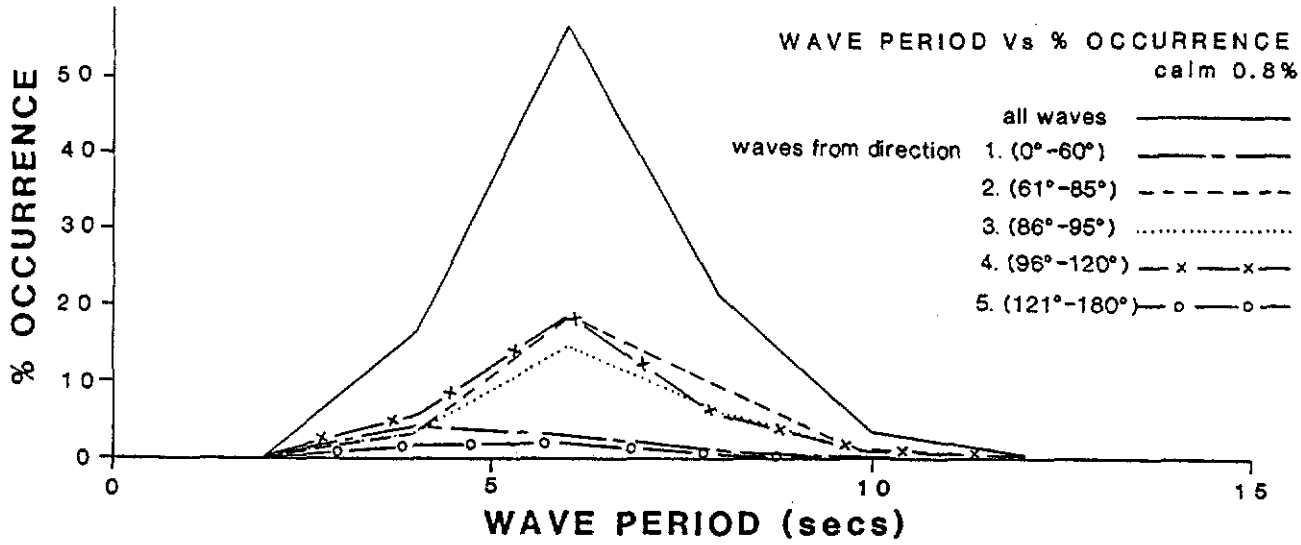
WAVE DIRECTION ANALYSIS
ALL DATA

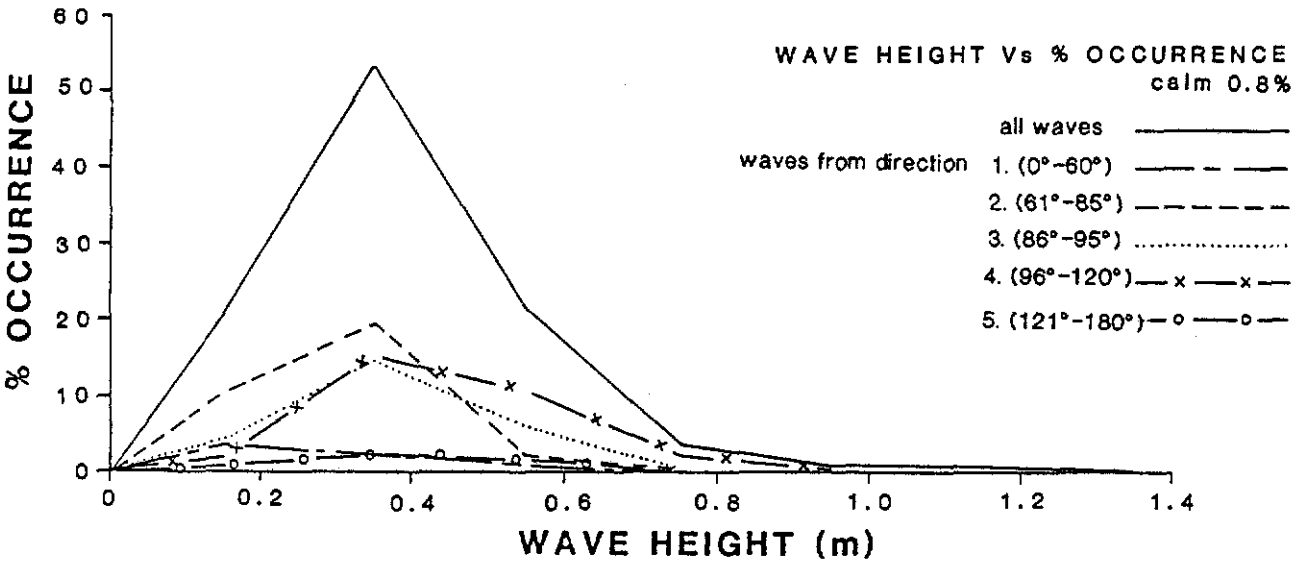
COPE

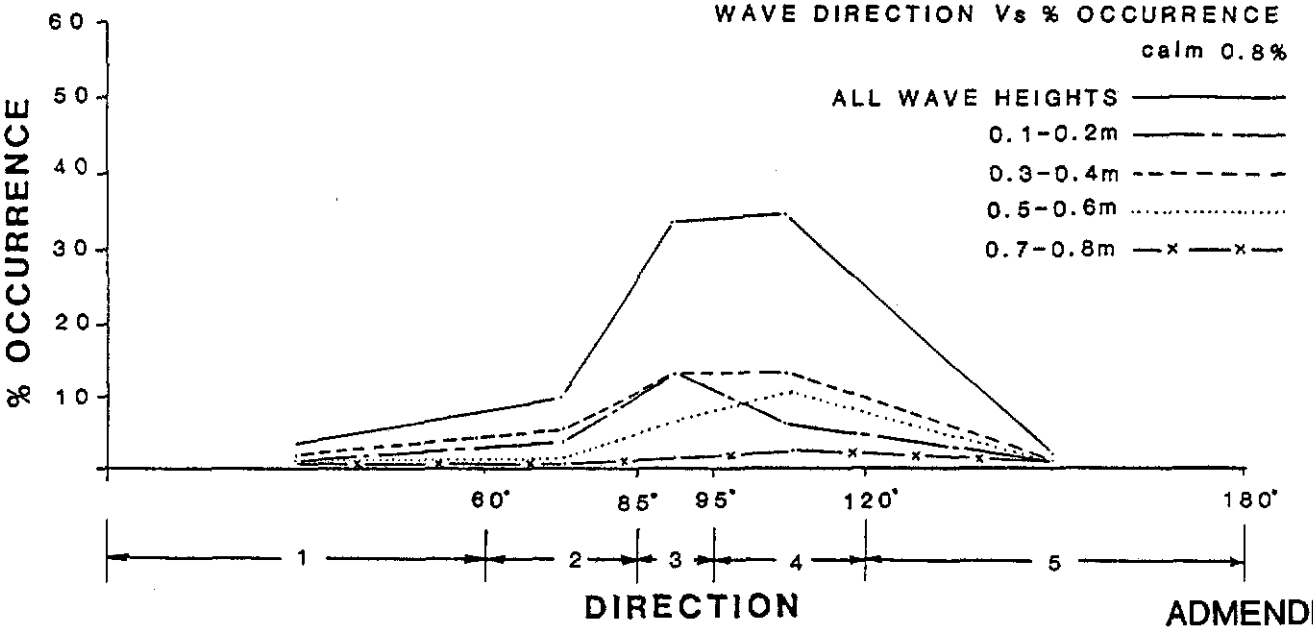
Bramston Beach

Figure 9

C 23.1







ADMENDMENT

COPE

Bramston Beach North

Beach Protection Authority

WAVE DIRECTION ANALYSIS
ALL DATA

Figure 10

C 23.1

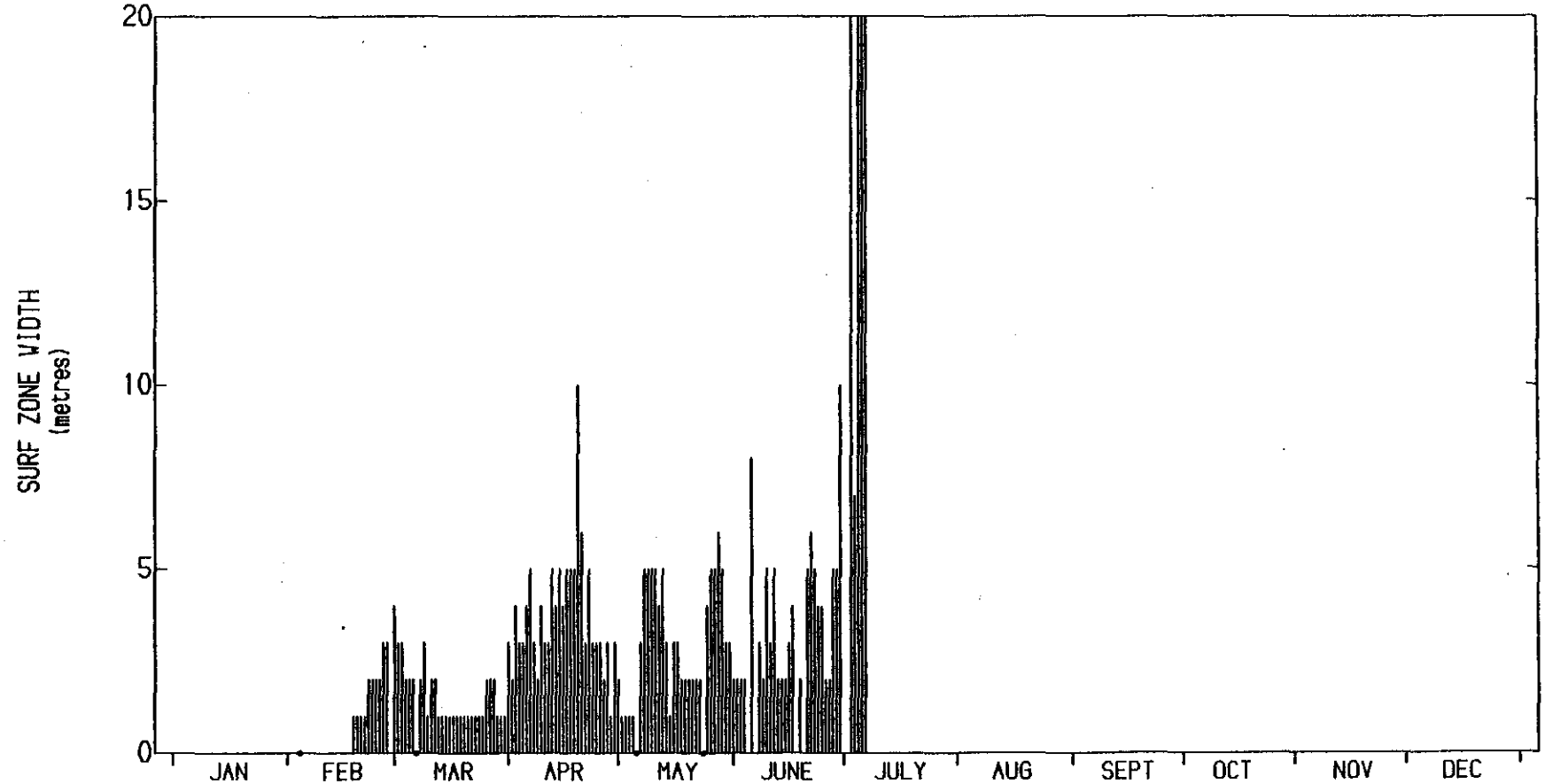
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH

MULGRAVE SHIRE

2905



SURF ZONE WIDTH SUMMARY - 1981

No. of Observations : 135

MORNING OBSERVATIONS

Mean Surf Zone Width = 3.4 m

SURF ZONE WIDTH - MORNING 1981

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Bramston Beach

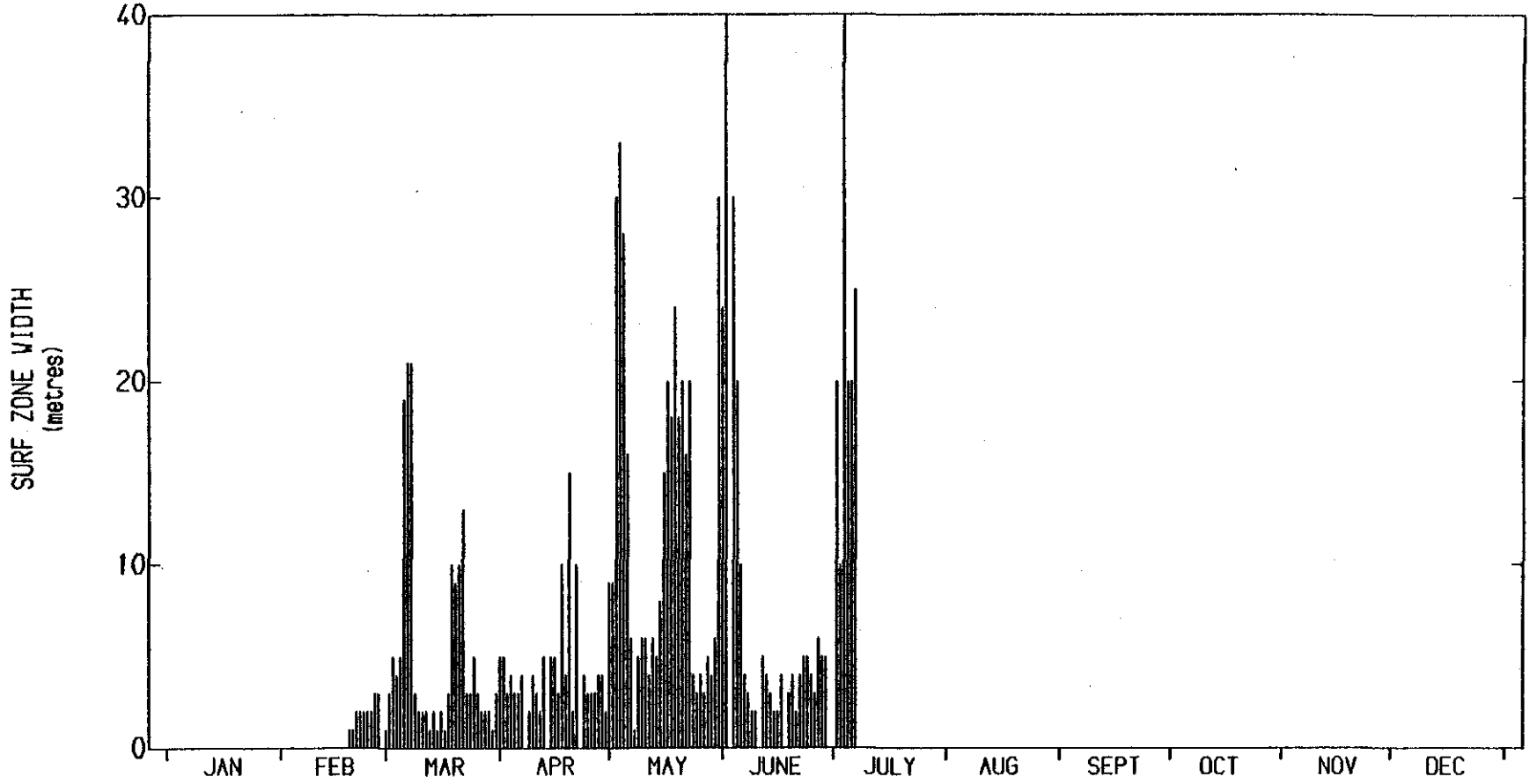
Figure 11

C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905



SURF ZONE WIDTH SUMMARY - 1981

No. of Observations : 130 AFTERNOON OBSERVATIONS Mean Surf Zone Width = 7.8 m

SURF ZONE WIDTH-AFTERNOON 1981

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Bramston Beach

Figure 12

C 23.1

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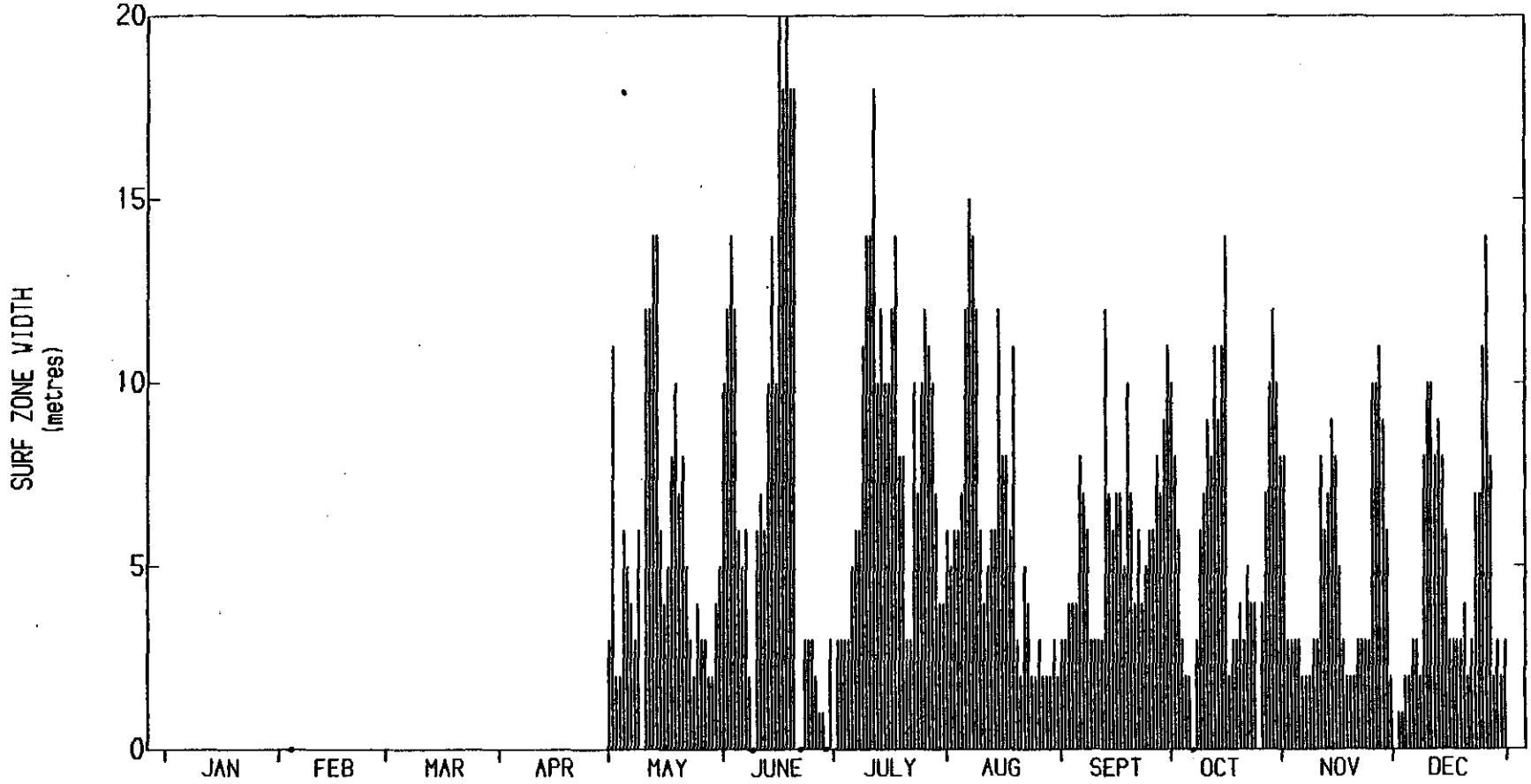
COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905



SURF ZONE WIDTH SUMMARY - 1983

No. of Observations : 243 MORNING OBSERVATIONS Mean Surf Zone Width = 6.2 m

SURF ZONE WIDTH-MORNING 1983

COPE

Bramston Beach

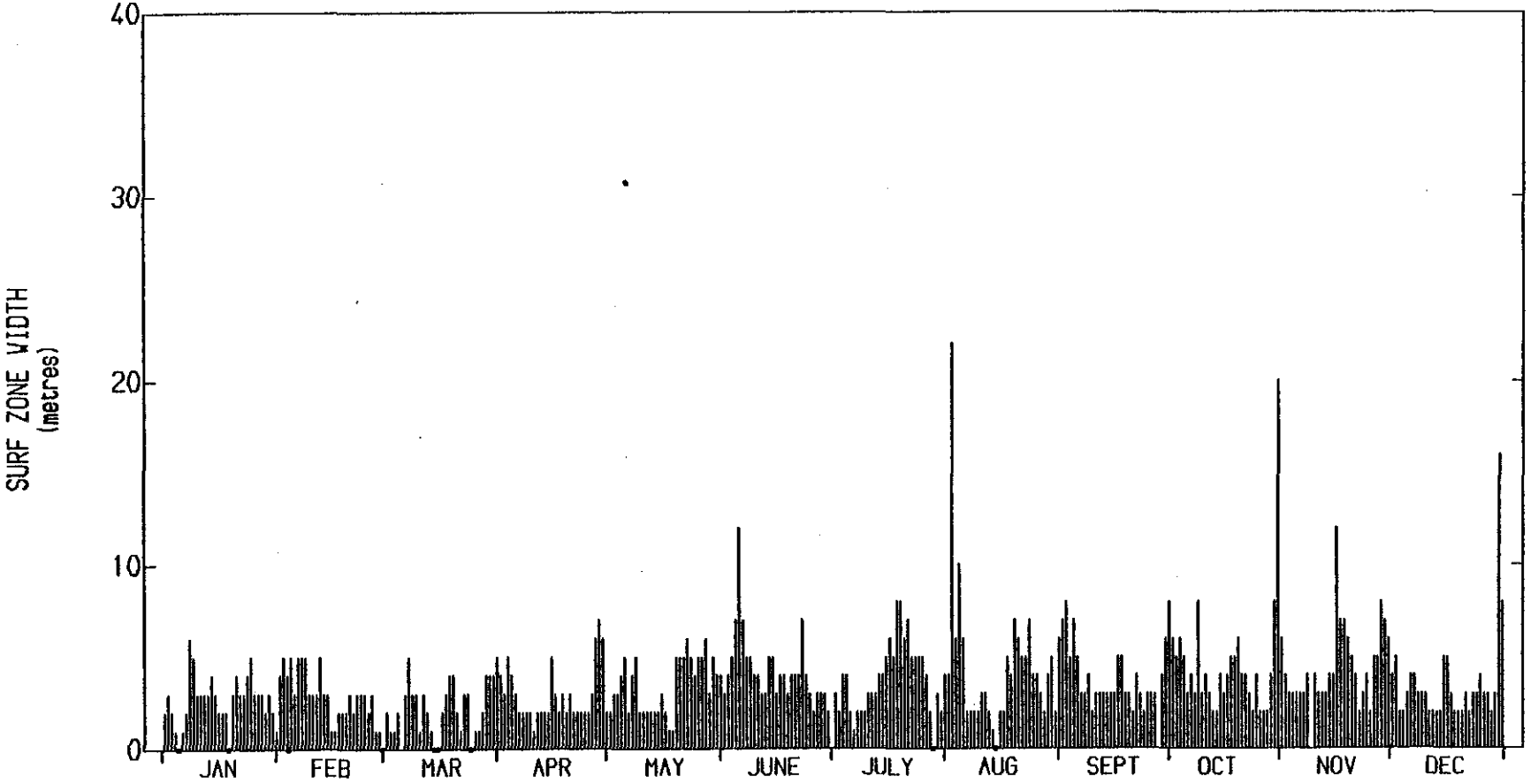
Figure 13

C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905



SURF ZONE WIDTH SUMMARY - 1984

No. of Observations : 364 MORNING OBSERVATIONS Mean Surf Zone Width = 3.6 m

SURF ZONE WIDTH-MORNING 1984

COPE

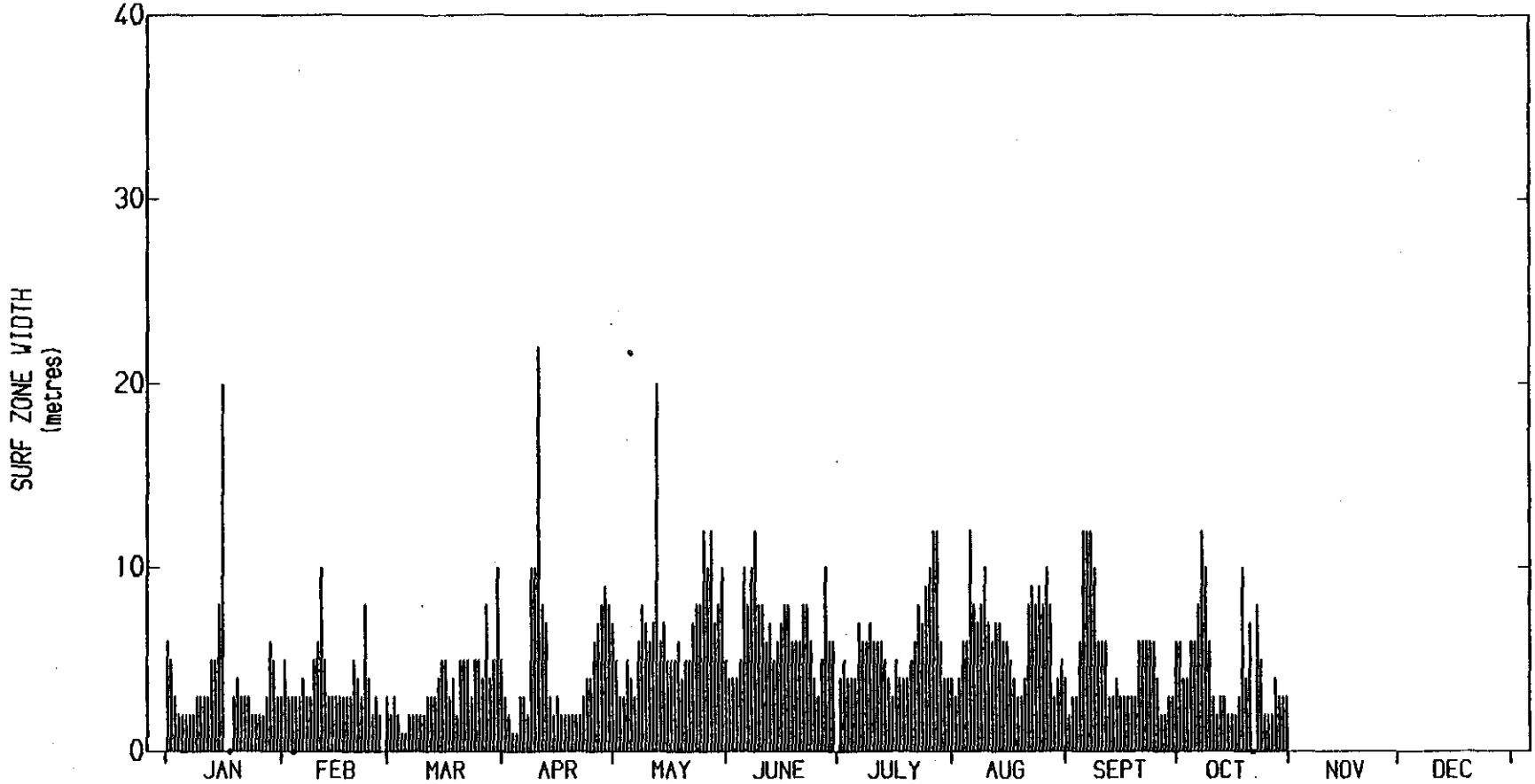
Bramston Beach

Figure 14
C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905



SURF ZONE WIDTH SUMMARY - 1985

No. of Observations : 303 MORNING OBSERVATIONS Mean Surf Zone Width = 5.2 m

SURF ZONE WIDTH-MORNING 1985

COPE

Bramston Beach

Figure 15

C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905

SURF ZONE WIDTH SUMMARY - 1986

No. of Observations : 158 MORNING OBSERVATIONS Mean Surf Zone Width = 15.5 m

SURF ZONE WIDTH-MORNING 1986

Figure 16
C 23.1

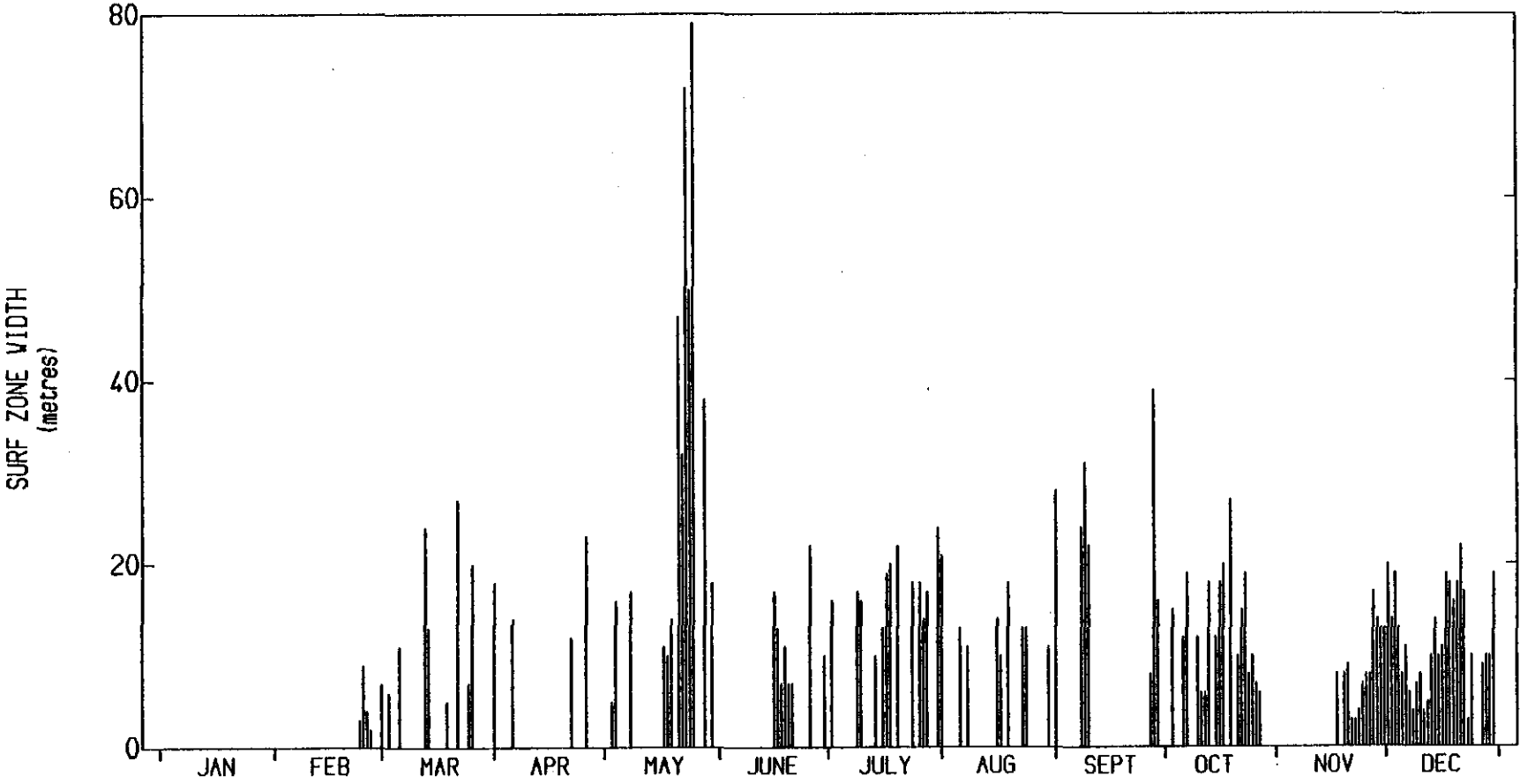
Bramston Beach

COPE

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905



SURF ZONE WIDTH SUMMARY - 1986

No. of Observations : 128 AFTERNOON OBSERVATIONS Mean Surf Zone Width = 15.0 m

SURF ZONE WIDTH- AFTERNOON 1986

COPE

Bramston Beach

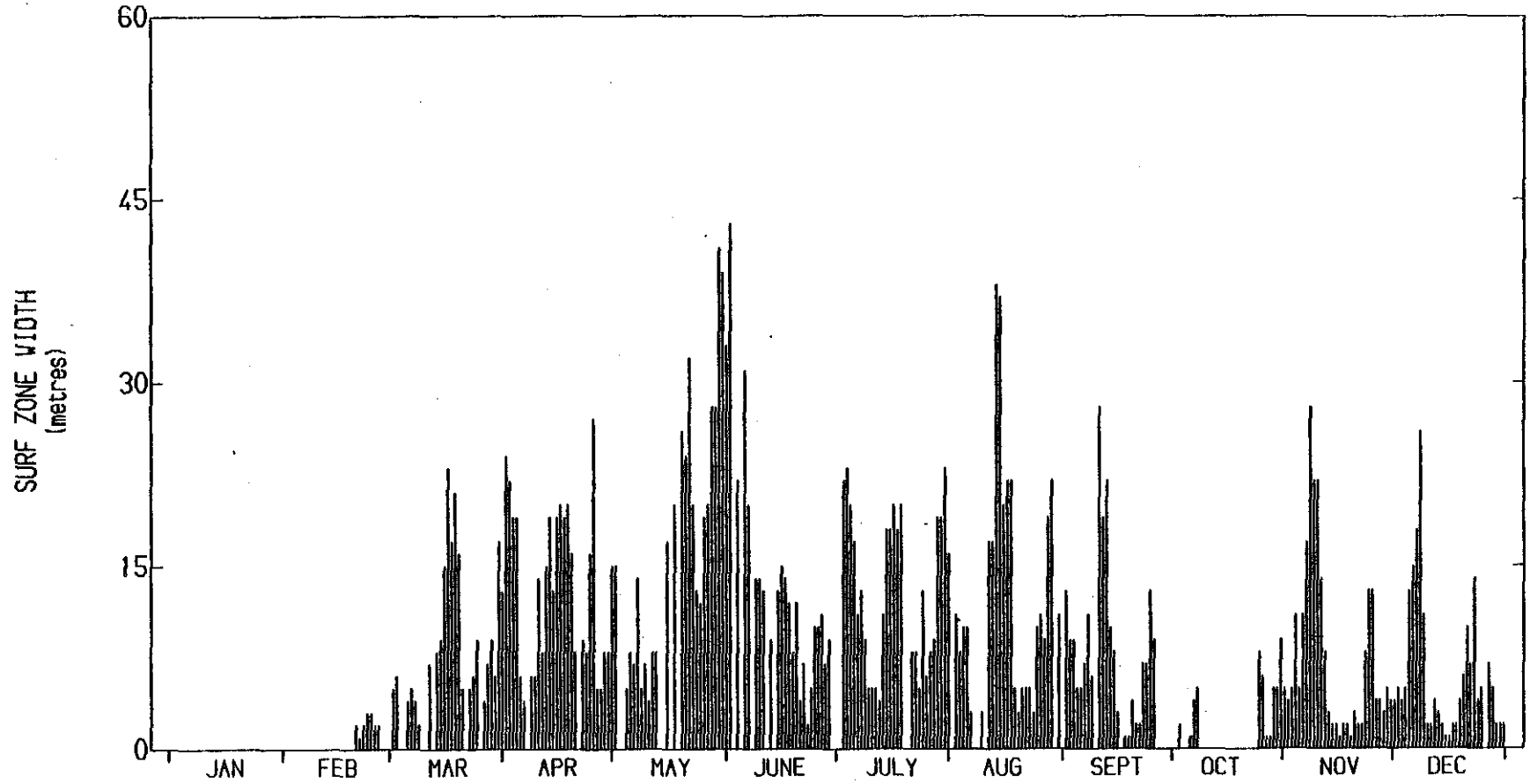
Figure 17

C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH NORTH MULGRAVE SHIRE 2908



SURF ZONE WIDTH SUMMARY - 1986

No. of Observations : 255 MORNING OBSERVATIONS Mean Surf Zone Width = 10.7 m

SURF ZONE WIDTH-MORNING 1986

COPE

Bramston Beach North

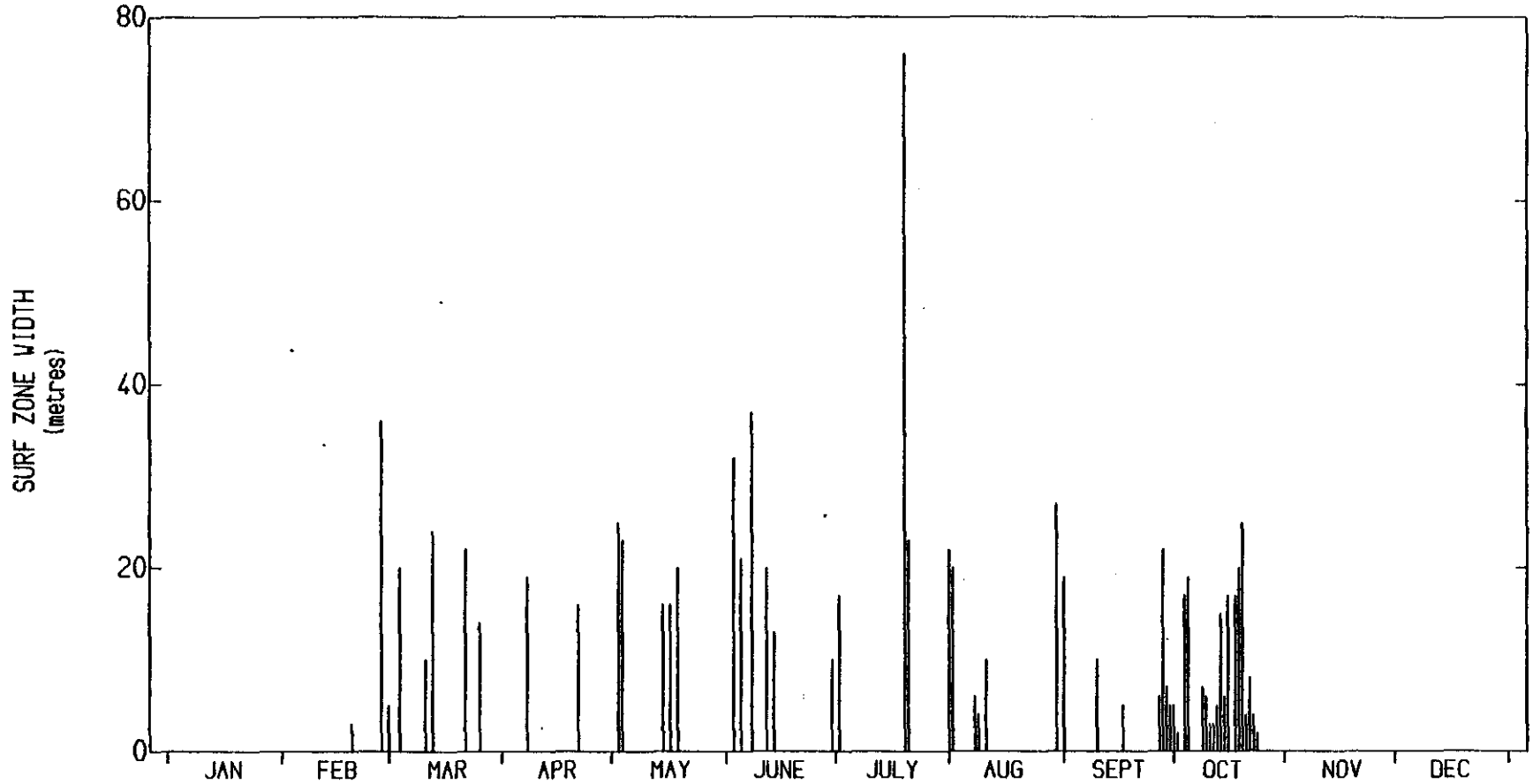
Figure 18

C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH NORTH MULGRAVE SHIRE 2908



SURF ZONE WIDTH SUMMARY - 1986

No. of Observations : 56 AFTERNOON OBSERVATIONS Mean Surf Zone Width = 15.5 m

SURF ZONE WIDTH- AFTERNOON 1986

COPE

Bramston Beach North

Figure 19

C 23.1

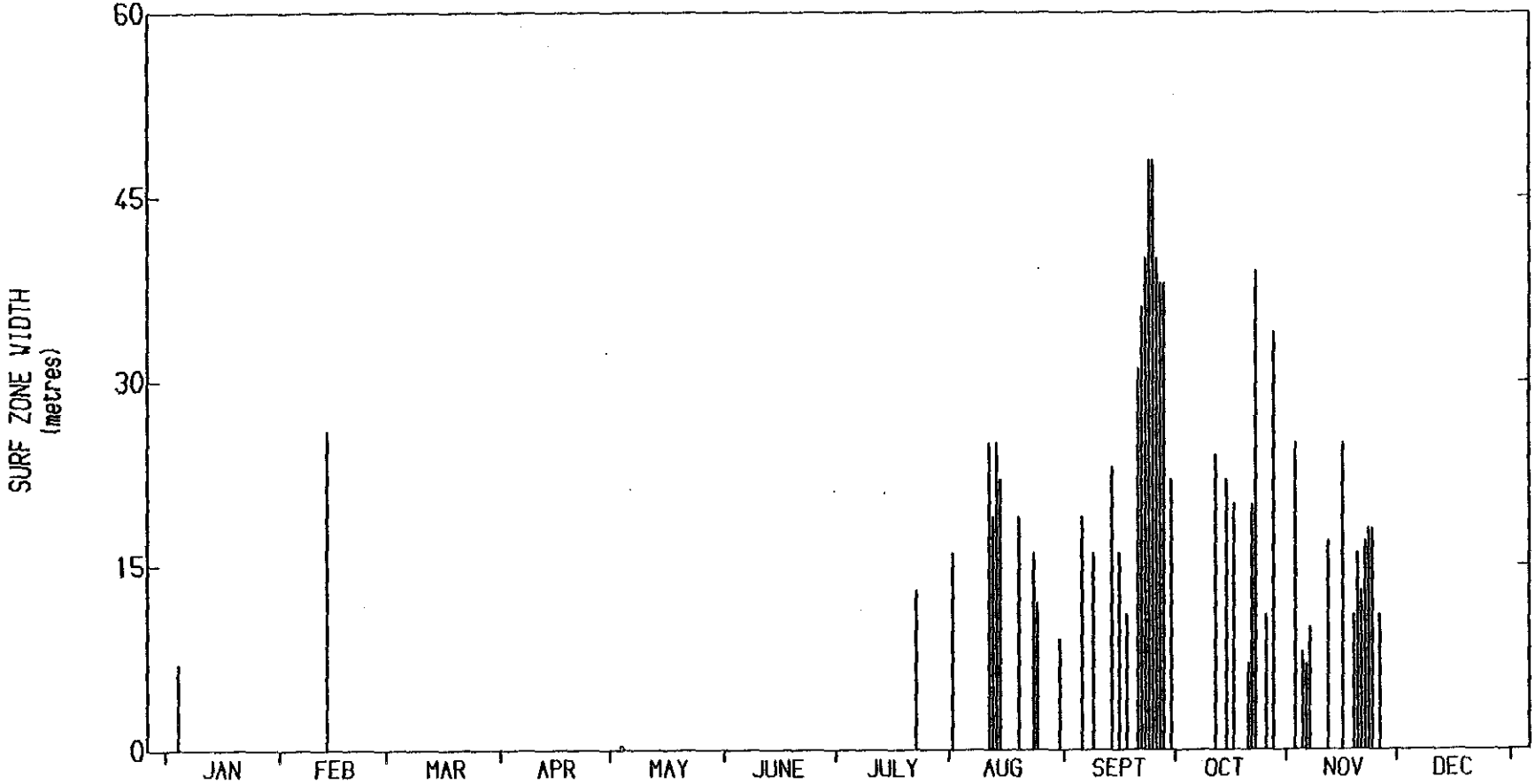
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH

MULGRAVE SHIRE

2905



SURF ZONE WIDTH SUMMARY - 1987

No. of Observations : 47

MORNING OBSERVATIONS

Mean Surf Zone Width = 21.4 m

SURF ZONE WIDTH-MORNING 1987

COPE

Bramston Beach

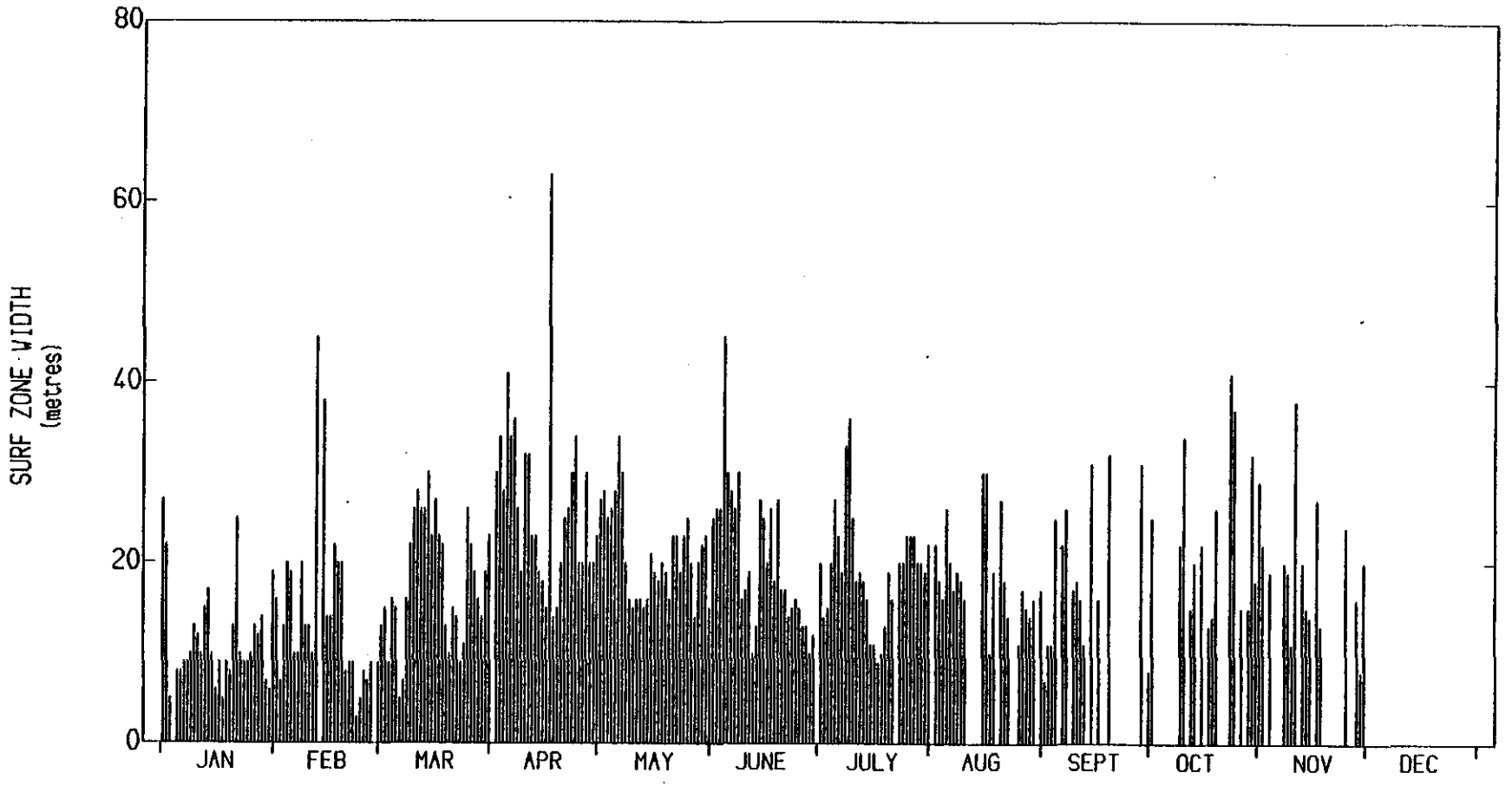
Figure 20

C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH MULGRAVE SHIRE 2905



SURF ZONE WIDTH SUMMARY - 1987

No. of Observations : 279 AFTERNOON OBSERVATIONS Mean Surf Zone Width = 19.0 m

SURF ZONE WIDTH- AFTERNOON 1987

COPE

Bramston Beach

Figure 21

C 23.1

Beach Protection Authority

SURF ZONE WIDTH-MORNING 1987

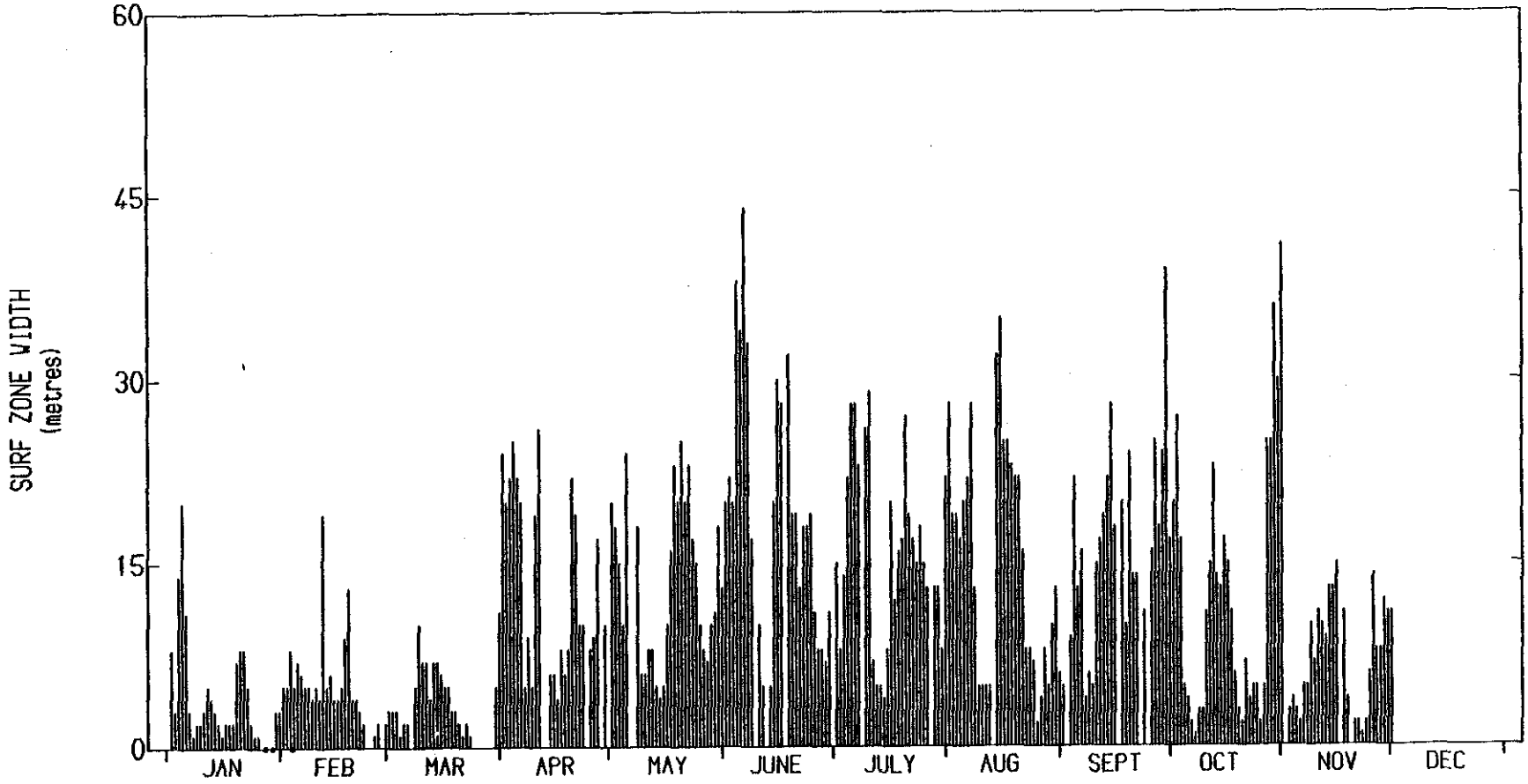
COPE

Bramston Beach North

Figure 22
C 23.1

COPE - Coastal Observation Programme Engineering

BRAMSTON BEACH NORTH MULGRAVE SHIRE 2908



SURF ZONE WIDTH SUMMARY - 1987

No. of Observations : 307 MORNING OBSERVATIONS Mean Surf Zone Width = 11.7 m

Beach Protection Authority

LITTORAL CURRENTS-MORNING 1981

COPE

Bramston Beach

Figure 23

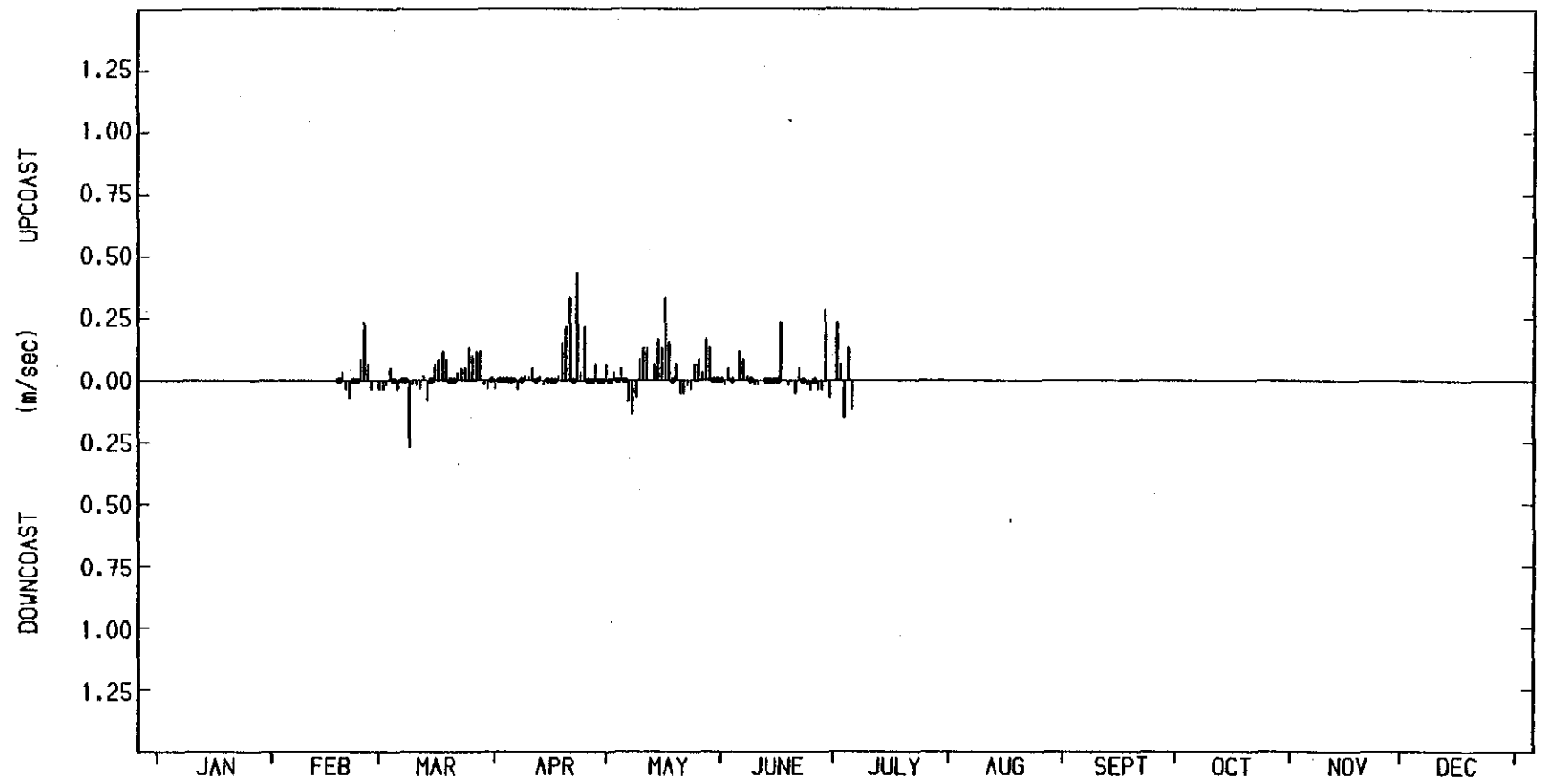
C 23.1

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1981

Mean Vel = .033 m/sec (up)

Mean Upcoast Vel = .110 m/sec

Mean Downcoast Vel = .050 m/sec

MORNING OBSERVATIONS - (133 recordings)

Beach Protection Authority

LITTORAL CURRENTS-AFTERNOON 1981

COPE

Bramston Beach

Figure 24

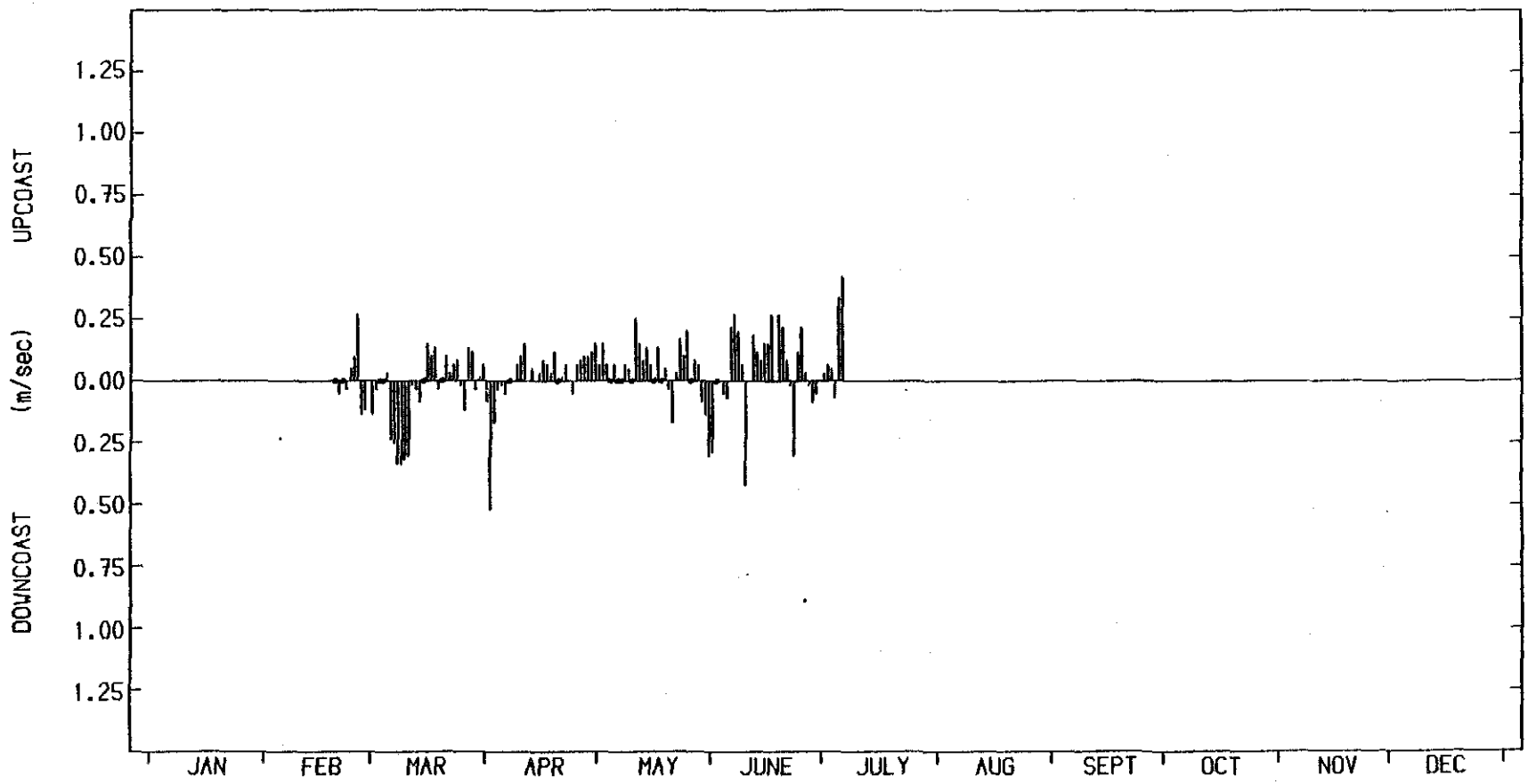
C 23.1

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1981

Mean Vel = .022 m/sec (up)

Mean Upcoast Vel = .116 m/sec

Mean Downcoast Vel = .136 m/sec

AFTERNOON OBSERVATIONS - (129 recordings)

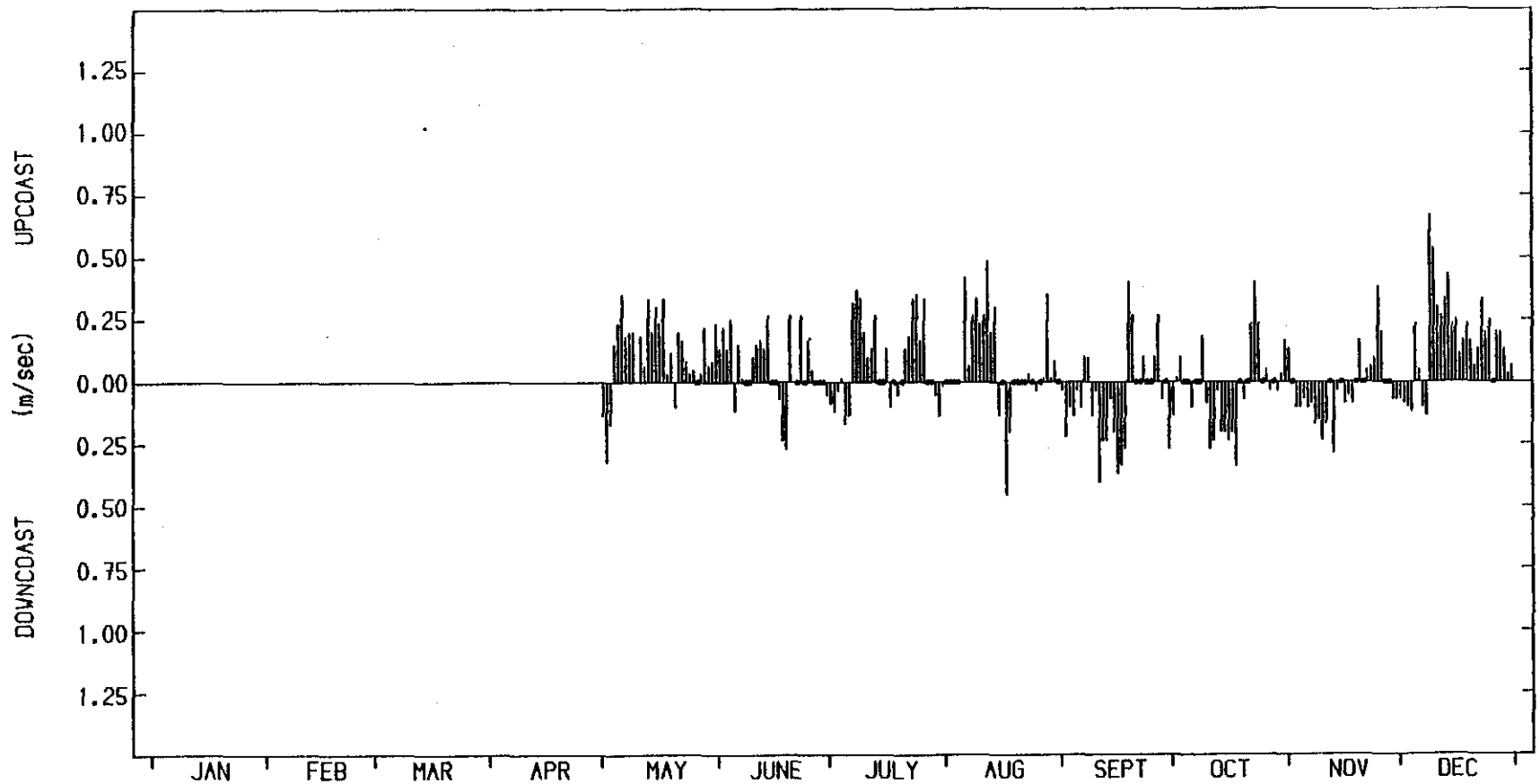
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1983

Mean Vel = .048 m/sec (up)

Mean Upcoast Vel = .195 m/sec

Mean Downcoast Vel = .142 m/sec

MORNING OBSERVATIONS - (242 recordings)

LITTORAL CURRENTS-MORNING 1983

COPE

Bramston Beach

Figure 25

C 23.1

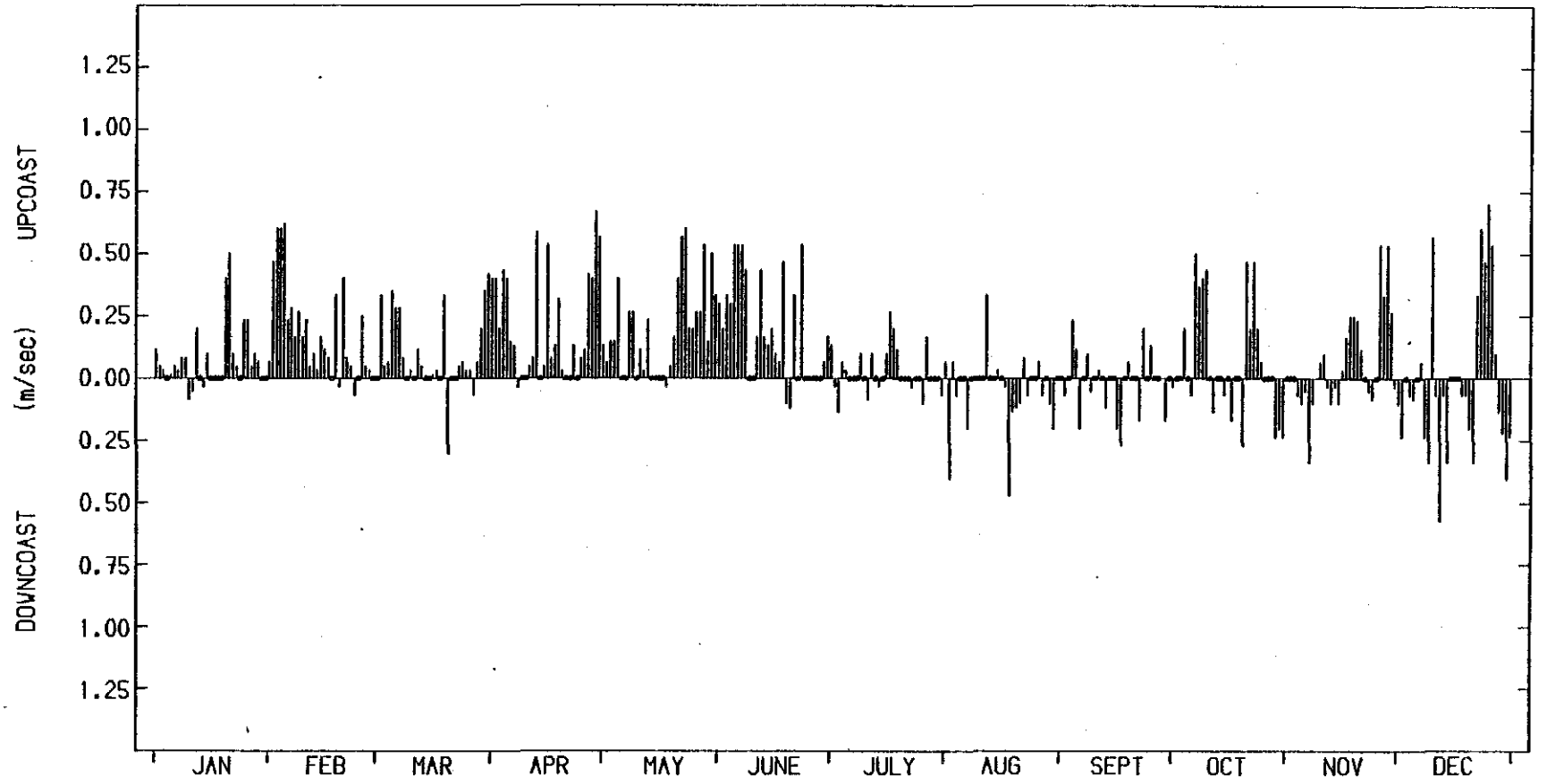
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENTS-MORNING 1984

LITTORAL CURRENT SUMMARY - 1984

Mean Vel = .086 m/sec (up)

Mean Upcoast Vel = .229 m/sec

Mean Downcoast Vel = .140 m/sec

MORNING OBSERVATIONS - (364 recordings)

COPE

Bramston Beach

Figure 26

C 23.1

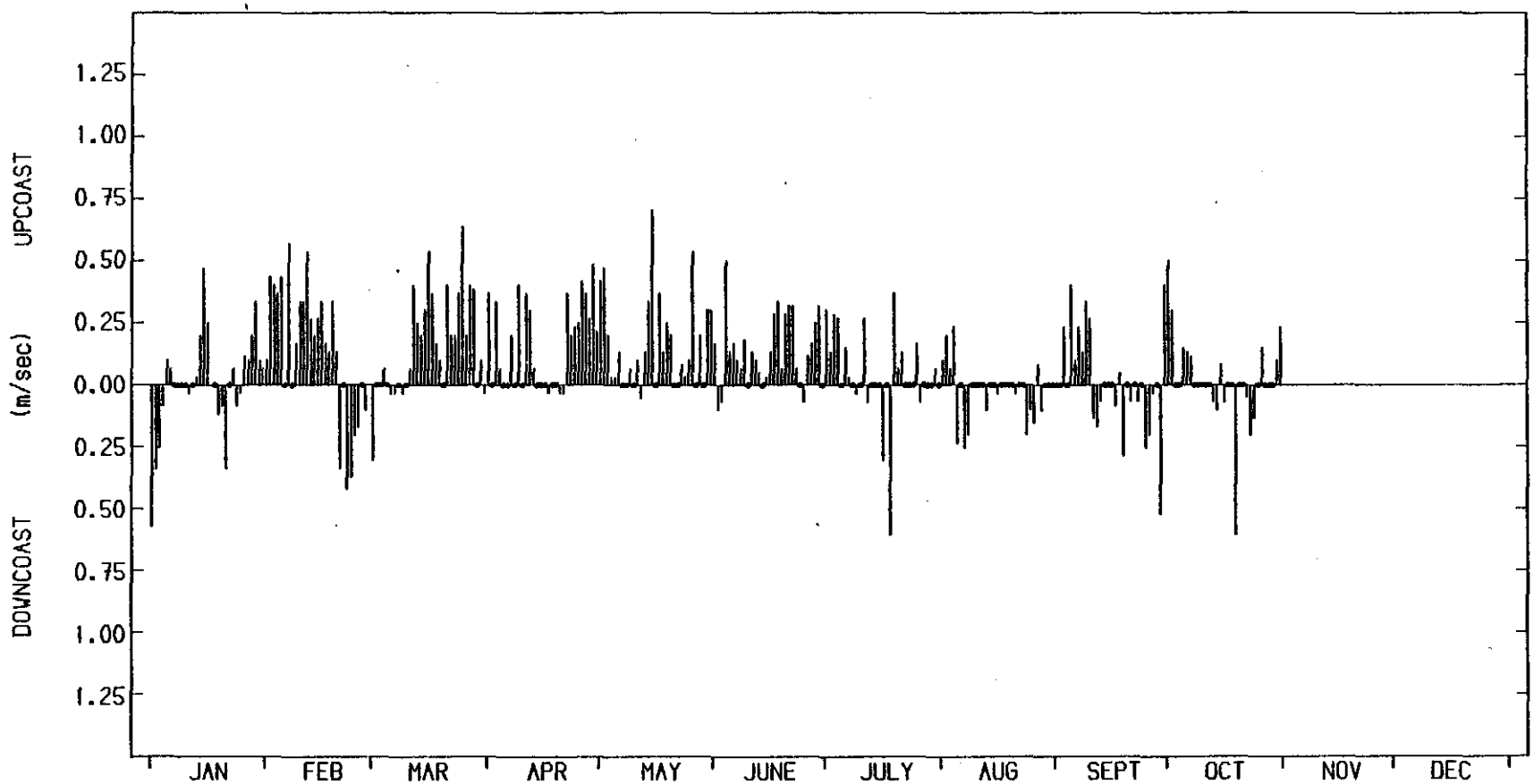
Beach Protection Authority

COPE - Coastal Observation
Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1985

Mean Vel = .080 m/sec (up)

Mean Upcoast Vel = .232 m/sec

Mean Downcoast Vel = .162 m/sec

MORNING OBSERVATIONS - (303 recordings)

LITTORAL CURRENTS-MORNING 1985

COPE

Bramston Beach

Figure 27

C 23.1

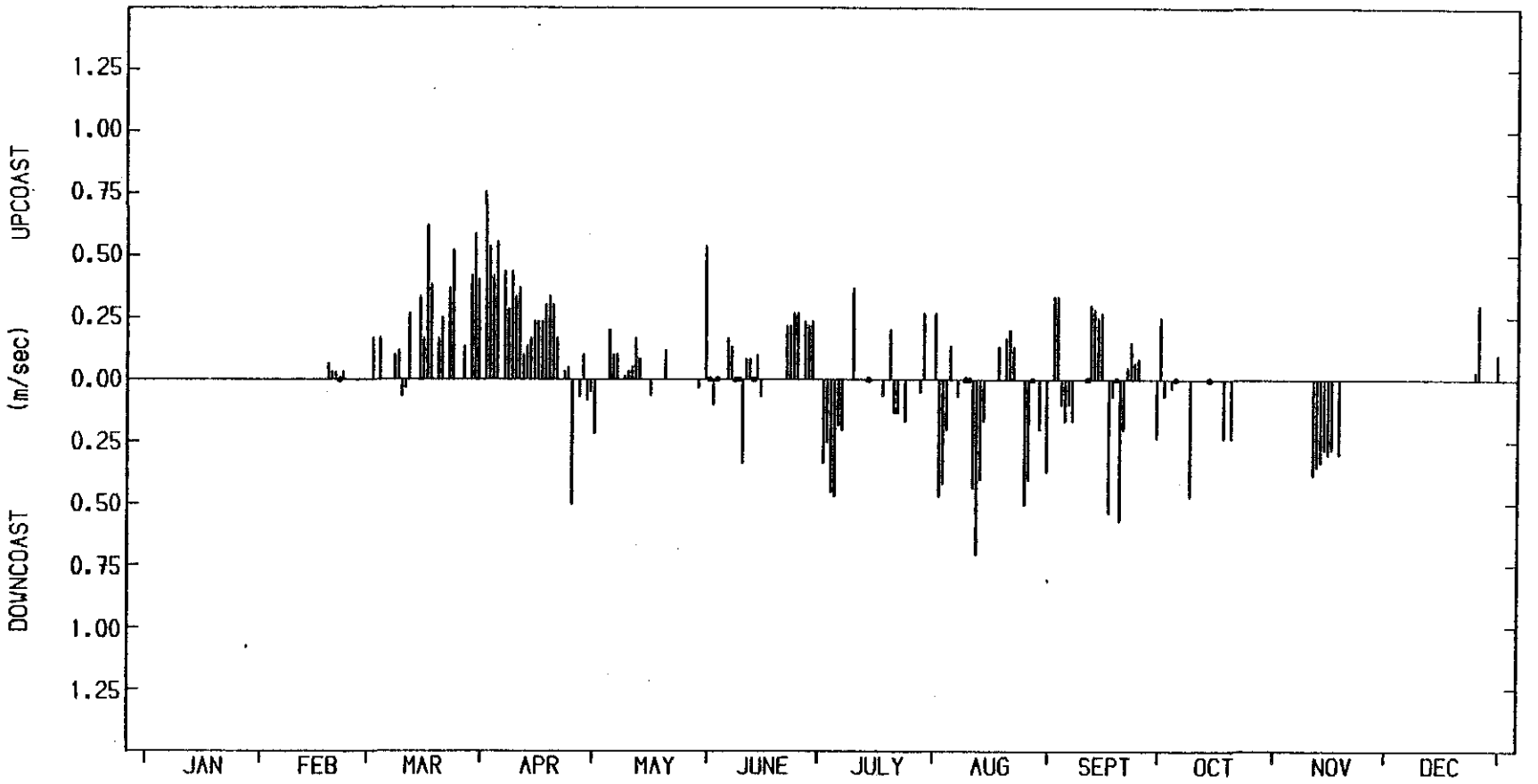
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1986

Mean Vel = .040 m/sec (up)

Mean Upcoast Vel = .228 m/sec

Mean Downcoast Vel = .246 m/sec

MORNING OBSERVATIONS - (158 recordings)

LITTORAL CURRENTS-MORNING 1986

COPE

Bramston Beach

Figure 28

C 23.1

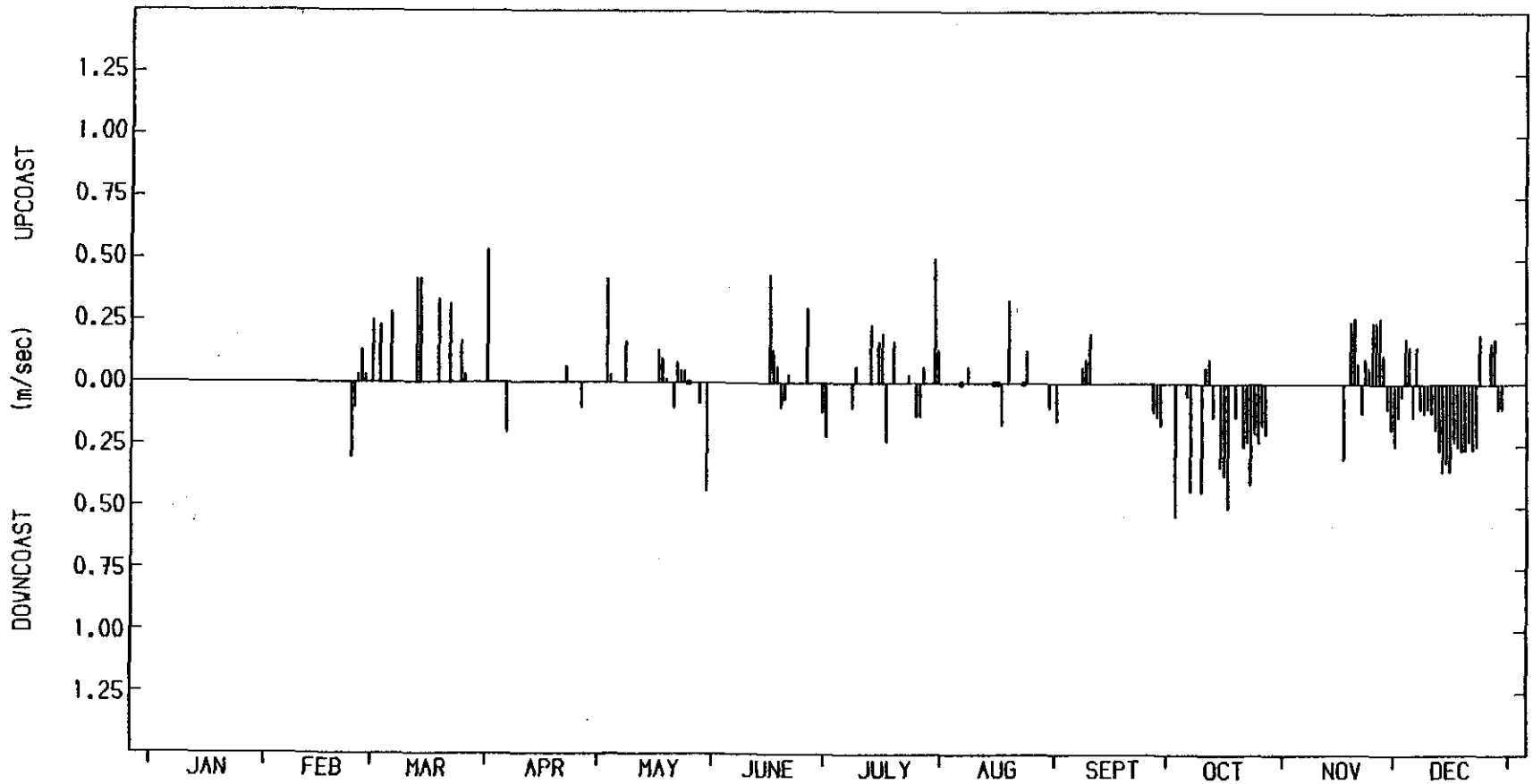
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1986

Mean Vel = -.019 m/sec (down)

Mean Upcoast Vel = .176 m/sec

Mean Downcoast Vel = .206 m/sec

AFTERNOON OBSERVATIONS - (128 recordings)

LITTORAL CURRENTS- AFTERNOON 1986

COPE

Bramston Beach

Figure 29

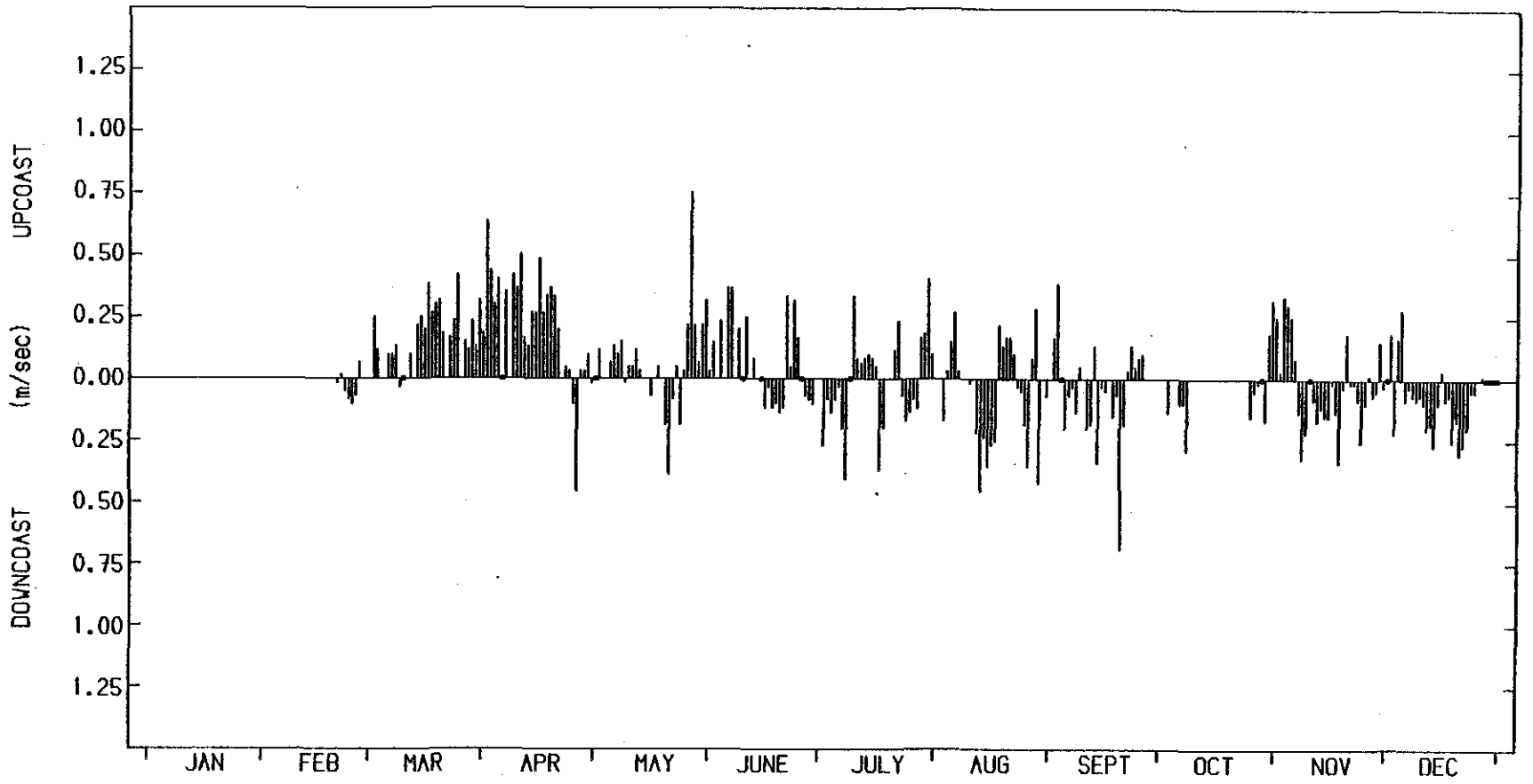
C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH NORTH 2908



LITTORAL CURRENT SUMMARY - 1986

Mean Vel = .030 m/sec (up)

Mean Upcoast Vel = .191 m/sec

Mean Downcoast Vel = .148 m/sec

MORNING OBSERVATIONS - (255 recordings)

LITTORAL CURRENTS-MORNING 1986

COPE

Bramston Beach North

Figure 30

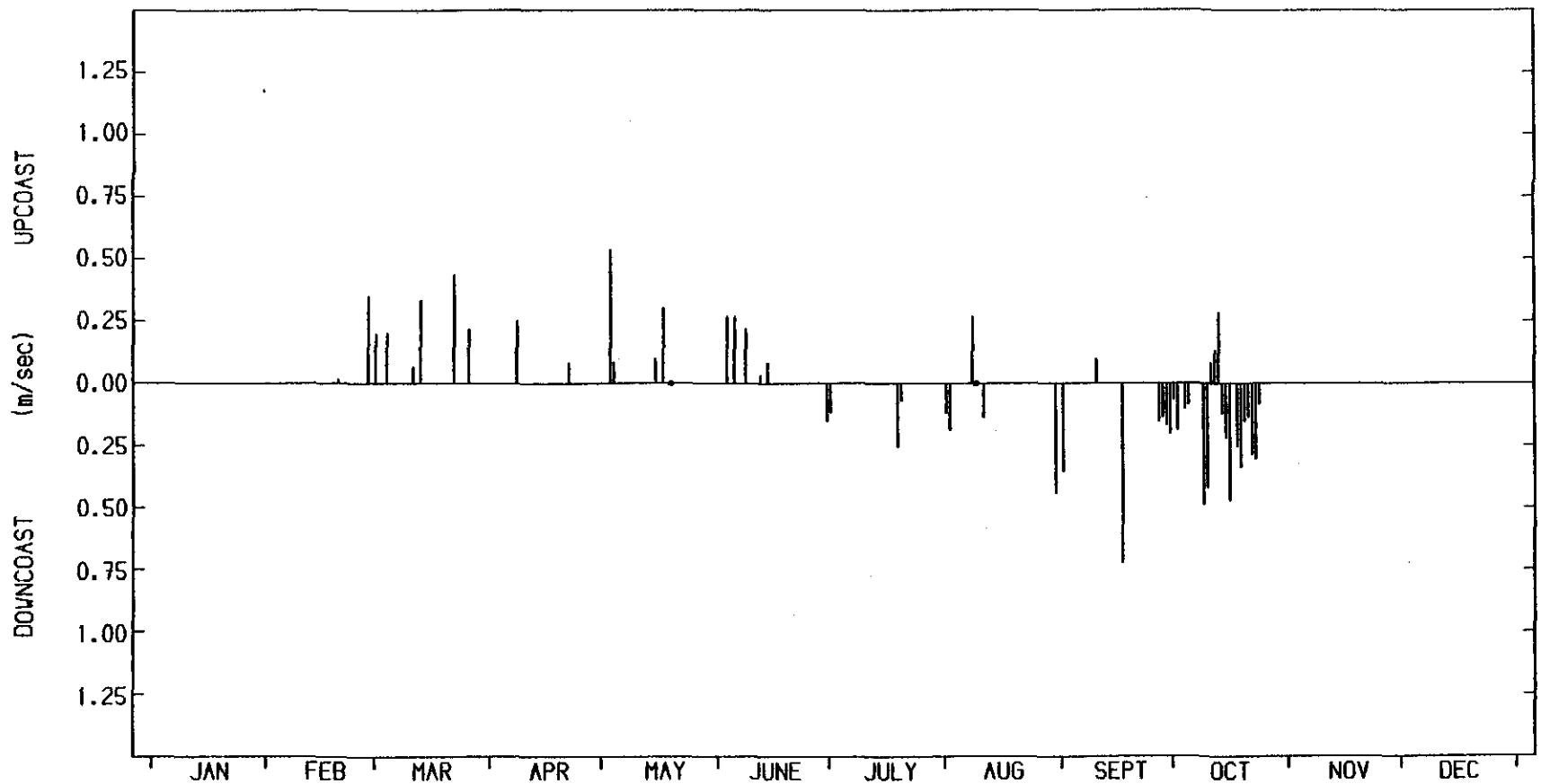
C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH NORTH 2908



LITTORAL CURRENT SUMMARY - 1986

Mean Vel = -.035 m/sec (down)

Mean Upcoast Vel = .204 m/sec

Mean Downcoast Vel = .228 m/sec

AFTERNOON OBSERVATIONS - (56 recordings)

LITTORAL CURRENTS- AFTERNOON 1986

COPE

Bramston Beach North

Figure 31

C 23.1

Beach Protection Authority

LITTORAL CURRENTS-MORNING 1987

COPE

Bramston Beach

Figure 32

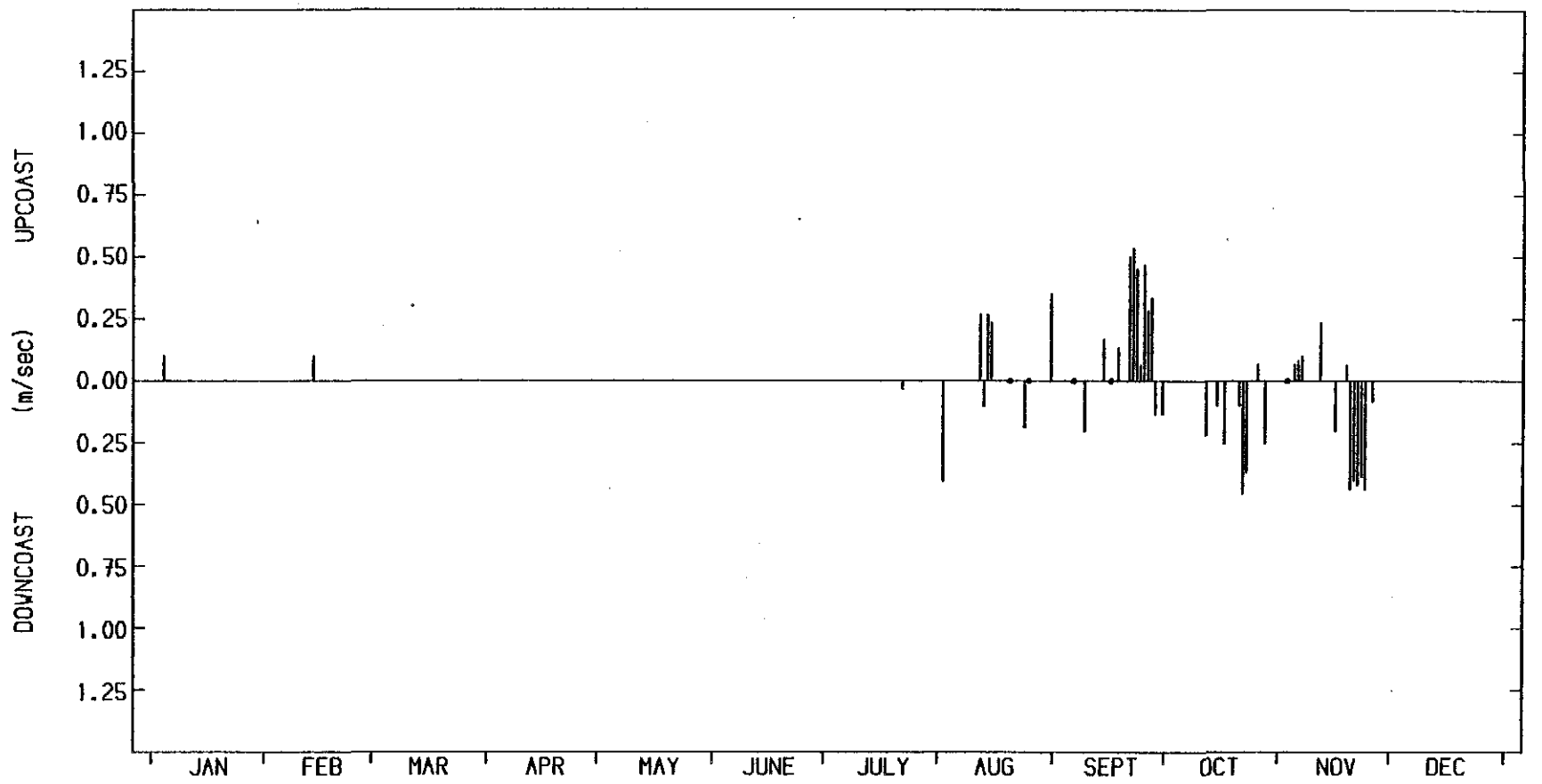
C 23.1

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1987

Mean Vel = -.009 m/sec (down)

Mean Upcoast Vel = .232 m/sec

Mean Downcoast Vel = .251 m/sec

MORNING OBSERVATIONS - (47 recordings)

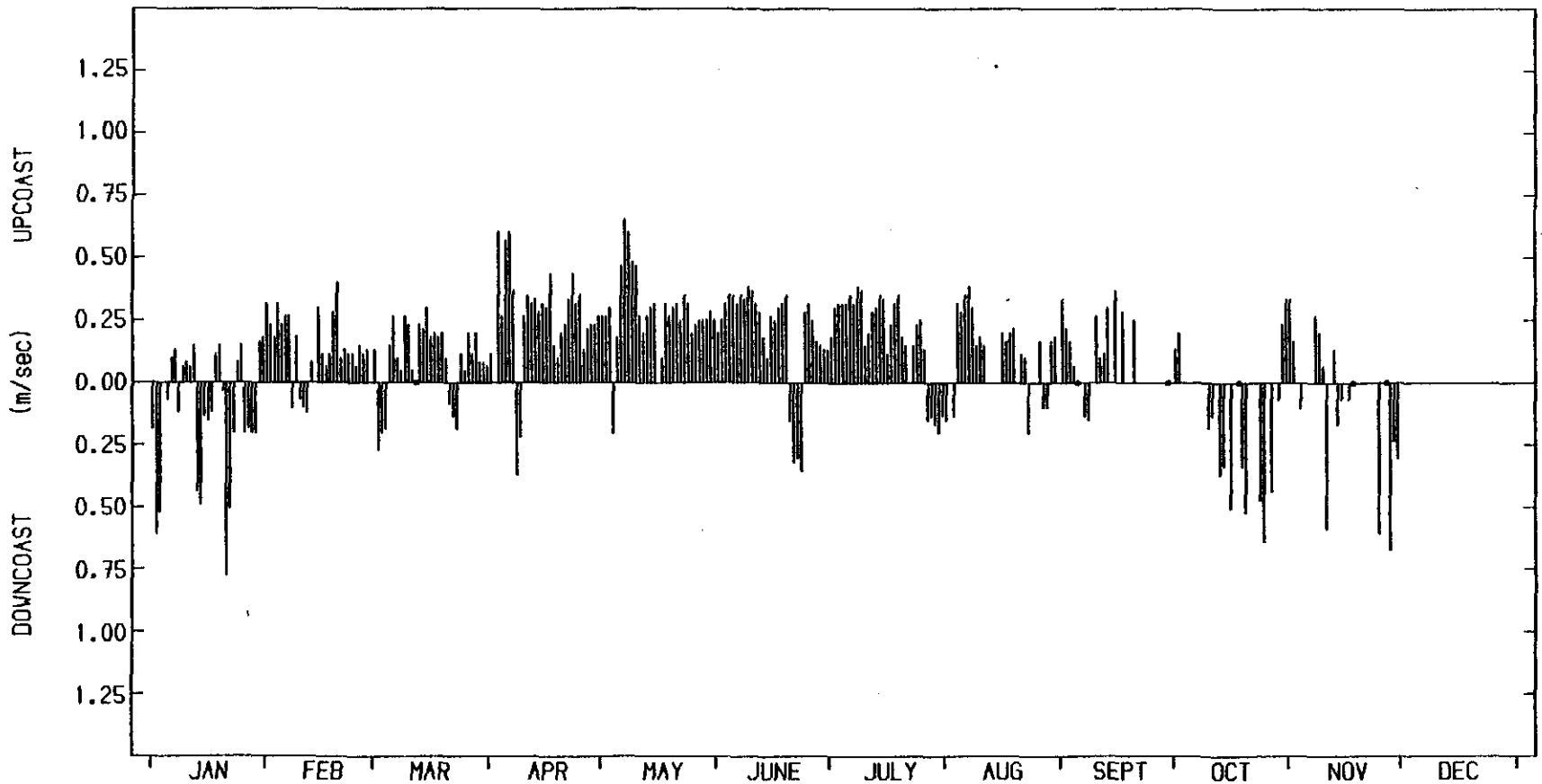
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905



LITTORAL CURRENT SUMMARY - 1987

Mean Vel = .115 m/sec · (up)

Mean Upcoast Vel = .238 m/sec

Mean Downcoast Vel = .252 m/sec

AFTERNOON OBSERVATIONS - (278 recordings)

LITTORAL CURRENTS- AFTERNOON 1987

COPE

Bramston Beach

Figure 33

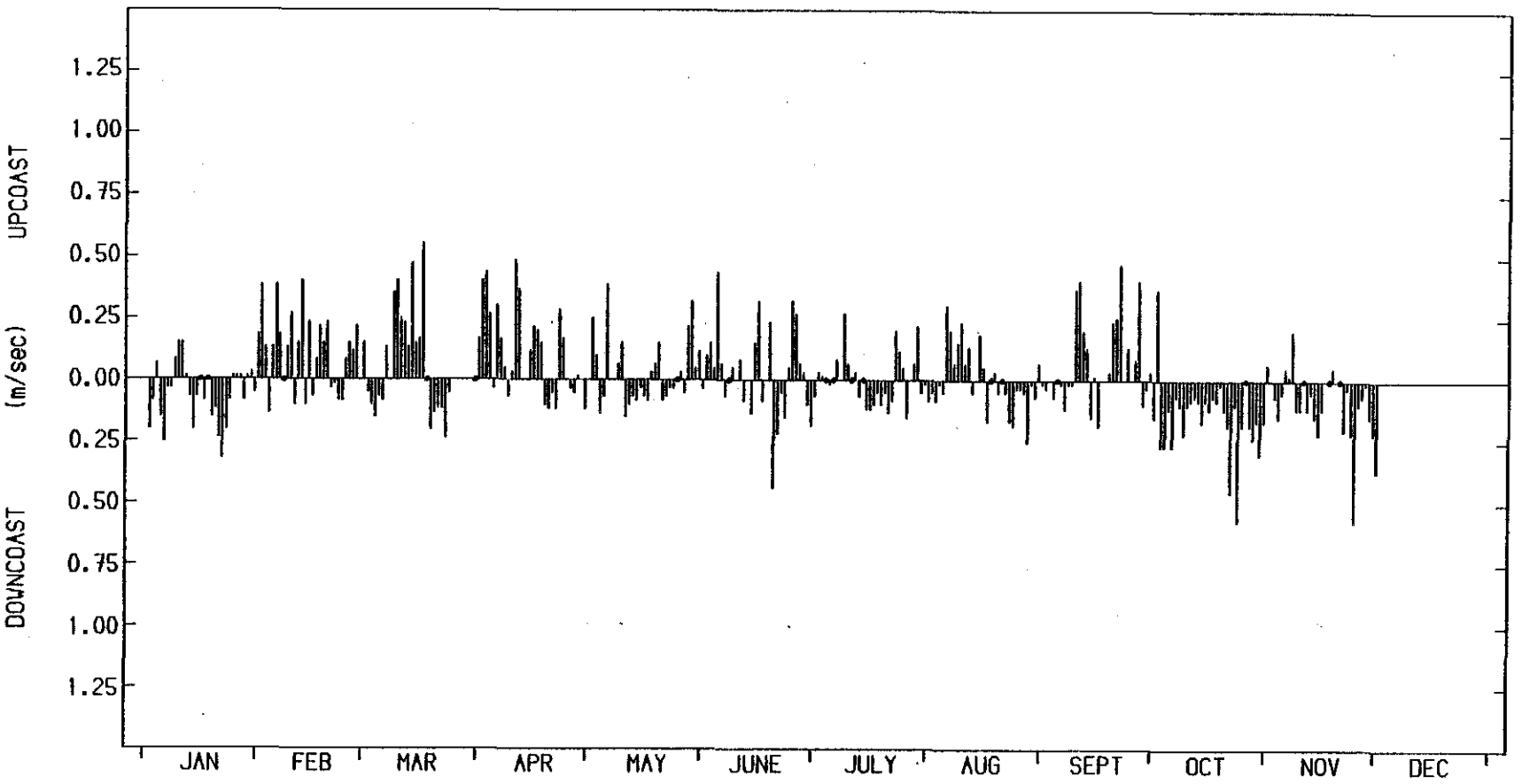
C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH NORTH 2908



LITTORAL CURRENT SUMMARY - 1987

Mean Vel = .009 m/sec (up)

Mean Upcoast Vel = .172 m/sec

Mean Downcoast Vel = .117 m/sec

MORNING OBSERVATIONS - (306 recordings)

LITTORAL CURRENTS-MORNING 1987

COPE

Bramston Beach North

Figure 34
C 23.1

Beach Protection Authority

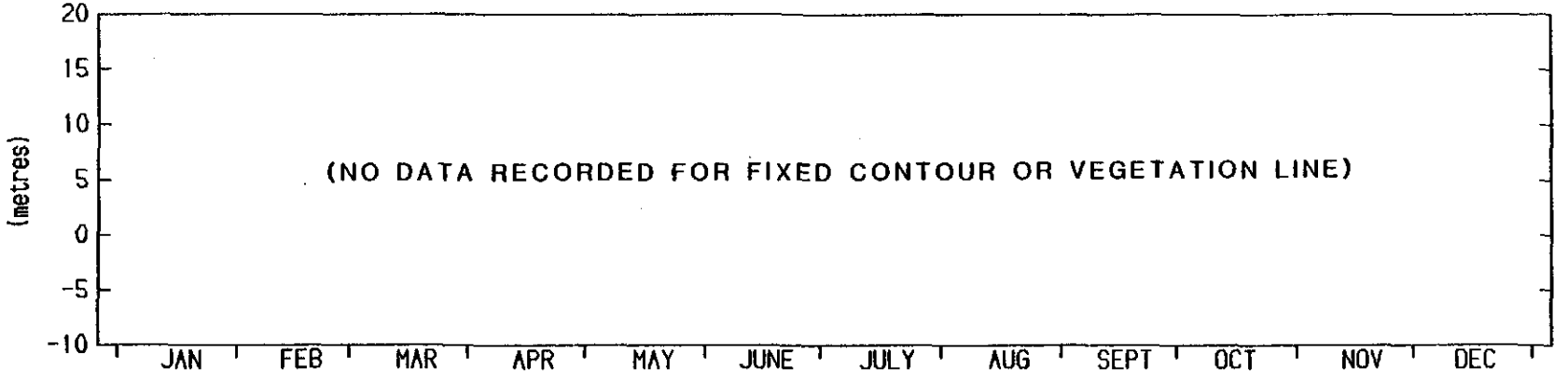
BEACH PROFILE PARAMETERS- 1981

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905

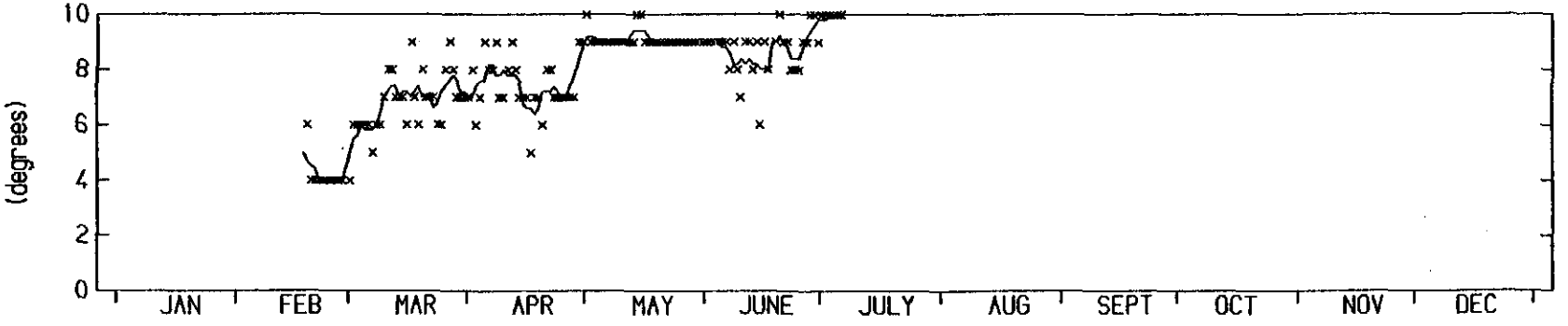


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1981

×××× Indicates Distance to Fixed Contour : 0 Observations

Fixed Contour Level is approx 1.5 m above AHD

— Indicates Distance to Vegetation Line : 0 Observations



FORESHORE SLOPE - 1981

Five Day Moving Average

No. of Observations : 137

COPE

Bramston Beach

Figure 35

C 23.1

Beach Protection Authority

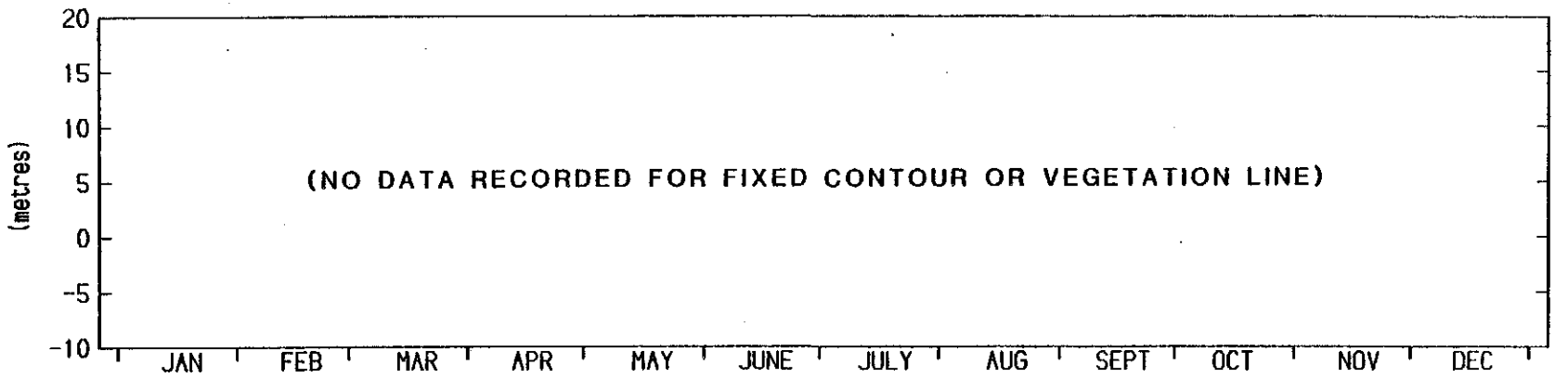
BEACH PROFILE PARAMETERS-1983

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905

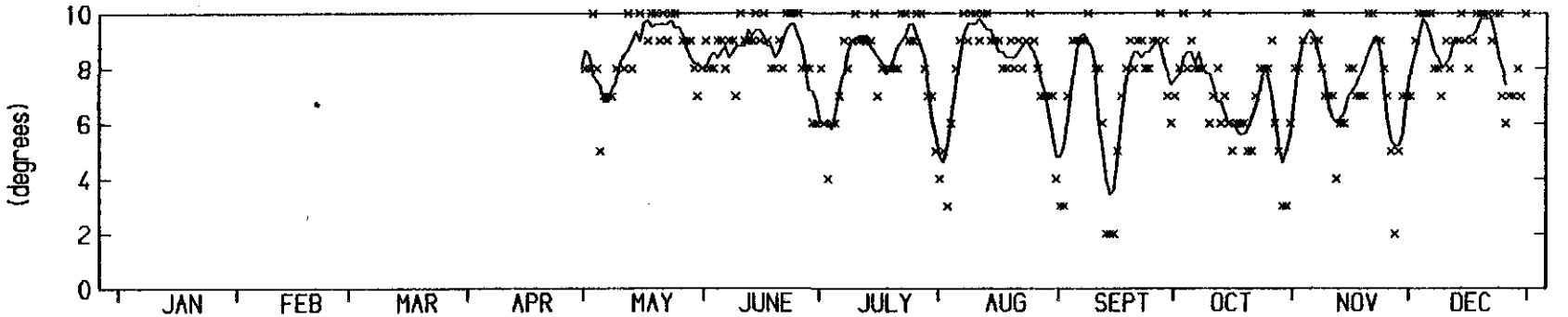


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1983

×××× Indicates Distance to Fixed Contour : 0 Observations

Fixed Contour Level is approx 1.5 m above AHD

— Indicates Distance to Vegetation Line : 0 Observations



FORESHORE SLOPE - 1983

Five Day Moving Average

No. of Observations : 240

COPE

Bramston Beach

Figure 36

C 23.1

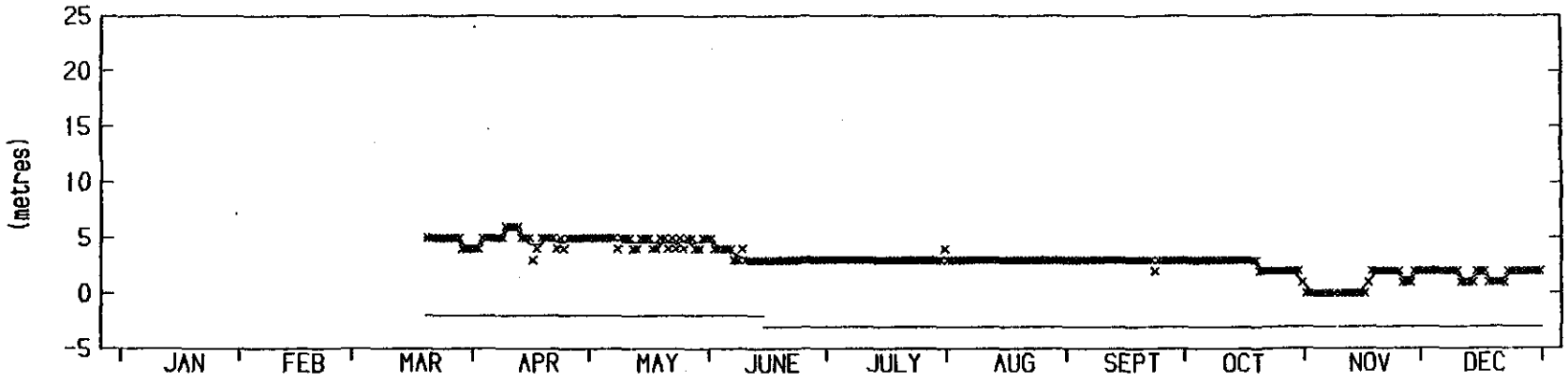
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905

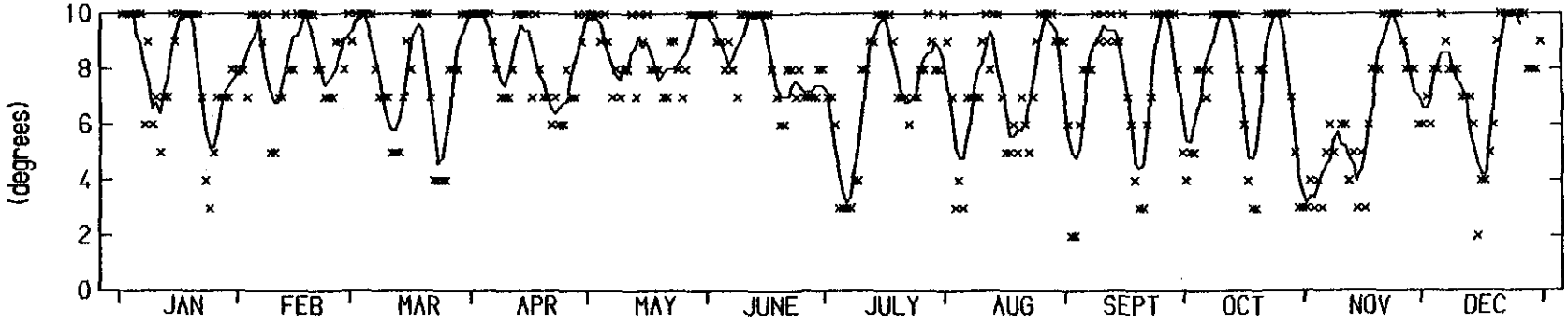


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1984

xxxxx Indicates Distance to Fixed Contour : 286 Observations

— Indicates Distance to Vegetation Line : 286 Observations

Fixed Contour Level is approx 1.5 m above AHD



FORESHORE SLOPE - 1984

Five Day Moving Average

No. of Observations : 365

BEACH PROFILE PARAMETERS-1984

COPE

Bramston Beach

Figure 37

C 23.1

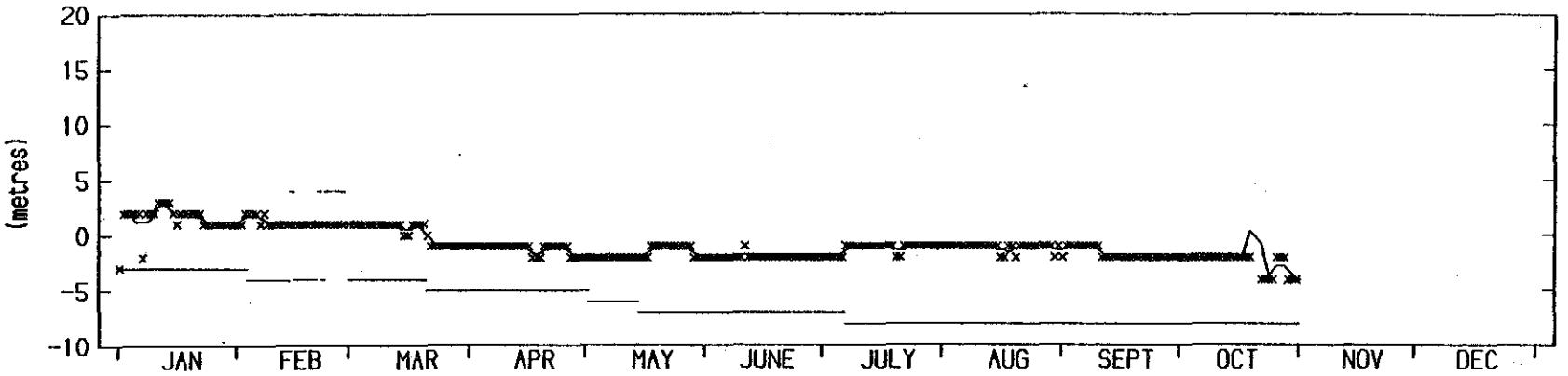
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905

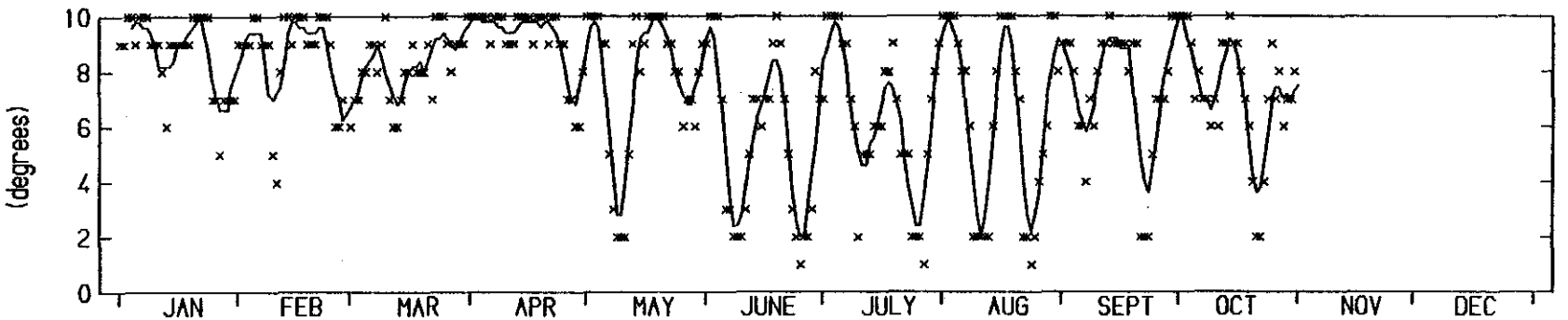


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1985

xxxxx Indicates Distance to Fixed Contour : 304 Observations

— Indicates Distance to Vegetation Line : 304 Observations

Fixed Contour Level is approx 1.5 m above AHD



FORESHORE SLOPE - 1985

Five Day Moving Average

No. of Observations : 304

BEACH PROFILE PARAMETERS-1985

COPE

Bramston Beach

Figure 38

C 23.1

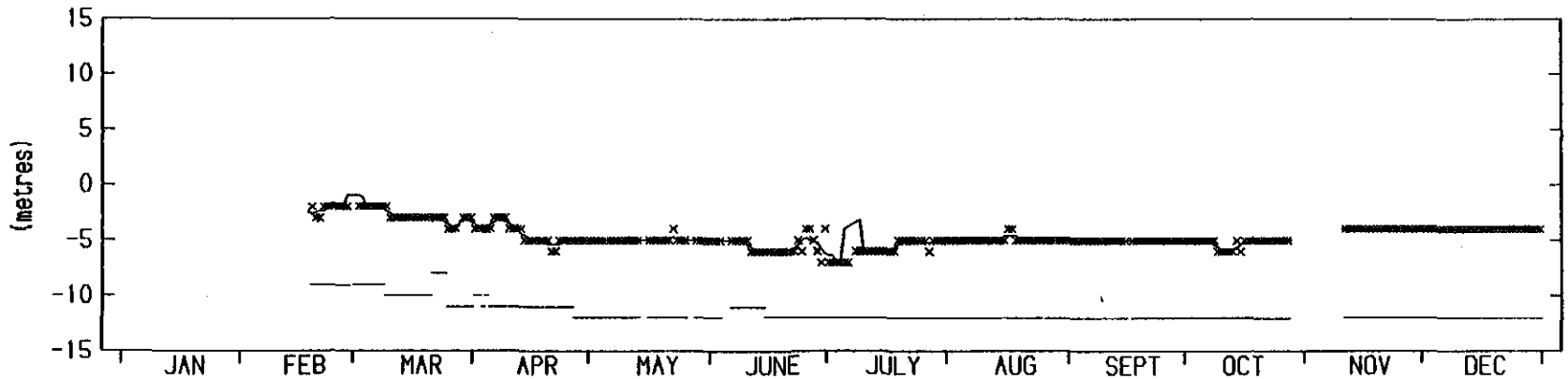
Beach Protection Authority

COPE - Coastal Observation
Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905

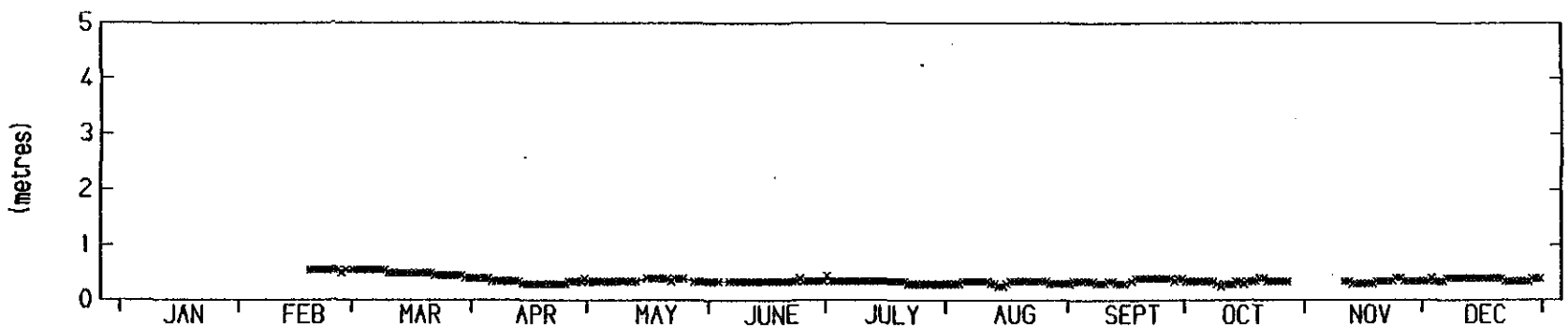


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1986

xxxxx Indicates Distance to Fixed Contour : 294 Observations

— Indicates Distance to Vegetation Line : 294 Observations

Fixed Contour Level is approx 1.5 m above AHD



SAND LEVEL AT POLE - 1986

Five Day Moving Average

No. of Observations : 295

BEACH PROFILE PARAMETERS- 1986

COPE

Bramston Beach

Figure 39

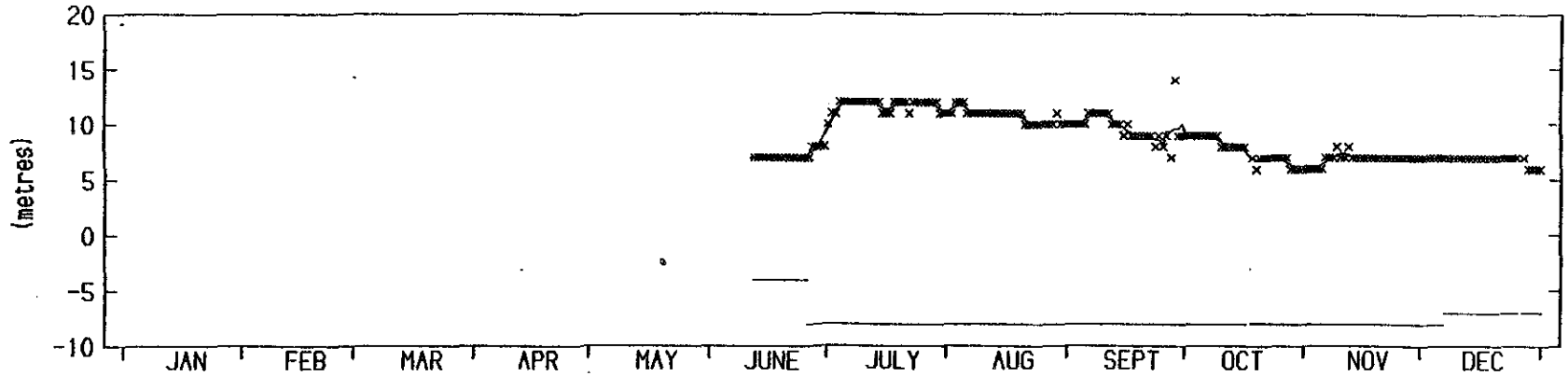
C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH NORTH 2908

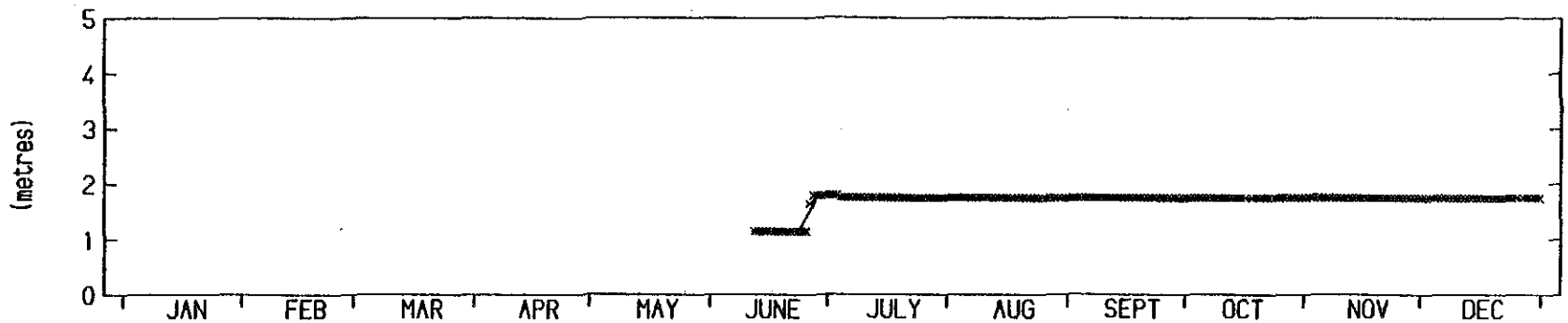


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1986

xxxxx Indicates Distance to Fixed Contour : 201 Observations

— Indicates Distance to Vegetation Line : 201 Observations

Fixed Contour Level is approx 1.5 m above AHD



SAND LEVEL AT POLE - 1986

Five Day Moving Average

No. of Observations : 201

BEACH PROFILE PARAMETERS-1986

COPE

Bramston Beach North

Figure 40
C 23.1

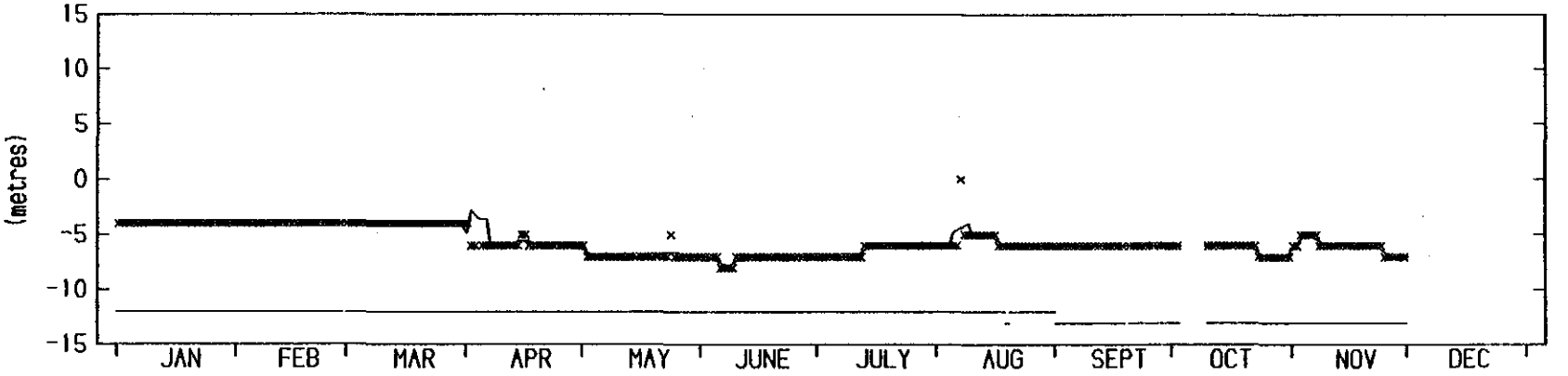
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH

2905

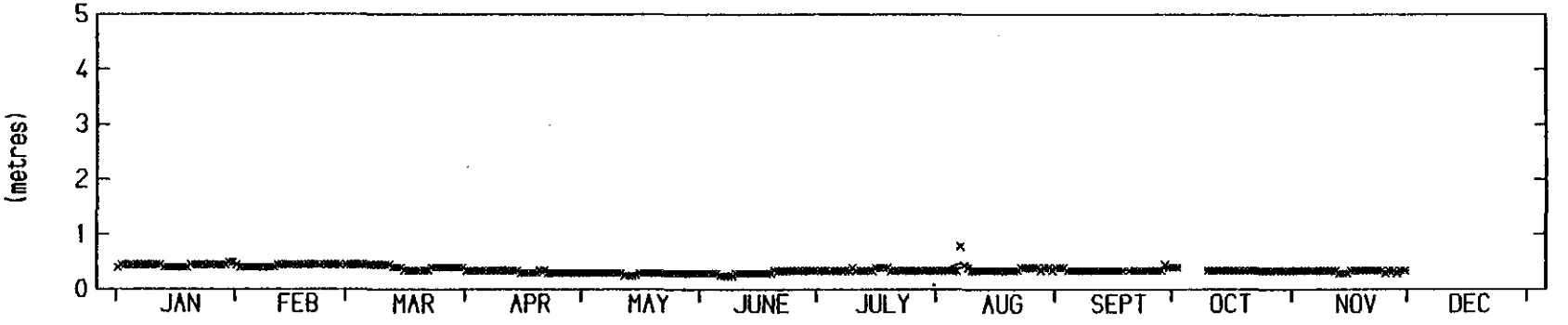


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1987

xxxxx Indicates Distance to Fixed Contour : 326 Observations

— Indicates Distance to Vegetation Line : 326 Observations

Fixed Contour Level is approx 1.5 m above AHD



SAND LEVEL AT POLE - 1987

Five Day Moving Average

No. of Observations : 326

BEACH PROFILE PARAMETERS-1987

COPE

Bramston Beach

Figure 41

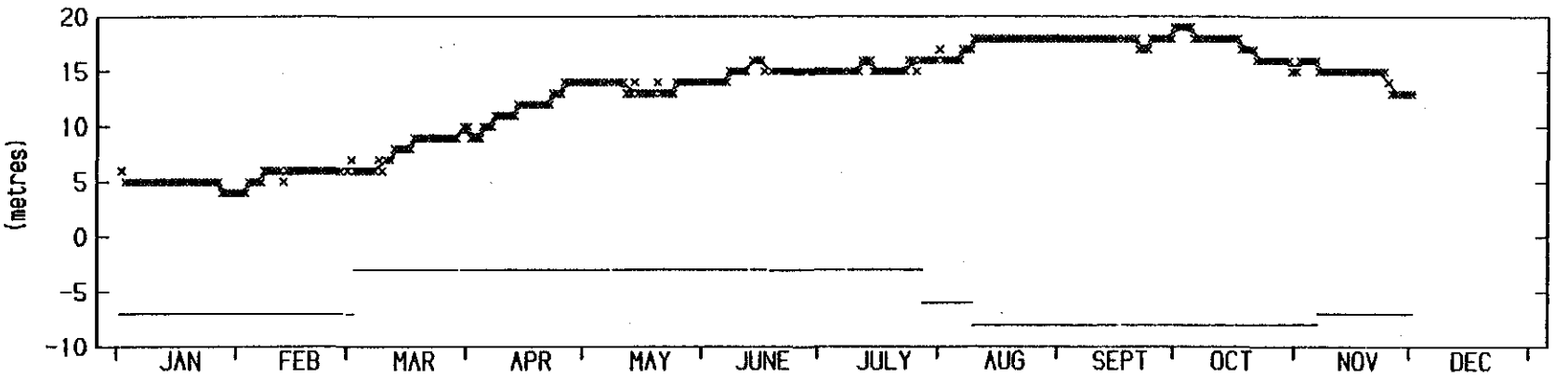
C 23.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

MULGRAVE SHIRE

BRAMSTON BEACH NORTH 2908

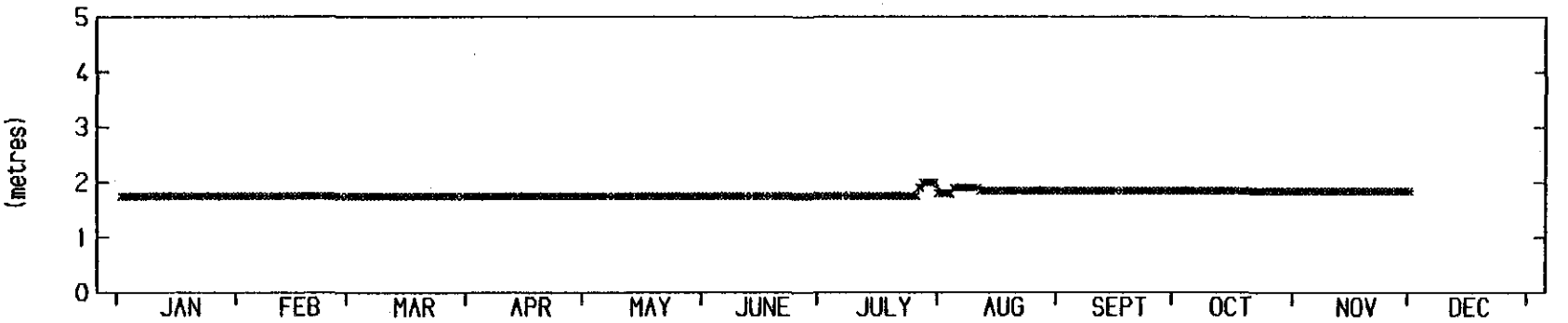


DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1987

xxxxx Indicates Distance to Fixed Contour : 328 Observations

— Indicates Distance to Vegetation Line : 328 Observations

Fixed Contour Level is approx 1.5 m above AHD



SAND LEVEL AT POLE - 1987

Five Day Moving Average

No. of Observations : 328

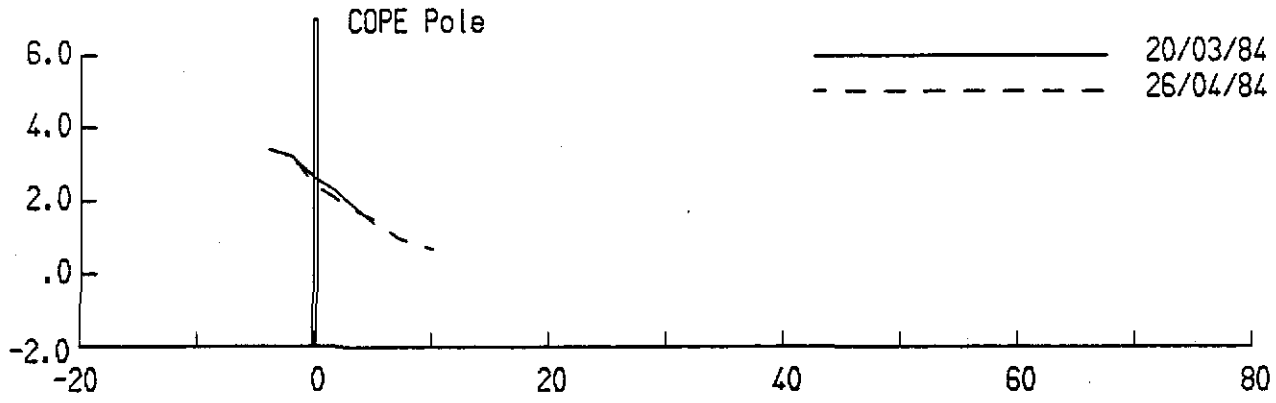
BEACH PROFILE PARAMETERS-1987

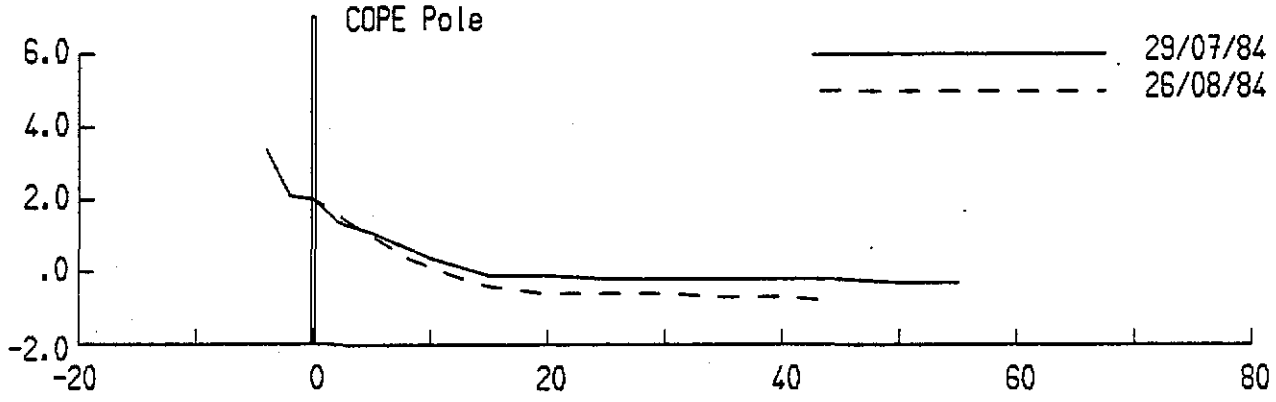
COPE

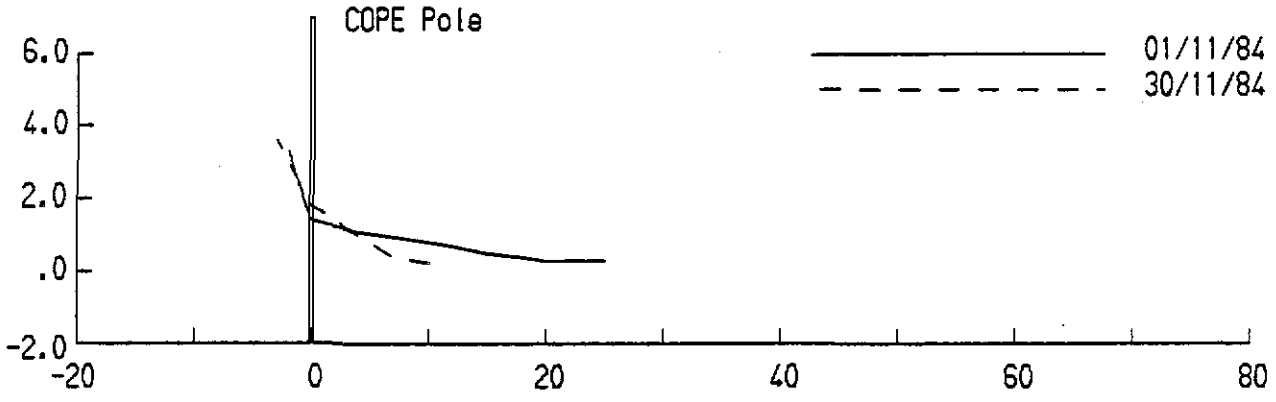
Bramston Beach North

Figure 42

C 23.1







Level Datum is A.H.D.

Distances and Levels are measured in Metres

Beach Protection Authority

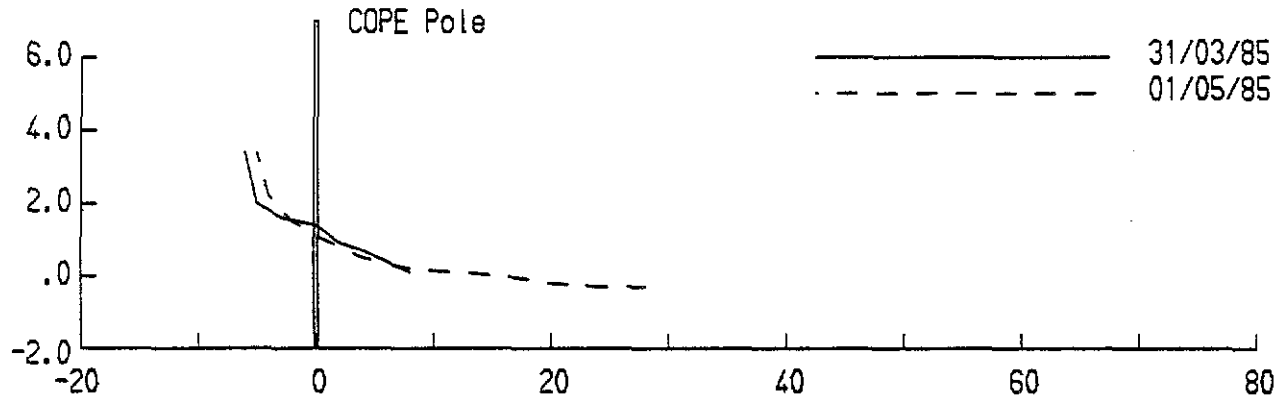
MONTHLY BEACH PROFILES

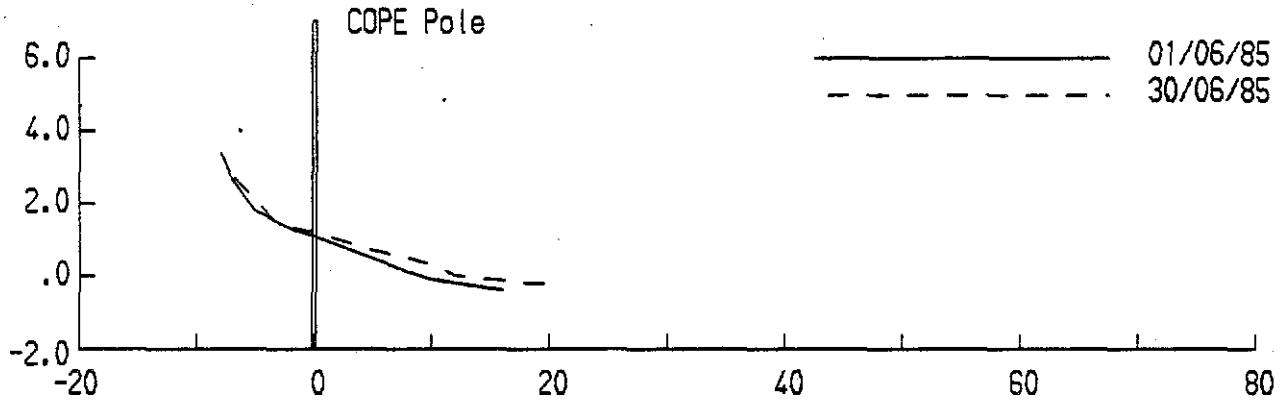
COPE

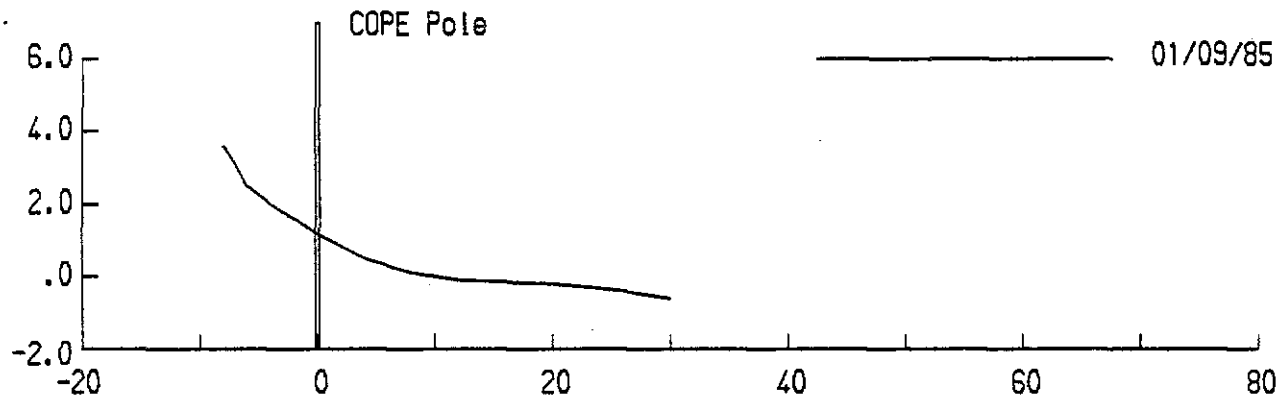
Bramston Beach

Figure 43

C 23.1







Level Datum is A.H.D.

Distances and Levels are measured in Metres

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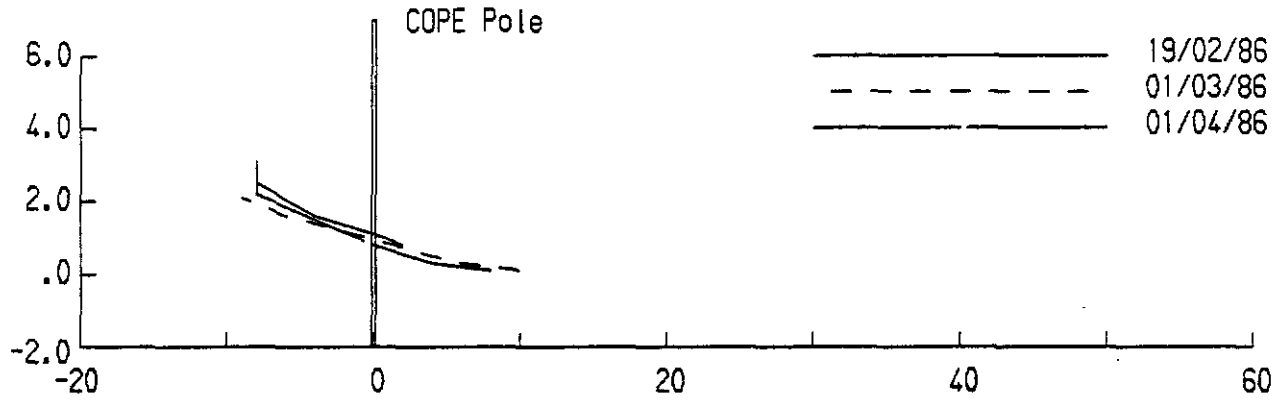
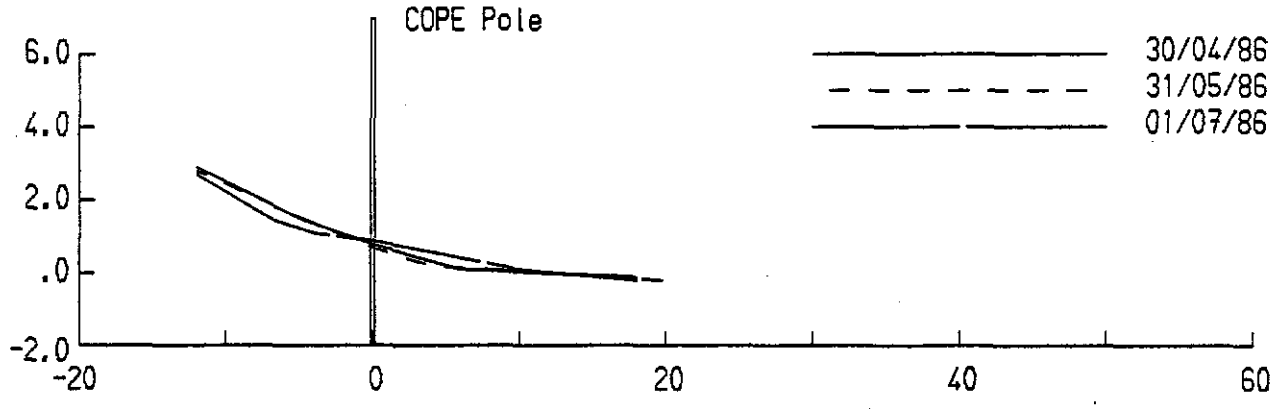
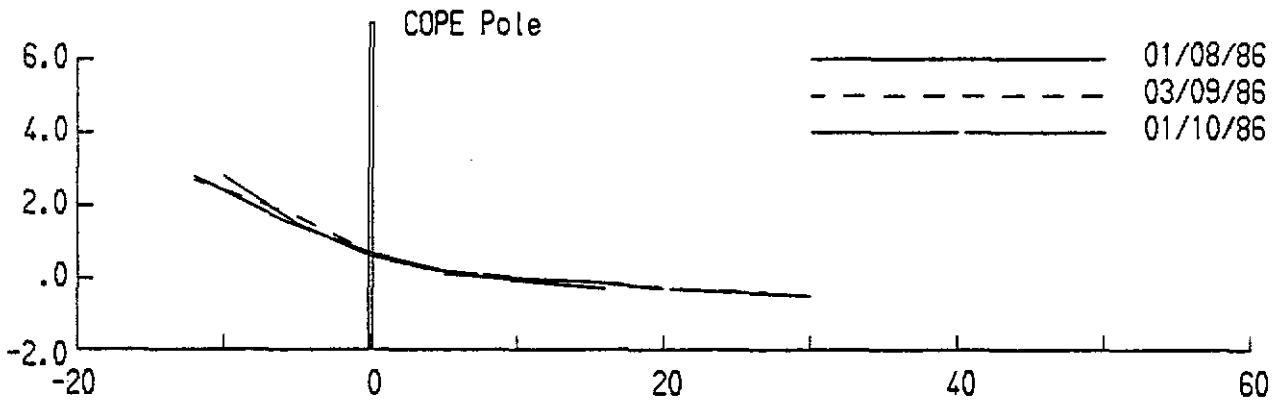
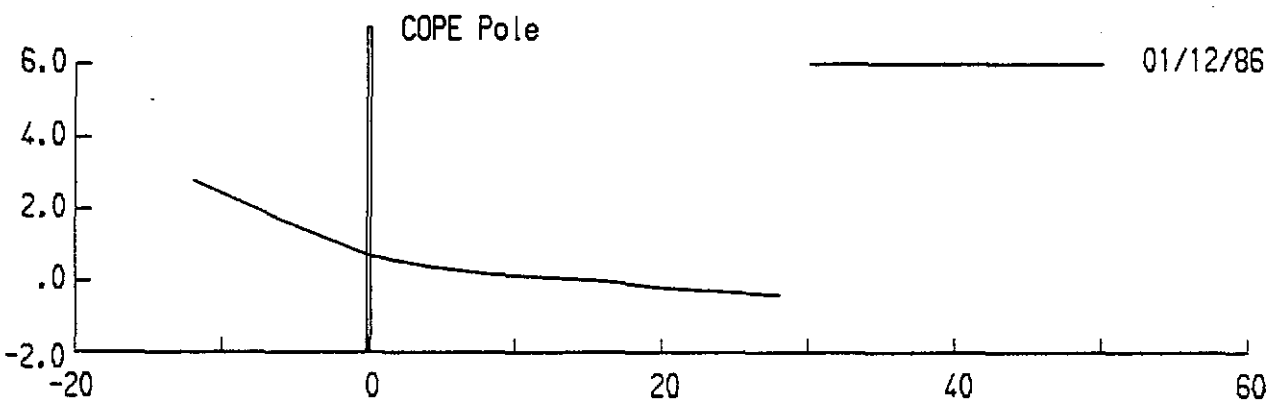
Figure 44

C 23.1









Level Datum is A.H.D.

Distances and Levels are measured in Metres

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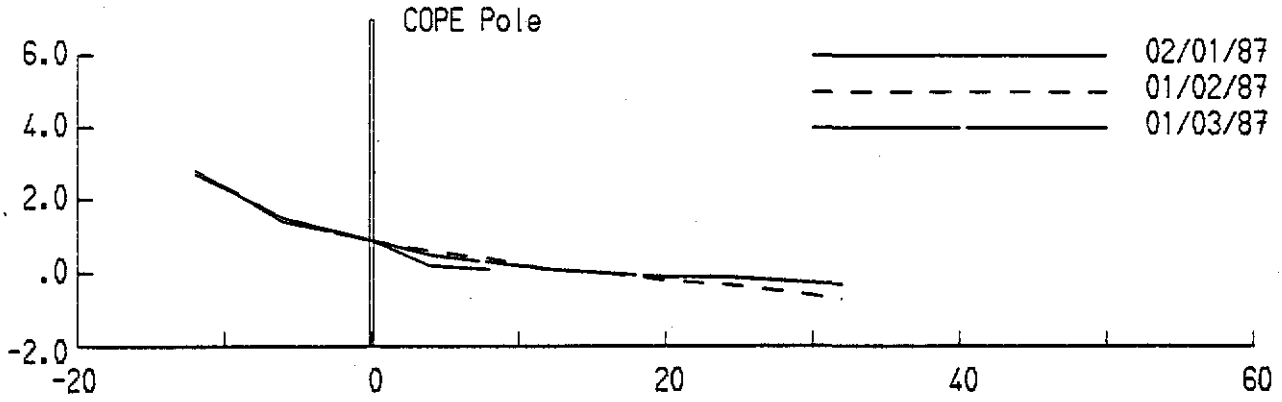
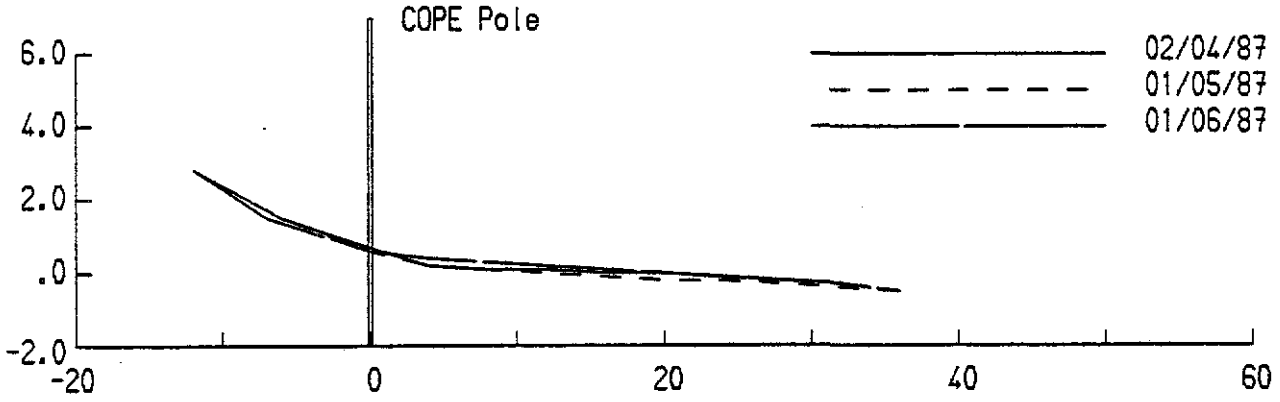
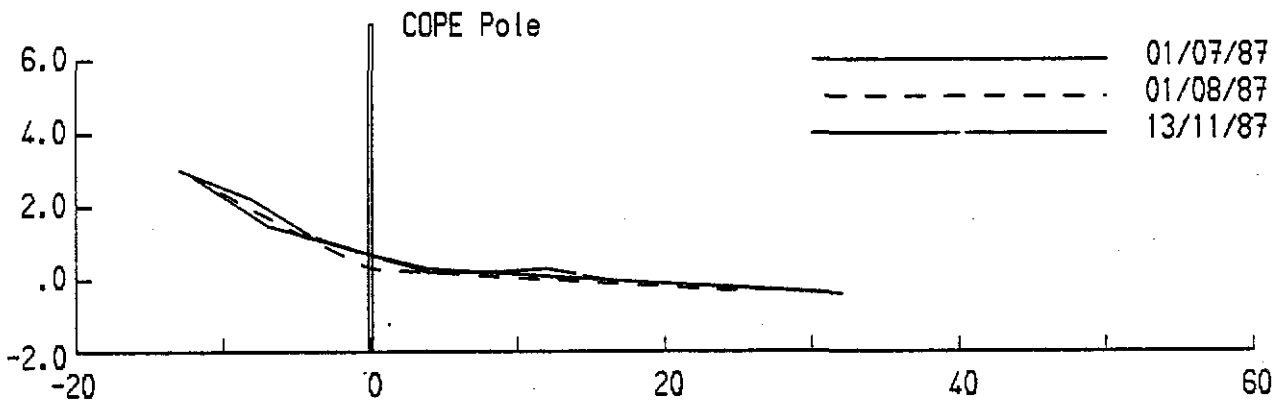
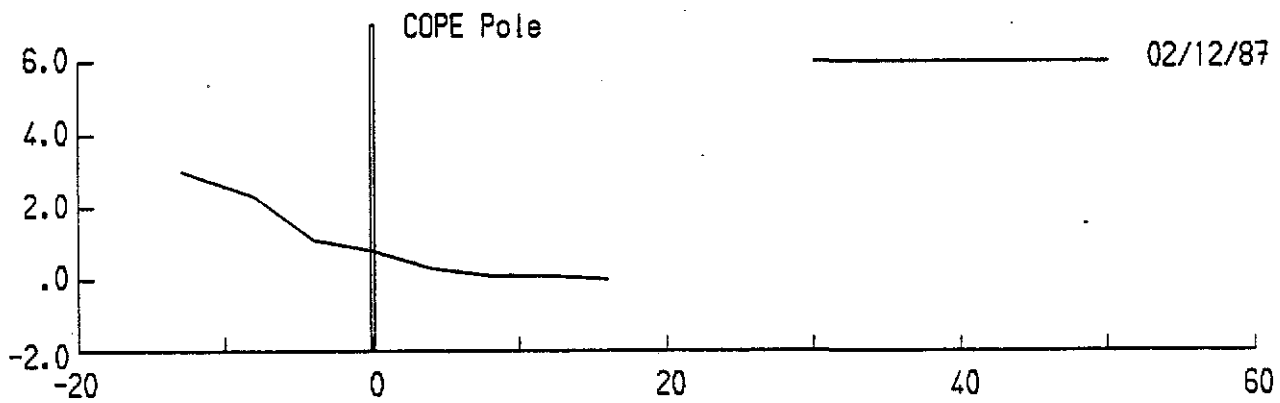
Figure 45

C 23.1









Level Datum is A.H.D.

Distances and Levels are measured in Metres

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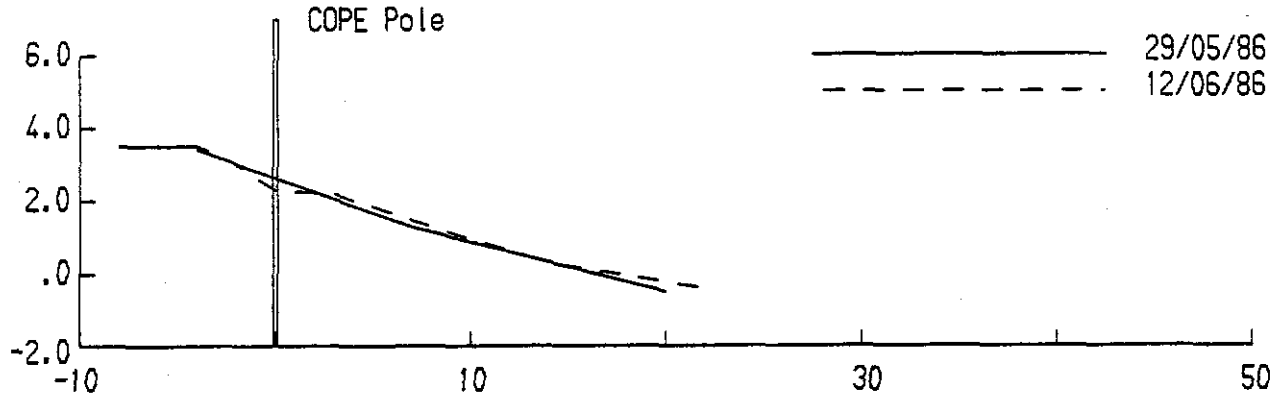
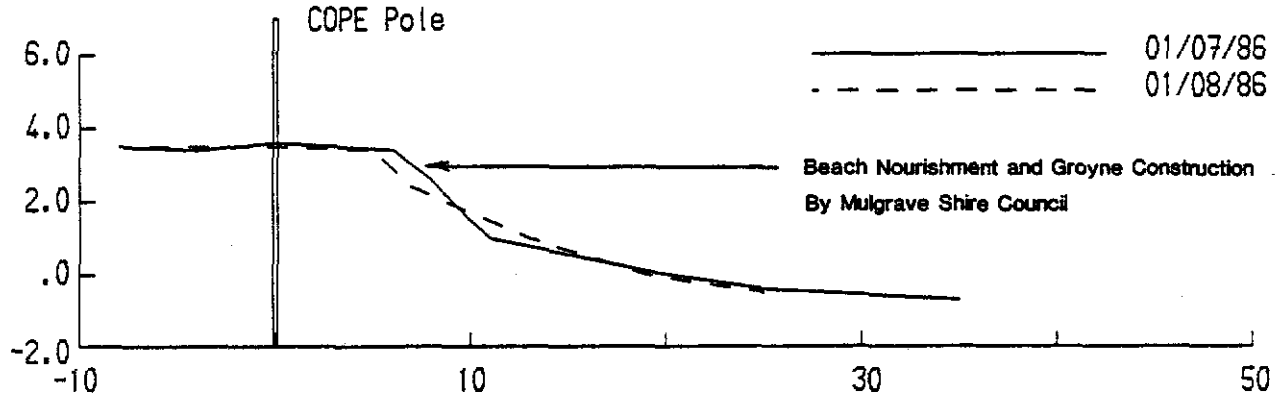
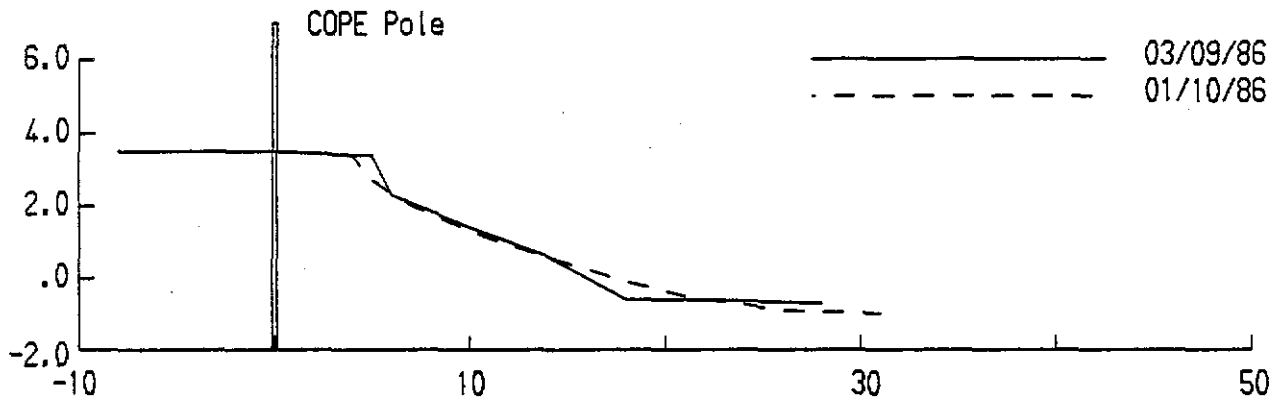
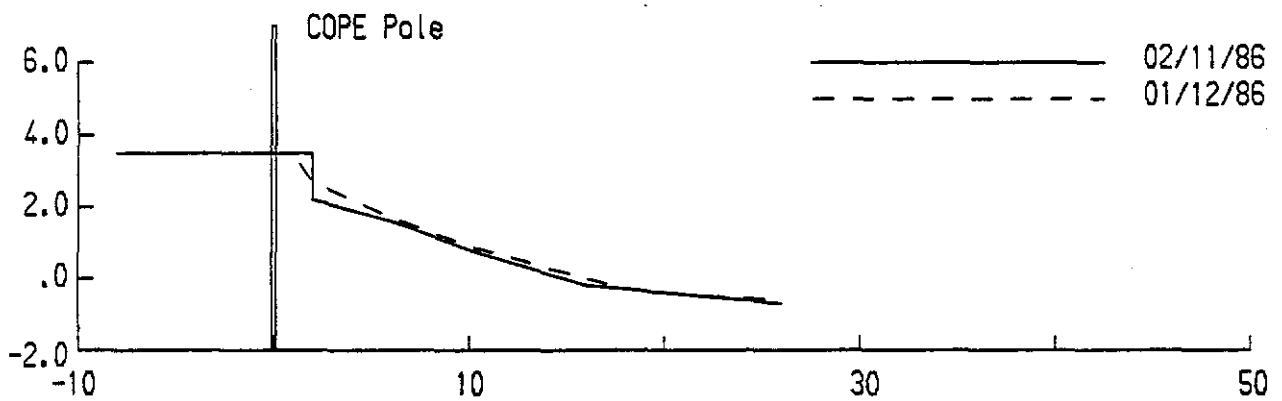
Figure 46

C 23.1









Level Datum is A.H.D. Distances and Levels are measured in Metres

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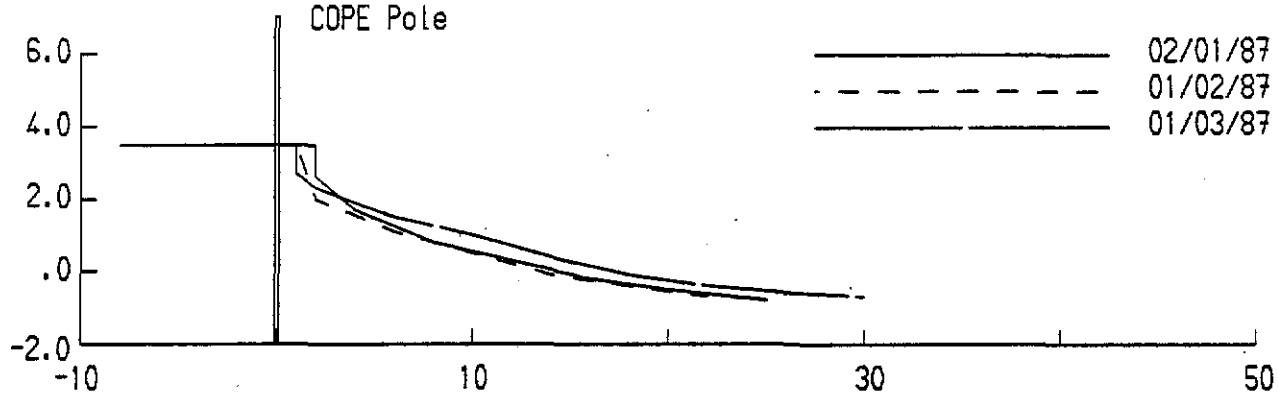
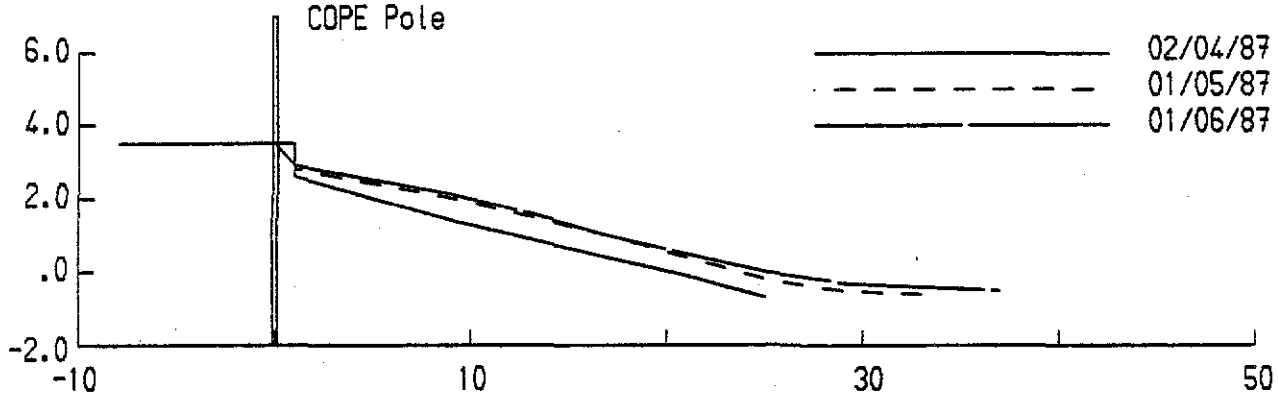
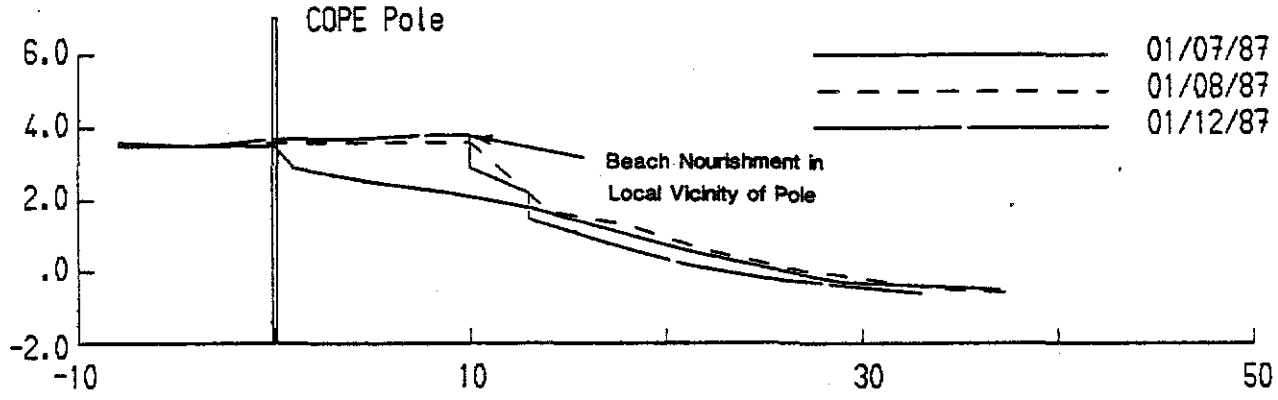
Figure 47

C 23.1







Level Datum is A.H.D.

Distances and Levels are measured in Metres

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Figure 48

C 23.1