

Fire Management Branch
Department of Conservation & Environment

RETARDANT DISTRIBUTIONS
FROM SIX
AGRICULTURAL AIRCRAFT

RESEARCH REPORT NO. 18
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INTRODUCTION

A number of different agricultural aircraft are used for firebombing in Victoria. This report presents the results of tests conducted on six such aircraft to assess the distribution of retardant obtained, and to therefore determine the suitability of the aircraft for fire-bombing operations.

Insufficient tests have been conducted to allow precise identification of the drop pattern likely to be obtained under a range of conditions. Rather the tests simply indicate whether an aircraft is suitable or unsuitable for our purposes although, even on the basis of the limited data available, the results give an indication of the lengths and the widths of fireline likely to be constructed.

AIRCRAFT TESTING

The aircraft tested were a Thrush Commander, De Havilland Beaver, Air Tractor, Bull Thrush, Fletcher and Turbo Thrush (Figures 1-6). Because the standard systems do not allow a suitably fast flow rate the hopper gate on each aircraft was specifically designed for use during fire-bombing operations. The Beaver used a factory-made gate imported from the USA as did the Bull Thrush and Turbo Thrush. The other aircraft were fitted with gates manufactured by their operators. The dimensions of each gate are given in Appendix 1 and Figures 7 and 8 show the gates fitted to the Thrush Commander and Air Tractor.

The test for each aircraft comprised two drops, made in opposite directions, over an open field on which a sampling grid 186 m x 39 m was established. Each grid cell was 6 m long and 3 m wide and containers with a collection area of 263.5 sq cm were used to sample the retardant reaching ground level in each drop. The weight of retardant collected, together with its specific gravity, was then used to calculate the concentration of retardants (l/sq m) at each point on the grid. Using six classes, a diagram of retardant distribution was constructed for each drop.

RESULTS

The retardant distributions for each aircraft are shown in Figures 9-20. The information obtained is summarised in Table 1 with more detailed statistics in Appendix 1. The effective lengths and widths quoted are based upon retardant concentrations equal to or greater than 0.25 l/sq m. This level has been shown to stop the spread of a mild fire, with an intensity of approximately 520 kW/m, burning in eucalypt fuels weighing 17 t/ha.¹

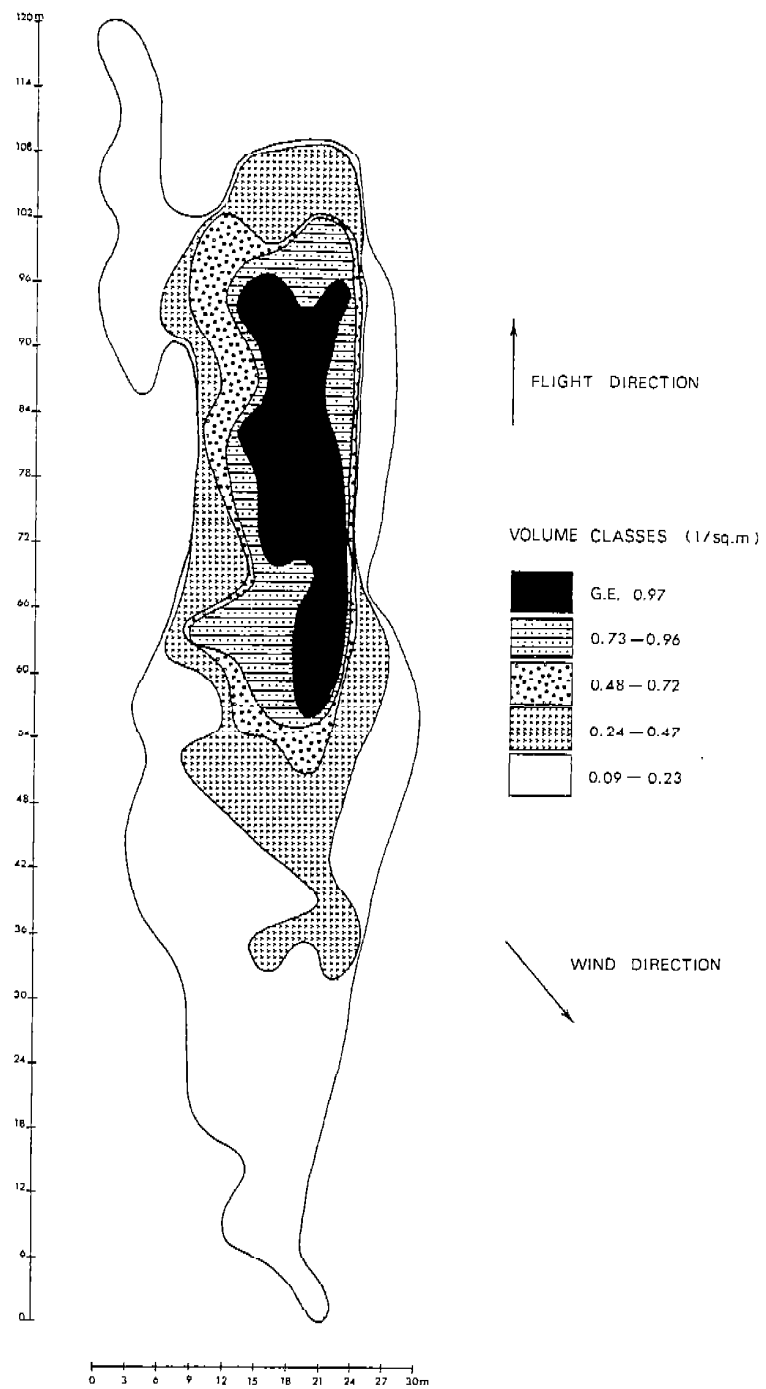
TABLE 1 : RETARDANT DISTRIBUTIONS

	AIRCRAFT					
	FLETCHER	THRUSH COMMANDER	DE HAVILLAND BEAVER	AIR TRACTOR	BULL THRUSH	TURBO THRUSH
Hopper capacity	1210	1510	910	1210	1930	1510
(1)						
Drop speed *	100	100	105	100	115	95
(knots)						
Drop height *	15	15	15	15	15	45
(m)						
Effective length *	80	98	77	153	94	65
(m)						
Effective width *	20	17	18	15	24	25
(m)						

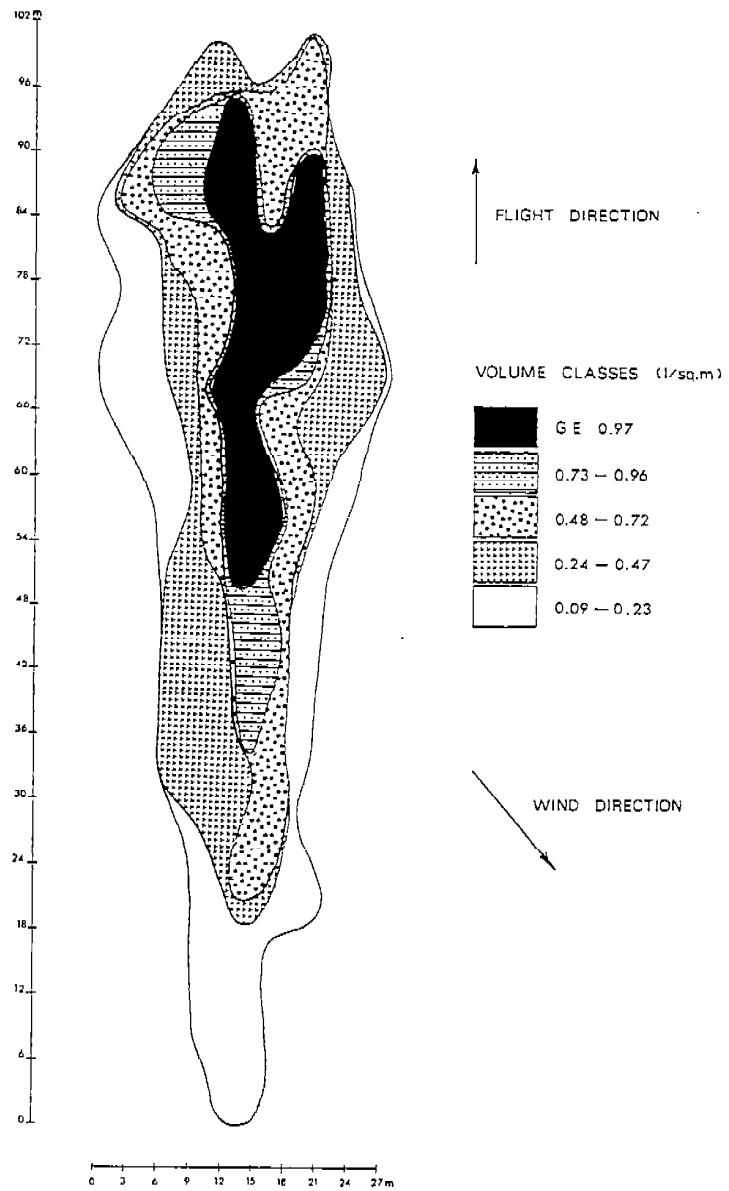
* Averages for the two drops.

¹ Air Operations for Forest Fire Control. Forests Commission Victoria.

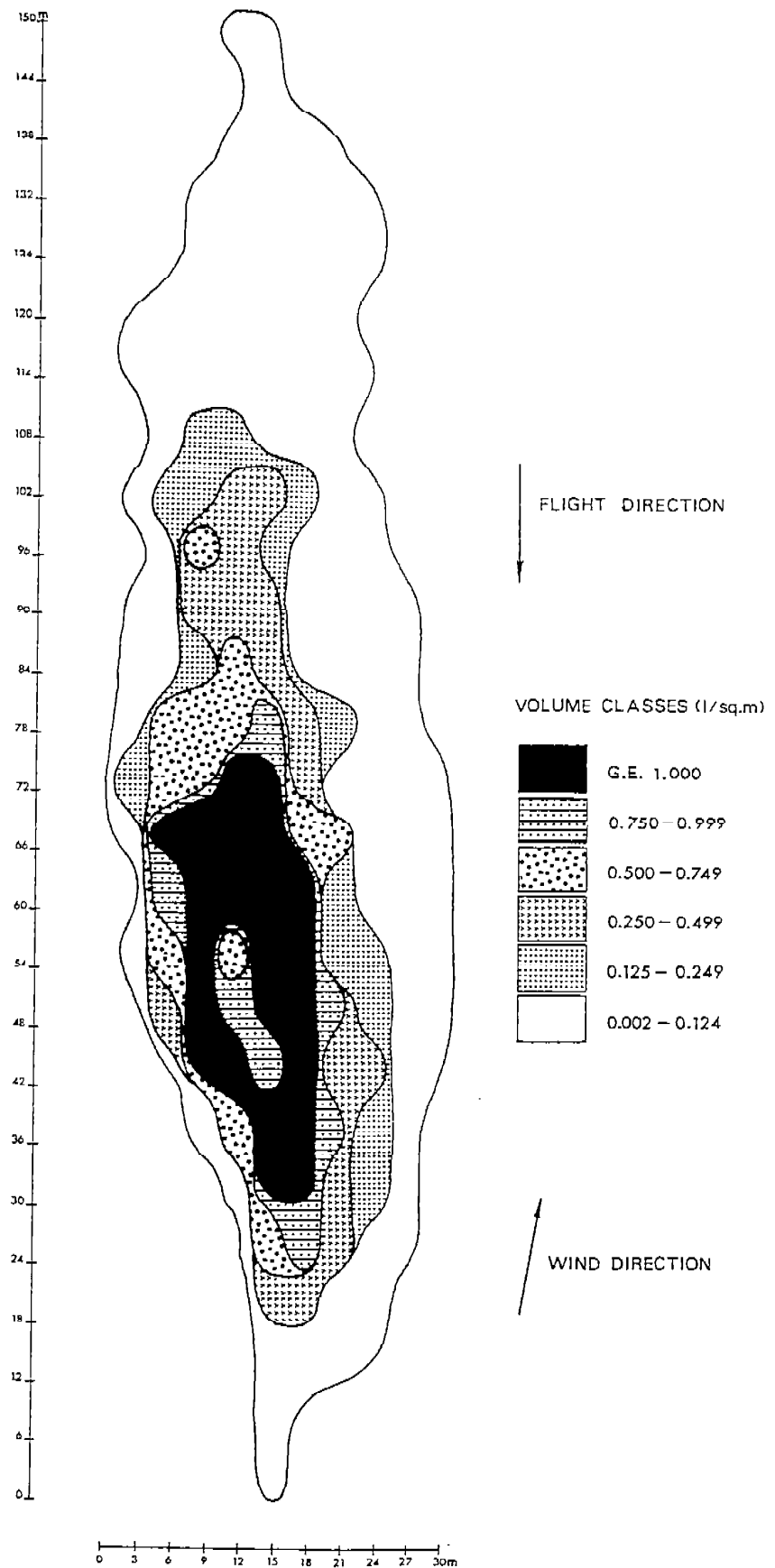
FLETCHER : DROP 1



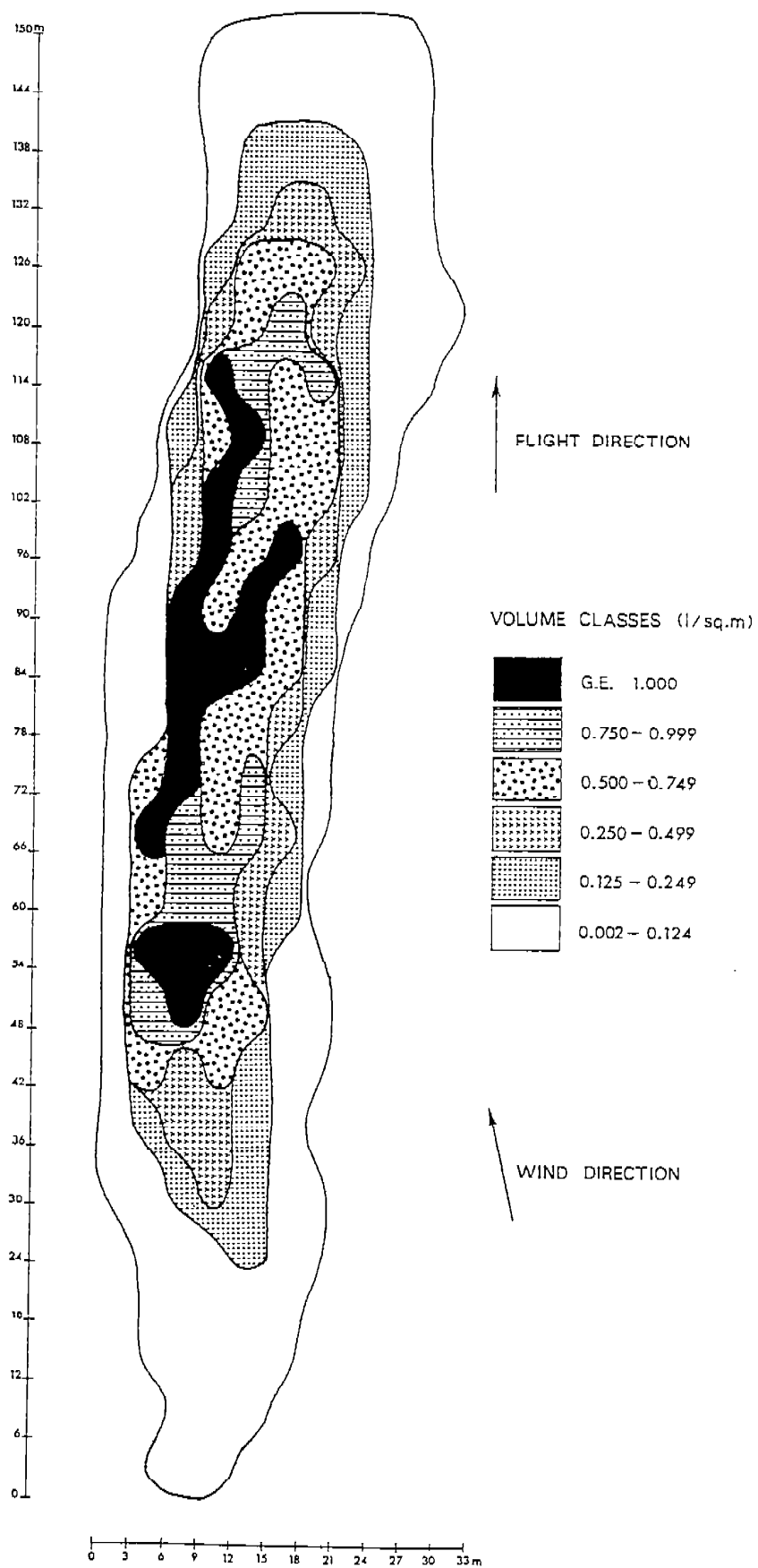
FLETCHER : DROP 2



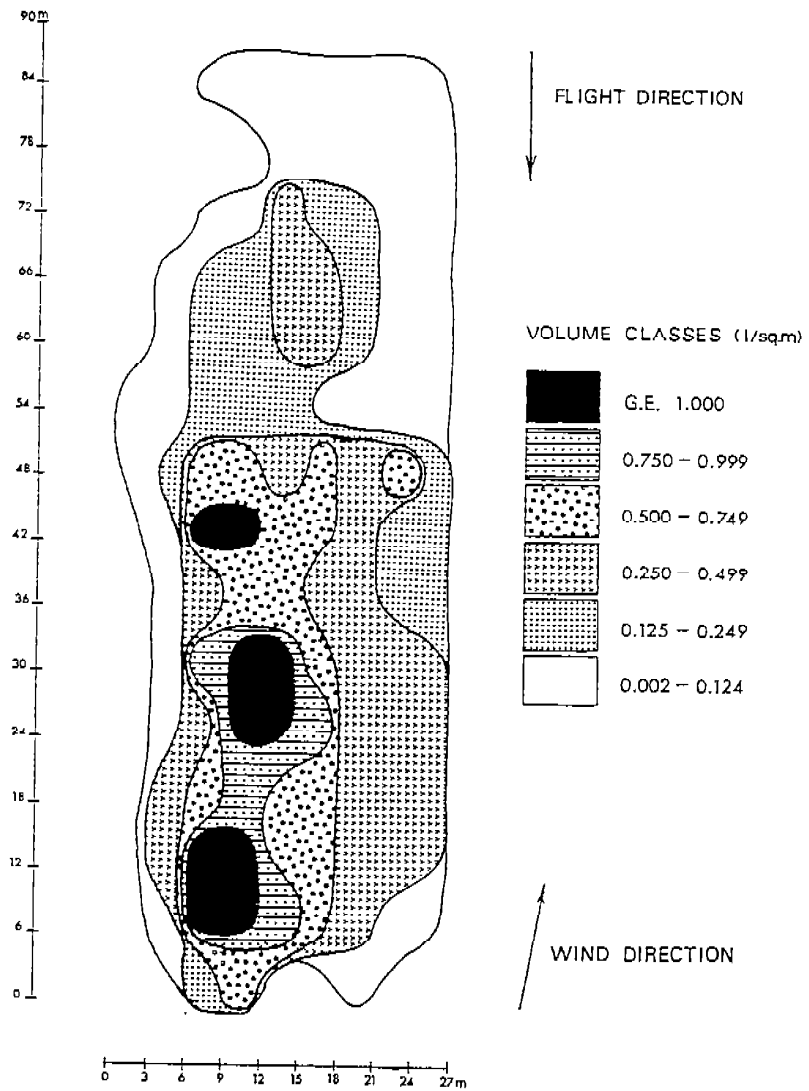
THRUSH COMMANDER : DROP 1



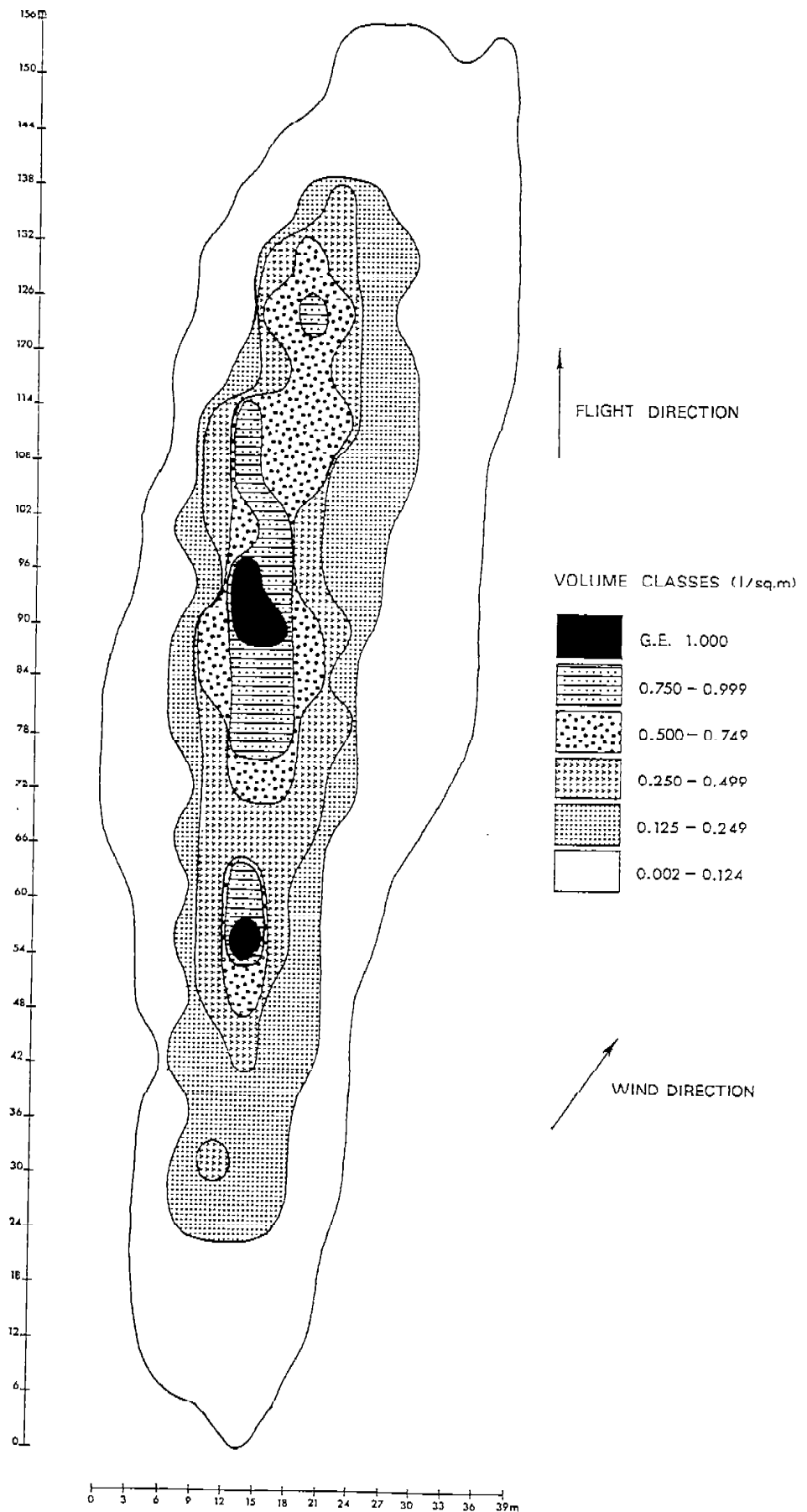
THRUSH COMMANDER : DROP 2

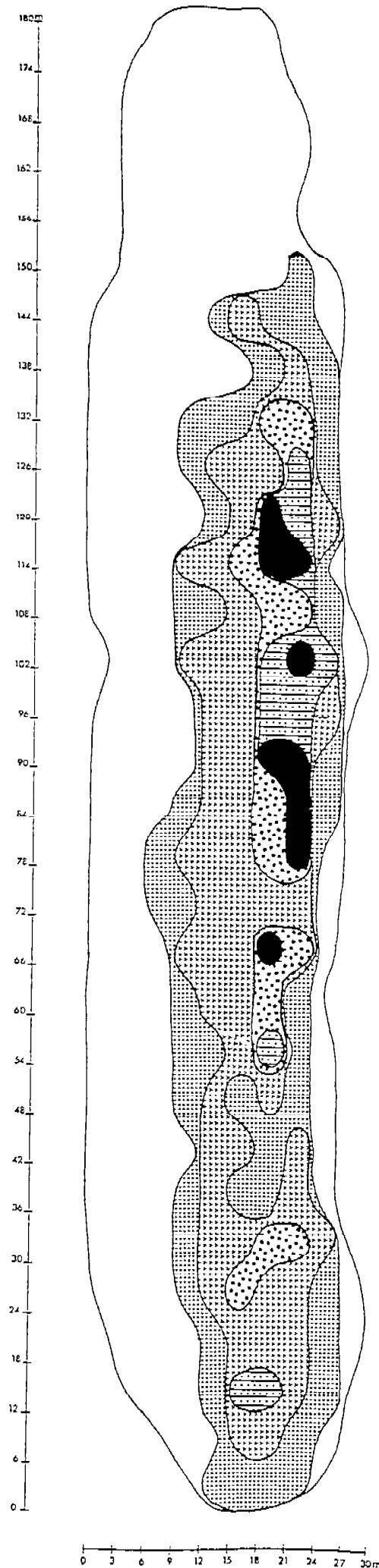


DE HAVILLAND BEAVER : DROP 1



DE HAVILLAND BEAVER : DROP 2

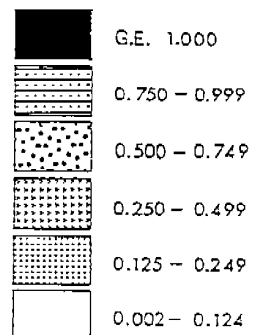




AIR TRACTOR : DROP 1

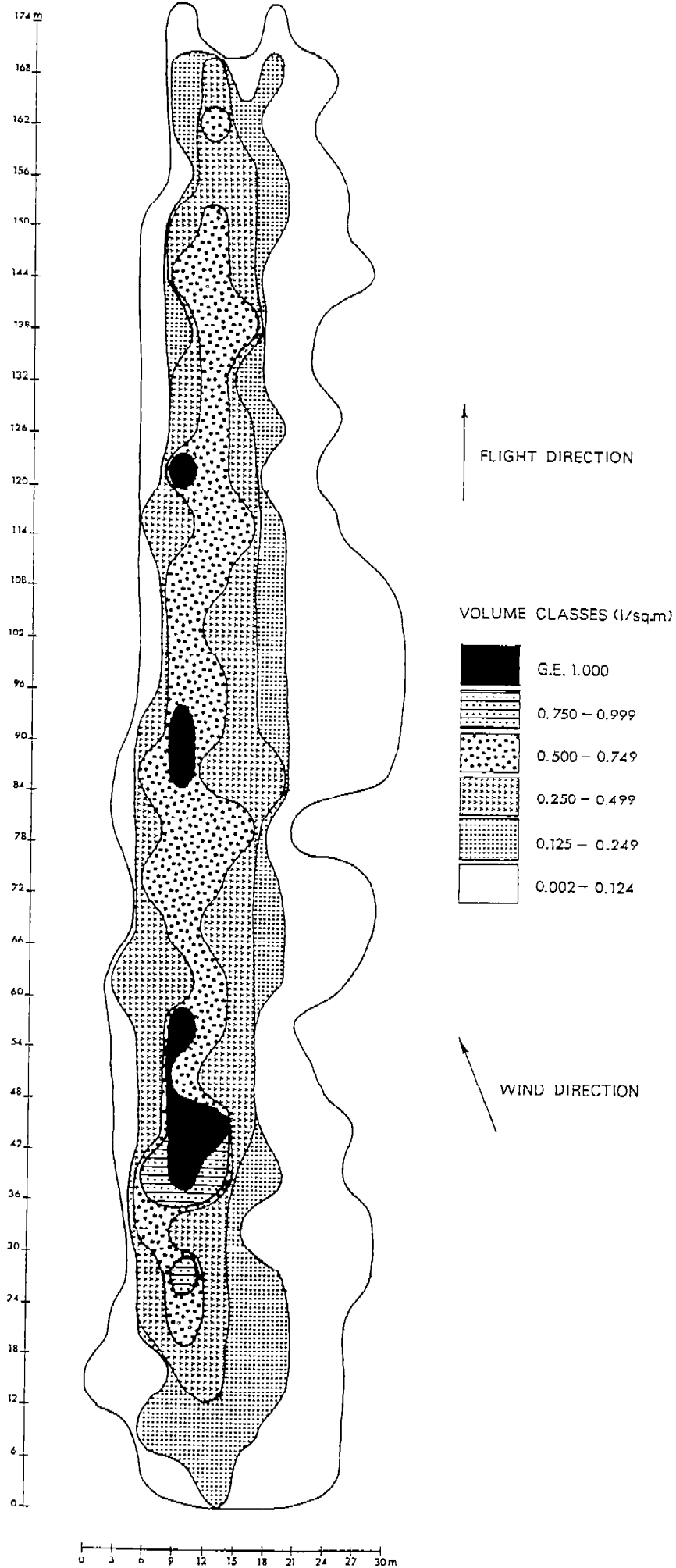
FLIGHT DIRECTION

VOLUME CLASSES (l/sq.m)

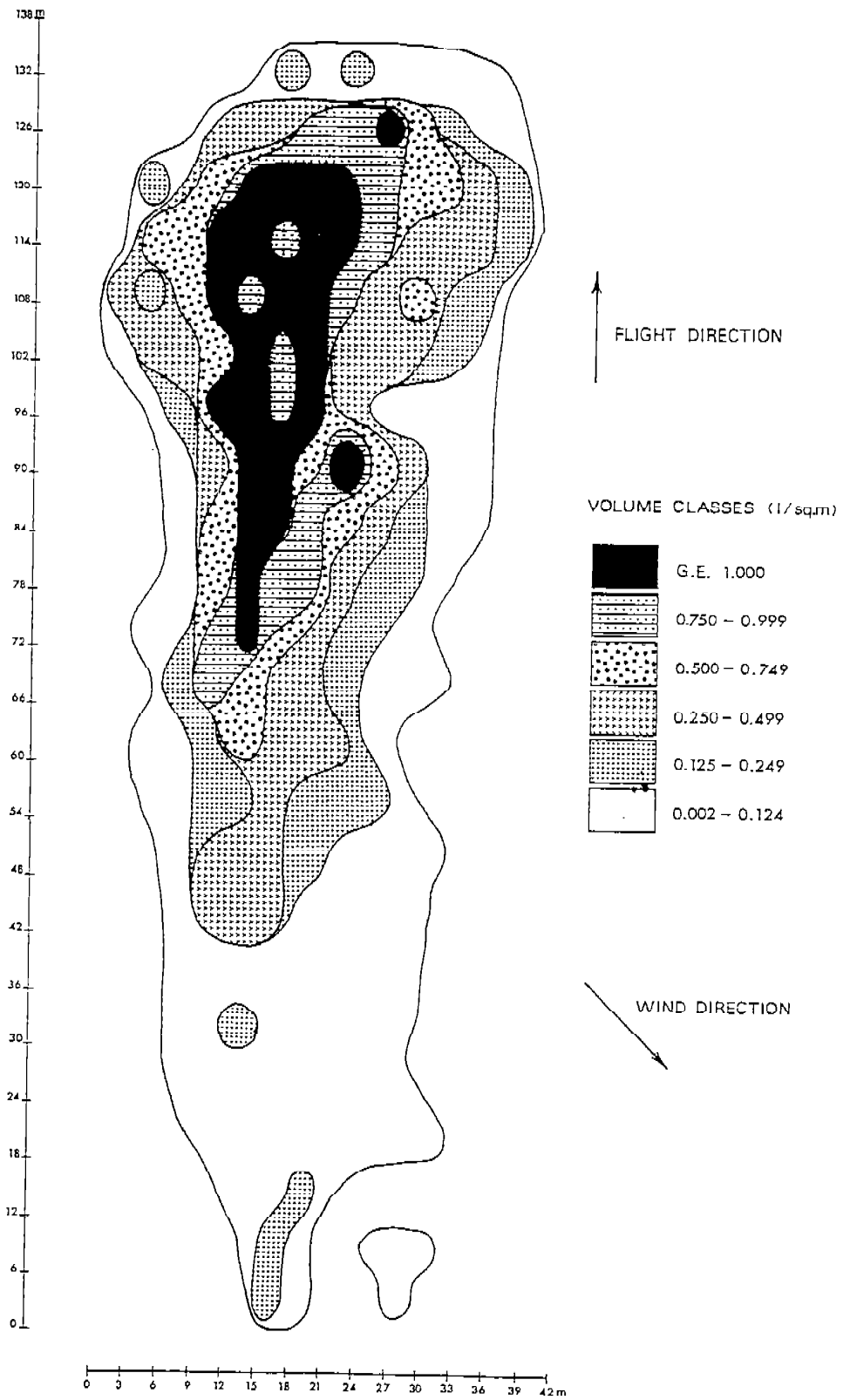


WIND DIRECTION

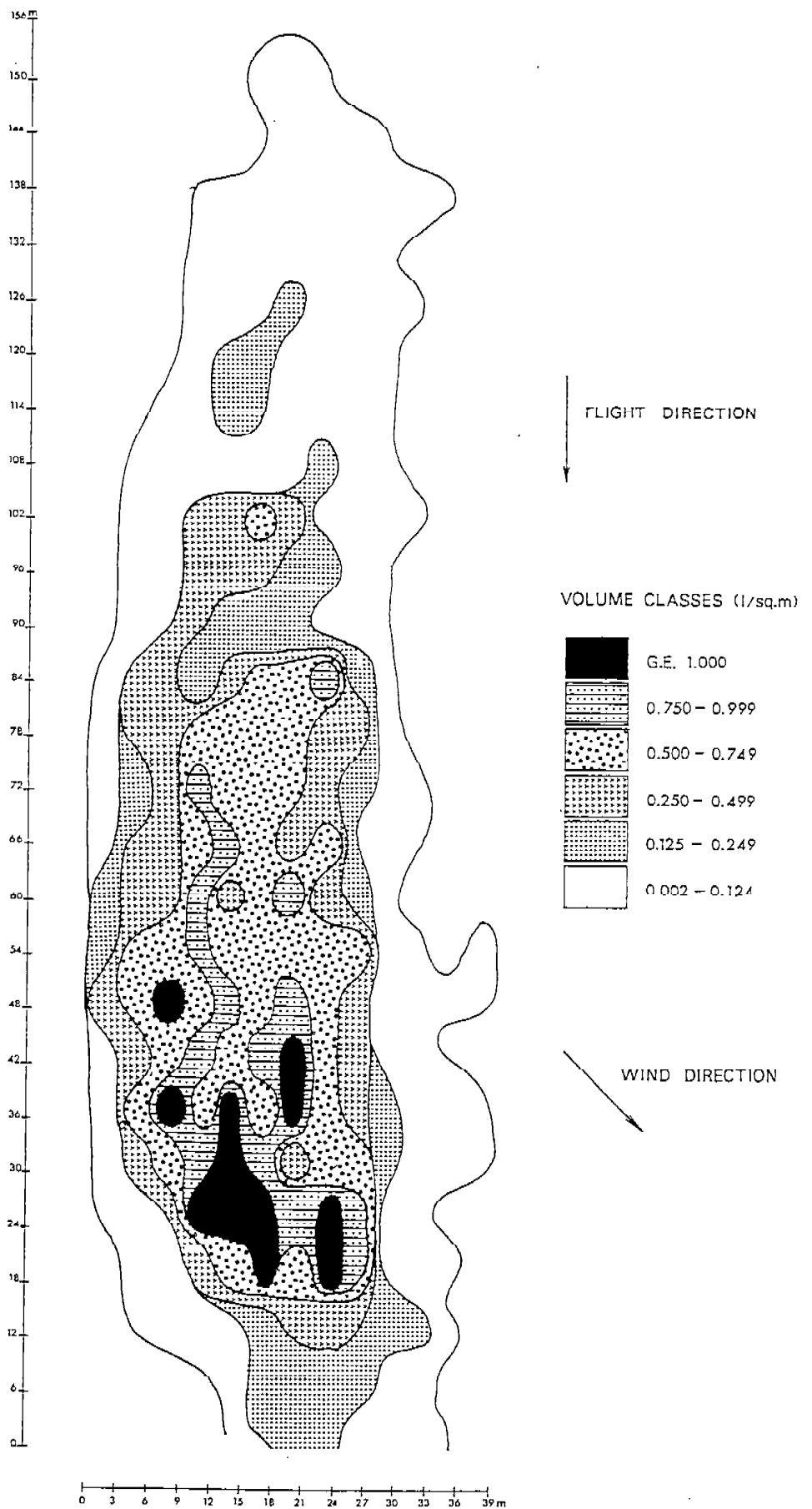
AIR TRACTOR : DROP 2



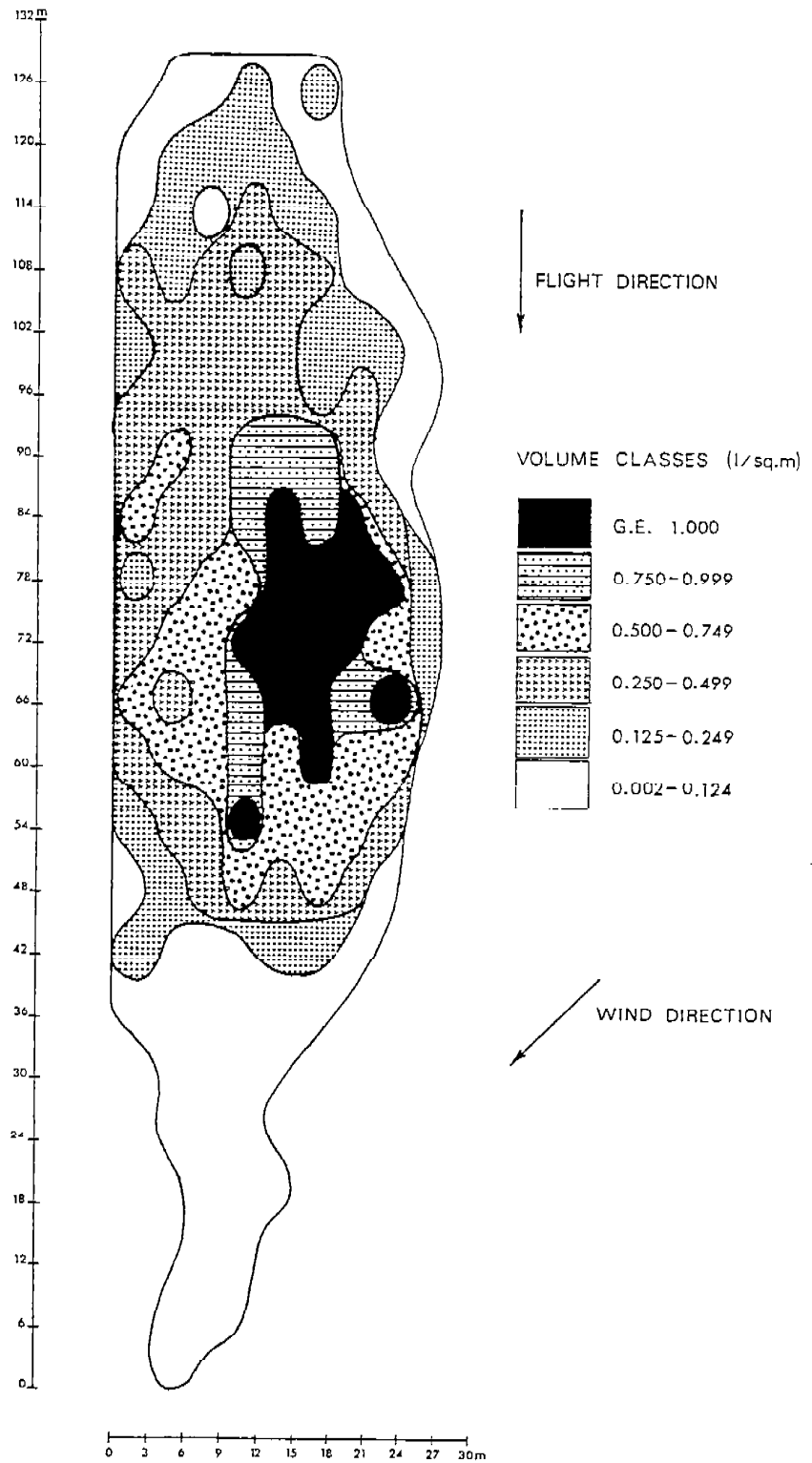
BULL THRUSH : DROP 1



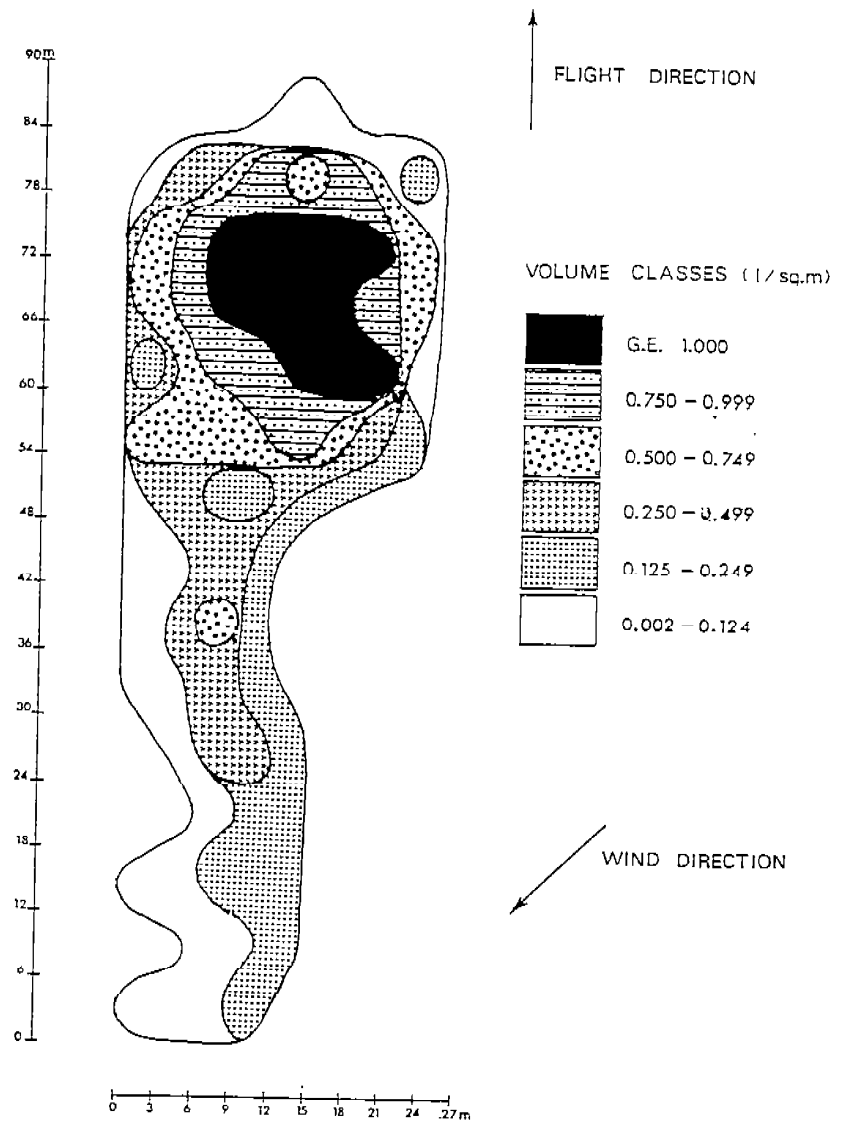
BULL THRUSH : DROP 2



TURBO THRUSH : DROP 1



TURBO THRUSH : DROP 2



APPENDIX 1 : OPERATIONAL AND TEST DETAILS

AIRCRAFT	FLETCHER	THRUSH COMMANDER	DE HAVILLAND BEAVER	AIR TRACTOR	BULL THRUSH	TURBO THRUSH
OPERATOR	A/G AIRWORK	A/G AIRWORK	SUPER SPREAD AVIATION	FIELD AIR	SPINAN	SPINAN
BASE	STAWELL	STAWELL	MOORABIN	BALLARAT	SHEPPARTON	SHEPPARTON
HOPPER CAPACITY (1)	1210	1510	910	1210	1930	1510
GATE DIMENSIONS (cm)	23 x 66(2)	30 x 46(2)	39 x 50	40 x 96	104 x 40.5	104 x 40.5
GATE AREA (cm ²)	3036	2760	1950	3840	4212	4212
TEST LOCATION	VICTORIA VALLEY AIRSTRIP					
TEST DATE	27.8.75	30.9.80	30.9.80	BALLARAT 19.11.81	FISKVILLE 11.3.82	FISKVILLE 31.12.82
RETARDANT DROPPED	PHOSCHEK	PHOSCHEK	PHOSCHEK	GREENLEAF FIREBRAKE	AMGARD	PHOSCHEK
AMOUNT DROPPED (1)	DROP1 DROP2	DROP1 DROP2	DROP1 DROP2	DROP1 DROP2	DROP1 DROP2	DROP1 DROP2
	1210 1210	1290 1210	910 910	1180 1180	1740 1740	1325 1420
VISCOSITY (M.F.S)	28 28	48 45	53 50	33 33	110 48	30 52
DROP SPEED (knots)	NA NA	100 100	105 105	100 100	115 115	95 95
DROP HEIGHT (m)	15 15	15 15	15 15	21 15	14 17	45 45
AIR TEMP (O ^C)	NA NA	19 18	19 18	21 21	23 23	29 32
WIND SPEED (kph)	12.0 5.5	15.5 14.0	9.0 12.5	8.0 8.0	10.0 15.0	8.0 11.0
EFFECTIVE LENGTH (m)	76 82	89 107	54 99	144 161	91 96	71 59
EFFECTIVE WIDTH (m)	19 20	18 15	24 14	16 15	22 25	25 25