BREDASDORP:
A REGIONAL LAND-USE STUDY

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section 1 INTRODUCTION

1.1 A BRIEF DESCRIPTION OF THE STUDY AREA.

The study area lies in the South West Cape and forms a sub-region of the predominantly agricultural region known as the Overberg. (see map no.1). Bredasdorp, the primary urban node of the area lies to the east-south east of and some 180 km. by road from Cape Town. The regional setting of the area is clarified on map 1.

The extent of the region to be analysed (map 2) approximates to the boundaries of the Bredasdorp Divisional Council administrative area, although it includes small portions of land at its western and eastern extremities which fall in the Caledon and Riversdale Divisional Council areas. It's southern limit is the 190 km. stretch of coast along the Atlantic and Indian oceans to the west and east respectively of Cape Agulhas which cape forms the southern tip of both the study area and the African continent. The study area includes the whole of the catchment areas of the six rivers which flow across it towards this coast. The extent of the drainage basins appear on the hydrology maps (see maps 6a, 6b and 6c). From Danger Point at the western, through to the Potberg mountain at the eastern extreme of the area these are the Uilenkraal-, Hagelkraal-, Ratel-, Nuwejaars-, Kars- and Sout rivers. The Nuwejaars- and Kars rivers from their point of confluence reach the sea as the Heuningnes river at De Mond. The inland boundaries are thus determined by the drainage basins of rivers. At the eastern end of the area a small portion of the Breede river catchment area is included in the study area in order to terminate the area on the banks of this river.

The region is contained within the lines of longitude 15^{o}. 15' and 20^{o}. 52', east and latitudes 34^{o}. 10' and 34^{o}. 51' south. The mountainous east- west spine formed by the Koueberg and Bredasdorp mountain and the limestone ridge east of Bredasdorp divides the region into the two ecological areas, the Strandveld and the RÛens, so named by the early local farming communities to aptly describe the relatively treeless sandy open coastal pasture land from Bot river to the Potberg and the rolling hilly wheatlands region extending from the Franschhoek mountains to the Potberg respectively.

The region which approximates spatially to the Bredasdorp magisterial district, the area served by the local farmers co-operative namely Bredasdorp-Napierse Koöperasie Beperk and the Post Office telephone exchanges at Bredasdorp and Napier,serves a predominantly agriculturally based community, has few industries and has in recent years increased in

popularity as a coastal recreation area.

1.2 Selection of study area.

The region appears to have development potential for agriculture, conservation and recreation. Two roads are planned to traverse the region from east to west both of which will considerably increase the accessibility of much of the countryside and coast which is now relatively unfrequented. Considerable stretches of land along the coastline which up to recent years have formed part of farms have passed into the ownership of firms intending to establish townships.

As the area will come into the comfortable range from Cape Town as a venue for weekend recreation, and growth therefore appears inevitable, it seems desirable that opportunities for receation be made available in an orderly manner. The need for an ecological environmental analysis of the areas constituent parts and the whole thus has a greater urgency in order to provide a basis for an understanding of the historical, physical and biological processes which in sum give the various parts their distinctive character and quality and constitute their social value but also impose usage restraints. Planned growth is necessary in order to accommodate the real needs of the community which it is capable of serving and to avoid the misuse of prime coastal and other land suitable for recreation.

1.3 Methodology.

An ecological approach was preferred involving the disclosure of environmental resources and their evaluation in terms of human needs. A detailed environmental resource analysis introduces the regional study in a manner similar to that developed by Ian McHarg (Ref.no.1). Natural features are described and a range of resource information useful for planning and assessing land potential was produced. Graphic descriptions clarify the spatial extent of resources. For the purpose of mapped presentation the study area was divided into three sections each bounded by the extent of one or more of the regions drainage basins.

The analysis commences with the evolution of the landform which becomes comprehensible through an understanding of the bedrock geology and geomorphology. The physical evolution is amplified by graphic representation of present form and configuration. Following physiography is the distribution and movement of water on the surface and the underground water storage in the regions aquifers, an analysis of the various climatic features is then presented.

Unfolding the nature of the area continues with a description and graphic presentation of the areal distribution and characteristics of

plant communities and soils and the data bank is completed with animal, bird and fish life.

The major forces operating in the region are agriculture, conservation and development for recreation. The contribution of the environmental resource base was then translated into values for human use relative to these four activities.

The ecological-economic criteria bearing on agriculture was considered in all its relevant aspects. Environmental resources, human and man-made are evaluated in terms of present and prospective production levels. The major requirements for full agricultural potential are pinpointed and land suitability for agricultural purposes graphically presented. Suitability for the major land uses other than agricultural were assessed and presented in map form. When suitability of all land in the study area was assessed for the various alternative uses a map was produced showing alternative suitabilities for all land. As inter-compatibility of land uses vary a matrix was prepared reflecting the degree of intercompatibility between all important land uses occurring in the area now and likely to occur in the future.

The matrix was used in conjunction with the synthesis of land use suitabilities in the land use structuring process. Choices were necessary in areas where different uses with high suitability are in-compatible as in the case of coastal land which has grade one suitability for both development and conservation. Evolution of land use struc-turing involved land use classification for varying intensities of human use. Land bearing grade 1,2 or 3 suitability for agriculture was classified as agricultural land.

Objectives, controls and permitted land use were outlined for each land use class. The existing and proposed road system was integrated with the land use structure proposals while the restraints imposed by the land use classification objectives were recognized. An appendix was added in the form of a pot pourri of thoughts on aspects of development potential.

study area

urban place

overberg region

REGIONAL SETTING map 1

SCALE 1:500,000

THE STUDY AREA

SCALE 1:250,000

MAP 2

section 2 ENVIRONMENTAL RESOURCES

2.1 GEOLOGY.

2.1.1 Geological formations. (see geology maps no. 3a, 3b and 3c)

The following formations are found in the area :-

Tertiary to Recent	Bredasdorp Beds	Sand, calcareous tufa, talus and pediment gravel. Alluvium. Marine gravel and conglomerate. Calcified dune sand, limestone and conglomerate. Surface-quartzite, sandstone and conglomerate of which some is ferruginous and ferricrete.
	UNCONFORMITY.	
	Bokkeveld Series	Shale and phyllite with minor sandstone. Sandstone and quartzite with subordinate shale and conglomerate.
	Table Mountain Series	Shale with minor sandstone, sandstone quartzite with conglomerate layers and minor shale bands.
	UNCONFORMITY.	
Pre-Cape, Post Malmesbury		Granite.
Malmesbury formation		Shale, phyllite and chloritic mica schist.

2.1.1.1 Malmesbury Formation and Granite. (Ref. no. 2 p.31)

Malmesbury Strata are found over large areas but are poorly exposed. The Malmesbury consists of rock which are highly cleaved and sheared. Porphyritic granite is intrusive in the Malmesbury Strata at several localities. (Ref. no. 2 p. 31)

2.1.1.2 Cape System.

Only the Table Mountain series, an alluvial deposit which formed in shallow water under a cold climate and the Bokkeveld series which found its origin under deeper water conditions and a warmer climate are present in this area of which they occupy a very large portion. The rocks of the series are chiefly hard, moderately coarse grained, whitish sandstones capable of absorbing large quantities of water which issue as springs at contacts of quartzites with shale bands or a dissimilar formation.

The main upper shale band comprising mainly grey sandy shale, is present all over the area. The rest of the series comprises mainly thickly bedded sandstone and quartzite. The Bokkeveld beds are poorly exposed as a rule consisting of light to dark grey shale and sandy phyllite. (Ref. no. 2 p. 31)

2.1.1.3 Tertiary to Recent Deposits.

The Bredasdorp Beds which occur along most of the coast attain a maximum thickness of some 135 to 500m. Lenticular conglomerate bands occur sporadically at the base and are followed by marine limestone. Beds consisting mainly of shells that may be comminuted or fairly well preserved are wide-spread. The major portion of the formation consists of dune sand that contained greatly varying proportions of quartz grains and shell grit and locally grades into pure shell-beds; it has been calcified into rocks varying from crumbly calcareous sandstone to hard, crystalline limestone.

Sand forming a weathering product of the underlying rocks, is very commonly found on Table Mountain sandstone and Bredasdorp Beds. Dune sand containing a large proportion of shell grit occurs in enormous amounts along the coast. Other superficial deposits include small patches of marine gravel on the coast, talus on the mountain sides that may grade into pediment gravel, and alluvium along some rivers. (Ref. no.2 p.33)

2.1.2 Structural Geology.

Orogenesis of either Pre- or Post-Klipheuvel age led to folding of the Malmesbury strata along axes trending north-east. During Post-Cape orogenesis the Table Mountain and Bokkeveld series were folded and faulted on a grand scale. The main fold axes and faults trend either north-east or slightly south of east. Two large strips of Malmesbury formation form the cores of two regional east-west anticlines. (Ref. no.2 p. 33)

2.1.3 Economic Geology.

Very large supplies of limestone from the Bredasdorp beds are available in this area. Lime for mortar and agricultural purposes is produced by two factories at Bredasdorp.

Clay derived from Malmesbury and Bokkeveld shale is plentiful but none suitable for the ceramic industry has yet been found. Limited quantities of salt are reaped from pans during favourable seasons. Table Mountain sandstone and Bredasdorp limestone are suitable for building stone but are used on a very limited scale only. Quartzite from the Table Mountain series and calcified Bredasdorp rocks are used as aggregate in building and for making tarred roads. Ferricrete and ferruginous weathering products make excellent road-building materials.

The south western part is well endowed with water from springs and in perennial streams. In the coastal plain bordering the Indian

ocean the farmers are dependent mainly on bore-holes. Good supplies are struck at depths of 35 meter or less; that from the Bokkeveld Beds is very brack but water from the Bredasdorp and Table Mountain Beds is of good quality. (Ref. 2 p. 33)

2.1.4 Geomorphology.

The land form is graphically highlighted by the relief, physiography and slope maps read in conjuction with each other. The geomorphological development during the Tertiary and Recent periods in the beginning involved prolonged erosion after which the ocean covered most of the area now underlain by Bredasdorp Beds. These occur along the whole coast up to the Potberg mountain in a band varying from three to twenty kilometers in width. During the Miocene the ocean began to retreat and on this wave-cut platform the Bredasdorp Beds were left as inshore deposits. The beach sand was blown up in dunes that transgressed the former extension of the ocean. Subsequently the sea-level rose again and a platform was cut over Bredasdorp and older formations; this terrace now stands at an average altitude of 60 feet. As the sea retreated again the beach sand was blown up in dunes locally on this marine terrace. Still later the sea-level sank furthur due to world wide glaciation and another terrace was formed; its maximum height is 7 meters and it is preserved only in patches along the coast. (Ref. no. 2 p. 33)

Greater resistance to weathering processes has left the Table Mountain sandstone as the most prominent feature in the landscape, forming high ground and mountain ranges while the less resistant shales have weathered to lower elevations, characterized by the rounded hilly nature of the Bokkeveld shales in the RÛens and the softer undulations of the Malmesbury shales in the southern part of the Strandveld.

2.1.5 Physiography.

2.1.5.1 Main Physiographic Features.

(Maps no. 5a, 5b and 5c.)

The physiographic features and subdivisions of the region which lies within the Cape fold-belt corresponds closely to the geology. The surface rocks are predominantly those of the Cape System with inliers of Pre-Cape rocks, (Malmesbury shale) and outliers of tertiary to recent strata being chiefly the limestones and calcified dune sands of the Bredasdorp formation.

The Table Mountain series builds mountain ranges with maximum heights of 510 to 645 meter as well as slightly mountainous terrain elevated 260 to 340 meters above sea-level.

Bokkeveld Beds north of Bredasdorp forms part of the undulating Rûensveld. Elsewhere the Bokkeveld and the Malmesbury strata underlie flat to slightly undulating plains.

The Indian ocean has many miles of continuous sandy beach flanked by a narrow strip of sanddunes extending from Struisbaai to De Hoop. The coastal physiography changes east of the wild life farm, continuing up to the Breede river mouth, as a rocky coastline backed by a steeply sloping limestone ridge. Along the Atlantic ocean a rugged, rocky coast is alternated by strips of sandy beach, sand-dunes occur in strips and patches of varying length and width.

A marine terrace with maximum height of 7 meters, is preserved at various places along the coast. A higher terrace with its inner margin at 35 to 50 meters above sea-level extends right round the coast with a breadth varying from less than six to more than 16 kilometers. The Bredasdorp Beds build local hills of 35 to 70 meters. On this terrace or coastal plain but furthur inland it forms an undulating landscape typical of consolidated sanddunes rising 170 to 230 meters above sea-level.

The main streams in the western portion of the area are perennial. Within areas of fairly high relief the streams have steep gradients and narrow, steepsided valleys but within the low-lying areas they meander and are bordered by broad, marshy vleis.

The large areas underlain by Bredasdorp Beds have very poor drainage, as is testified by the numerous and mainly brack pans on the coastal plain east and south of Bredasdorp. Even where fed by strong springs or in areas of fairly high relief, run-off is low as the water is absorbed by the porous strata. (Ref. no.2 p.30 and 31)

2.1.5.2 Relief Physiography.

The relief maps no. 4a, 4b and 4c, graphically represent the unevenness of the land surface and highlight the patterns of landform created by the interaction of erosive forces and the land fabric. The spatial arrangement of mountain high ground and the incisions of the drainage system are clarified.

2.1.5.3 Physiography of the three Sub-divisions of the Study Area.

2.1.5.3.1 The Sout river catchment area (map 4c).

The Sout river which drains most of the land surface of the northern sector of this area traverses from its source to De Hoop vlei, three of its physiographic subdivisions of the upper reaches of the catchment basin drains the hilly Rûens. The hill forms moulded from the underlying shales are rounded and undulating with steep slopes seperated by

brack kloofs. The hills to the north of the Sout river are generally steeper than those in the southern part of the catchment system.

North of the Sout river the geology causes steeper hillsides. Soil cover which is thin on the hilltops deepens towards stream and river beds. Before reaching the limestone ridge and De Hoop vlei the river skirts the Noord Vlakte, a small gently sloping physiographically differentiated plain drained by the Waterskilpad river and its tributaries where the surface rocks are clays and clay-gravels, ferricretes and calcretes. (Ref. no. 4 p.3)

The Sout river discharges into De Hoop vlei where river action has cut a ravine through the limestone and calcified dune sands of the duine as this physiographically distinct feature is locally named. The coastal plain is separated from the Indian ocean by a wide band of wind blown dune sand.

2.1.5.3.2 <u>The Kars river catchment area (map 4 b.)</u>

The upper reaches of this river drain two physiographically differentiated areas, the drier northern face of the Bredasdorp and Soetanys mountain to the south and the local RÛens area which though undulating is generally less hilly than the RÛens of the Sout river basin. The head of the drainage basin is characterized by more vigorous topographical undulations.

Near Bredasdorp the river cuts through the limestone ridge before entering the relatively featureless nearly level expanse of the coastal plain. Poor drainage and slow runoff contribute to extensive wetlands in the lower reaches of the river system.

A relatively narrow strip of shifting sanddune forms a coastal fringe to the plain, forming a distinct feature.

2.1.5.3.3 <u>The sub-region comprising the drainage basins of the Nuwejaars river, the Ratel river, the Haelkraal river and the Boesmans - and Uilenkraal rivers. (map 4a).</u>

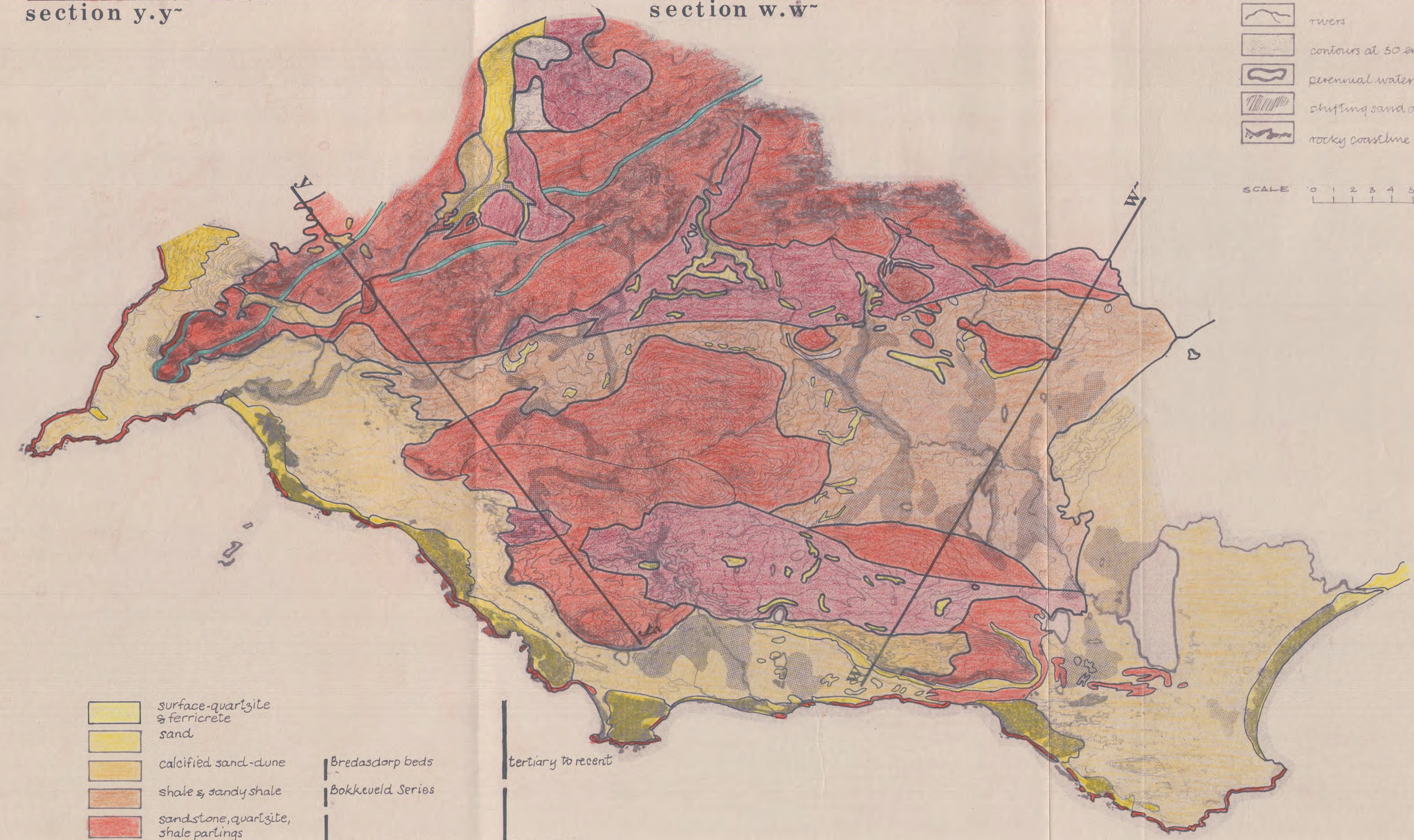
This area, the largest of the three sub-divisions of the study area constitutes a number of physiographically distinct areas. The coastal plain, a wide low lying terrace south of the Heuningnes river becomes narrower and varying in width along the Atlantic ocean coast. The shifting sanddunes form irregular patches and strips of varying topographical characteristics.

The limestone ridges are discontinuous and present a sawtooth profile in places. The outcrops of Table Mountain sandstone feature in the

Elim, Groot Haegelkraal. Viljoenshof triangle as softly undulating landscape in contrast to the more mountainous physiography flanking the Uilenkraal river and forming the north and north west periphery of the Strandveld. The Strandveld is distinguished by flat uninteresting landscape surrounded by the slopes and foothills of the surrounding mountains.

section y.y~

section w.w~



- marshes, swamps & vleis
- rivers
- contours at 50 english foot intervals
- perennial water
- shifting sand dunes
- rocky coastline

INLAND

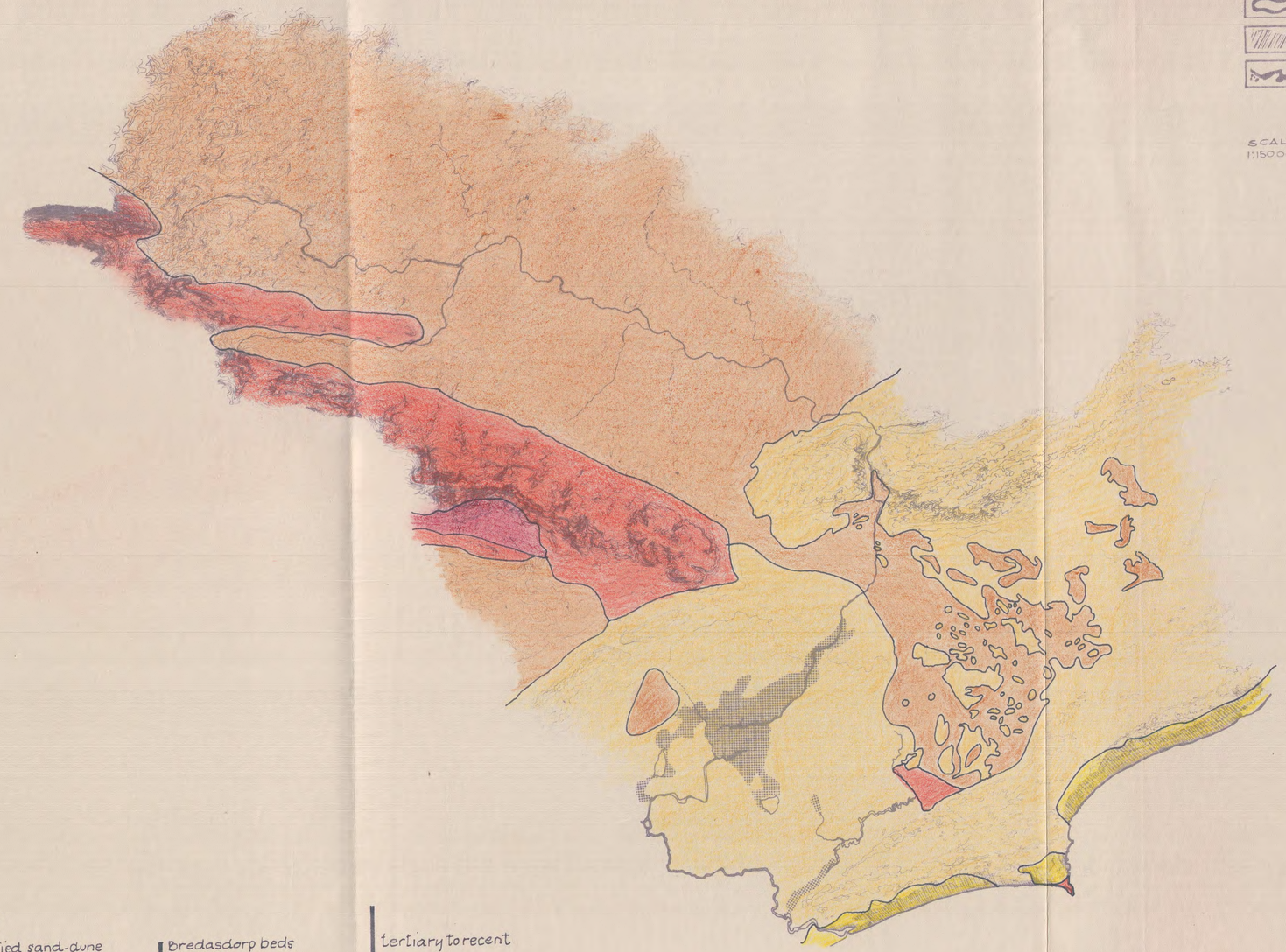
SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

- surface-quartzite & ferricrete
- sand
- calcified sand-dune — Bredasdorp beds
- shale & sandy shale — Bokkeveld Series
- sandstone, quartzite, shale partings, shale — Table Mountain Series
- sandstone & quartzite with conglomerate & shale layers
- granite
- sheared shale & fine grained graywacke

- tertiary to recent
- Cape system
- post-Malmesbury, pre Cape
- Malmesbury formation

GEOLOGY

map 3a



- marshes, swamps & vleis.
- rivers
- contours at 50 english foot intervals
- perennial water
- shifting sand dunes
- rocky coastline

NORTH

SCALE 1:150,000 — 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

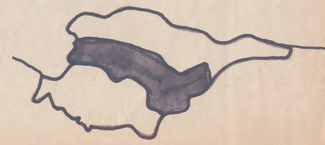
- sand
- calcified sand-dune
- shale & sandy shale
- sandstone, quartzite, shale partings
- sheared shale & fine grained graywacke

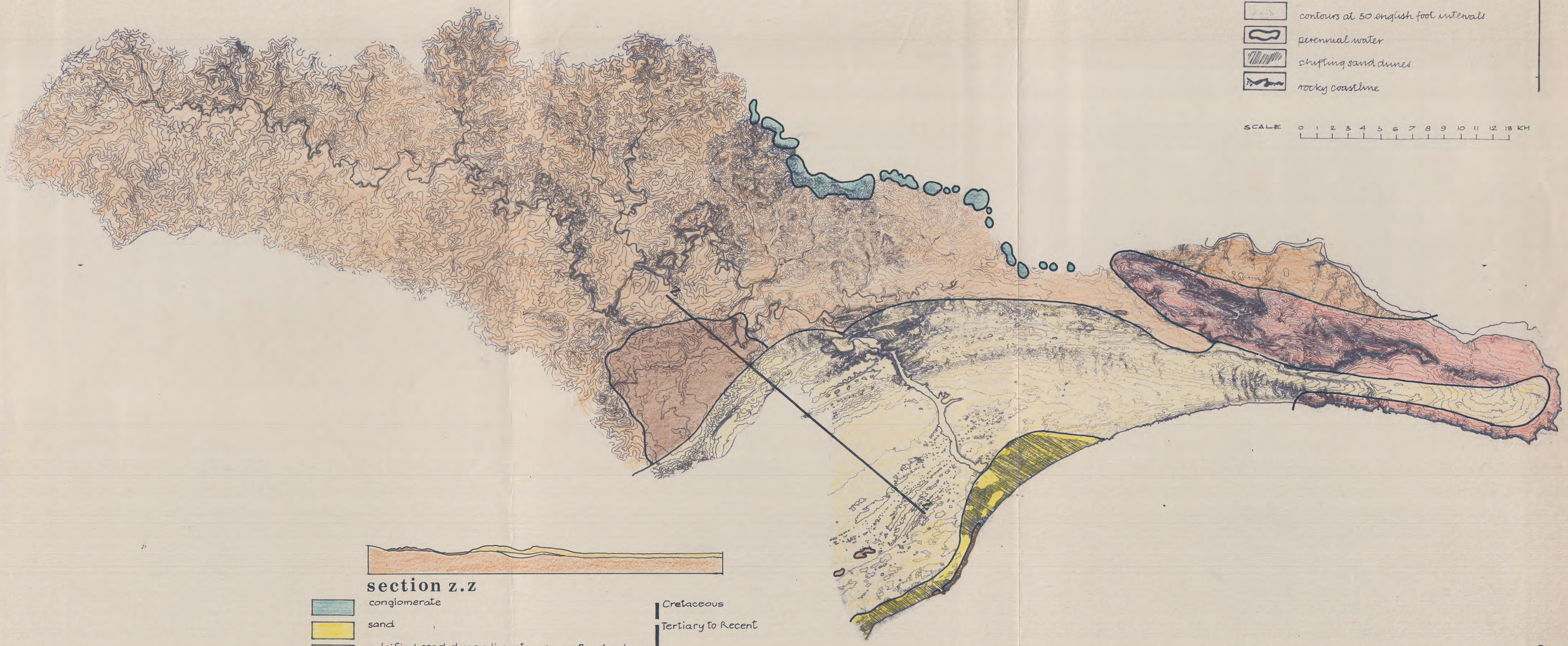
- Bredasdorp beds
- Bokkeveld Series
- Table Mountain Series

- tertiary to recent
- Cape system
- Malmesbury formation

GEOLOGY

map 3b





GEOLOGY

map 3c

HEIGHTS
500 –
400 – 500m
300 – 400m
200 – 300m
100 – 200m
sea level – 100m

Marshes, swamps & lakes
rivers
contours at 50 english foot intervals
perennial water
shifting sand dunes
rocky coastline

NORTH

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

RELIEF

map 4a

Marshes, swamps & vleis.

rivers

contours at 50 english foot intervals

perennial water

shifting sand dunes

rocky coastline

N
I
T
R
O
N
Z

SCALE 1:150,000 0 1 2 3 4 5 6 7 8 9 10 11 12 18 KM

700 – 800m

600 – 700m

500 – 600m

400 – 500m

300 – 400m

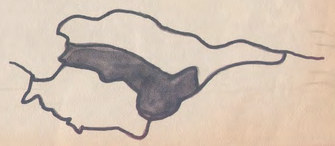
200 – 300m

100 – 200m

sea level – 100m

RELIEF

map 4b



RELIEF

map 4c

- marshland
- strandveld
- mountains
- limestone ridge
- coastal plate
- sanddunes
- water body

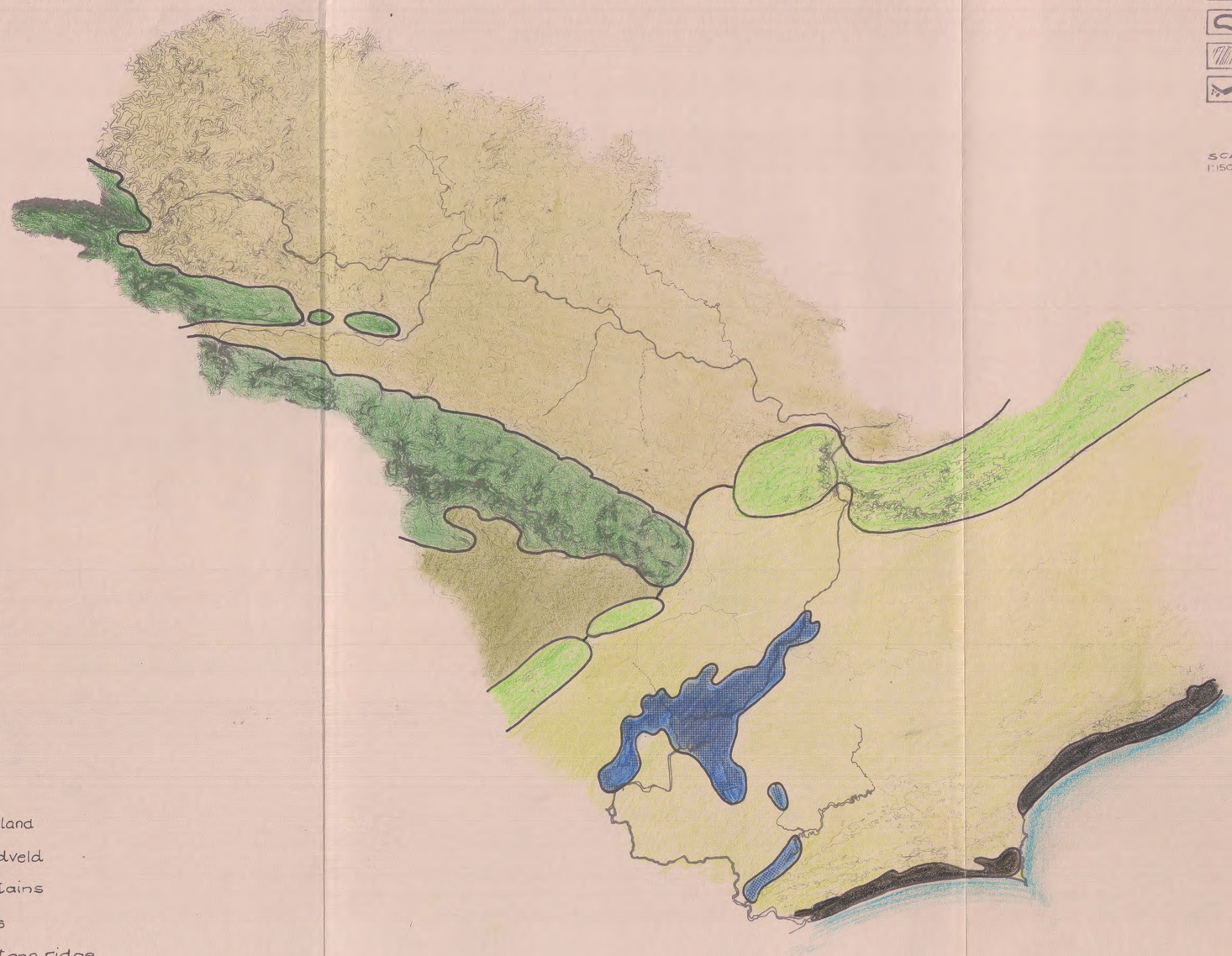
- marshes, swamps & vleis.
- rivers
- contours at 50 english foot intervals
- perennial water
- shifting sand dunes
- rocky coastline

NORTH

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 18 KM

PHYSIOGRAPHY

map 5a



marsh land
strandveld
mountains
ruens
limestone ridge
coastal vlakte
sanddunes

marshes, swamps & vleis.
rivers
contours at 50 english foot intervals
perennial water
shifting sand dunes
rocky coastline

N

SCALE
1:150,000

0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

PHYSIOGRAPHY

map 5b

PHYSIOGRAPHY

map 5c

0-5%
5-10%
10-15%
15-25%
>25%

SLOPE

map 6A a

map 6Ac

SLOPE

2.2 WATER FEATURES.

2.2.1 Telluric.Water Supplies.

2.2.1.1 Table Mountain Sandstone.

Higher precipitation is concentrated in the areas of elevated Table Mountain sandstone from which rain water run-off gives rise to many perennial and intermittant streams of excellent quality water. The rocks though seldom weathered to any depth, function as aquifers absorbing large quantities of water which issue as springs of virtually pure water occurring in relation to the rock structure at vertical joints, folds and faults and contacts of quartzites with shale bands and dissimilar formations. (Ref. no.3 p. 115)

2.2.1.2 Bokkeveld Shales.

The Bokkeveld shales which underlie lower lying ground in the study area and the clays and clay gravels of the Noord vlakte form poor aquifers (Ref. no. 4 p.6) the underground supplies being highly mineralized by magnesium and sodium salts leached from rocks of the series with which these are connate since the submarine formation of the shale. (Ref. no.3 p. 117). Underground water is most probably derived from downward percolation of surface water although this process is limited by the argillaceous nature of the rock. (Ref. no.4 p.34). Boreholes in the Bokkeveld Series generally yield poor quality water in limited quantities. Since marginal farming land has been utilized for cultivation on top of hills where soil is thin and rock outcrops occur the process of refected ploughing has exposed fresh shale to rainwater percolation. (Ref. no.4 p. 35). This has increased the salinity of water in aquifers considerably as connate salts have been absorbed from rocks by downward percolating water.

2.2.1.3 Bredasdorp Formation.

The limestone ridges forming the inner edge of the marine terrace and the marine terrace up to the coast comprises Bredasdorp formation consisting mainly of limestone and calcareous sandstone having the properties of a good aquifer. In the Duine the base of the Bredasdorp Beds which overlie the relatively impervious shales of the Bokkeveld Series tend to be higher in the region north-east of Bredasdorp along the inland edge of the limestone ridge sloping downward in the direction of the coast. Along the coastal edge of the Duine the base of the Bredasdorp formation is deeper and drilling has proved that a substantial aquifer has formed here. (Ref. no.4 p. 40). This situation appears to continue as far as the limestone

ridge opposite the Potberg mountain where boreholes deliver large quantities of water. The Bredasdorp Beds of the coastal vlakte which vary in depth from 135 to 500 meters are underlain by shales and sandstones of the Malmesbury and Cape formations. Widespread beds of shells, and limestone and calcareous sandstones of the formation render the Bredasdorp an excellent aquifer particularly where hollows in the underlying impervious strata traps underground water. The aquifers overlying Table Mountain sandstone contain as a rule potable water while those over the shale tend to be brack. In the area underlain by shale to the west of Elim underground water is virtually non-existent.

2.2.2 Drainage.

The drainage basin is a permanent landscape feature, it is the collecting ground and storage tank for rainfall and provides the route which water takes to the sea. It forms a geomorphological unit within which takes place the development of the landscape by rock weathering, slope development and sediment transport and the drainage basin is of significance to man as it is his source of water and the area of management of water resources governed by industrial, agricultural and domestic demands and the need to control the effects of flood and drought.

The drainage system approximately determines the areal extent of the study area. Subdivision A of the study area (map 6a) comprises the catchment areas of the Uilenkraal river and Boesmans river, the smaller drainage basins of the Haelkraal river and the Ratel river, while the larger land surface drained by the Nuwejaars river and its tributarys drains into the Soetendalsvlei and thence to the Indian ocean via the Heuningnes river.

The whole of subdivision B of the study area (map 6b) drains to the sea down the Kars river and its tributary the Poort river and thence to De Mond via the tidal reaches of the Heuningnes river. The river system is fed in its upper reaches by streams from the mountain aquifer and is perennial up to the farm Nachtwacht.

Subdivision C of the study area (map 6c) comprises the whole of the catchment area of the Sout river and a very small portion against the eastern slopes of the Potberg of the Breede river catchment area.

The meandering tendency of rivers causes the mouths of some river to move; there is evidence that the Heuningnes river at one time reached the sea some half mile east of De Mond where the river now enters the Indian ocean (Ref. 5. p. 13) In the lower reaches of the Kars river where it traverses the coastal vlakte the slow run-off and flat landscape cause extensive wetlands. Excepting for the Sout river, the rivers tend to meander in shallow channels over the

flat coastal plain forming marshes and small vleis at intervals. Having a small volume of water, slow run-off from the surrounding countryside and slow rate of stream flow they tend to close their mouths in summer. To prevent flooding of the low lying farms by imprisoned water their mouths have to be opened after the first winter rains. (Ref. no.5 p. 13)

In the lowlying areas between Elim and Soetendalsvlei and to a lesser extent furthur up the drainage system from Elim the semi-impervious shales and clayey soils hinder downward percolation of surface water giving rise to extensive marshy ground and vleis in the vicinity of drainage channels.

The north eastern part of the study area drains to the Sout river discharging into De Hoop vlei which is separated from the Indian ocean by extensive sand masses up to 3 kilometers wide. The vlei is probably a submerged valley the mouth of which was blocked by the emergence of calcitic estuarine sandbars. (Ref. no.5 p. 15)

The lake overflows at about 50 year intervals when thousands of morgen of veld are submerged. The extent of the floodplain is shown on map 6c.

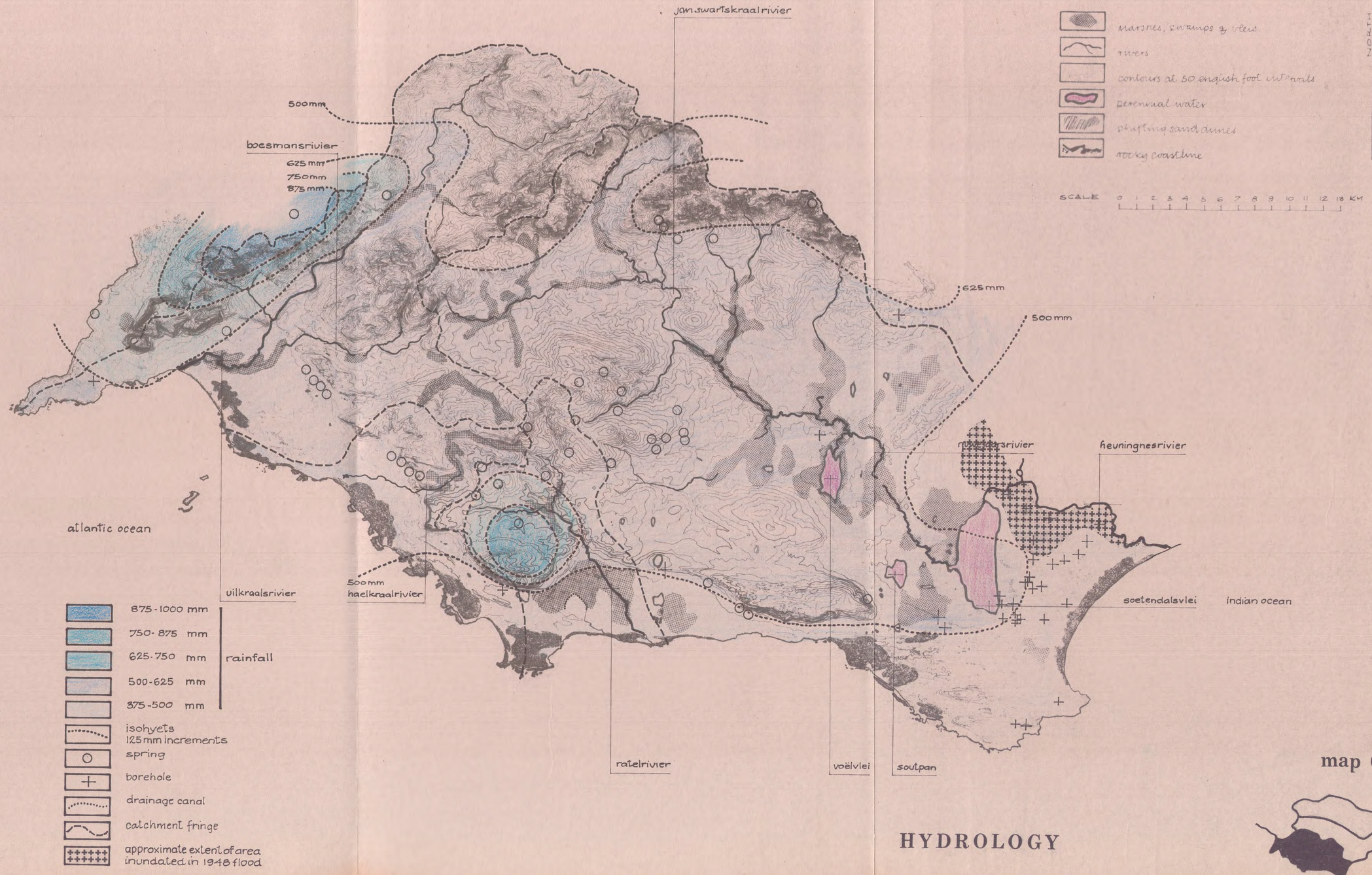
2.2.3 Precipitation.

Average annual rainfall is highest in the mountains of the south western edge of the area and decreases gradually as one moves towards the area's eastern end. Rainfall is higher on south facing mountain slopes than on northern slopes.

The areal distribution of rain is revealed on hydrology maps numbered 6a, 6b and 6c while the typical monthly distribution of rainfall appears on diagram 1. The area is a marginal winter rainfall area as about 40% of the annual rainfall occurs during the summer months.

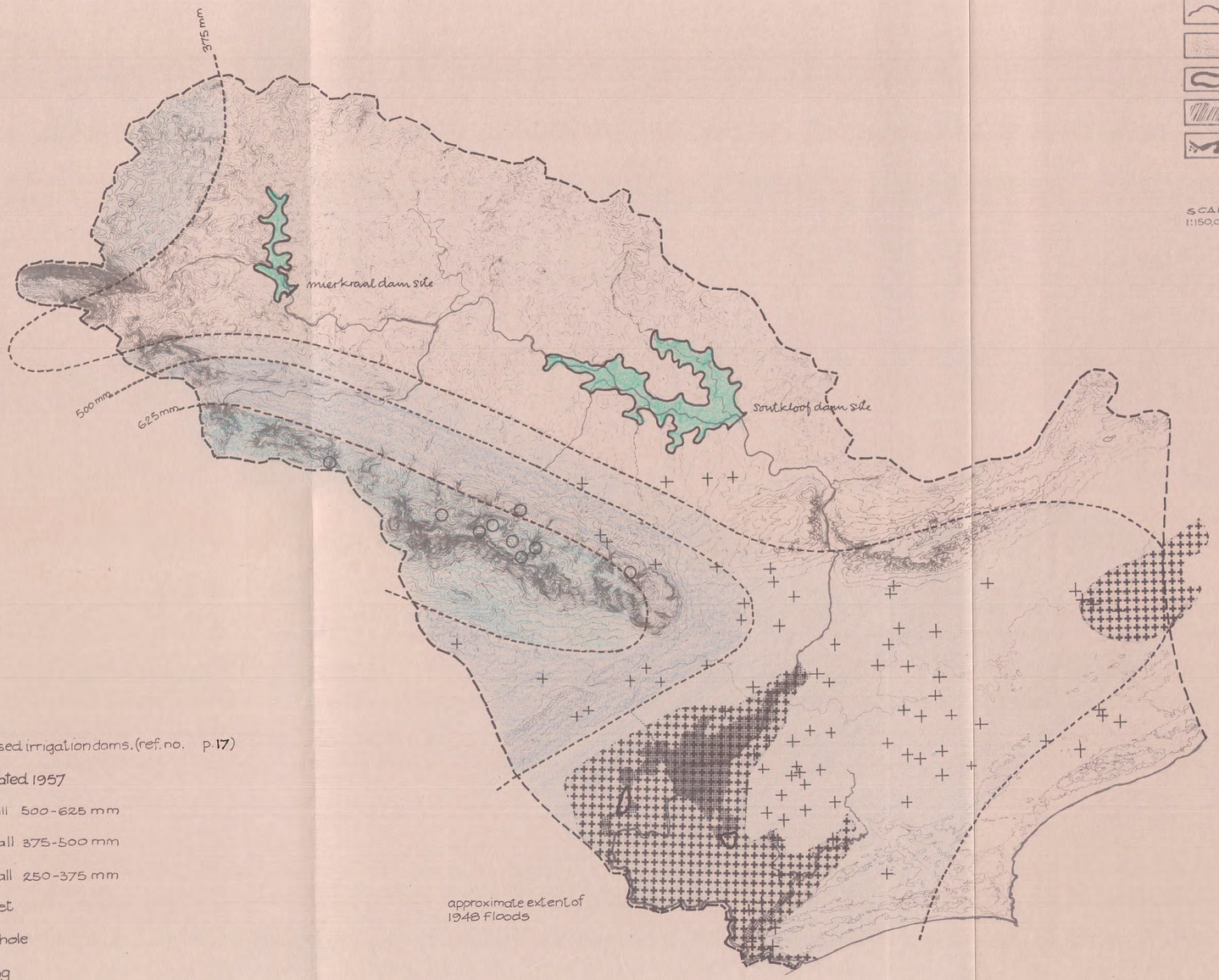
CATCHMENT AREAS

THE STUDY AREA MAP 2



HYDROLOGY

map 6a



marshes, swamps & vleis.
rivers
contours at 50 english foot intervals
perennial water
shifting sand dunes
rocky coastline

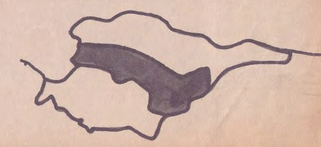
NORTH

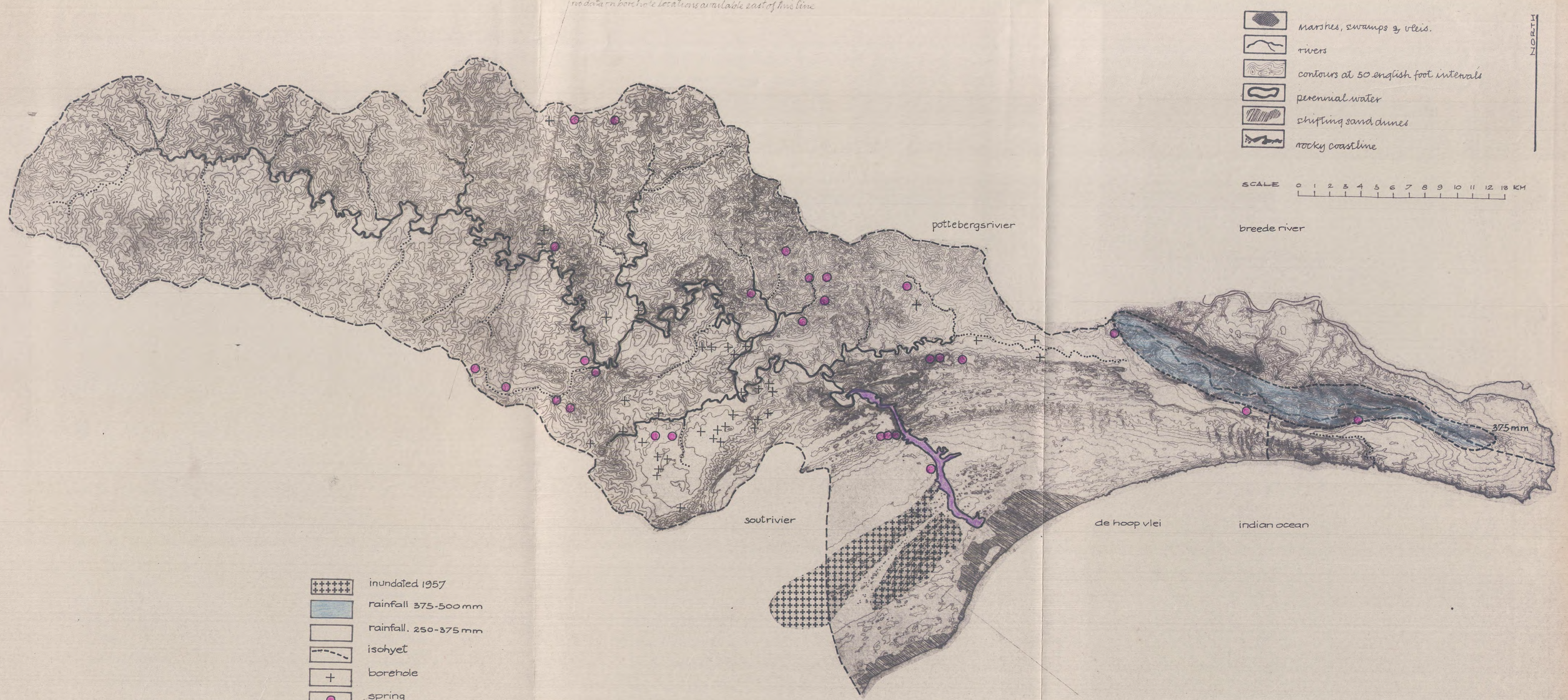
SCALE 1:150,000 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

proposed irrigation dams. (ref. no. p.17)
inundated 1957
rainfall 500-625 mm
rainfall 375-500 mm
rainfall 250-375 mm
isohyet
borehole
spring
perennial water
rivers
catchment fringe

HYDROLOGY

map 6b





map 6c

HYDROLOGY

2.3 NATURAL VEGETATION.

2.3.1 Fynbos.

The greater surface of the study area excepting where man has removed the natural vegetation or this has been suppressed by certain exotic species is the habitat of the distinctive temperate flora found within the mediterranean type climate of the south-western Cape and known now by the word "Fynbos". This indigenous word has replaced other ambigious terms such as Sclerophyll bush or scrub, Maquis or Macchia and Heath. The word fynbos implies both the fine-leaved form of many of the shrubs and the bushy structure of the vegetation.

The study area forms part of a plant geographical unit forming a roughly L-shape in which fynbos occurs extending from beyond the Cederberg to Port Elizabeth. (Ref. no. 6 p.10)

Fynbos is characterized by the following features -

(1) Lack of single species dominance, and/or

(2) The conspicuous presence of members of the family Restionaceae (Cape reeds or "riete").

This last gives the vegetation its characteristic physiognomic feature or restioid element. The other constant physiognomic feature is the small narrow rolled leaves or ericoid element.

Fynbos flora is very rich in species and is characterized, restricted distribution or high degree of endemism of many species, some species being confined to a single mountain top while others have distinct distribution.

Fynbos is a fire-type vegetation that must be burnt to retain its identity as a plant association. Many component species need fire for their reproduction and survival. Others put out poisons from their roots that alter the soil environment adversely. These poisons are probably destroyed by fire temperature. (Ref. no.6 p.15)

2.3.2.

The study area is subdivided for the purpose of botanical analysis into three main regions, the Strandveld, Mountain area and the RÛens while riparian land is considered as a distinct habitat.

2.3.2.1 Strandveld vegetation.

The Strandveld vegetation comprises the coastal strip varying in width from about three kilometers at the western half of the study area to approximately twenty kilometers in the vicinity of Bredasdorp comprising the littoral and inner dune fields from high water mark to

where the ancient dunes of the prehistoric seashore and.

The Strandveld souls are rich in lime, fine grained, derived from shelly beaches and of relatively recent origin. The dunes and beaches encountered in the study are white and have a fine texture (Ref. no. 5 p. 10)

2.3.2.1.1 Habitat subject to salt water inundation.

Within the Strandveld are a number of plant habitat variations. The narrow strip along high water mark comprising beach or sandy areas just inland of rocky coastlines subject to immersion by sea water and riverbanks in tidal estuaries such as at De Mond and Uilenkraal forms the habitat for a variety of reeds, runnergrass and succulents such as Cyperus Laevigatus, Scirpus Nodosus, Eragrostis Sabulosa, Limonium Scabrum, Triglochin Striatum, Suaeda and Arthrocnemium Variiflorum which withstand immersion conditions in varying degrees.

2.3.2.1.2 The littoral plant communities.

The littoral area may be defined as the strip of coast within 50 meters of the highwater mark. Here in the sheltered troughs between the dunes where soil moisture is greater, thickets of woody shrubs develop if protected from fire. The plant families are those of the temperate coastal forests. Of this non-fynbos vegetation which can develop into a closed scrub, the Melkhout, (Sideroxylon inerme) a small tree reaching up to six meters in height is the dominant growth.

The littoral area is subject to seawinds, salt laden sea spray and sandblast, maximum exposure being along the sea tending to reduce inland. Moisture content of the surface sand varies, troughs between dunes being moist compared to dune crests.

Particularly on the seaward side of dunes and in an area extending below high watermark grows sea wheat, a coarse perennial which tends to extend its terrain into open drift sands immediately inland of the narrow strip of littoral dunes. Sea wheat is found in community with sea pumpkin and marramgrass, the latter preferring sand fifty meters and furthur inland particulary where conditions are moist. Other of the non-fynbos species forming communities in the littoral area are, to use their popular names, sour fig, hotnotsvy, ostrich grass, steekriet, gonnabos, strandsabie, brakgras and seeplakkies.
(Ref. no. 7 p's 55, and 56)

2.3.2.1.3 Coastal fynbos.

From the inland edge of the littoral area extending to the inland border of the duneveld is the habitat of the coastal fynbos thriving in the lime rich sand. The coastal vegetation differs from the mountain and other fynbos in the study area. The restioid element is less conspicuous though forming the matrix of the ground layer and the ericoid element is prevalent. These latter fine leaved plants are bushy and rounded in form and often scattered as a discontinuous upper layer. Grasses are much in evidence. The indigenous species which form communities under the environmental conditions to be found here include Aspalathus Armatus, Aspalathus Forbesii, Konings-kandelaar, Nooienshaar, Bitterbos, Chasmanthe Aethiopica, two varieties of Dekriet, Bitou, Brakvygie, Heuningtee, Kapkappie, Bos-gwarrie, Hotnotskooigoed, Bekbessie, Cherrywood, White Milkwood, wild Cineraria, Keurtjie, Wild-currant and Slangbos. (Ref. 6 p.12 and 13)

2.3.2.2 Mountain fynbos.

The mountains of Table Mountain sandstone are the isolated Potberg and Soetanysberg and the grouped Paardeberg, Elandskloof and Bredasdorp mountain ranges, the plains and mountain slopes are the natural habitat of a relatively tall dense climax vegetation community with three layers :

1. the proteoid upper layer of 1.5 to 3 meters which varies in height and density with moisture and aspect.
2. the ericoid middle layer of shrubs to about 1 meter.
3. a ground layer of smaller woody plants, herbs, geophytes and specially Restionaceae. Annuals are infrequent.

On boulder slopes or talus, shrubs such as Taaibos and gnarled trees like kliphout and sybas can develop in time to a closed shrub or forest community in the absence of fire. Protected kloofs, folds and valleys on the seaward side have a moister type of forest with Rooi-els, Wit-els and without, Stinkhout, Assegai, Wild Peach, White Pear, Cape Holly, South African Beech, Ironwood, Wild Coffee, Dewberry and real Yellow Wood. These trees have broad hard shiny leaves; the forest is a rather poor relation of the Knysna forest furthur east. Climbing plants and ferns eg., Pteris Dentata are plentiful. Against particularly the northern slopes facing the RÛens are large bare patches where rainfall is less and usually covered with gravelly soil deficient in humus. These originate with summer fires the vegetation recovering very slowly.

Distinct communities develop in small specialised habitats such as streamsides with dense fynbos to 5 meters high where a single species (e.g. Leucadendron or Berzelia) may be locally dominant. These

plant communities are dealt with later under the heading riparian lands. Other specialized habitats include; flushes with almost impenetrable thickets of Restionaceae; seepages on drainage lines with dense spindly mixed shrubs with Psoralea Aphylla and Osmitopsis Asteriscoides dominant; shalebands with low matted shrubs and many grasses. (Ref. no.6 p's 12 and 13 and Ref. no.7 p's 48 and 51)

2.3.2.3 The RÛens.

The loamy soils of the hilly RÛens district are formed from the Bokkeveld series. The rainfall varies from 10 to 15 inches but the drier parts are towards the east and around Napiers. A preponderant area is put to the plough; only steep lands are cultivated. The characteristic natural vegetation is the Renosterbos. In Renosterbos communities one finds a variety of grasses particularly Elephant grass, soft shrubs, succulent shrubs and Geophytes. Grasses are the climax vegetation of the area in the vicinity of mountains the characteristic mountain vegetation mingles with the Renosterbos. Here veld burning and grazing allows the Renosterbos to suppress the mountain vegetation. (Ref. no. 7 p's 53 - 55)

2.3.2.4 Riparian lands.

In these areas occur a variety of plant communities. Alongside most perrenial streams common reeds and bull rushes are characteristic, also honey-bush and the ubiquitous Taaibos. On the riparian plains grows a fynbos typical of these areas comprising Leucadendron varieties including Knoppiesbos, Berzelia, Ferns and Arum Lilies. Vlei fires commonly occur resulting in the riparian machia being supplanted by the exotic Accacia varieties. Riparian vegetation in the mountain areas migrate along rivers deep, into the RÛens region. (Ref. no. 7 p's 55 and 56)

In this area adjacent to streams grows Conyza Iyaefolia, Kooibossie, Spikethorn and Thorn-trees. Deep ravines with rocky slopes are a frequent occurrence in the RÛens where Taaibos and Milkwood trees are the dominant tall vegetation. In the vicinity of Napier are brack valleys where the dominant plants are shrublike succulents.

2.3.3 Exotic vegetation.

The pest-plants Acacia Cynanophylla (Port Jackson wattle) and Acacia Cyclops or Rooikrans are found in the study region in coastal areas on dunes and lower slopes of mountains facing east, along the banks of many rivers and streams and in the disturbed ground adjacent to roads. (Ref. no. 8 p. 290)
These plants are stimulated by fire to reproduce at a frightening rate (Ref. no. 6 p. 16)

They were introduces into the area by the Department of Forestry for the purpose of reclamation work on the coastal driftsands in the effort to stabilize and reclaim the windblown sands with as low cost as possible.

B.N. Walsh states that "no detailed information has been available concerning..... the ecological consequences of their (the exotic Acacias) use..... It is perhaps now time to investigate.... whether the South African indigenous vegetation should be preserved, whether the complete ousting of the latter by the exotic Acacias is now in sight or will eventually ensue as indicated at present, and whether these Acacias should perhaps be limited in use..... if used at all" (Ref. no. 5 p. 61)

The present extent of spread of the Acacias is indicated on the natural vegetation maps. The edaphic limit to distribution in the study area is roughly up to the 1.000 foot contour line. (Ref. no. 8 p. 289)

2.3.4 Noteworthy plant communities.

Two noteworthy small plant communites exist in the study area. A remnant coastal forest of an advanced type in two sections named short forest and tall forest about 120 acres in extent resembling the coastal forests of the Knysna region and differing from the small scattered forest patches typical of the mountain areas are located in the mountain a few miles north of the Uilenkraal river mouth. This forest has been described in great detail in an ecological work by H.C. Taylor (Ref. no. 9).. Near the eastern end of the study area in the valley between the Potberg and the limestone hills on its coastal side on the farm Cupidokraal is the unique habitat of the Leucosperumum fulgens. (Ref. no. 10)

2.3.5 The specialized fynbos of the limestone ridges.

On the limestone ridges forming the inner fringe of the marine terrace a narrow discontinuous strip varying in width forms the habitat of a specialized fynbos community. The community has adapted during its development to the limestone and comprises entirely limestone endemics.

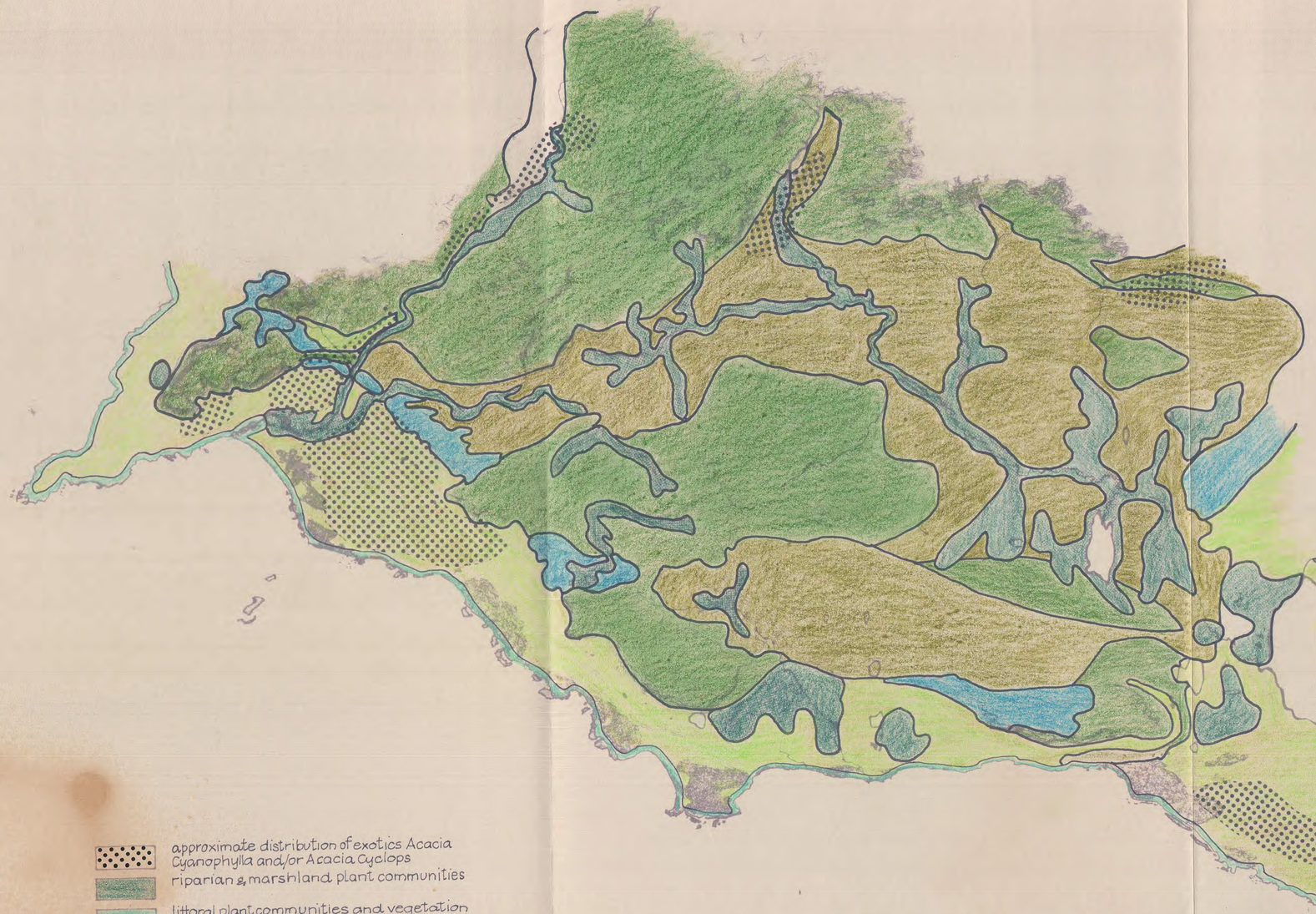
This narrow belt of limestone species located between acid fynbos species is quite remarkable and of particular scientific and aesthetic interest. It forms a vital area of observation on the evolution of the Cape Flora and fynbos. Here is found pairs of vicarious species which diverged from a common ancestry and here can be studied the plant evolution and mechanism of specisiation. In such a plant

habitat which has been disturbed by periodic inundations during the Pleistocene Evolution takes place rapidly, this being typical for new ecological niches becoming available for colonization during the Pleistocene. (Ref. no.10)

2.3.6 Fynbos as a value system.

Fynbos is a vegetation of great beauty and is of considerable scientific interest. However it produces no timber, little and until quite recently has had little commercial value and consequently accessible fynbos on better soils in the area have been ploughed up and replaced by crops of value to man. A great deal of what remains is in the mountain wilderness of krantz and kloof. These high places yield mans vital resource, water. For conservation of water catchments fynbos has a prospect as young fynbos veld transpires at least 20% less than a pine forest. Scientific management of such catchments could result in optimum water yield (Ref. 6 p. 23) Fynbos has value to man for purposes of conservation of rare species and vegetation types, scientific study and human recreation in wilderness areas where the hardy few can appreciate wild nature.

In the soft undulating country in the Elim - Klein Hagelkraal - Viljoenshof triangle land values have recently increased considerably due to commercial exploitation of the reedy Restionaceae which are allowed to dry and are traded for their ornamental value. At present farmers are selling picking rights to entrepreneurs, who employ the pickers. Much of the picking is done disregarding the future of the resource which requires careful management to ensure continuity. (Ref. no. 10) The mountain fynbos on farms in the area is now generally regarded by landowners as a welcome additional source of income in certain areas where ground values as pasturage is low. Livestock has on some farms been completely withdrawn in favour of wildflower exploitation.



- approximate distribution of exotics Acacia Cyanophylla and/or Acacia Cyclops
- riparian & marshland plant communities
- littoral plant communities and vegetation habitats subject to salt water inundation
- mountain fynbos
- coastal fynbos
- specialized fynbos on limestone ridges shows transition to vestigial woody scrub. Climax as at Grootbos "tall forest"
- dwarf fynbos on Bokkeveld shale

- marshes swamps & vleis
- rivers
- contours at 50 meter with foot intervals
- perennial water
- shifting sand dunes
- rocky coastline

NORTH

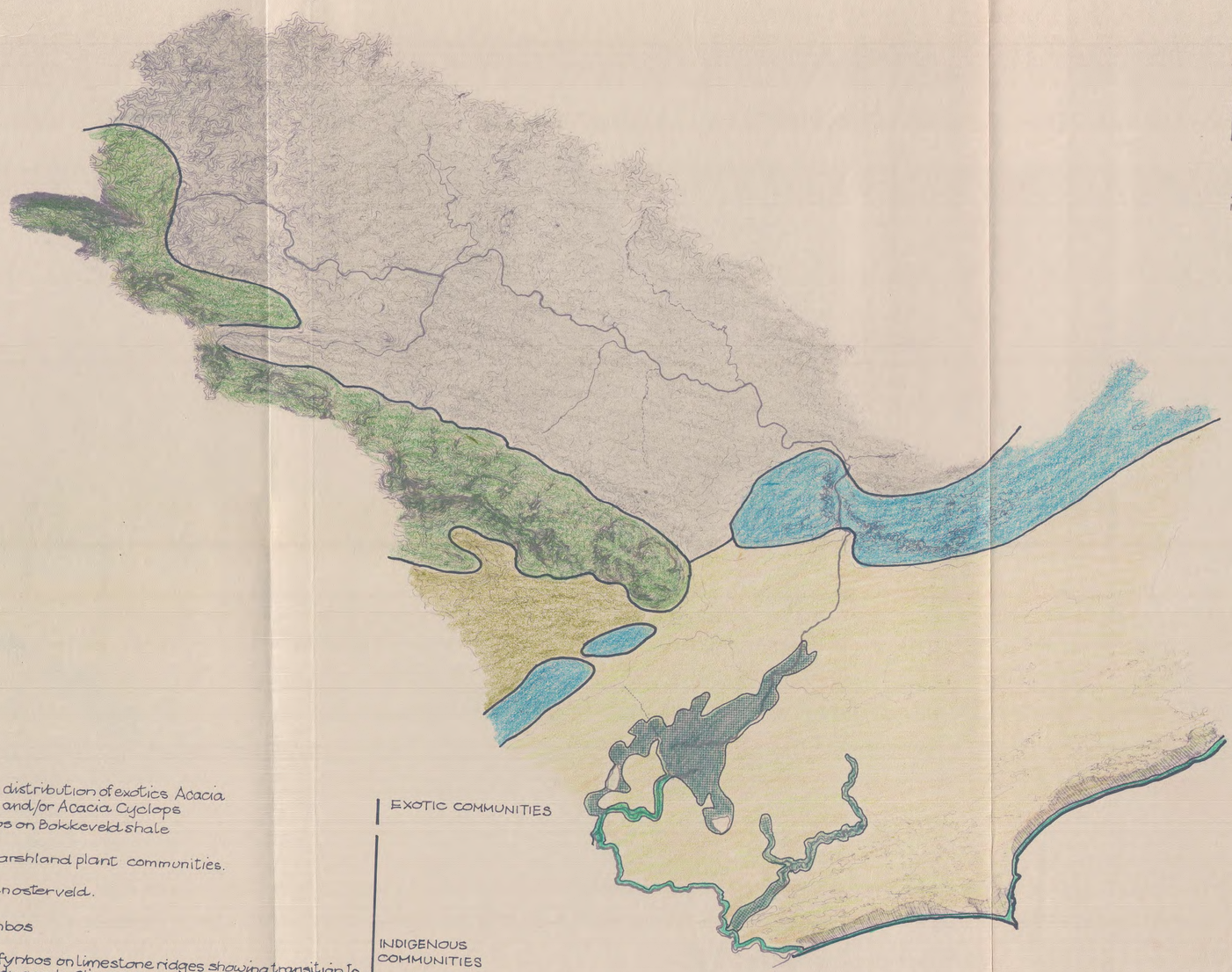
SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

NOTE
the whole of this area was in 1400 a.d covered in forest & scrubforest excluding the mountains to the north and west which had a cover of fynbos. with scientific management the former area would be mixed grassveld.
ref. Acocks, J.P.H. Veld types of South africa. maps no 1 & 4

map 7a

NATURAL VEGETATION

showing vegetation endemic to cultivated lands



- approximate distribution of exotics Acacia Cyanophylla and/or Acacia Cyclops
- dwarf fynbos on Bokkeveld shale
- riparian & marshland plant communities.
- coastal rhenosterveld.
- mountain fynbos
- specialized fynbos on limestone ridges showing transition to vestigial woody scrub. Climax as at "Grootbos" tall forest.
- coastal fynbos
- littoral plant communities and vegetation subject to salt water inundation

EXOTIC COMMUNITIES

INDIGENOUS COMMUNITIES

- marshes, swamps & vleis.
- rivers
- contours at 50 english foot intervals
- perennial water
- shifting sand dunes
- rocky coastline

INTRO

SCALE 1:150,000

0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

NATURAL VEGETATION

map 7b

map 7c

NATURAL VEGETATION

showing vegetation endemic to cultivated lands.

2.4 SOILS.

2.4.1 Soil association areas.

Soil association zones indicating the spatial distribution and characteristics of soils (maps 8a, 8b, 8c) divide the region under consideration into areas of geographically associateed soils of more than one class. These soil association zones have significance at a broad level of agricultural planning. Each representing a specific combination of soil parent material, relief, climate and vegetation.

The following is a brief description of soils found in each soil association zone and an evaluation of their irrigability.

2.4.1.1 Soils on Table Mountain Sandstone.

Interspersed between hard bare surface rock on Table Mountain sandstone on large areas of coarse, acid, highly silicious porous generally poor sand derived by weathering from the underlying strata of Table Mountain sandstone, the sand is bound by vegetation, is in places rich in organic material and dark grey in colour. The soil is generally whitish or grey supporting grasses heaths and proteas, along the Uilenkraal river large areas of sandy soil used for gardening have probably been deposited by rivers. The soil varies in depth but is often very shallow.

The mountainous areas generally are unsuited to irrigation although small irrigable areas may exist.

2.4.1.2 Soils on limestone ridges forming inner edge of marine terrace.

The outcrops of recent limestones in the form of ridges are covered with thin poor soil. (Ref. no. 4 p.5)

2.4.1.3 Soil association area 6.

In soil association area 6 the stony soils Vaalsand and Spruitfontein occuring on old river terraces are widely distributed and should present no difficulties for irrigation and judging from their morfological characteristics have high potential under irrigation. Deep alkaline soils occur on terraces near the river where the soil suitability for irrigation decreases with higher alkaline content. The red, brack or alkaline soils in the area are thus generally unsuitable for irrigation purposes. In association with these soils occúr soils with light textured top soil with a sharp transition to clayey subsoil. The potential for irrigation is dependent on topsoil depth and the salt content of the subsoil. (Ref. no. 11)

2.4.1.4 Soil association area 9.

Here occur soils derived from the underlying shale. The topography is generally rolling with rounded hills with shallow soils on the upper parts of hills while on hilltops rock outcrops occur and soil depth is usually from 100 millimeter to 150 millimeters. Shale layers slope steeply giving good water retention properties. slopes exceeding 20% gradient are unsuited to contour furrows as the distance between furrows restricts movements of combines and other implements. These lands should be utilized for grazing only by planting clover grasses and perennial lucerne grazing in order to combat erosion. (Ref. no. 11)

The stony nature of the soils lends resistance to erosion and good moisture holding properties yet mechanical erosion control by means of contour furrows are necessary on slopes between 10% and 20%. The soils are inherently highly fertile. As 40% of the rainfall occurs in the summer months these soils are eminently suited to the cultivation of perennial pastures and thus the production of meat which however is limited by unseasonable droughts and attendant problems with livestock drinking water. (Ref. no. 12 2.1.2 and 2.1.2.1)

2.4.1.5 Soil association area 10.

Soil is generally limited in depth, is acid and has weak water retention properties. The soil is referred to as suurveld (sour veld). Soils are poorly endowed with inherent plant nutritive materials and many stony outcrops occur and shaly soils occur. Trace element deficiencies occur where soils are highly alkaline. Such soils cannot be easily corrected. (Ref. no. 13)

2.4.1.6 Soil association area 11.

The higher rainfall areas near mountains and soil association zone 11 includes areas with soils suited to irrigation. The zone 11 topographically comprises rolling hilly countryside generally comprising shallow residual soils on shales. Soil depths, which in the main are under 250 millimeters and steep slopes, place considerable limitations on the suitability of this zone for intensive irrigation while level valley soils are scarce and inclined to be brack. Given effective management and cultivation the area below the proposed Mierkraal damsite can to a degree be utilized for farming with irrigation if economically feasable. (Ref. no. 13),

2.4.1.7 Soil association area 13.

Soils here are shallow and sandy and subject to wind erosion.

2.4.1.8 Soil association area 14.

In association area 14 which hugs the coastline forming a narrow strip varying in width from a $\frac{1}{2}$ to 6 kilometers stretching from the limestone ridge adjacent to the Potberg mountain to the eastern end of the study area. The sand varies from shallow lime rich sand on lime to deep lime rich sands subject to wind erosion and is not irrigable.

2.4.1.9 Soil association area 15.

Soils on the Bokkeveld shales of soil association zone 15 are generally not suitable for irrigation but irrigable soils occur locally in the higher rainfall areas in the vicinity of the mountains. Soils are generally sandy on clayey sub soil giving rise to waterlogging. The area is characterised by the great variety of soil types occuring within relatively small areas and a reasonably high rainfall. Deficiency in trace elements is generally found, causing problems relating to cultivation of pasturage and the health of livestock. Trace element deficiencies are probably the reason for the low proportion of land surface under cultivation. These deficiencies can be rectified by adding copper, zinc, manganese and molybdenum. (Ref. 13) With corrections of these deficiencies, a good farming system and application of fertilizers the area has potential for a crop rotation system with mixed grass clover pasture and grain. High humidity causes grain diseases.

2.4.1.10 Soil association area 16.

Area 16 known as the Bredasdorp vlakte comprises largely brack soils which tend to be waterlogged. Successful large scale intensive irrigation is impossible without the necessary preliminary precautions, effective management and cultivation. (Ref. no. 13)

2.4.1.11 Soil association area 17.

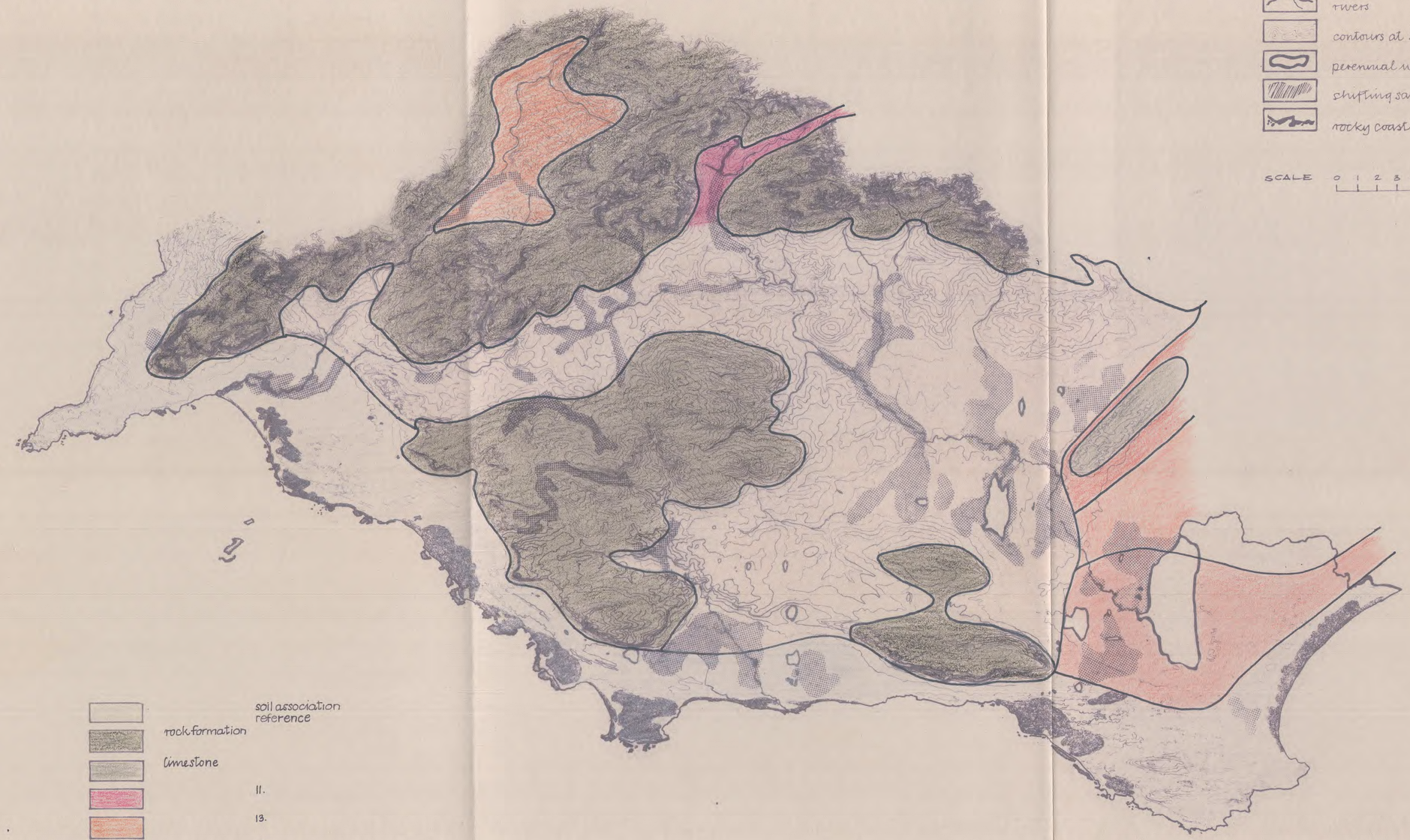
Ubiquitous in association area 17 are shallow sandy lime-rich soils associated with recently formed limestone which overlie the bedrock limestone. The soils are completely unsuited to irrigation and comprise Muden and Dudfield soil series. (Ref. no. 14 p.2)
The soils are marginally suitable for grain and pasture cultivation due to low rainfall and shallow topsoil and subject to periodic waterlogging under conditions of above average rainfall. Soil is often stony, tending to dense subsoil. Brack soils occur. Wind erosion is not a serious problem in this area. (Ref. no. 13).

2.4.1.12 Potential for irrigation of soils in the study area.

Pedological studies have revealed a wide range of soil forms, groups and soil series each of these having different characteristics. Of the 32 soil types or series found in the study area ohly 5 can be considered as class 1 irrigable soils on which any type of crop may be cultivated providing that climatic, specific plant requirements, unit cost of water and the production potential of the soil are favourable. 21 of the soil types fall in class 2 irrigable soils implying irrigability with reservation. The remaining 6 soil types are of class 3 which are under present circumstances non-irrigable for various reasons.

The area covered by class 1 irrigable soil is small compared to non-irrigable soils which occur extensively. Irrigable soils are widely scattered in small areas, and vary in respect of the type of irrigation to which they are suited. As a result of physical and chemical problems much of the soil is of doubtful value for irrigation purposes but there are however no insuperable problems of soil fertility.

The study area together with the Overberg region within which it lies is considered of doubtful potential for development with irrigation as a result of the dispersed distribution pattern of soil types suitable for irrigation which will involve a costly water distribution system. (Ref. no. 15 p. 52)



marshes, swamps & vleis.
rivers
contours at 50 english foot intervals
perennial water
shifting sand dunes
rocky coastline

NORTH

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

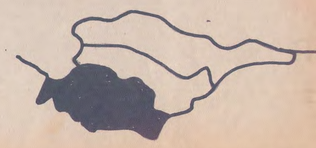
rock formation
limestone

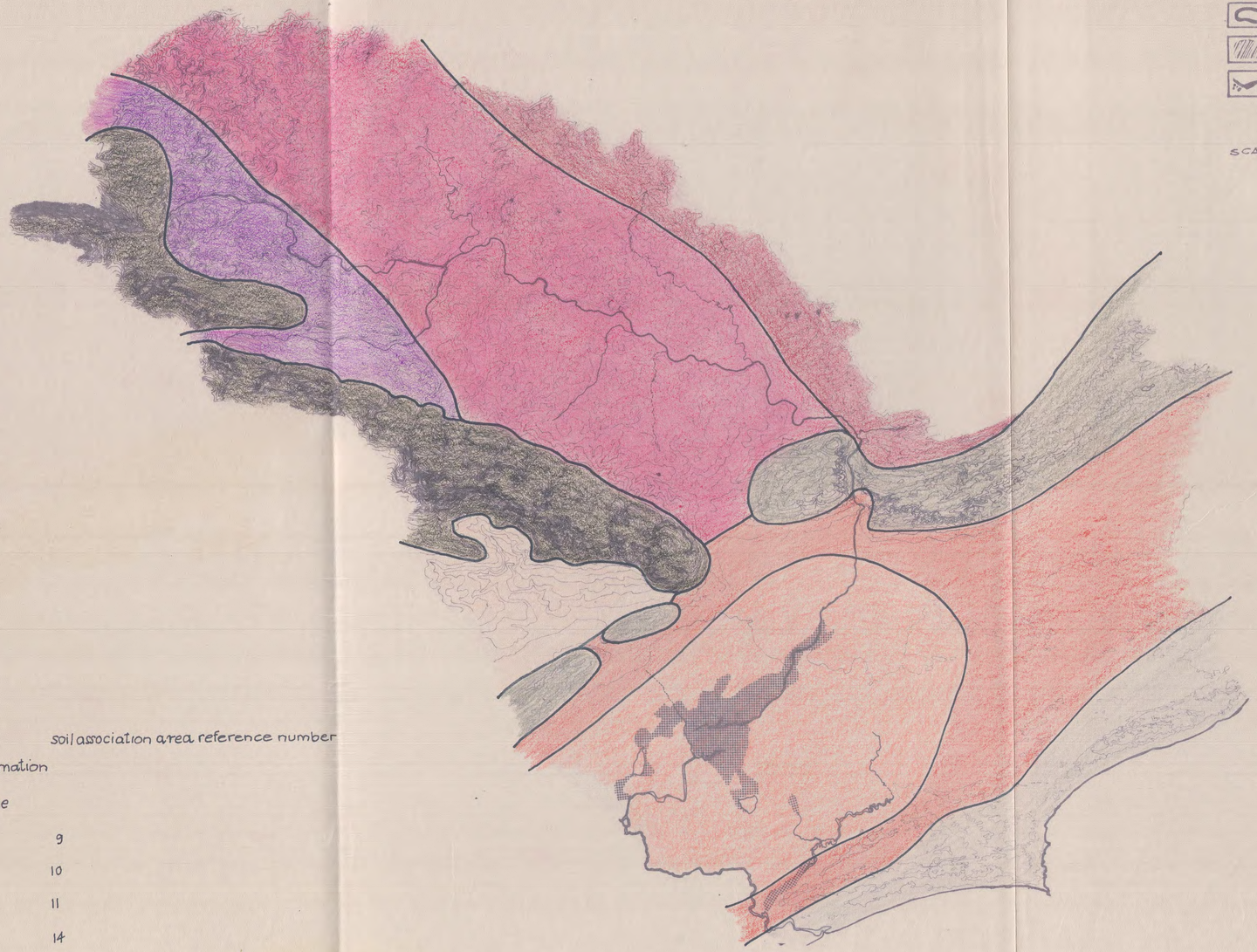
soil association reference

11.
13.
14.
15
16
17

SOILS

map 8a





marshes, swamps & vleis.
rivers
contours at 50 english foot intervals
perennual water
shifting sand dunes
rocky coastline

NORTH

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 18 KM

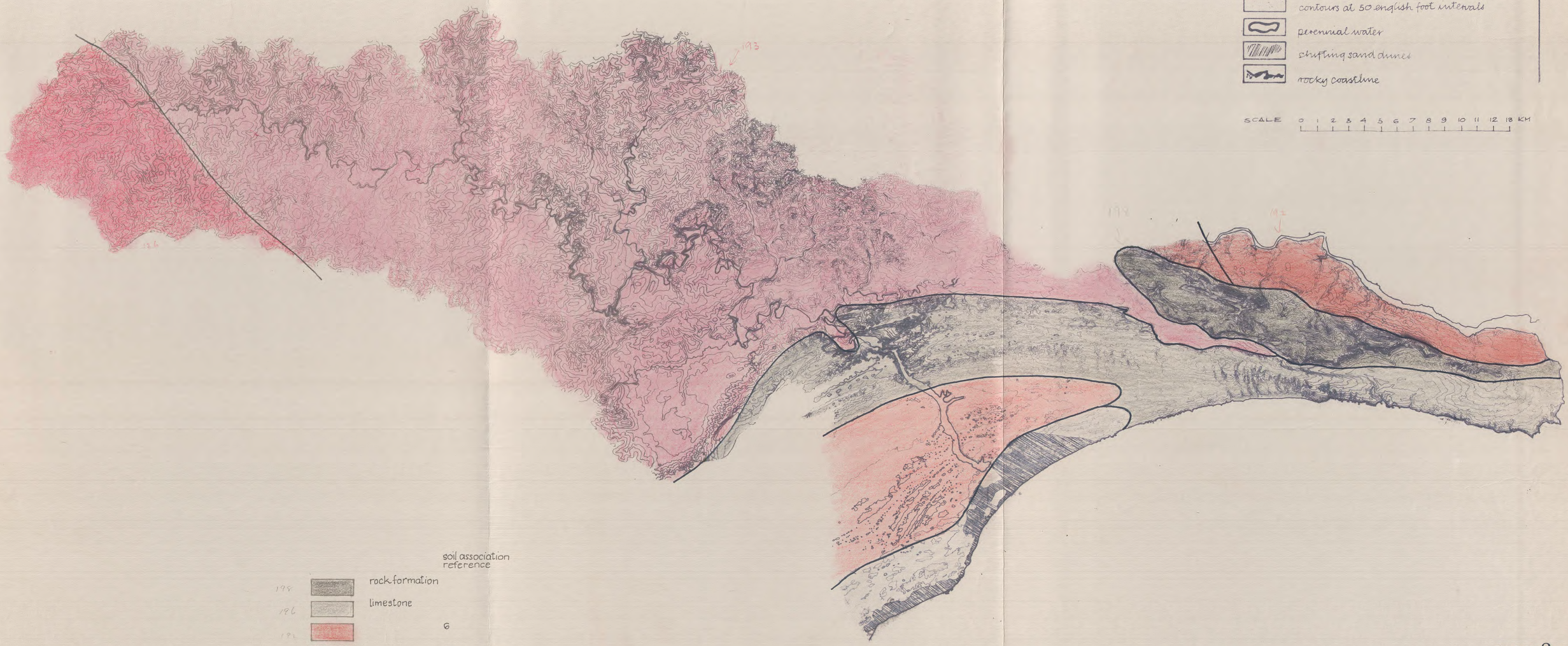
soil association area reference number

rock formation
limestone

9
10
11
14
15
16
17

SOILS

map 8b



marshes, swamps & vleis.
rivers
contours at 50 english foot intervals
perennial water
shifting sand dunes
rocky coastline

NORTH

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 18 KM

soil association reference

	rock formation	
198	limestone	
196		6
194		
193		9
126		10
195		14
191		17

SOILS

map 8c

2.5 WILDLIFE.

2.5.1 Introduction.

Man has influenced the ecology of the study area as a hunter-gatherer at least since the Middle Stone Age, but the greatest ecological changes have occurred since van Riebeeck's settlement at the Cape. The scrub forest covering of all but the mountains where fynbos was the natural vegetation has now disappeared excepting for the few surviving forest patches which have escaped man's fire and axe. Fynbos now covers the uncultivated land. Man's influence on the vegetation is also seen in the prolific exotics that he has introduced.

Vegetation changes bring about changes of environment and the distribution of wildlife species. With the virtual disappearance of the scrub forest for example the habitat necessary for the continued existence of the bosbok in the area is now reduced to the two remnant forests at Grootbos. (Ref. no. 9 p. 29).

The habitats of certain species have given way to the plough while over the years initially abundant wildlife has been greatly reduced in numbers.

2.5.2 Mammals.

Of the 78 wildlife types known to have existed in the area 17 are now extinct, one of which has been reintroduced while two species have been introduced from other parts of the country. (Appendix A) The list in appendix A includes mammals introduced directly or indirectly by man and also mammals types which became extinct and have been reintroduced into private estates and reserves.

Conditions of habitat in the study area have not remained static over the years and changes particularly in the flora have had repercussions on the ecology of the animals. The eradiction of game by intensive methods and the supplanting of the normal vegetation by the white man since his arrival at the Cape has resulted in the disappearance of numbers of creatures that once freely roamed the area. The areas which for instance are now or which when uncropped become worthless renosterbosveld was once covered with rich red grass.

The occurence of fauna in a district is influenced by environmental conditions created by topography, vegetation, climate and other factors. The coastal plainlands of Bredasdorp for example are particularly appropriate for lowland living forms of fauna. (Ref. no. 44 p. 29) Map 9 graphically presents the distribution of the mammal family Bovidae.

The grysbok prefers the cover of the scrub and bushveld of the area where the vaal-ribbok also thrives although this type of country is totally unlike their normal habitat. The study area includes the origional habitat of the bontebok which extended from the Bot river to the vicinity of Riversdale and from the coast up to the Langeberg mountains. For this reason the origional Bontebok Park was located to the north of the Heuningnes river but was subsequently moved to Swellendam.

2.5.3 Avifauna.

Ornithological interest in the study area focuses on a number of significant and various unique habitats.

2.5.3.1 The De Hoop vlei region.

The vlei and its immediate vicinity is of particular significance. The vlei overflows at intervals of about fifty years inundating large tracts of surrounding countryside, resulting in a series of temporary birdlife habitats in the form of a few large fresh water vleis which change over the ensuing 10 year period through evaporation and seepage to a series of isolated excessively saline pans alternating with salt flats. The final recession of inundation results in re-colonization of land by vegetation forming extensive alternating salt flats and grass covered flats. The reconversion of the whole origional area of inundation to the origional coastal fynbos cover may take 15 years (Ref. no. 30 p. 236)

The following are the main permanent habitats.

1. The brackish waters of De Hoop vlei prosper where water birds, roost and feed along the shallow sandy western bank particularly where vlotgrass grows in dense patches.
2. Riverine bush.
3. Coastal fynbos.
4. The sea.
5. Isolated fresh water vleis.

"It appears that the rich avifauna of the De Hoop region and the large number and variety of breeding records from here are attributable largely to the variety of habitats compounded together in this relatively small area" (Ref. 30 no. p. 253). At least 188 species have been recorded in the De Hoop region and there are breeding records for 96. These are impressive figures for any region in the south-western Cape. The relative isolation of the area and freedom from interference contributes to the birdlife and may have been the final inducement for example for the Namaqua sandgrouse towards breeding here.

2.5.3.2 The Potberg.

This mountain is interesting both for its bird life and botanically. In the upper krantzes of a south-west facing kloof, on the lower slopes of which is a remnant forest, is to be found one of the last of two known surviving colonies of the Cape vulture. This site has potential as a tourist attraction (Ref.no. 19).

2.5.3.3 The Prinskraal area.

Unique to Southern Africa are 5 pairs of breeding European storks on and in the vicinity of the farm Prinskraal located on the coastal plain between Bredasdorp and De Mond. These storks which in the Northern hemisphere breed on roofs need the marshy ground found in the Prinskraal area and breed in the indigenous milkwoods (Ref. no.19).

2.5.3.4 Inland vleis, marshland and salt flats.

All these areas are important ornithologically as the permanent habitat of wading birds. (Ref. no. 19) Such species as waterhen, gallinul crakes and rails are attracted to reed beds. The coot builds nests in vlotgrass patches which forms their staple diet.

The larger vleis are De Hoop vlei, Soetendals vlei and Voël vlei while various small vleis and pans occur mainly in the eastern part of sub-division (a) of the study area. In the lower reaches of the Kars-river are the Kars river vlei and Varkens vlei, in the poorly drained lower part of the Nuwejaars river drainage basin are the large Voël vlei, Langpan, Rondepan, Moddervlei and a number of other small brack water bodies while in the area drained by the Ratel river are Melkbos-pan, Vispan and a largish unnamed vlei near Buffeljagsberg. The relatively narrow coastal plain from Franskraal se berg to Soetanys-berg is characterized by marshy ground and a series of small pans and vleis other than those referred to above. There is a fresh water pan named Grootvlei pan on top of the Duinfonteinberg.

2.5.3.5 Coastal fynbos.

Appendix B lists 28 species found in this habitat from which extends the Potberg to the western end of the study area interrupt only by areas covered by exotic Acacias.

2.5.3.6 Estuaries.

The only tidal rivers are the Heuningnes and the Uilénkraal rivers. The former is tidal for about 11 kilometers (Ref. no. 5 p. 15) while the latter is very shallow and tidal for a short distance only.

Migratory European and Asian wading birds are dependant chiefly on estuaries particularly the shallow water of these habitats. (Ref. no.19)

At least 64 species have been noted in the Heuningnes area (Appendix B) by nature conservation officers at the Heuningnes research station.

2.5.4 Aquatic life.

Aquatic life is related to two broad habitat classes, inland water bodies ranging from fresh water to the sea water of tidal rivers and water bodies varying in degree of salinity and marine within which class is included the long narrow intertidal habitat.

2.5.4.1 Inland waters.

2.5.4.1.1 Vleis.

In the De Hoop vlei aquatic life comprises Cape kurper and large daphina magna, small crustaceans, fresh water crabs and frogs while there is an absence of estuarine fish species.

The 4.000 acres of private waters of the Soetendals vlei until recently when prolonged drought in 1969 caused complete drying up of the vlei's water for the first time since 1790, was the habitat for a very large fish population comprising a variety of species including white bait, springers, harders, white steenbras, Kaapse nooientjie, largemouth bass, spotted bass, bluegill and carp. The majority of fish were marine or estuarine. Since the drought the vlei has not overflowed into the Heuningnes river.

Invertibrates in the vlei include fresh water mussel, fresh water snail and fresh water crab. The fish population of the vlei is at present virtually unexploited although an excellent potential appears to exist for commercial exploitation of the springer, harder and steenbras populations.

2.5.4.1.2 Rivers and estuaries.

The rivers of the area are unsuitable for trout and are not utilized by members of the Cape Piscatorial Society. Bass could be introduced into the perennial Uilenkraal river which is fed by fresh water emanating from sandstone aquifers.

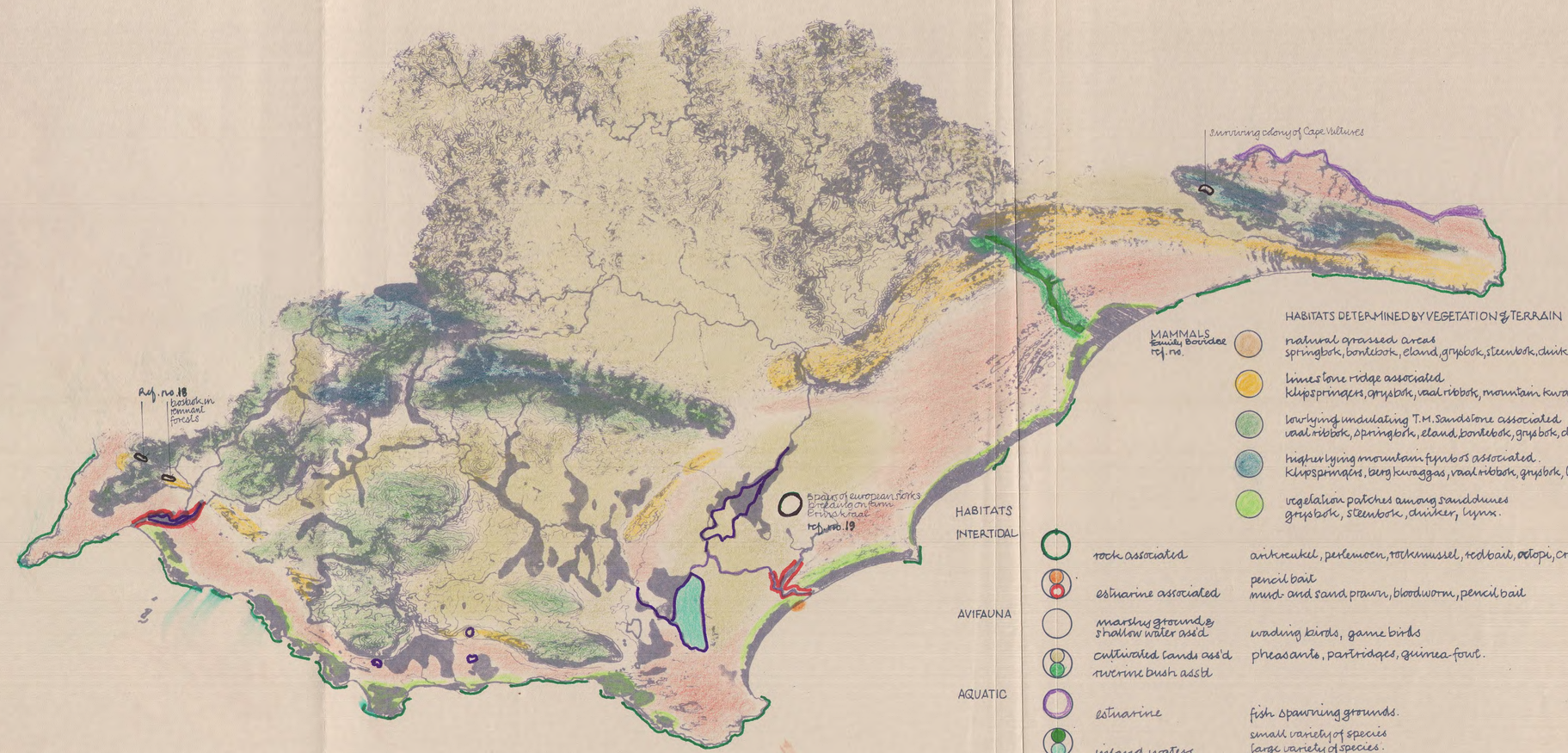
The fish of the tidal reaches of the Heuningnes river estuary include the spotted grunter, white steenbras and many other varieties which enter the river from the sea to spawn. The estuary and Soetendals vlei are parts of the same river system together forming an ideal

area for the study of ecological problems related to aquatic animal and plant life. At the Heuningnes research station of the Department of Conservation research is conducted on certain varieties of estuarine life forms (Ref. no. 27). In the unpolluted waters are the habitats of bloodworm and pencilbait and the breeding places of mullet.

2.5.4.2 Marine life.

The inshore water west of Cape Agulhas is generally noticably colder than the water close in between Struisbaai and the Potberg. This temperature difference influences sea life. The intertidal zone is the habitat for oysters at certain rocky spots in the warmer water while kelp and perlemoen prefer the colder waters. Red bait, arikreukel, octopi and crab occur at various rocky places on the whole coast of the study area. Some beaches are the habitat for sand mussel.

A large variety of fish frequent the sea in the area. Reef fish include red steenbras, white steenbras and stompkop found in summer and biskop, galjoen, john brown, pens-en-derms, kalkvis, french madams, blacktails and steentjies. Among the pelagic fish occurring in these waters are harders, yellowtail, kartonkel, elf and mackerel. (Ref. no.38).



scale 1:300,000

HABITATS DETERMINED BY VEGETATION & TERRAIN

MAMMALS
Family Bovidae
ref. no.

- natural grassed areas — springbok, bontebok, eland, grysbok, steenbok, duiker, vaal ribbok
- limestone ridge associated — klipspringers, grysbok, vaal ribbok, mountain kwagga
- low lying undulating T.M. Sandstone associated — vaal ribbok, springbok, eland, bontebok, grysbok, duikers.
- higher lying mountain fynbos associated. — klipspringers, berg kwaggas, vaal ribbok, grysbok, leopard.
- vegetation patches among sand dunes — grysbok, steenbok, duiker, lynx.

HABITATS			
INTERTIDAL	rock associated	anker cukel, perlemoen, rock mussel, red bait, octopi, crab.	
	estuarine associated	pencil bait mud- and sand prawn, bloodworm, pencil bait	
AVIFAUNA	marshy ground & shallow water ass'd	wading birds, game birds	
	cultivated lands ass'd riverine bush ass'd	pheasants, partridges, guinea-fowl.	ref. no 18 ref. no. 30 p. 235.
AQUATIC	estuarine	fish spawning grounds.	ref. no. 26.
	inland waters	small variety of species large variety of species.	ref. no. 26
	rock ass'd. marine life		
UNIQUE	bank associated		

WILDLIFE

map 9

2.6 CLIMATE.

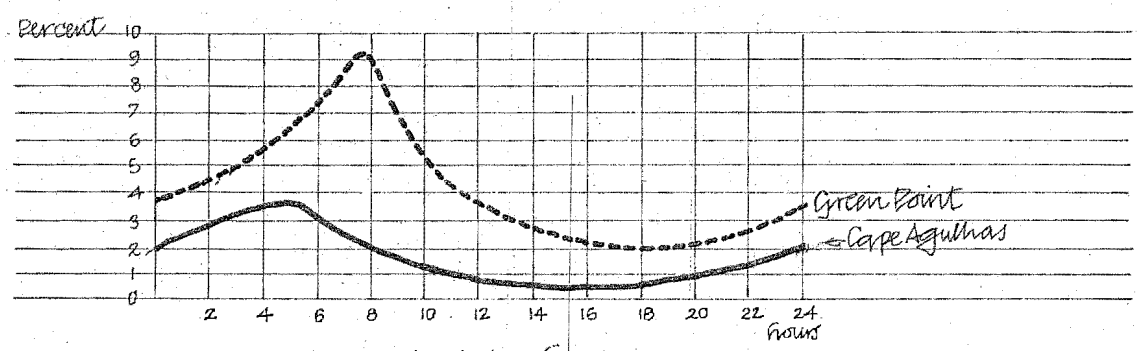
2.6.1 General description.

The climate is typical of the winter rainfall region with wet winters and dry summers.
The proximity of the ocean has a moderating influence on temperatures, summers being warm to hot and winters cool (see Figure 1. Temperature analysis). Windless days in summer tend to be very hot.

The autumn months are characterised by periods of calm (see Figure 1) while long periods marked by overcast skies often occur prior to the winter rains. (Ref. no. 2 p.8). Most rainfalls from May to September caused by north west or south east winds. Wind velocities during winter are often high. Rainfall is highest in the mountains at the western end of the study area and decreases towards the east. (see hydrology maps no. 6a, 6b and 6c). Rainfall is higher on the south faces of mountains than on north facing slopes as the direction of rain bearing winds is mainly from the south or south east. Rainfall occurs characteristicly as light showers but heavy rainfall accompanied by thunderstorms occasionally occurs during summer or winter(Ref. no.2 p.8).

40% to 50% of daylight time throughout the year is under conditions of bright sunlight (see solar analysis Figure no.1). . The occurrence of fog and mist is greatest at five o'clock in the morning gradually decreasing to a minimum likelihood of incidence of less than 5% at 6 o'clock in the afternoon. (see Figure 2). Generally the climate is more suited to coastal recreation in the autumn due to the likelihood of lengthy calm periods at this time of the year. The summer months tend to be windy particularly in the afternoons.

FIGURE 2.



Mean hourly frequency of mist & fog

MEAN HOURLY FREQUENCY OF MIST AND FOG. REF. 46

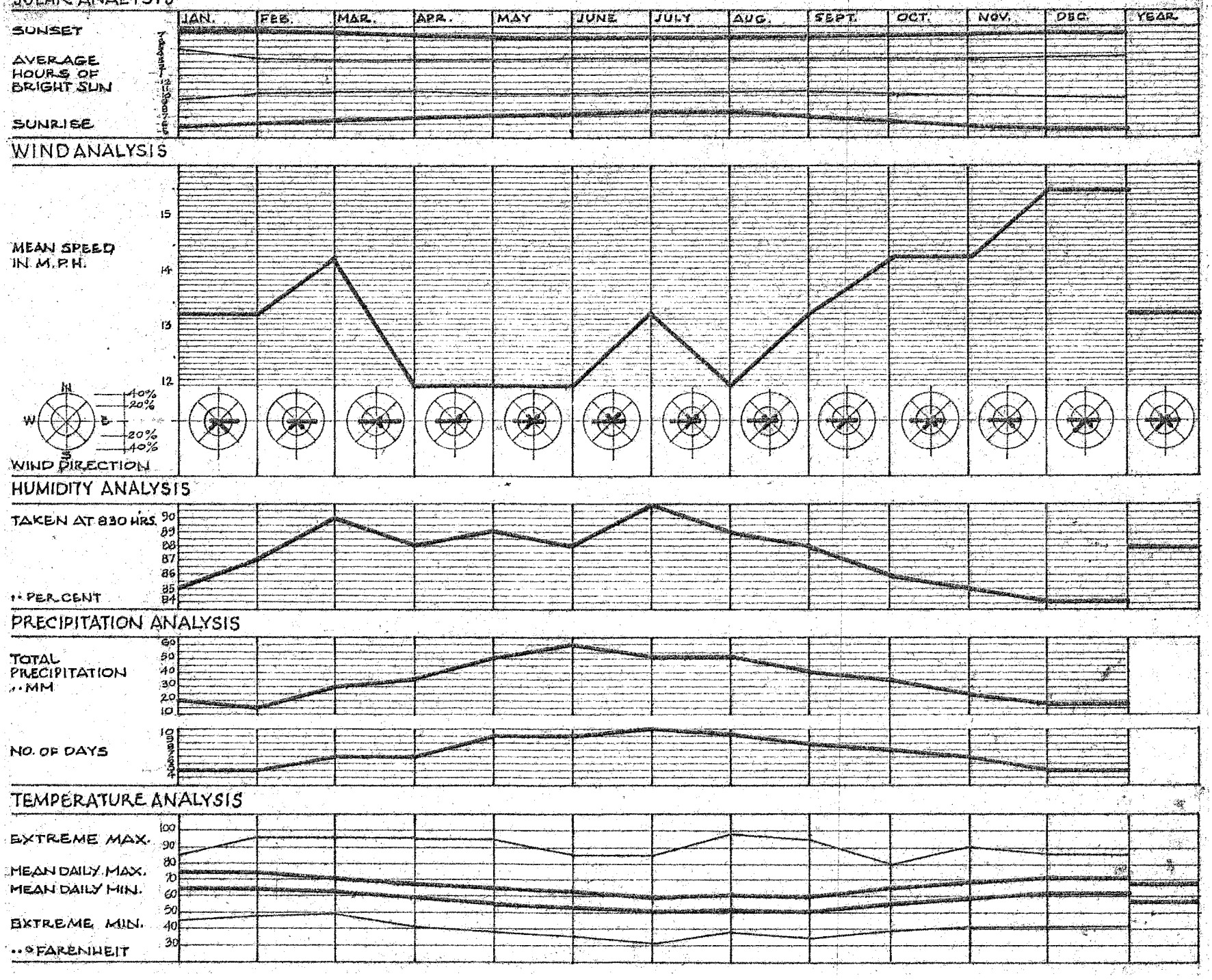
2.7 SUMMARY AND CONCLUSIONS.

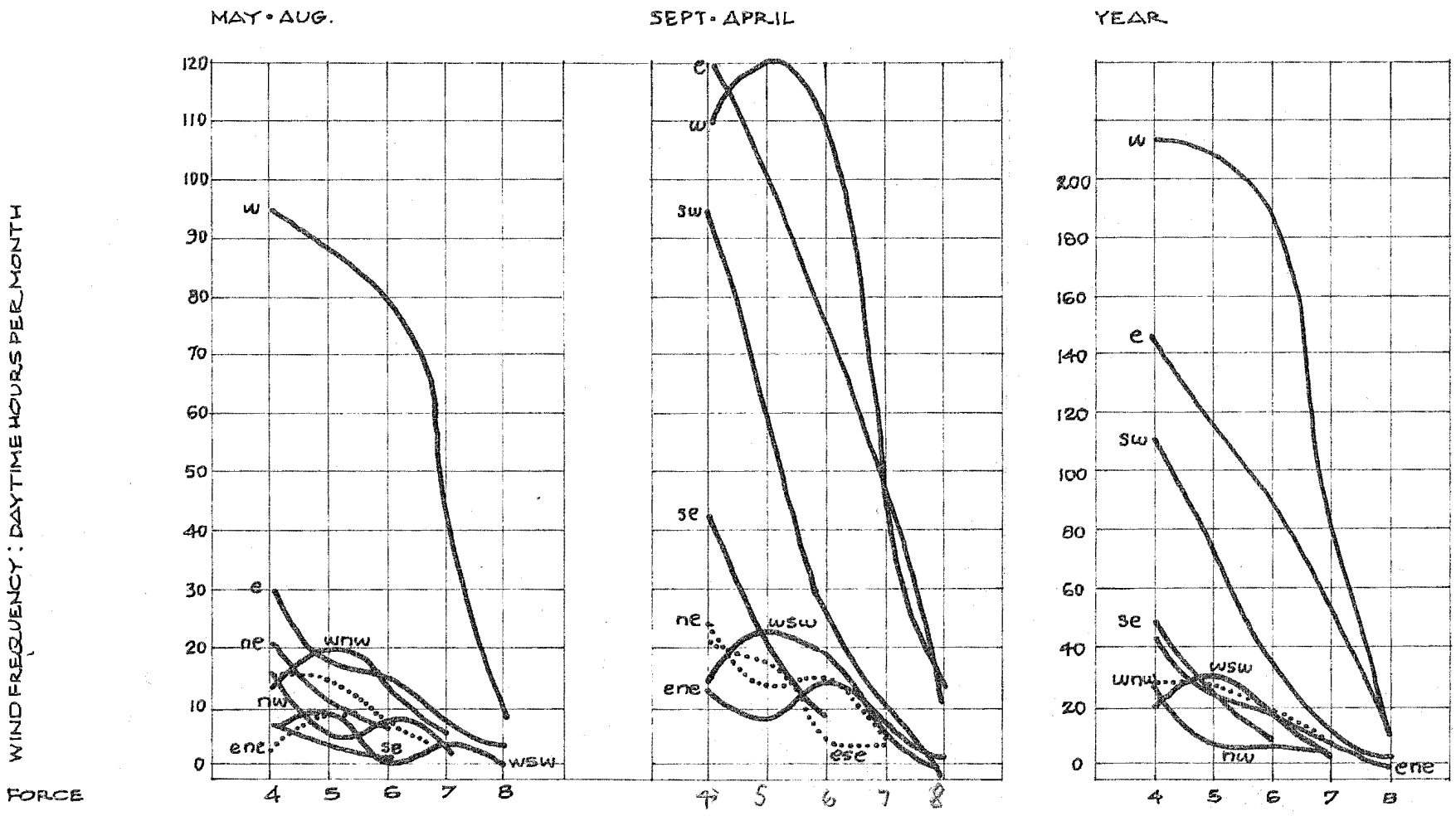
The foregoing data on the region's resources represents a valuable source of information for the purposes of this study and future planning for the area. The interrelations and nature of bedrock geology, physiography, soils, the water regimen, natural vegetation and wildlife has become clearer. As the region is not boundlessly endowed with amenity producing and other natural resources furthur development should be preceeded by efforts to discover and record the true quality and potential of the resource base. The remainder of this study is devoted to that end and to create a control framework for development.

The values and restrictions for the major land uses agriculture and recreation and for sub-dominant purposes may now be more surely determined together with the spatial extent of land use suitability within a broad framework. In the field of agriculture a far more detailed survey of micro-climatic conditions and soil variations to amplify the coarse grained overview of climate and soil association areas system of classification will however be necessary to expose the mosaic of soil types, related problems and small scale climatic variations influencing agricultural production. The resource analysis clarifies the special juxtaposition of climate, land, coastline and water occurring in the region which constitutes an amenity resource and offers conditions of living which exert a seasonal pull on vacationers and attracts to some extent non job-oriented migrants.

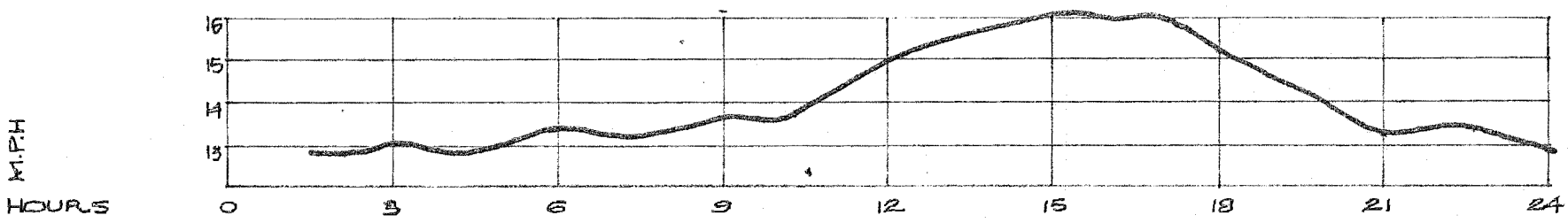
Land in itself however does not dictate its own use, but provides ascertainable opportunities for development and the satisfaction of men's needs. Use of the resource endowment at any time is rooted in the determinants of final demand, consumer preferences, income distribution and current organization and the technology of production. Through the effect of a rising per capita income in the nation and given the high elasticity of demand for travel and recreation the regions amenity resources will result in greater use of these resources in the form of tourist services to vacationeers.

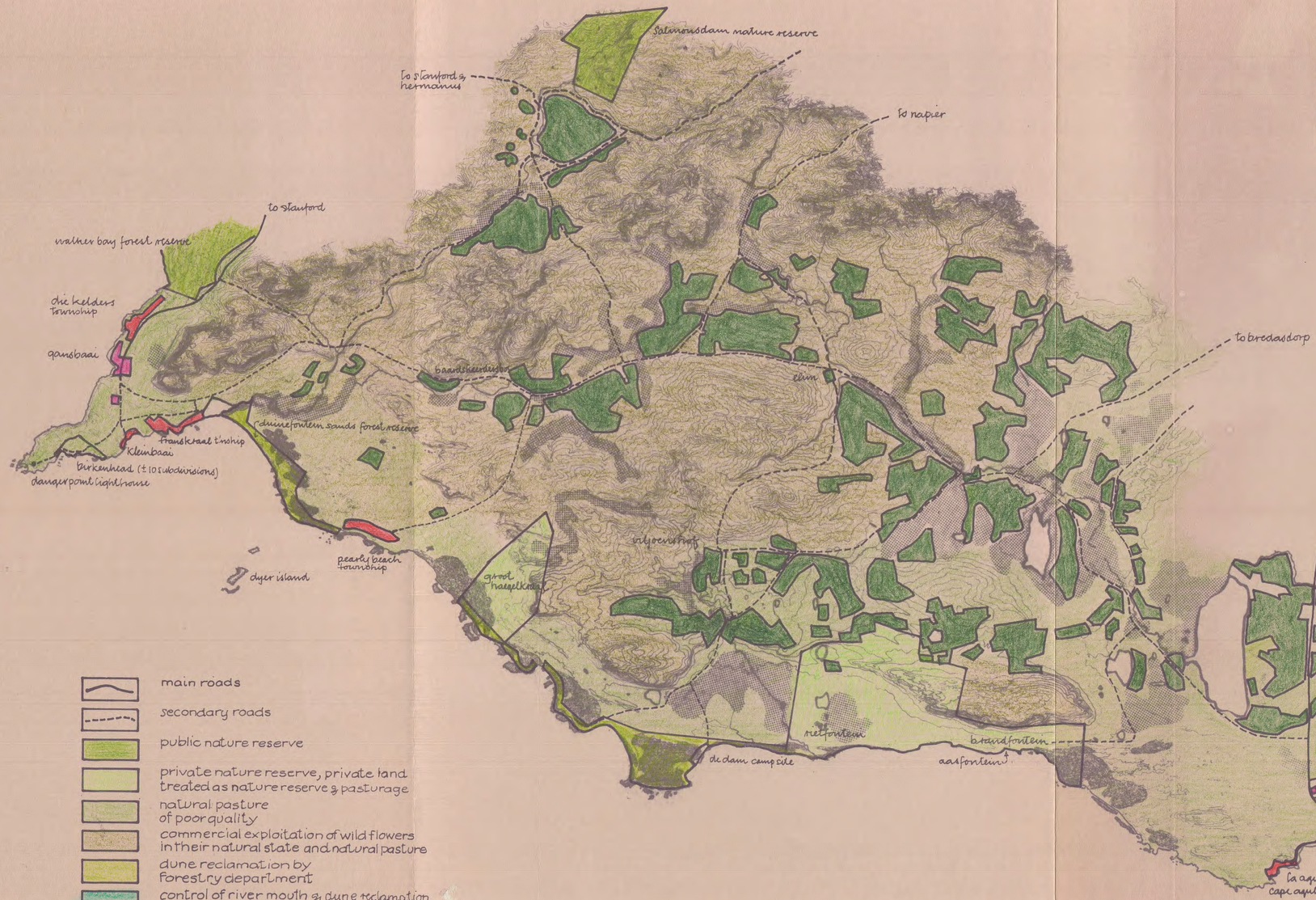
FIGURE 1





SEASONAL WIND FREQUENCY • VELOCITY L'AGULHAS 1940-1943 REF. NO.5 P. 21





marshes, swamps & vleis.

rivers

contours at 50 english foot intervals

perennial water

shifting sand dunes

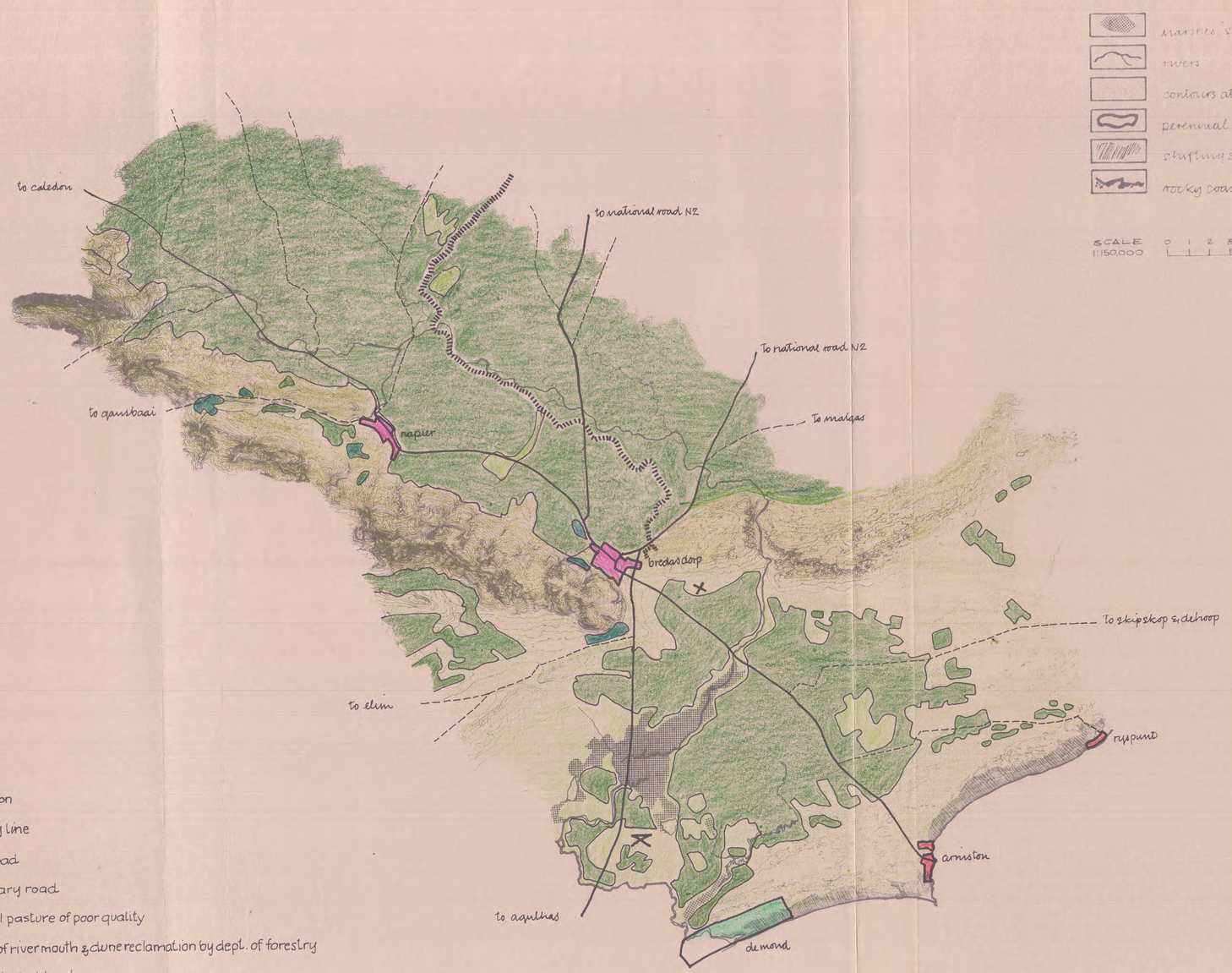
rocky coastline

NORTH

SCALE 1:150,000 — 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

LAND USE

map 10a



marshes, swamps & vlei
rivers
contours at 50 english foot intervals
perennial water
shifting sand dunes
rocky coastline

NORTH

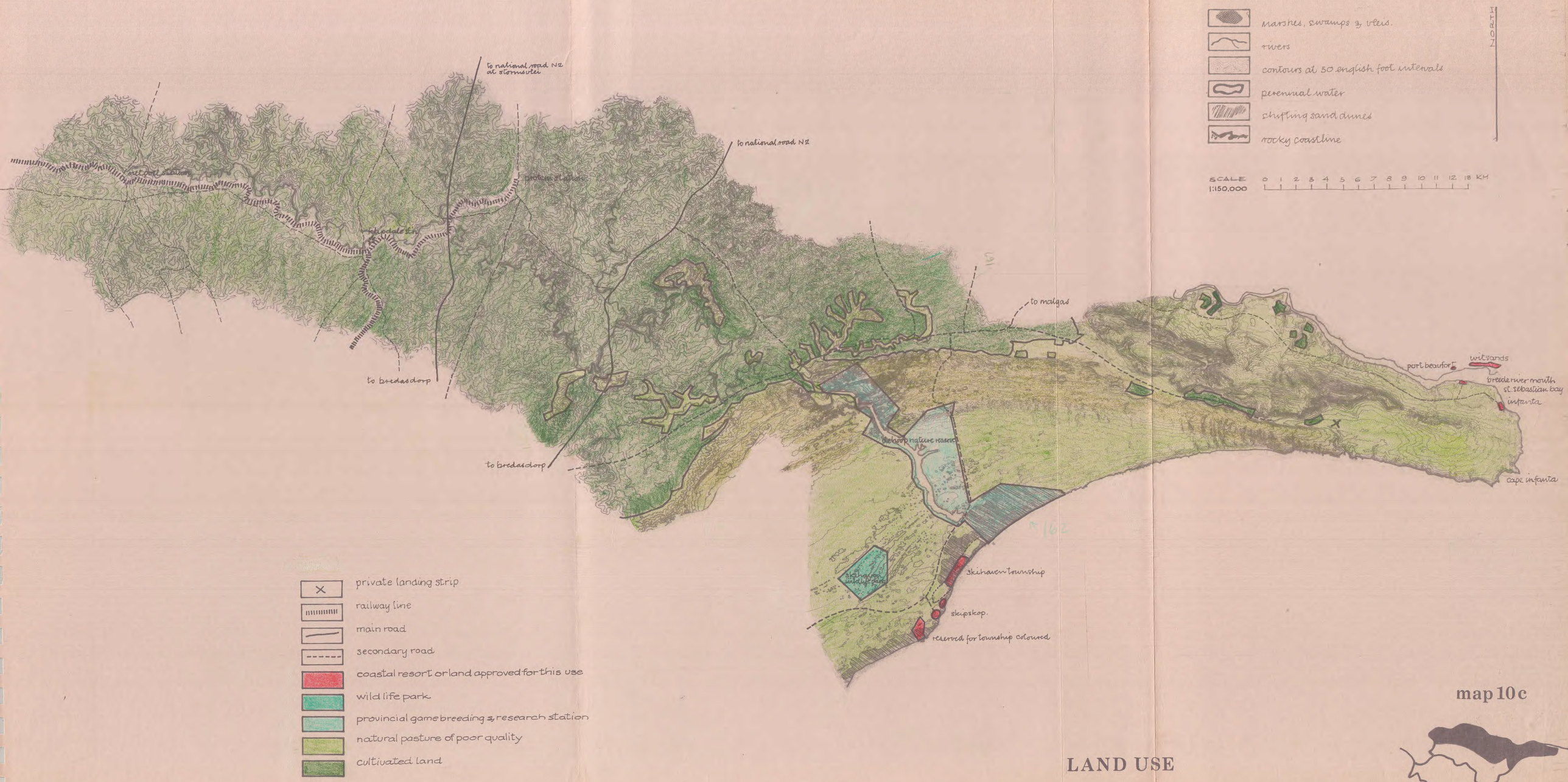
SCALE 1:150000 0 1 2 3 4 5 6 7 8 9 10 11 12 13 KM

173

plantation
railway line
mainroad
secondary road
natural pasture of poor quality
control of river mouth & dune reclamation by dept. of forestry
dry cultivated land
coastal resort township
urban place

LAND USE

map 10b



LAND USE

map 10c

section 3 CONSERVATION

3.1 Introduction.

The environmental resource analysis has exposed inherent values to man in the given natural endowment. Within the resource framework the activities of man take place and these may either disregard or take cognisance of the resource values. Disregard can lead to irreplacable loss of or diminuition of value.

With the goal of preserving amenity in the area for the enjoyment of man, features and sites of value are first determined and graphically represented on map 12.
The following conservation factors were taken into account in this process.

3.2 Land use value.

3.2.1 Historic and other features of cultural value.

The Historical Monuments Commission has proclaimed certain folk buildings on the coast. At Hotagterklip are four fishermen's cottages and one at Arniston bearing the plaque of the Commission while at Bredasdorp the Independent Church and Rectory complex, now a cultural history museum is a proclaimed monument as is the lighthouse at Cape Agulhas. The commission is also considering the coloured town at Elim as a monument. The lighthouse at Danger Point is a prominent and interesting landmark on the coast worthy of conservation.

The history of the area hinges around the farming activities of the white man and the coloured folk as fisherman. On a number of farms are noteworthy buildings including the homestead at Soetendalsvallei dating from the Cape Dutch period while impressive large building groups exist at Fairfield, Springfield and Ratel river. An interesting small thatched building group of limestone construction has been preserved on the farm Groot Hagelkraal. At Hotagterklip in the vicinity of the four preserved cottages are a number of similar cottages well worthy of preservation which are being allowed to fall into disrepair through disuse. .Arniston owes of its attractive character to the adjoining village of fishermans cottages at Kassiesdorp. The whole village if sensitively restored could be a unique tourist attraction.

Delightful cottages clustering round the inlet at Aasfontein have been restored by the owner ; combined with the remarkable state of preservation of the natural vegetation the complex forms a highly significant example of conservation.

Recent archeological research in the study area conducted by the South African Museum has revealed extensive evidence of the presence of man as a hunter-gatherer during the middle and later stone ages. The location of inhabited caves on the coast and inland, coastal shell middens and stone packed fish traps are known. (Ref. no. 16) The approximate position of the majority of these appear on map no. 12. The whole promentory at Danger Point is richly endowed with evidence of pre-historic man's use of the coast. Research at a cave near the Die Kelders has revealed evidence of human use in the year 31.800 + 5.000 - 2.900 B.P.. (Ref. no.17). These sites require accurate mapping and conserving as far as possible for the purposes of science and tourism.

3.2.2 Public and private nature reserves.

Nature reserves administered by public authorities whether used for scientific purposes or the public enjoyment of nature have a high value for man.

Planning decisions should increase rather than detract from these values. In the case of De Hoop for example a major road through the reserve should be avoided as this will restrict free movement of wildlife between the coast and the limestone ridge. An inherent value of this reserve is the number of habitat varieties included within its boundaries as its length is roughly at a right angle to the coast. The habitat composition includes the intertidal, coastal dunes, coastal fynbos, limestone ridge fynbos, riverine bush and the vlei itself with shallow and deeper water.

The Heuningnes Research station is operated by the Provincial Administration's Nature Conservation Department on land owned by the Department of Forestry for the purposes of scientific research into the estuarine related wildlife.

The Salmonsdam Nature Reserve under the administration of the Caledon Divisional Council is of value as an outdoor recreation area for the appreciation of flora and fauna typical of the area and is suitable for walking, climbing. Accommodation is available in the form of bungalows.

All flora and fauna is protected by the Department of Forestry on its coastal land. These areas are primarily administered for the purposes of dune sand reclamation and generally retained under control of the Department for ten years after vegetation has been initially established. These areas are then usually entrusted to the care of the local authority. The continued conservation of the established vegetation then becomes the responsibility of the administering body to ensure the non re-currence of the open dune problem. Conservation of the dune vegetation

is of prime importance in the vicinity of river mouths such as the Heuningnes river where extensive periodic flooding of agricultural land occurs if sand movement is allowed to block the flow of flood waters into the sea. (Ref. 5 p.13)

Planning policy in relation to private nature reserves falls in a different category. Private reserves are administered by the individual land owners for the exclusive use of a small group of people. Access to the reserve is usually strictly controlled and the general public is excluded. Land use planning decisions in such cases should be made on the basis of an informed assesment of the inherent potential value of such land for the community as a whole. Such areas may have prime value both for conservation and development and a planning decision is required taking cognisance of the needs of not only the study area but a much larger area. A private nature reserve may have a resource endowment qualifying it as a unique natural area of regional or even national concern.

3.3 Wildlife value.

3.3.1 General ecological associations.

This factor is employed in order to evaluate wildlife associations common to the area and its component parts. The areas in which the different wildlife species occur are graphically presented on map 9.

Wildlife conservation is possible on land used for agriculture. Crop-land is suitable for wild fowl varieties such as pheasant wild duck, partridges, water fowl and quails. The farmer can make provision for vegetation cover, if necessary although with the nine year crop rotation system which is being developed a large proportion of land will at any time be under perennial pasture which will provide the necessary cover.

Agricultural land given to wild flowers and grazing is suitable for large and small wildlife varieties. The marsh landareas have value to the farmers only as grazing but can be used for conservation of marsh related wild fowl and buck varieties including rooi hartebees and vaal ribbok. (Ref. no. 18)

The conservation of wildlife on land used for farming is not incompatible with hunting. Hunting can be a source of income to the farmer who will consequently ensure that the wildlife supply is maintained. (Ref.no.18) The existence relatively near the study area of a large urban population in need of recreation could be exploited to advantage. The necessary knowledge of the availability of opportunity for hunting could be achieved by advertising.

The wild flowers of the non arable land is a commercially exploitable resource. The resource requires informed management to ensure its continued existence and to maximise output. Control is exercised by the Department of Nature Conservation who are responsible for the issue of lisences for the sale of wild flowers.

3.3.2 Scarce ecological associations.

Although remnant forests are treated seperately they classify as scarce ecological associations. Scarce ecological associations are primarily of scientific and educational value although they attract a numerically small group of the general public interested in rare flora and fauna. While remnant forest and scrub forest can be of scientific import they contribute patently to environmental quality and provide shelter from the elements. The larger remnant forest patches are the only hatitat for the bushbuck. (Ref. no. 18)

Scientific interest in the scarce flora of the study area centres on the limestone ridges and the Potberg and Soetanysberg mountains.(Ref.no.10) These low value agricultural areas should be conserved. Of high priority concern for conservation is the surviving colony of Cape Vultures on a krantz in the Potberg. (Ref. no. 19)
A remarkable feature at Prinskraal is five pairs of European Storks breeding in the tops of indiginous trees on the farm. (Ref. no. 19)

3.3.3 Good quality natural vegetation.

Good quality natural vegetation cover occurs in areas where land owners have conserved vegetation and veld is not intensively used as grazing. Such areas range from attractive when associated with undistinctive topography to outstandingly beautiful in conjunction with impressive physiographic features. An area falling in the latter category occurs at Brandfontein (see photograph on map 12) and must be seen as a high priority conservation area. High quality vegetation areas include the coastal area from Groot Hagelkraal to Brandfontein and the land to the south of the Potberg.(Ref.no. 19)

3.3.4 Remnant forests.

Little of the origional scrub forest remains for man's enjoyment. The better known coastal patches occur at Kleinbaai, Franskraal, Uilenkraalmond, Pearly Beach, Die Dam and Skipskop while larger forest remnants exist on and near the coastal plain at Kleinbos, Pearly Beach and in the vicinity of De Hoop vlei. On many farms small indiginous tree groups are preserved in fields and near homesteads.A small remnant forest exists in a kloof in the Potberg. A careful inventory and mapping of indigenous scrub forest remnants is

necessary as part of a conservation programme.

An extraordinary remnant forest exists at Groot Bos, representing the climax vegetation of the limestone ridges. This has been described in great detail by H.C. Taylor (Ref. no. 6) some years ago and is now being threatened by exotics, advancing from the south east.

3.3.5 Water related wildlife.

Water bodies have value as wildlife habitats. All vleis estuaries and to a lesser extent the rivers of the study area attract avifauna . The wealth of bird life in the vicinity of De Hoop vlei enjoys the sanctuary of the Provincial Nature Reserve where a significant habitat variety exists. Other centres of water related bird life are the Breede river, Heuningnes and Uilenkraal rivers estuaries, and the Soetendalsvlei, soutvlei and Waskraalvlei. Avifauna is also attracted to numerous small pans and vleis in the Strandveld.

All wildlife is protected where waterbodies are controlled by the Department of Forestry. The tidal area of the Heuningnes river between the dunes and portion of the Uilenkraal river estuary falls under this department.

3.3.6 Intertidal habitats.

The richest intertidal habitats are found in river estuaries and between sand beaches where Table Mountain sandstone or limestone form capes and points. Much of the marine life in the intertidal zone is used for bait, is edible and subject to conservation measures administered by the Division of Sea Fisheries. The whole intertidal habitat along the coastal boundary of De Hoop reserve is fully conserved. The use by the public of the coastline forming the Southern boundary of the private nature reserves in the vicinity of Soetanysberg is vigourously restrained while access to the greater part of the coast to the east of De Hoop and south of the Potberg is privately owned and closed to the public.

3.3.7 Marshland.

The marshes of the study area are confined to the Strandveld. The better quality marshes have a value as bird and small game habitats and could be conserved for scientific and recreational purposes.

3.4 Land and water features value.

3.4.1 Physiographic features.

The coastal dunes have a scenic value particularly where they relieve

wide topographically featureless coastal plains and also provide a measure of protection from the frequent summer winds. The stability of the loose dune sand depends on the vegetation cover which has decreasing characteristics of resistance to trampling as distance to the high water mark decreases.

3.4.2 Stream quality.

The Heuningnes river system is eminently suitable for the research into ecological problems related to aquatic animal and plant life due to the high level of water purity and small scale human activity. The whole system including the Soetendalsvlei has been proposed by the coordinating committee as a conservation area under the Project Aqua of the International Biological Programme. To maintain the value of the river system for research, planning control of potentially adverse factors such as pollution producing industry in the drainage basin, large numbers of people in the vicinity of the river and road bridge construction which deleteriously influences the ecology. The presence of a road bridge near the estuary will result in mechanical pollution.

3.4.3 Aquifer recharge areas.

The springs and perennial streams provide the main source of water supply for the larger urban places in the study area.and serves agriculture in the Strandveld. These are fed from the Table Mountain Sandstone aquifers where the vegetation and soil cover of the sandstone mountains and hills constitute the aquifer recharge areas. These areas have a high conservation value for maintaining the water supply. The coarse sand acts as a sponge while the fynbos vegetation reduces water loss by evaporation and excessive transpiration (see clause 2.3.6) Informed veld management of the recharge areas is necessary if maximum water supply from the aquifers is to be maintained.

3.4.4 Scenic value of land features.

The mountains of the area have little of the impressive grandeur of those at Hermanus. The scale is less imposing yet the Table Mountain Sandstone and limestone outcrops which contribute to the environmental quality of the area need to be conserved. Reduction of scenic value can occur through acts of commission and ommission. Careful selection of sites for excavation of road material can avoid the unsightly despoilation of the mountain face that has taken place on the Franskraal mountain. Ill considered removal of marine gravel from the shoreland area for road surfacing purposes has been responsible for diminition of the scenic value in the littoral area. Conservation of naturally created topography is preferable to arbitrary changes to the land form.

In scenic areas all landform changes are best executed under the direction of a landscape architect.

Changes in landform caused by road building in scenic areas require careful consideration with the emphasis in the design stage on flowing roadscape into the landform and avoiding unsighly intrusions.

Both landform and vegetation contribute to scenic value of high ground. The great variety of flora species of the indiginous fynbos covering lends richness of colour, tone and textural quality to the landscape. This valuable scenic asset is in grave danger of ultimate invasion and succession by exotic species particularly the two common Acacias. Almost the whole of the study area falls within the edaphic limits of these plants. A clear choice is presented either to allow the exotic species to advance unhindered or to conserve the indiginous land cover. An informed decision must opt for retention of the fynbos as opposed to the visual monotony of a landscape covered with few plant varieties and forming a habitat for a greatly reduced number of fauna and flora species. Where acacias are established land becomes practically worthless for grazing and the cost of their elimination is high.

Conservation measures directed towards preventing acacias gaining a foothold in the disturbed ground adjacent to roads and alongside all river and stream courses and where this has already happened to remove the bushes will be effective. The increase in value of land suitable for commercially exploiting wildflowers is a factor favouring the conservation process as farmers then protect the resource for its money value.

3.4.5 Scenic value of water features.

Waterscape has a higher scenic value than landscape and the larger the water body the greater generally is the value. Seascape is considered as providing greater visual enjoyment than inland water bodies.

Conservation of the scenic value of water features is of less urgency than conservation of scenic land features. Nevertheless strict control is necessary over the visual impact of landing stages, piers and other structures obtruding into the sea and inland water bodies.

The major water scenic areas in order of importance are the whole marine offshore area. Soetendals vlei, De Hoop vlei, Breede river tidal area, Heuningnes river estuary and tidal area. The conjunction of rockbound coastline and sand beaches have the highest visual interest followed by the offshore area adjacent to rocky shores and then sand beaches.

3.5 Summary and conclusions.

This section includes the important factors of conservation value. Evaluation of relative importance and suitability is largely subjective. In arriving at the four grades of suitability relative uniqueness of factors was taken into account. All areas of scientific interest, existing conservation areas, coastal faces of mountains of scenic value to coastal areas and the coastline were classed grade 1 conservation suitability. Generally the number of factors of significance for conservation was used as a guide in grading for suitability. The overlapping of factors is graphically indicated on map 1.

cottages at vasfontein

lighthouse at cape agulhas

restored folk cottages at hotagterklip.

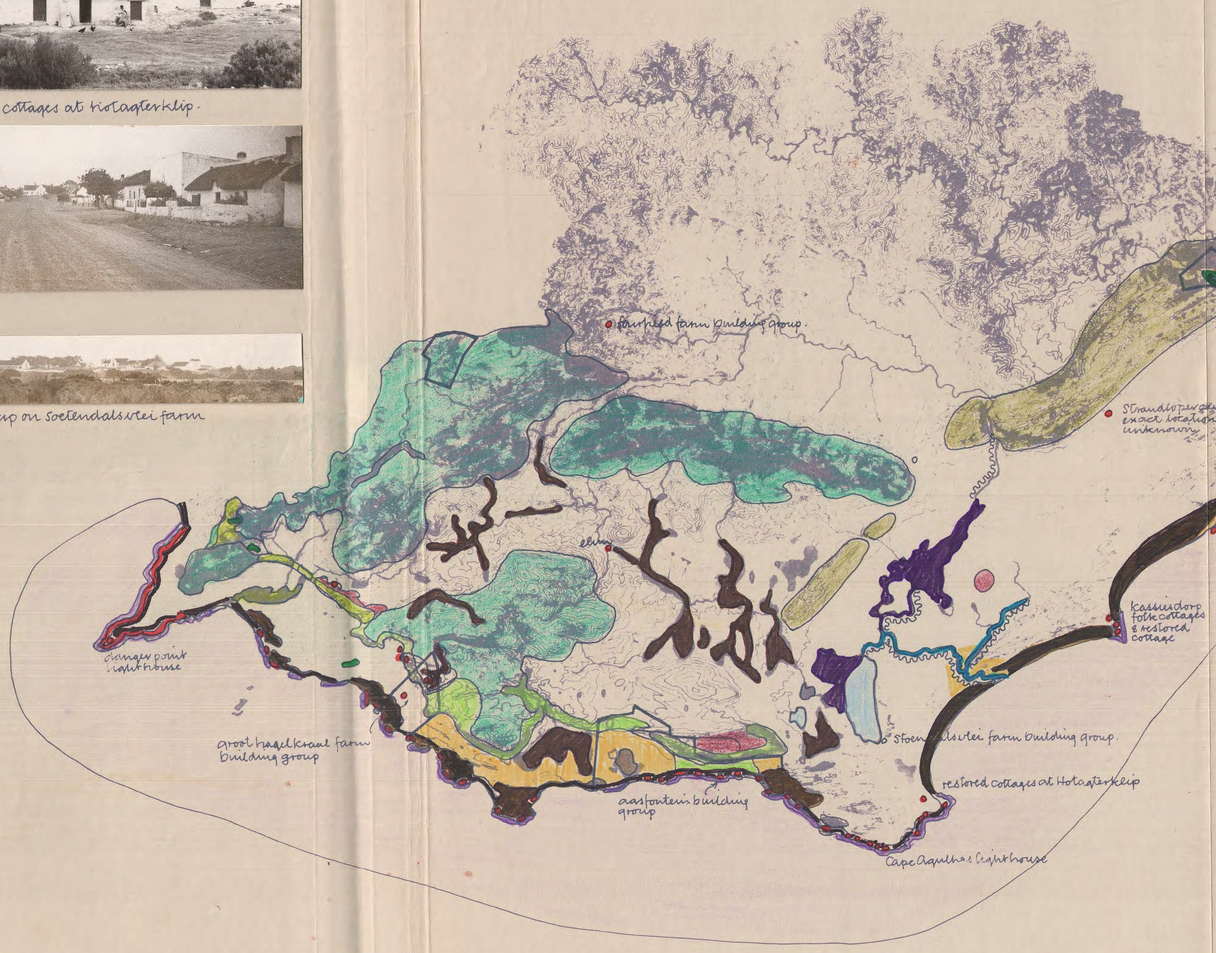
elim

buildings at baardscheerdersbos.

building group on soetendalsvlei farm

unique landscape quality at brandfontein

brandfontein farm & nature reserve buildings

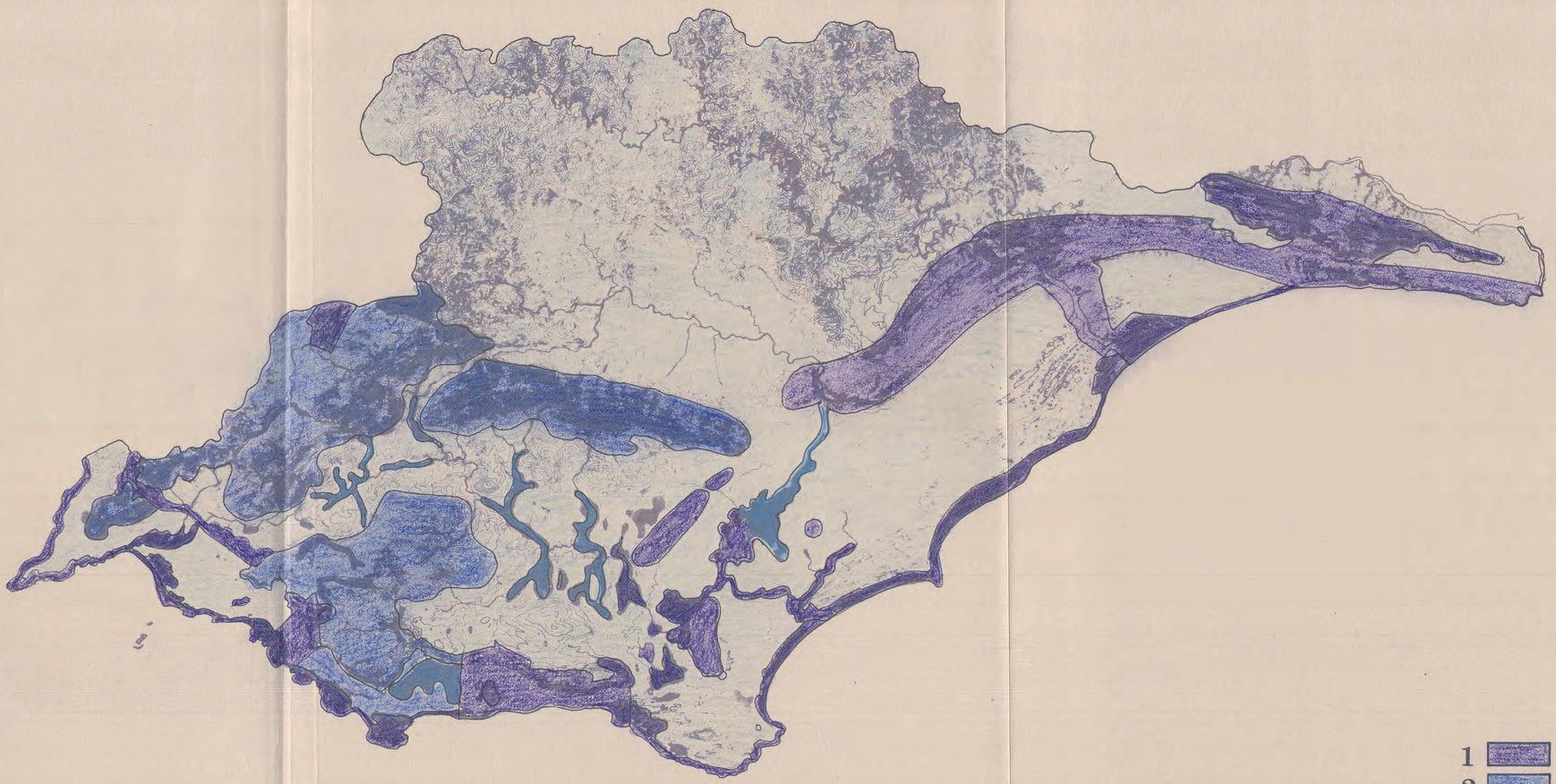


factors

- INTERTIDAL HABITAT
- HISTORIC FEATURES
- REMNANT FOREST
- MARSH
- SCENIC VALUE (LAND)
- SCENIC VALUE (WATER)
- ECOLOGICAL ASSOCIATIONS (SCARCE)
- PHYSIOGRAPHIC FEATURES
- WATER RELATED WILDLIFE
- GOOD QUALITY NATURAL VEGETATION
- NATURE RESERVES (PUBLIC & PRIVATE)
- ECOLOGICAL ASSOCIATIONS (GENERAL)
- STREAM QUALITY (ABSENCE OF POLLUTION)
- AQUIFER RECHARGE AREAS

CONSERVATION AREAS

map 12



1
2
3
4

suitability grades

scale 1:300,000

CONSERVATION SUITABILITY

map 13

section 4

AGRICULTURE

4.1

The importance of agriculture in the study area.

Agriculture is of overriding importance to the area the natural resource endowment favouring few supplementary activities other than limestone extraction, coastal recreation and to a lesser extent outdoor recreation in certain inland areas.

4.2

Planning for agriculture in the region.

Agricultural planning may be defined as the art, science, theory and action of examining the natural, social and economic setting and interrelations of crop and livestock production, processing, distribution and marketing, with the object of guiding policy and practise so as to generate and maintain efficiently the greatest possible financial and other relevant advantages to the industry, related activities and the nation, simultaneously with conserving and improving the natural resources. (Ref. no.20 p.3)

In planning for this function of mans activity in the study area the interplay of life and its environment is of cardinal importance and the ecological or synoptic approach as advocated by John Phillips (Ref. no.20 p.4 etc.) which allows for an examination of all possible factors, features and interrelations of phenomena relevant to agriculture, is considered the only viable system. The factors to be taken into account are environment, climate and soil ; those which are responsible for supporting life. Life responds to these factors thus reacting upon the environment and maintaining and altering it. Life and environment develop together to form a natural system.

This integration of biotic, physico-chemical and organic constitutes a natural or ecosystem which has been found to be a satisfactory basis for the study of nature, crop and livestock production, pastoral management and wild life conservation and management. (Ref.20 p.4 & 5)

The ecosystem is the basic entity in nature but is very complex. A scientifically acceptable and viable substitute exists in the concept of a bioclimatic unit together with more elaborate subdivisions such as the bioedaphoclimatic and biophysioedaphoclimatic units. The first of these subdivisions is differentiated within the bioclimatic perameters by the nature, genesis and ecologic-economic significance of soils. The second of the subdivisions is a furthur refinement based on the parameters of climate, vegetation, soil and physiographic features, the primary physiographic features being geology, occurrence of rocky outcrops, rock at particular depths, topography and influent geomorphological characters. Within this category the angle of slope may be integrated. Slope is of concern for agricultural planning

because of its bearing on the distribution of potential arable land and the policy and practice for soil and water conservation.

The mapping of the area to a suitable scale is necessary as a preliminary process in planning. The biophysioedaphoclimatic units in an area such as the hilly ruens may require quite large graphic presentation as slopes vary considerably in comparatively small areas. The biophysioedaphoclimatic units are presented on map no. 12A
Soil variations are based on soil association areas which are large areas. In the Strandveld where soils vary over small areas mapping to a much larger scale is necessary to be of practical significance for scientific analysis of soil variations and the application of trace element correction procedures.

4.3 The bioclimate of the study area.

The whole of the study area falls in the Macchia (Fynbos) sub-tropical bioclimatic region (Ref. no. 25 p. 266). The bulk of the area falls in the bioclimatic sub-regions, sub-desert and arid, having a humidity range of 200-400 and 400-600 millimeter rainfall respectively.
The bioclimatic potential according to John Phillips (Ref. no.26 p.. 4 & 5) varies from medium to short but rarely tall woodland and/or thicket stages, woodland with grassland successional stages and woodland and/or thicket with short to very short shrubland and dwarf thicket, or very short to dwarf succulents.

4.4 The broad potential of agriculture.

Despite the relatively poor physical features and low fertility of soils over wide areas and climatic hazards, significant improvements in both arable and livestock production are possible. Raising of the fertility and the production of better structure in arable soil, the replacement of the poor fynbos browse and grazing by more nutritions pasturage and the growing of supplementary grain and roughage for livestock is possible but must take long to achieve. (Ref.no. 25 p.267).

4.5 Reasons for planning and plan implementation in the study area.

Successful application of the ecological approach to agricultural planning will result in a number of desirable embellishments to the industry. As a result of a comparatively restricted return from agriculture, re-investment in the land is gradually losing interest even among traditional family farmers (Ref. no. 20 p. 18). It is essential that farming must pay and that it no longer be considered as no more than a social service for the production of food and other requisites and that its economic and commercial significance be upgraded.

Planning and implementation could well increase returns and so leave a higher proportion for stimulation of the profit motive. Planning and implementation could also keep a greater proportion of people on the land, particularly the good farmer while it is recognized that in a modern affluent society such as South Africa the proportion of farmers and workers on the land diminishes as the nation develops its industrial, commercial and other services. While the infusion of capital into agricultural projects has often been ineffective in ensuring viability and an adequate development rate this can be attributed to insufficient support in the fields of science, technology and education, insufficient input to generate continuing and sustained viability, lack of soundly based incentive and enlightened management, and poor business acumen. Planning and wise implementation and sustaining of the plans, with necessary modifications as circumstances demand is essential to any stimilus by capital in the area.

4.6 Ecological - economic criteria in planning a natural unit.

The criteria classification advocated by John Phillips (Ref. no.20 p.8) is to a large extent used in the following assessment of agricultural potential. These criteria serve as a background from which general conclusions may be drawn as to potential development of the terrain for agriculture, forestry and related industries.

4.7 Ecological-economic criteria in agricultural planning of the area.

4.7.1 Physical features.

4.7.1.1 Soils ; Identity and distribution.

The soil association areas are graphically presented on maps no. 8a, 8b and 8c. The characteristics of the soils found in the various soil association areas have been dealt with in chapter 2.

In the Table 14 the soils found in the various soil association areas are graded with respect to fertility, vunerability to erosion by wind and by water action, suitability for irrigation and vulnerability to waterlogging. No insuperable fertility problems were encountered in a recent investigation into soil characteristics. (Ref. no.21 p .88) Irrigation is at present restricted to riparian land using water from rivers. 4096 Morgen less than 1% of the total land surface used for farming is cultivated under irrigation. Most of this land is adjacent to the Kars river. The whole of the area together with the Overberg region within which it lies must be considered as very unfavourable for irrigation development in the light of a decentralized water scheme which will inevitably prove costly. (Ref. 21 p.88).

4.7.1.2 Water Resources.

4.7.1.2.1 The dependence of agriculture on water.

The agricultural potential of a region depends largely on its own water resources and/or the economic feasability of obtaining fresh water from beyond its boundaries. At present livestock numbers in the study are restricted by the availablity of water particularly during the drier summer months and increased production is dependent on the provision of additional water through the offices of the Department of Water Affairs.

4.7.1.2.2 Telluric and surface water resources exploited in the study area.

Water occuring as surface runoff and in aquifers has been made available for livestock by storage in earth farm dams and drilling of boreholes. Seepage and water from springs is also stored in this manner. Dams are largely confined to the hilly Ruens, particularly the catchment area of the Sout river where 2.512 of the 3.480 existing dams are located. Of the 60.000 gallons of water that can be stored in this way only a third is fresh. . While most dams serve livestock drinking requirements some 1.650 morgen of land is also irrigated from this source. Water from the 748 usable boreholes mainly located over the aquifer beneath the coastal plain of which more than half deliver less than 1000 gallons.per hour serves primarily for livestock. Less than fifty per cent of boreholes deliver fresh water. (Ref. no. 22 p. 48) Most of the water sources in areas underlain by shale including surface runoff deliver brackish to very brack supplies. (Ref. no. 4 p. 7)

The restriction of choice of dam and borehole location due in the former case to topographical limitations and in the latter instance to the areal distribution of good quality aquifers leads to capital outlays in piping water to livestock camps particularly as farms are being subdivided into smaller camps with the development of cattle farming. (Ref. no.12, 2.1.4). Surface water in rivers is available in the area but is utilized on a small scale only on riparian farms which form a small percentage of the total number of farms in the area. Water for domestic consumption is usually rain water from roof runoff stored in tanks.

4.7.1.2.3 Potential water resources.

A geohydrological/geophysical Survey covering the eastern half of the Bredasdorp district was carried out in 1969 (in an attempt to locate underground water supplies usable for watering livestock) (Ref. no. 4 p.1). It was concluded that the use of borehole water in the Ruens

area where most bore-holes became weaker and more saline with time, could not be considered a permanent solution and that outside water sources would have to be considered.

Two sources were possible, borehole water extracted from the aquifer under the south foot of the duine or the water from the Sonderend-Breede river. Water will have to piped from either source. The survey concluded that an aquifer in the form of a ridge of Table Mountain sandstone may exist beneath the duine and that the possibility be explored.

4.7.1.3 Climatic Hazards.

The ultra intensive system employed in recent years for cultivation of cash crops has diminished soil fertility and led to water erosion particularly on the steep slopes which abound in the hilly Ruens region. The system necessitates leaving the land fallow during the summer months, the unprotected land being thus exposed to the danger of soil erosion by water runoff during the periodic thunderstorms occurring at this time of the year in this marginal winter rainfall area. The soil layer is comparatively thin and water erosion takes the form of thin shallow dispersed fingers not as apparent as the deep etched furrows formed by water erosion in the deep soils of the Swartland. Contour furrows are necessary on all ploughed slopes between 10^{o} and 30^{o} in the opinion of the local Nature Conservation Committee, but are at present rarely employed as soil formation from the underlying shale is relatively rapid, the process being assisted by breaking up of rock surface during ploughing operations. This form of soil conservation is unpopular because benefits accrue in the long run and the furrows both hinder farming operations on the land and necessitate the use of more costly equipment e.g. caterpillar tractors and self-propelled combines. The large camps used are conducive to soil erosion but smaller fenced camps of ideally 30 morgen are only possible with adequate water supply for animals.

Rain during the period when the wheat ripens has a furthur adverse effect causing a decrease in crop quality and value. The warm waters of the Indian Ocean and onshore winds give rise to humid conditions which combined with summer heat create conditions conducive to fungal disease in wheat. (Ref. no. 12).

Strong winds during summer months cause problems in those areas where soil characteristics under dry conditions are conducive to erosion. (Table no. 14) This problem is mainly confined to certain soils of the coastal plain.

4.7.1.4. Physiographic Hazards.

The soils suitable for cultivation are mainly confined to the Strandveld and the Ruens which for agriculture purposes extends on to the coastal plain south to east of Bredasdorp, while the soils on much of the land too steep for cultivation is derived from underlying Table Mountain sandstone and is of little value for crop production. Production costs are higher in the Ruens due to the hilly nature of most of the land surface in contrast to the gentle slopes characteristic of the coastal plain and Strandveld. The slope analysis (maps 6Aa, 6Ac reveals the basis for sub-division of the Ruens into biophysioedaphoclimatic units. Areas of consistent physiographic features occur in the small Noord Vlakte (see map 5c) the characteristic Ruens hills are absent while a large part of the lower reaches of the Kars river drainage basin has gently sloping hills. North of the Noord Vlakte the localized physiographic characteristics produces a sub-division typified by steep sided hill and valley north of the Sout river. The remainder of the Ruens comprises rounded hills with less steep sides and numerous intervening vales.

4.7.1.5 Agricultural Land-use.

The land in the six catchment areas in the region including vleis and dunes but excluding urban areas covers some 490.000 morgen. The extent of land and the use to which it is put for various purposes is given in table no. 1 . The areas covered by dunes and vleis are unutilized for farming purposes. The spatial distribution of cultivated lands, natural pasture and areas used for wild flower exploitation is graphically represented on maps 10a, 10b and 10c.

Table no. 1.

Areas of land used for various purposes on farms in the various catchment areas in morgen.

Land use	Catchment Areas						Total.
	6	7	8	9	10	11	
Cultivated irrigated pasture (lucern)	329	0	17	324	3.408	10	4.088
Vegetables irrigated	0	0	0	18	0	0	18
Cultivated rainfed pasture(lucern)	0	0	0	6.174	20.079	36.738	62.991
Rainfed wheat	3.134	56	1.987	1.764	11.218	23.283	41.442

Table no. 1 /....

Land use. .... Catchment Areas.

	6	7	8	9	10	11	Total.
Rainfed oats	0	0	0	1.080	4.118	5.616	10.814
Rainfed barley	0	0	0	360	2,556	3.744	6.660
Other rain-fed cereals	0	0	0	468	142	117	727
Fallow land	0	0	0	1.476	10.508	25.974	37.958
Natural pasture	41.064	3.409	14.933	83.051	74,281	98.273	315.011
Dunes	306	0	0	3.588	2.370	1.887	8.151
Vleis	0	0	0	0	745	3.730	4.475
	44.833	3.465	16.937	98.303	129.425	199.372	492.335
	Only local private water schemes are possible.			State aided water schemes possible serving these areas.			

Reference no. 22 p.7 and 20.)

Associated with the information on areas of land utilized for various agricultural purposes is the subdivision of the land into individual farm units of various sizes. The manner of subdivision appears in Table 2.

Table 2. (Reference no. 22 p.6).

Distribution of farms according to size (measured in morgen under cultivation) by catchment area.

Catchment areas.	6		7		8		9		10		11	
Morgen cultivated.	no.of farms.	%	no.of farms	%	no.of farms	%	no.of farms	%	no.of farms	%	no.of farms	%
0-100	67	85.9	4	100	29	90.7	83	68.7	61	36.3	37	17.4
101-300	9	11.5	0	0	2	6.2	22	18.2	48	28.6	54	25.3
301-500	2	2.6	0	0	0	0	13	10.7	34	20.2	65	30.5
501-700	0	0	0	0	1	3.1	2	1.6	17	10.1	32	15.0
701-900	0	0	0	0	0	0	0	0	6	3.6	12	5.6
900 +	0	0	0	0	0	0	1	.8	2	1.2	13	6.2
Total	78		4		32		121		168		213	

4.7.2 BIOLOGICAL FEATURES.

4.7.2.1 Bio-climatic units.

The bio-climatic planning units Sub-desert and Arid into which agricultural areas of the study area may be subdivided are graphically illustrated on map 11a.

4.7.2.2 Annual and perennial crop production; rainfed and under irrigation, actual and potential.

The various crops currently produced, which are mainly rainfed, appear in Table no.1 together with the average land surface typically devoted to each. Annual crops are wheat, oats, barley and other cereals, the main perennial crop being lucern.

The study area is traditionally a wheat producing region and as this farming sector is relatively profitable it can be expected that output in this field will not be diminished. Expansion should take place with regard to livestock production as rainfed lucern output is increased. This can be achieved to the extent of an average 126 morgen per farm without a noteworthy reduction in wheat production in the event of a water scheme principally for increasing livestock drinking water. The sheep population will as a result increase by an average of 252 per farm. A sound crop rotation system can be followed concurrently with such a scheme. (Ref.22 p. 52). The additional land surface under lucern and the consequent increase in sheep population possible in catchment areas 9, 10 and 11 with additional water appears in Table no.

Potential for increased agricultural production is latent in the Strandveld (catchment area no. 9) the area with its moderate climate and rainfall is pre-eminently suited to livestock production. The large variety of soil types which occur often over short distances and the trace element deficiencies which characterise the soils of the area necessitate scientific study and a special intensive research programme particularly as the conditions in the area differ completely from those pertaining in the existing agricultural research centres. Given scientific analysis and prescription for trace element correction and other farming problems the area can develop into an important livestock producing area. Areas with similar problems occur in the coastal areas from Hermanus to Humansdorp. (Ref. no. 22 p.5 & 4)

4.7.2.3 Pasturage, veld and established.

The 315.000 morgen of veld is restricted to the land wither too steep or rocky to be plowed which is mainly found on the mountains of Table Mountain Sandstone, the limestone duine where soil is thin and large tracts of the coastal plains where the danger of wind erosion and other

4.7.3 HUMAN FEATURES.

4.7.3.1 The Human Potential.

Other than money, machines and methods men are a necessary ingredient in the inputs to agricultural development. The application of improved agricultural practises and new improved methods is closely related to certain characteristics of the men farming the land including level of education, contact with farmers organizations and receptivity to improved farm practises.

4.7.3.1.1 Education in the Ruens.

The education level is an important factor in developing potential and in the Ruens of Bredasdorp a reasonably high standard exists. The statistics in this respect are given in Table no. 3.

Table no. 3.

4.7.3.1.2 Education level of farmers in the Ruens of Bredasdorp.

Years of education.	% of total.
School : 8 years and less	7.9
9–10 years	34.0
11–12 years	58.1
Post schooling training at College and University. .	17.9 (Ref. no.12, 2.2)

4.7.3.1.3 Contact with farmers organizations in the Ruens.

64.7 percent of farmers enjoy membership of either of the two local farmers associations of Bredasdorp and Napier while 72% of the members attend more than half the meetings.

4.7.3.1.4 Receptivity to improved farming practices.

In the Bredasdorp Ruens the rate of acceptance of improved farming practises is reasonably high. In recent years a new wheat variety was used by 72.6% of the farmers within three years of its becoming available : Molibdeen treatment of lucern was used on 49.4% of the farms within three years of the publication of research findings. (Ref. 12, . 2.2.3)

4.7.3.1.5 The human potential in the Strandveld.

Limited information is available regarding the sociological characteristics of farmers in this area. The farmers with few exceptions are less progressive and moneyed than in the Ruens and this can be ascribed to the fact that the Strandveld was, up to the 1940[s]

generally considered as an area which provided a change of pasture for livestock and because of the comparatively poorer soil quality was, and to a large extent still is considered an inferior farming area. Without the necessary scientific research into the areas many problems the area will not develop, farmers being generally unable to finance their own experiments in farm practises.

4.7.3.2 Population distribution.

Table 4 reveals the distribution of employees on farms in the three major catchment areas by race group.

Table 4.
Total employees on farms by catchment area in the Bredasdorp area. (a)

Catchment area	Permanent. White	Coloured	Bantu	Seasonal.
9	6	62	0	118
10	38	291	10	701
11	17	334	26	1,044
Total	61	687	36	1,863

(a) excluding farmers who are owners. Share-croppers or tenants.

In 1960 the population in the Bredasdorp Divisional council area was 15,079 giving a density of 9.4 persons per square mile. The density in agricultural areas is much lower as approximately 50% of people were concentrated in a few urban areas. The population of Bredasdorp for example in 1960 was 4,691. (Ref. no. 22 p. 15)

The population numbers will be affected by the provision of additional water for livestock watering by means of a regional water scheme as increased agricultural production will increase job opportunity on farms. The possibility also exists that productivity of the existing labour force could be increased.

In the area crop production offers relatively more job opportunities than is the case with livestock production and it is unlikely that additional water will be utilized for large scale cash crop production.

The greatest benefit of increased productivity of the existing labour force will be greater economic stability while at the same time sociological stability which at present gives cause for concern could be significantly increased.

4.7.4 THE ECONOMY : ACTUAL AND POTENTIAL.

4.7.4.1 Economics of crop and livestock production.

4.7.4.1.1 Crops.

The areas of land used for cultivation of various crops is revealed in Table 4 on a previous page.

Gross income from the sale of the various crops reaped in the major catchment areas is indicated in the following two tables.

Table 5 (Ref. no. 22 p.29)

Total quantities of grain crops reaped in bags and sold (in Rands) by catchment areas.

Crop		Wheat	Oats	Barley	Total grain.
Catchment area.					
9	Quantity reaped	14.706	6.858	5.238	26.802
	average per farm	817	381	291	1.489
	value sold (R)	66.096	8.406	4.500	179.002
	average per farm	3.672	467	250	4.389
10	Quantity reaped	77.461	18.673	37.488	133.622
	average per farm	1.091	263	528	1.882
	value sold (R)	390.713	17.608	82.715	491.036
	average per farm	5.503	248	1.165	6.916
11	Quantity reaped	193.986	20.826	46.566	261.378
	average per farm	1.658	178	398	2.234
	value sold (R)	952.497	7.371	121.563	1.081.431
	average per farm	8.141	63	1.039	9.243

Table 6 (Ref. no. 22 p. 27)

Total sales in Rands, of hay, fruit and winegrapes and vegetables by catchment areas.

Crop		Pasturage	Fruit and winegrapes	Vegetables	Total.
Catchment area					
9	value	0	0	11.484	11.484
	farm average	0	0	.638	.638
10	value	17.892	0	0	17.892
	farm average	252	0	0	252
11	value	351	0	0	351
	farm average	3	0	0	3

The total gross income from all crops in the three major catchment areas is R1.781.196 to which the predominant contribution of 89.3% of the total is made by the sale of wheat, gross income from this crop amounting to R1.751.469.

4.7.4.1.2 Livestock.

The present livestock populations are given in Table 7 it is clear that woolled sheep is by far the most important branch of farming in the area. With adequate additional water for livestock the sheep population could be increased by some 40.000, representing a total additional annual income of R488.000 and a total annual increase of net farm income of some R325.000. (See Table 7 .)

Table 7. (Ref. no. 22 p. 32)

4.7.4.1.2.1 Livestock populations and average per farm by catchment area.

Catchment area	9		10		11		
	Total	Farm av.	Total	Farm av.	Total	Farm av.	Total.
Woolled sheep	36.663	2.037	95.819	1.350	128.162	1.096	260.644
Slaughter sheep	1.774	99	378	5	1.169	10	3.321
Dairy cattle	881	49	1.201	17	2.027	17	4.109
Slaughter cattle	632	35	3.513	50	1.118	96	5.263
Pigs	544	30	115	1.5	113	1	772
Others	232	13	114	2	183	1	529

The wool production in the major catchment areas is given in Table 8.

Table 8. (Ref. no. 22 p. 33)

4.7.4.1.2.2 Wool production and average per farm by catchment area.

Catchment area	9	10	11	
Wool production (1 lb)	302.490	1.272.711	1.742.312	3.317.513
Farm average	16.805	17.940	14.892	

The total income derived from livestock and livestock products and average farm income from this branch of farming is given in Table 9.

Table 9. (Ref. no. 22 p. 35)

4.7.4.1.2.3 Total income from livestock and livestock products by catchment area and average farm income. (R)

Catchment area	9		10		11		Area
	Total	farm av.	Total	farm av.	Total	farm av.	Total
Capital income	76.060	4.226	178.075	2.508	430.343	3.678	684.478
Wool	120.720	6.707	600.408	8.456	656.080	5.607	1.377.208
Fresh milk	0	0	20.182	282	6.221	53	26.403
Factory milk	0	0	15.110	213	82.743	707	97.853
Cream	18.643	1.036	8.757	123	14.804	127	42.204
Sundries	572	32	4.500	63	5.578	48	10.650

The income from sundries is mainly derived from the sale of skins and hides, and poultry and pigs and is relatively unimportant.

Table 9 continued.

Catchment areas	9		10		11		Area
	Total	Per farm	Total	Per farm	Total	Per farm	Total
Additional income	4.320	240	115.872	1.632	367.848	3.144	488.040
Additional expense	1.440	80	38.624	544	122.616	1.048	162.680
Increase in net farming income	2.880	160	77.248	1.088	245.232	2.096	825.360

The information in table 9 was calculated in consulation with agronomists and implies an average expansion per farm of 126 morgen of land devoted to rainfed lucern without a noteworthy reduction wheat production (Ref. no. 22 p. 52). The sheep population will increase by an average of approximately 250 per farm and sound crop rotation system can at the same time be developed and perfected.

On the assumption that farmers are entirely dependant on a water scheme for livestock watering the water requirements will be as set out in Table 10.

Table 10.

4.7.4.1.2.4 Water requirements for livestock per farm and per catchment area with proposed increase of sheep population (water for domestic and gardening purposes excluded.)

Catchment area	Water requirements for livestock watering.	
	Per farm	Total
9	1217	21.906
10	814	57.794
11	744	87.048
Total	2775	166.748

The water requirements for livestock watering is very small as sheep requirements are only $1\frac{1}{2}$ gallons per unit per day. The total water provision for catchment areas 9, 10 and 11 should be 167.000.000 gallons annually. Water is relatively plentiful in catchment area 9 so that the 21.900.000 gallons allowed for in this area on the assumption that farmers have no available water at present will of necessity be high.

The additional water will result in an annual average increase in net farm income of R648. The largest proportion of water requirements is for catchment areas 10 and 11 where the increased net farm income will be R846 per annum.

4.7.4.2 Net income from farming.

The net income from farming in the three main catchment areas is given in Table 11 The net income from farming is relatively high in the area but can be increased with additional water for livestock.

Table 11 (Ref. no. 20 p. 42)

Present net income from agriculture per farm by catchment area.

	Gross income		Expenses	Net farm income
	Livestock	Grain crops		
Catchment areas	(R)	(R)	(R)	(R)
9	12.000	5.027	10.968	6.059
10	11.648	7.168	12.543	6.273
11	10.220	9.246	13.288	6.178

The financial position of farmers in the area is relatively sound and drastic structural changes in the pattern of farming is not advisable. The Ruens is traditionally a wheat producing area and this branch of farming is relatively profitable. The present expansion of the livestock expansion of the livestock branch of agriculture particularly woolled sheep should continue as is presently the case.

While it may be possible to show that large scale vegetable production could be economically justified the fact that this applies to other areas in the South West Cape where comparitive advantages are greater should be borne in mind.

4.7.4.3. Economic impact of the provision of additional water for livestock watering.

The effect that a water scheme making adequate provision for livestock will have on the area is shown in Table 12.

Table 12. (Ref. no. 22 p. 53)

Proposed agricultural development in the study area, average per farm by the three major catchment areas resulting from provision of additional water for livestock watering.

Catchment areas	9		10		11		Area
	Total	Per farm	Total	Per farm	Total	Per farm	Total
Additional morgen of rainfed lucern	180	10	4.828	68	15.327	131	20.335
Additional sheep	360	20	9.656	136	30.654	262	40.670

4.7.5 INFRASTRUCTURE : PHYSICAL : ACTUAL AND PROSPECTIVE.

4.7.5.1 Transport : Existing facilities.

The existing network of main and secondary roads and railways, air-fields both in use and disused, municipal and private are shown on land use maps 10a, 10b and 10c.

4.7.5.1.1 The road network. (see land use and road structure map.)

The main road system is tarred and links Bredasdorp to the two coastal resort towns of L'Agulhas and Struisbaai and the resort at Arniston. Main roads link Bredasdorp via Napier to the National road N2 at Caledon and two cross the RÛens on the north and north east areas to connect the urban centre of the region with the national road N2. 12% of the 1776 kilometers of road in the study area are tarred.

The southern part of the study area comprising the Strandveld and the coastal plain west of Cape Agulhas (see map 10a).is served by a system of unsurfaced secondary roads. The coast is comparatively of a wild nature and links to the few coastal places are in the form of extensions of the inland road system. There is at present no coastal road although such a road has been planned.

The coastal plain facing the Indian Ocean to the east of Cape Agulhas is in the main poor quality farming area comprising primarily natural veld and has a few small coastal resorts. The road system is correspondingly embryonic and unsurfaced except for the road to Arniston.

To summarize, three adequate surfaced roads link the centre of the study area to the Caledon - Swellendam sector of the Cape Town, Port Elizabeth national road N2, which pass through the RÛens some 90 kilometers to the north of Bredasdorp on a line roughly east-north east. Intra regional links reflect the economic value of the areas served. The RÛens is well served by roads. In contrast the Strandveld and large sections of the coastal sector are less well served.

4.7.5.1.2 Prospective roads.

A coastal main road is planned to link Gansbaai and Skipskop ; construction work has already commenced. The proposed route hugs the coastline in places is less than $\frac{1}{2}$ kilometer from the marine-land interface. Elsewhere sand dunes have forced the road route furthur inland.

The route of the projected continuation of the limited access coastal

road link between Cape Town and Port Elizabeth has been finalized from the end of the completed section at Strand and Somerset-West up to its point of entry into the Bot river valley. The eastward extension of the route is as yet undecided but a number of alternatives are under consideration.

4.7.5.1.3 Need for improved road facilities.

For development of the considerable tourist potential of the area and increased effectivity of the transport and marketing of the products of the area particularly in view of the expected increase in sheep, cattle and possibly fruit and vegetables the predominant requirement is the provision of a high standard of road infrastructure linking the area to Cape Town and the inland markets. It is desirable that there be a greater freedom of choice in the use of transport modes particularly in cases where road transport is far more economical or the urgency of rapid transport is the overriding factor.(Ref. no. 31 p. 134).

4.7.5.1.4 Road motor service.

Regular mixed goods and passenger and special goods road motor services radiate out from the stations at Rietpoel, Napier and Bredasdorp located on the Elgin-Bredasdorp railway route to Riviersonderend and Stormsvlei, Strandskloof and Elim and Suidplaas respectively. A daily passenger bus service links Bredasdorp and Cape Town.

4.7.5.1.5 Rail network. (See land use maps)

A low grade line terminating at Protem serves the area with daily average of one goods train. Only 38 miles of rail is required to link Protem with the Cape Town - Port Elizabeth main line at Swellendam which can be built at a cost of R3.5 million. Representations have at various times for a period of some 50 years been made to the Railways Administration for this remaining section to be completed but without success. A recent survey by the Research Centre of the Buro of Economic Research into transport conditions and needs in the Overberg region (see map no.2 for the areal extent of this region) concluded that the potential traffic between the region and the coastal areas to the east is of such a limited magnitude that the cost of this rail link will not be justified (Ref. no. 31 p. 133). An alternative suggested in the report as being the most economical for the Railways Administration was the reduction of railway rates for goods travelling on the long roundabout route via Cape Town, Wellington and Worcester.

4.7.5.1.6 Air transport.

Air transport can make an important contribution to the transport network in the form of a high standard of transport for certain persons and goods requiring speed and convenience. A higher level of personal contact is achieved between the area and adjacent marketing and supply centres.

The area is at present served by a good quality municipal airstrip a few kilometers east of Bredasdorp. (map 10 b). A disused landing field developed during the second world war exists near the Heuningnes river (map 10b) and private landing strips are located near Soetanysberg and Brandfontein farm and in the Potberg area. A flying club is now based at the Bredasdorp airfield.

4.7.5.2 Water.

The sources and use of water and the need for additional water for livestock watering purposes has been dealt with previously. The infrastructure for the provision of agricultural water is restricted at present to that provided by each farmer from the sources available to him on his farm, while his domestic water is usually collected from roofs. Water for gardens is invariably limited and often non-existent. The Bredasdorp municipality obtains water from a spring in the mountain above the town. Napier's water supply is from a spring and borehole. For water supplies the coastal resorts depend either on boreholes or small local dams. In the former case water as in the case of Arniston may be brackish.

The potential infrastructure for provision of water for the total future requirements of the study area together with the Overberg region of which it forms a sub-region must rely for its source of water on the Riviersonderend river as the available sources in the sub-region itself are inadequate for future requirements. A water scheme using this river as source should make provision for water for all predictable future water needs for agriculture, central places and future coastal and inland development for recreation and tourism.

4.7.5.3 Power.

Electric power is supplied to the municipal areas of Bredasdorp, Napier and Gansbaai by Escom. No electricity is available to any of the coastal resorts, Elim or Baardskeerdersbos. Fuel for lighting and cooking in these places is generally by means of bottled gas.

4.7.5.4 Industrial accommodation.

The industrial institutions in the study area in 1963/1964 are given

in Table no.13

Table no.13 (Ref. 31 p.30)

	Number of institutions	Number of workers	Gros production R' 000
Bakeries	2	14	
Salt workings and salt pans	1	13	
Boot and shoe factories	1	5	
Clothing to measure	3	10	
Sawmills	2	5	
Printing and bookbinding	1	2	
Lime works	2	129	
Smith	1	2	
Total	13	180	234

4.8 SUMMARY AND CONCLUSIONS.

4.8.1 Development potential.

Development of the agricultural resource potential and increased regional income is largely dependant on the following :-

(i) provision of additional water from sources outside the region for livestock whereby the sheep and cattle populations can be increased.

(ii) additional perennial pasture for the increased livestock populations.

(iii) the creation of special research facilities devoted to the particular problems of the coastal plain in this and other similar agricultural regions. The application of research findings to the Strandveld and a consequent increase in both volume of production per unit of land and an increase in the extent of land under cultivation.

(iv) the provision from sources external to the region of water for a small increase of land under irrigation in the near future and a planned reserve of water for the future development of land suited to vegetable and fruit production.

(v) the preparation of a detailed statement on the inherent productive capacities of agricultural land for alternative uses for each part of the whole area. Information relating to the expected average income per hectare for all land should be available to all prospective buyers or sellers in order to close the existing gap between agricultural and market value of land. (see Fig. 14) This will help to ensure an economic return to the farmer on his investment.

(vi) full exploitation of the commercial value of the flora of the region within the bounds of good veld management.

(vii) Expand the very small existing market for sourfig jam nationally and in a broader field by means of advertising to enable the currently low value areas on the coast to be more fully exploited.

4.8.2 Evaluation of agricultural land use suitability.

Four suitability grades are employed. Land having the highest value being designated grade 1 and land with the lowest value grade 4. These values appear on the agriculture suitability map. Grade 4 land is subdivided into various prime uses including wild flower exploitation, natural pasture and suurvy production. Alternative and compatible uses are possible in each case. Land used for wild flower picking can at the same time be used as limited grazing and marshland suited to grazing also produces saleable ornamental grasses and wild flowers. The coastal plain appears to be primarily suited to suurvy production provided the market can be expanded but limited grazing and some wild flo wer exploitation is possible.

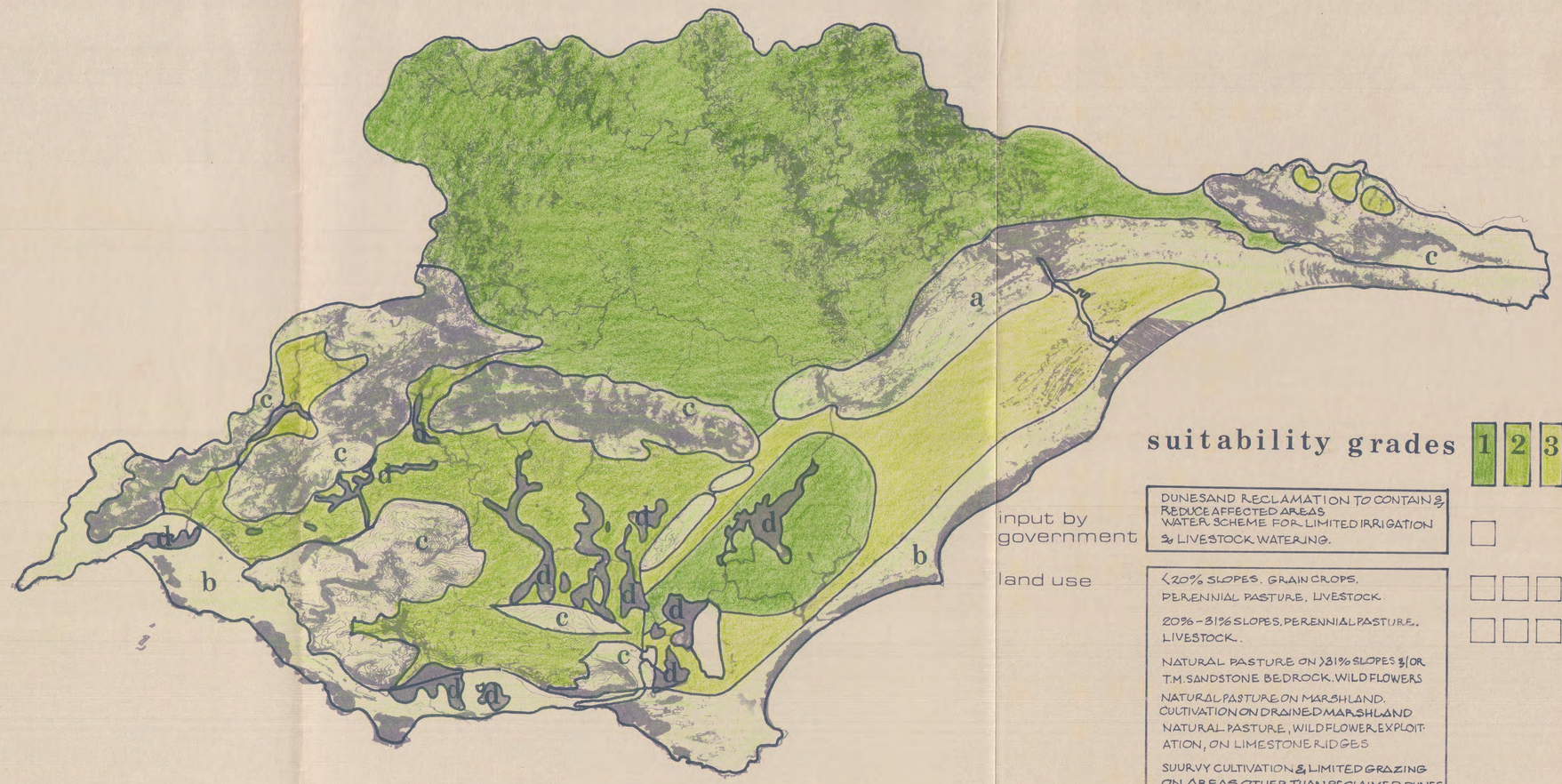
The relative suitabilities values are reinforced by the current market values of land reflected on Table no. 14 (Ref. 32). These values can be expected to rise with the inputs indicated on the agricultural land use suitability map but the grading of land should remain unaltered.

The spatial distribution of land of various suitabilities is graphically represented on map 11. The parameters evaluated in the assesment of relative suitability are chiefly the slope of land (see agricultural suitability map) and the soil association areas. The soil characteristics accounted for within the concept "areas of soil association" including fertility, vunerability to erosion and suitability for irrigation purposes are evaluated in relative terms in Table no. (14) 4 (Factors influencing agricultural land use.)

Table no. 14.

FACTORS INFLUENCING AGRICULTURAL LAND USE.

Soil ass'n areas see maps 8a, 8b & 8c.	Average land value for agriculture in Rands per morgen.		SOIL														CLIMATE						HUMAN	
			Fertility			Vulnerability to Erosion						Suitability for irrigation				Vulnerability to waterlogging			Rainfall					Progressive & financially stable.	Conservative & financially limited.
	Ref. no. 32					Water			Wind										Annual Precipitation			Distribution through year				
	Market value	Agricultural value	Low	Medium	High	Low	Medium	High	Low	Medium	High	Nil	Low	Medium	High	Low	Medium	High	Low	Medium	High	Poor	Medium	Good		
8																									
9	160	120			●		●		●											●				●	●	
10	150	120			●		●		●				●			●				●				●	●	
11		90 to 120 small areas 300			●		●		●				●	●		●				●				●	●	
13	60	40	●			●					●		●				●				●			●		
14	10		●			●					●	●						●	●	●				●		●
15	120	80		●		●			●				●				●	●		●				●		●
16	200	150			●	●			●				●				●	●		●				●	●	
17				●		●				●			●				●									
T.M.S.	10		●				●		●			●				●				●	●			●		
Lime-stone ridge	10		●			●			●			●				●				●				●		



scale 1:300,000

suitability grades

1	2	3	4 a	4 b	4 c	4 d

input by government

DUNESAND RECLAMATION TO CONTAIN & REDUCE AFFECTED AREAS
WATER SCHEME FOR LIMITED IRRIGATION & LIVESTOCK WATERING.

land use

<20% SLOPES. GRAIN CROPS. PERENNIAL PASTURE. LIVESTOCK.

20%-31% SLOPES. PERENNIAL PASTURE. LIVESTOCK.

NATURAL PASTURE ON >31% SLOPES &/OR T.M. SANDSTONE BEDROCK. WILD FLOWERS

NATURAL PASTURE ON MARSHLAND. CULTIVATION ON DRAINED MARSHLAND

NATURAL PASTURE, WILD FLOWER EXPLOITATION, ON LIMESTONE RIDGES

SUURVY CULTIVATION & LIMITED GRAZING ON AREAS OTHER THAN RECLAIMED DUNES

farmers input with state aid

BIOLOGICAL SOILCONSERVATION BY MEANS OF 3 YEAR CROP ROTATION SYSTEM ON 5%-20% SLOPES

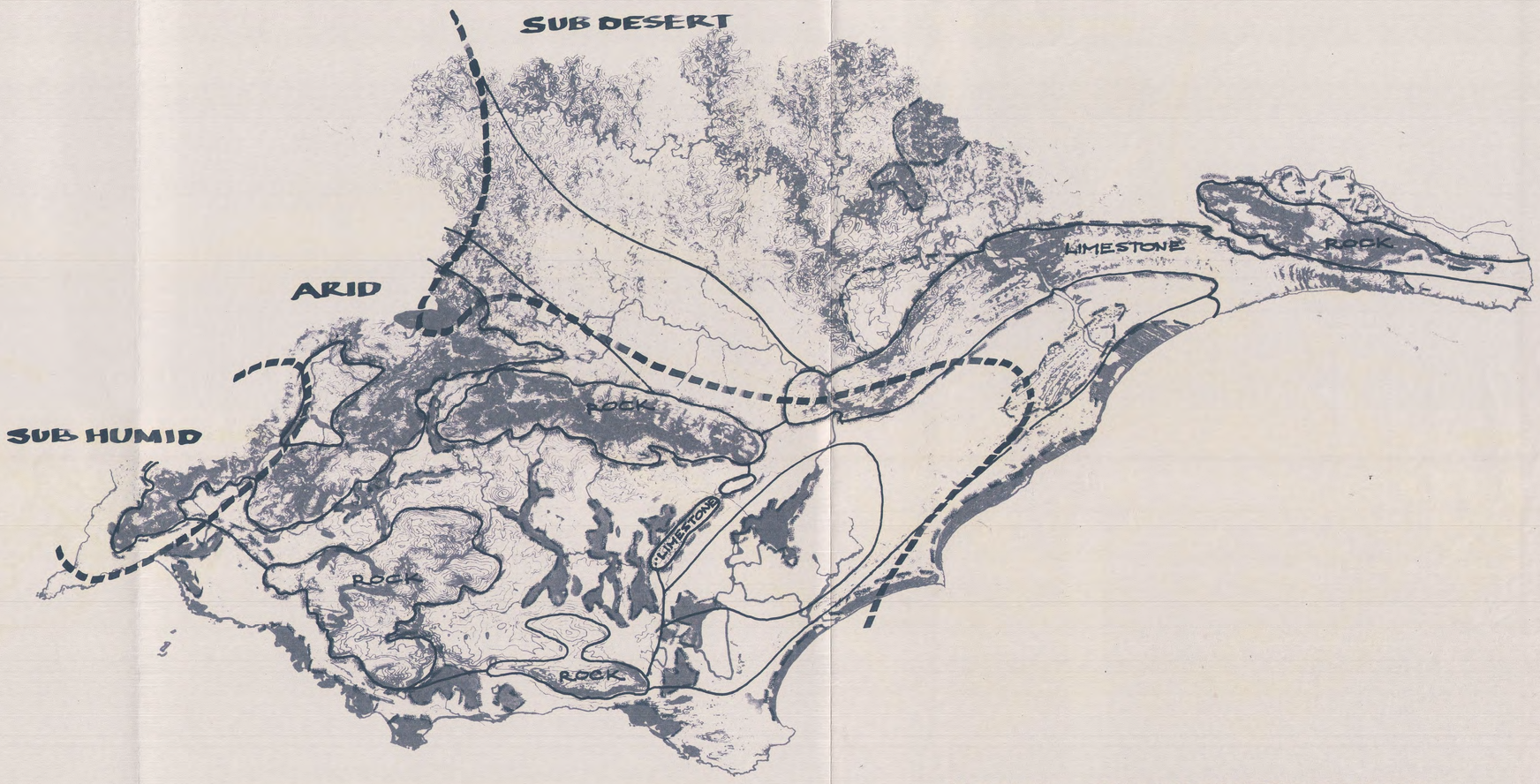
ADDITIVES TO SOIL FOR TRACE ELEMENT DEFICIENCY CORRECTION.

MECHANICAL SOILCONSERVATION ON 5%-20% SLOPES BY MEANS OF CONTOUR FURROWS

SOUND VELD MANAGEMENT PRACTISE

AGRICULTURE SUITABILITY

map 11



BOUNDARIES BETWEEN BIOCLIMATIC SUB-UNITS

BOUNDARIES BETWEEN BIOEDAPHOCLIMATIC SUB-UNITS - SEE SOIL MAPS

BOUNDARIES BETWEEN BIOEDAPHOPHYSIOCLIMATIC SUBUNITS

scale 1:300,000

AGRICULTURAL PLANNING UNITS map 12A

section 5 RECREATION

5.1 Introduction.

That there is need for recreation in the countryside and coastal areas is now generally accepted and it would be superfluous to include in this introduction a list of all the contributary factors causing a increase in leisure time and demand for recreation amenities. The necessary roll of recreation in any community which is to restore the physical and intellectual resources of man requires emphasis as it highlights the importance of the recreational potential of the study area to the population which it is capable of serving in this respect. For planning purposes it is essential to recognise that the population of the Cape Town Metropolitan area will undoubtedly steadily increase and that the world wide trend of rapidly increasing use of country and coastal study areas for recreation will be felt in the study area.

The prime recreational function of the area for urban populations is the change of environment that it offers. The area can play an effective role in the provision of a proper balance between work, living and recreation in a regional context.

The study area should be seen as a relatively small parcel of land requiring careful planning, which takes into account the specific role which its particular inherent qualities of resource endowment qualify it to play in regional recreation. The needs and preferences of the people likely to use the area is important in determining demand but a statistically viable assesment of these is beyond this scope of this work. The study of the area's environmental resources included in this work can however contribute to an assesment of the value of its various parts for recreation.

5.2 Recreational resource endowment.

The recreational resource content becomes clearer by subdividing the study area into sub-areas, each of which contribute uniquely to the opportunity for recreation.

The major sub-divisions are the coastal area or fore-land and the balance of the area or hinter-land..

5.2.1 Fore-land.

The fore-land comprises four bands running down the length of the coast. These are the neretic and beach zones, the shoreland and inland of this the vicinage. The following is an evaluation of the recreational significance of each. (Ref.no. 23 p's 6-8).

5.2.1.1 Neretic zone.

This is the marine area beyond the beach zone and overlying the continental shelf. The large variety of reef and pelagic fish and the presence of certain tropical fish makes this a exceptionally rich fishing area with interesting bars and reefs within the range if ski-boats, the largest of which are the six mile and twelve mile banks to the south of Cape Agulhas.

Upwelling of nutriunt rich water occurs with certain wind conditions adding to the variety of marine life. Fish are also attracted to the area off-shore from the Heuningnes river mouth, where the nutriunt laden warm waters of the river create good fish feeding grounds. The off-shore waters to the east of Cape Agulhas are ideal for ski-boating. The sea to the east of Cape Agulhas is considered to be reasonably safe for ski-boats as breakers are small while the potentially dangerous north-west off-shore wind gives a long warning. (Ref. no. 24). Struisbaai is considered a particularly suitable setting for off-shore power boat racing due to the relatively calm sea. (Ref.24) The environmental requirements for launching ski-boats, a free channel at least 10 meters wide with 2 meter water depth free of kelp rocks and breakers, and protection from the prevailing wind are satisfied here. These conditions are also wholly or partially met at various points along the coast including Cape Infanta, Arniston, Struisbaai, Brandfontein, Buffeljag, Franskraal, Kleinbaai and Gansbaai.

5.2.1.2 Beach zone.

This band overlaps the interface of land and water and varies with respect to land form configuration both vertically and horizontally, vegetation, surface ecology, exposure, environmental quality, inter-tidal wildlife, sea-life, underwater vegetation, degree of exposure to wave action, and scenic quality of sea turbulence. This area offers great variety of experience. Here occur sea caves, sea sculptured rocks of limestone or sandstone, sand beaches, points of conjunction between sandy and rocky coast, coves, baylets, bays, promentories, points, headlands, deep water areas and shallows, breakers far out and waves breaking on the beach, short intimate beaches and long stretches of beach.

This zone represents a special leisure activity base depending upon the distribution of environmental resources. Specific areas are suitable for one or more of a large range of recreation activities including surfing, skindiving, underwater exploration, spear fishing, beach combing, coastal lounging and swimming, coastal hunting, coastal fishing and general aesthetic appreciation. Aesthetic

pleasure is a major reason for seeking out coastal areas for recreation. Experiences peculiar to the coast include watching for ocean going vessels, feeling the ocean breezes, contemplating the historic past and legends of the sea, and possibly seeing porpoises or wales. Bathing in rock pools, collecting sea shells and flotsam, gathering bait from rocks and estuaries are among the experiences to be enjoyed in the beach zone.

The coastal area is the venue for activities which can also take place elsewhere such as hiking, sunning, horseback riding, picknicking, camping, photography, sketching, painting and nature studies.

The most popular activity in this zone is bathing. A number of natural requirements determine the degree of suitability of an area for bathing. Primary considerations are safety and comfort. Factors conducive to safe bathing include the absence of currents and back wash, sharks, steep shelving and rocks on the bottom. Factors contributing to the comfortable use of a swimming area depend on absence of stones and flints on the bottom, land insect pests, sea pests, flotsam and kelp and the availability of sufficient beach length and depth above high-water mark, shelter from wind and sun, suitable water depth, stable dune vegetation, fine white sand and suitable water temperatures.

Various beaches having a high degree of attractivness are found along this coast the more important safe bathing beaches occur at Uilenkraal-mond, Pearly beach, Castle beach, Die Dam, Brandfontein, Struisbaai, Arniston and Skipskop. Safe beaches not generally used occur almost continuously between Struisbaai and the intersection of the east boundary of the De Hoop wild life farm and the coast and also to the east of the De Dam camping site. The rocky coastlines between sand-beaches are particularly suited to passive recreation. These areas are indicated on the recreation suitabilit..(Map no. 14)

5.2.1.3 Shoreland.

This is the ribbon of land lying back of the beach and having a strong visual connection with the sea. In the study area shoreland often comprises windblown sand dunes but some dunes have well established indiginous vegetation.tending to greater richness in the higher rain-fall conditions to the west of the area. The shoreland varies in width depending on the topography.

5.2.1.4 Vicinage.

Vicinage comprises the marine coast backland in which a geographic image of proximity to the coast rather than a direct visual linkage exists. The feeling of proximity is heightened in areas surrounding

estuaries but exists elsewhere due to features which reinforce the sea's nearness such as the microclimate with its strong influence, physiographic features, the natural vegetation typically found here and the sound of the sea.

Along the coast from Struisbaai to Skipskop this zone lies in the lee of sand dunes and offers a measure of protection against the prevailing summer winds. A greater degree of linear variety in the vicinage area occurs west of Struisbaai where sand dunes occur discontinuously between land covered with vegetation of varying quality.

5.2.2 The hinter-land.

Opportunities for recreation for the general public consist of driving for pleasure on the public roads, visiting the Salmons dam nature reserve and making use of the public and private recreational facilities at Bredasdorp and Napier. Excepting for public land and buildings in the municipalities of Bredasdorp and Napier and the De Hoop Wild-life farm and Salmons dam nature reserve most of the hinter-land is in private ownership.

For the purpose of considering inherent suitability for recreation the hinter-land is sub-divided into characteristic areas, these being the coastal plain exclusive of first and third grade agricultural land, the limestone ridges, first, second and third grade agricultural land, the mountains of Table mountain sandstone, marshland, water bodies and unique and special features.

5.2.2.1 The coastal plain.

The coastal plain is largely level and poorly drained, physiographic features being restricted to the shifting and stabilized dunes, marshes estuaries and vleis. The coastal plain may be sub-divided into the area to the east of Soetanysberg which is wide and scenicly uninteresting generally. The more attractive areas are concentrated in the vicinity of De Hoop and Soetendals vleis, the Heuningnes river area and interesting farm landscape at Nacht Wacht on the road between Bredasdorp and Arniston where the plain has been humanized by bordering the farm camps with rows of trees.

A change of scale occurs in the coastal plain west of Soetanysberg where a higher degree of environmental quality prevails due to the relative narrowness of the plain and the proximity of Table Mountain sandstone outcrops and limestone ridges. Much of the area contains good quality vegetation and the landscape becomes interesting due to variations in the width of the plain, the occurrence of small vleis, marshland, some patches of remnant forest and the Uilenkraal river estuary.

5.2.2.2 Limestone ridges.

Limestone ridges are of particular recreational significance because of the extremely interesting and unique flora found here and the interesting and contrasting land forms. In the Franskraal area the ridges present a saw tooth skyline. The recreational suitability map shows a potential hiking trail which traverses the limestone ridges where these occur.(Ref. no. 19)
Note that the hiking trail shown does not exist at present,its realisation being dependant on legal access over the various properties.

The limestone ridges are of low agricultural value and other than for recreation suitable only for grazing and wild flower picking.

5.2.2.3 First and second grade agricultural land particularly during the winter months.

The rich varied greens and reds of cultivated lands present a humanized landscape of unusual beauty. The scenic attributes of these areas constitutes its chief recreationa value. The assortment of wild fowl and other small game occuring on arable land represents a relatively unexploited though small scale recreational opportunity.

5.2.2.4 The mountains.

The mountains of Table Mountain sandstone form three distinct groups the largest of which is the main east west spine extending from Gansbaai to Bredasdorp. To the south of this mountain as backbone of the area is the lower sandstone outcrop forming soft undulating countryside in the Viljoenshof, Groot Hagelkraal, Elim triangle rising up to Buffeljagts mountain to the south. The Potberg exist as an isolated outcrop at the eastern end of the study area. Recreational value of this area is mainly related to its scenic value. Driving for pleasure, walking, limited climbing and appreciation of the flora and fauna appear to be the recreational activities likely to occur. More opportunities should be made available in the area in the form of hiking trails and possibly an extension of the ground devoted to reserves.

5.2.2.4.1 The main east west spine.

In the centre of the spine are the highest mountains in the area between the farm Fairfield and Salmons dam nature reserve. The southern faces of these mountains are better vegetated than the north faces which receive less rainfall. The most scenic of the hinter-land areas occurs here and is indicated on the recreational suitability map in the form of the scenic drive commencing near Walker bay coast from where it passes over a neck north of the Franskraal mountain providing

at this point a spectacular view over the sea and skirting the two remnant forests Kleinbos and Grootbos from where the road follows a winding path up the Uilenkraal river valley. For some miles the valley is narrow and wooded with views over reeded riverside wetlands. Furthur up the valley on the way to Salmons dam the scenic value diminishes under the influence of exotic acacias before crossing the mountain near the farm Fairfield through an area of wild landscape which provides the platform for a panoramic view over the hilly cropland of the RÛens.

The whole of this area has largely undeveloped opportunity for recreation in the form of pony trails, hiking, picknicking, camping and caravaning and general estethic and wild life appreciation. Excepting for the Salmons dam nature reserve and the public roads the area is inaccesible to the general public. In common with the other mountain areas the economic value of the wild flowers found here is becoming increasingly recognised by the landowners and the steps which will undoubtedly be taken to protect this natural asset will also preserve it as a scenic area as the exotics will surely be eradicated. The three mountain areas also present opportunities for recreation related to the wildlife content.. The varieties of buck found here are graphically presented on the wildlife map no. 9.

5.2.2.4.2 <u>The Viljoenshof, Groot Hagelkraal, Elim triangle and the Buffeljagtsberg.</u>

This area is topographically different, the easier gradient and soft undulations being particularly suitable for walking given rights of way and general aesthetic appreciation of landscape and flora. In the southern part views over the sea are obtained.

5.2.2.4.3 <u>The Potberg mountain area.</u>

This mountain due to its prolonged isolation abounds with scarce ecological associations. The remnant forest in a dramatic kloof seen from the west side and the surviving colony of cape vultures in the krantzes above presents a unique opportunity for passive recreation which could be developed as a tourist attraction. The whole area because of its richness of natural vegetation resources is particularly suited as a nature reserve.

5.2.2.5 <u>Marsh-land.</u>

Over a wide area in the Strandveld and the coastal plain poorly drained flatland produces marsh-land of agricultural value only for grazing where marshes cannot be economically drained. Recreation value depends on marsh quality. Such areas could be used for bird watching and other forms of passive recreation, riding and hunting.

Water bodies.

A number of relatively shallow vleis and pans exist in the marshland areas. Some are quite small and as most of these including the large vleis attract wading and other birds they are suitable for bird watching.

Soetendals vlei.

Soetendals vlei, the largest inland water body is privately owned excepting for a large area in the center belonging to the Government. The riparian land is private.

Most of the vlei is fairly shallow except for the southern end which is up to 20 feet deep (Ref. no. 28). The vlei forms part of the Heuningnes-Nuwejaars river system and reeds are gradually encroaching into it from the western bank. The vlei will ultimately disappear as a result of natural succession. (Ref. no. 27)

The whole Heuningnes river system including Soetendals vlei has recently been proposed in terms of the Project Aqua as a conservation area because of its value for scientific research due to the very low level of pollution. The proposal is at present receiving consideration by the Prime Minister. As a conservation area the vlei will be a limited use area and only sail and other non-powered boats will be permitted. (Ref. no. 27)

Some eleven kilometers of the Heuningnes river is tidal and is suitable for canoes and row boats. Both the Heuningnes river and Soetendals vlei form the habitat for large varieties of fish and therefore presents considerable opportunity for angling. (Ref. no. 28)

De Hoop vlei.

The long narrow vlei at De Hoop has varied potential for recreation and forms the habitat for a very large variety of avi-fauna of interest to ornithologists. It falls wholly within the boundaries of the Provincial Wildlife farm De Hoop and is not open to the general public. The average depth is three meters in the summer season and varies in width from a 170 meters at its narrowest to 600 meters (Ref. no. 28). The water conditions comply with the requirements of the British Royal Yachting Association for competitive and recreational dinghy sailing (Ref. no. 40).

Breede river.

The lower reaches of the Breede river at the eastern end of the study area are suitable for a large range of recreational activities in-

cluding fishing and swimming, sail boat cruising, power boats, water skiing and general environmental appreciation.

5.3 Summary and conclusion.

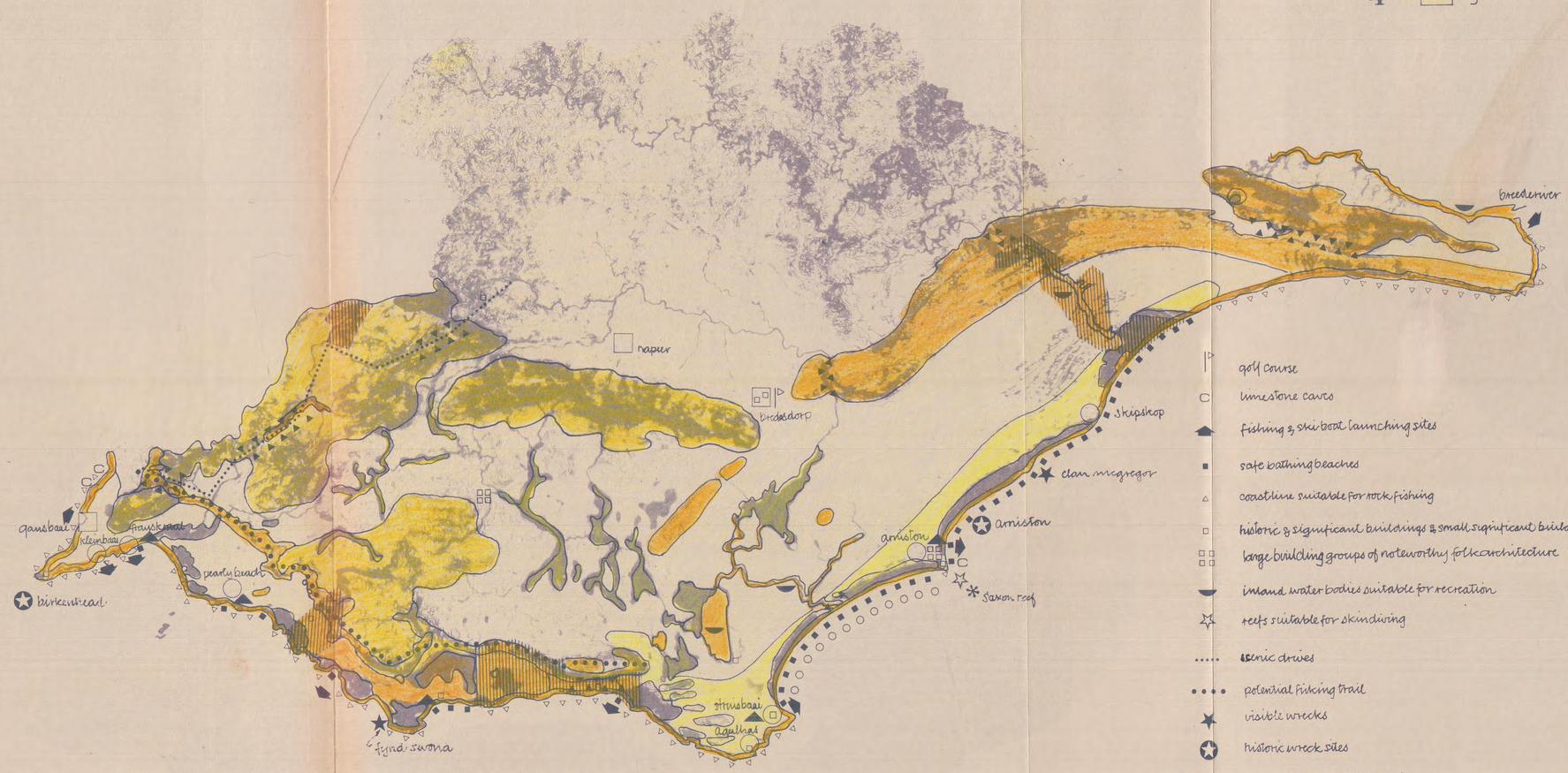
The area is well situated to cater for certain recreation needs particularly of the inhabitants of the Cape Town Metropolitan Area. Its value as a weekend "get away" region is high and will improve as the time-distance from Cape Town shrinks.

The most intensive agglomeration of resources supporting active and passive recreation is concentrated in a narrow band overlapping the coastline and to a lesser extent the perimeter of certain inland water bodies while resources conducive mainly to passive recreation and a lower intensity of human use are unevenly distributed in the naturally vegetated mountains, hills and coastal plain and arable land.

passive recreation areas value grades

1
2
3
4

} includes limited potential for hunting buck, or small game



golf course
limestone caves
fishing & ski boat launching sites
safe bathing beaches
coastline suitable for rock fishing
historic & significant buildings & small significant building groups.
large building groups of noteworthy folk architecture
inland water bodies suitable for recreation
reefs suitable for skindiving
scenic drives
potential fishing trail
visible wrecks
historic wreck sites
above average scenic areas inland
coastal resorts
marine reefs
towns with limited recreation facilities
tents & caravan park
offshore ski boating

RECREATION SUITABILITY map 14

section 6. DEVELOPMENT

"DEVELOP(-UP) Verb 1 To uncover or unfold ; bring or come to light or to completion by degrees ; disclose itself.

2 To cause to pass or to advance from a lower to a higher stage, as in function, structure, or the like ; unfold gradually by natural processes, as a bud ; also increase the power, strength or natural qualities of". (Ref. no. 47 p. 364)

The process of development for recreation with particular reference to much of that has taken place on our coasts has failed to enhance the natural qualities or recognize the qualities, this usually being a process of chopping up the land into marketable plots. In development forces in relation to the coast various influential factors require consideration. A fuller knowledge of these influences will lead to more appropriate use of land than is the case at present.

6.1 Environmental factors influencing development.

6.1.1 Climate.

The influence of the sea produces a mild and generally pleasant climate suited to outdoor recreation with respect to rainfall, temperature and incidence of sunshine. (See figure 1)

The one climatic factor detrimental to amenity is the occurrence of wind blowing onshore during the period December to February at mean speeds of 13 to 18 m.p.h. when pressure is low over the interior plateau. The summer school vacations and holiday season fall in this windy period which is followed by a relatively calm season from March to May during which time the short school holiday between the first and second school terms occurs.

Diurnal variations of wind velocity in the summer season are considerable, lowest wind speeds occurring at sunrise and the strongest winds blowing in the mid afternoon. The mean velocity recorded at Cape Agulhas at 4-00 p.m. is 18 m.p.h. (Ref.no. 48 p. 21) Open air recreation in the mid afternoon is thus adversely affected during this period. (See figure 1.)

The strong summer winds passing over the dry loose sandy surface of the coast pose major problems in re-establishing duneland vegetation, and has also had some influence in the location of certain development on the coast where buildings occur in the lee of elevated physiographic features. At Skipskop for example vacation houses find shelter in the lee of a high ridge. . The milkwood trees in a patch of scrub forest survive here to afford futhur wind protection. The bluff at Arniston

deflects southerly and westerly breezes from the bathing area and boat launching ramp opposite the hotel.

The launching ramp and offshore water at Struisbaai lie in the lee of the promentory with the wind from the south or west. Wind conditions occurring in relatively small areas play an important role in the location of many summer activities on the coast. Wind considerations can to advantage significantly effect the positioning of resorts, road and site layouts, landscaping and building forms in well considered ecological planning. The Sea Ranch coastal community of "second homes" situated about 200 miles north of San Francisco in this respect serves as an example of effective ecological planning for adverse wind conditions. The drawings on fig. 2 illustrate how windstudies preceded and influenced building placement decisions. The principles involved can be applied with advantage in adapted form to wind problems in the study area. Using wind deflecting features of sand dunes reinforced with tree and vegetation,planting programmes may be effective in improving micro climatic conditions.

6.1.2 Coastal dunes.

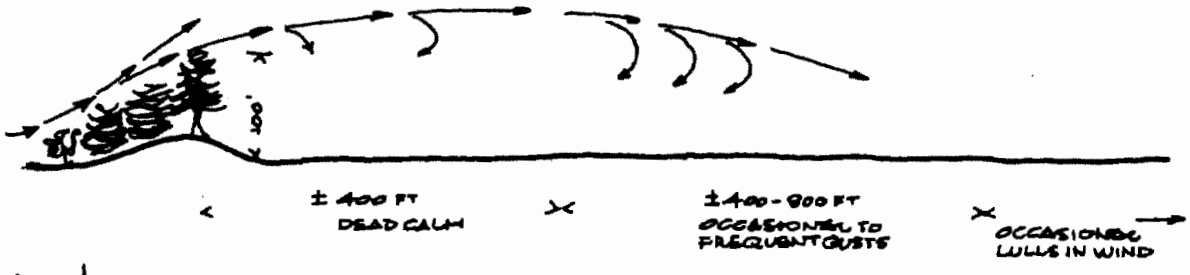
The 7.600 hectares of open coastal driftsands (see relief maps 4a, 4b, and 4c) are an important factor in the location of coastal resorts. Development has taken place where dunesand does not occur or where the dune area is narrow and consequently does not form a major barrier between the developed area and the beach. Patches of established dune bush surrounded by open dunes occuring at Skihaven and Ryspunt have formed the locale for recent township layouts.

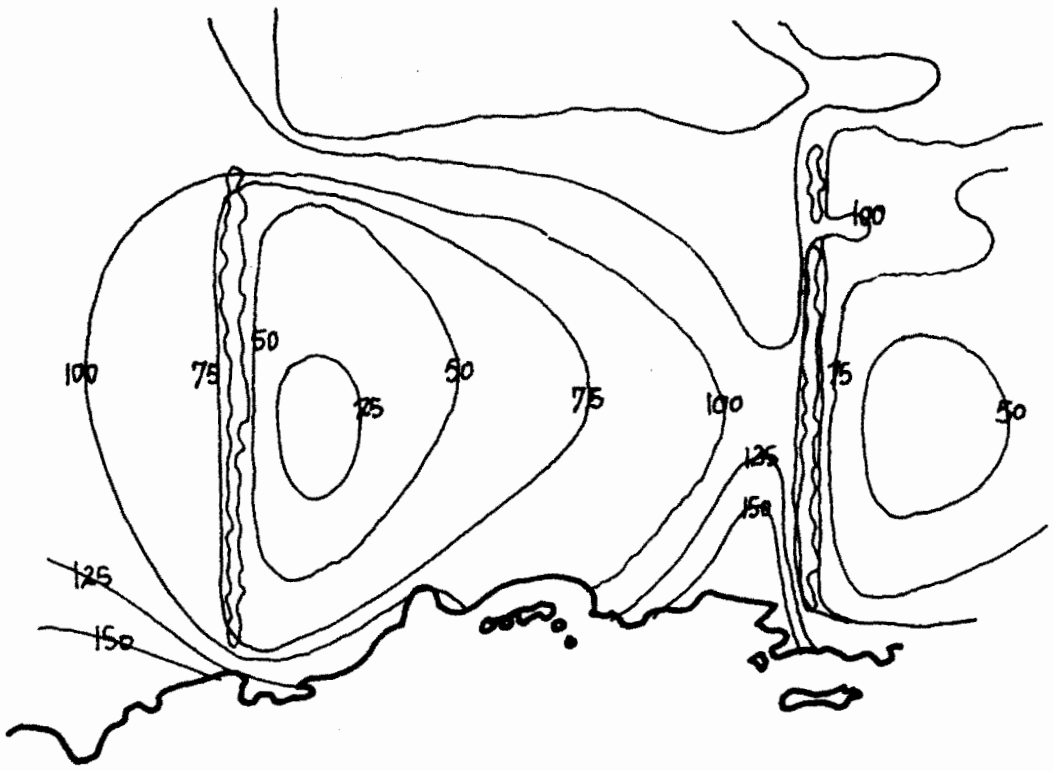
In the areas of land owned by the Department of Forestry (see landuse maps no. 10a, 10b, and 10c) reclamation work relying for plant growth on rainfall has been in progress for years. With sufficient fresh water dunes can however be stabilized fairly rapidly by means of irrigation (Ref. no. 11) Fresh water in the vicinity of the coast such as Soetendals vlei and De Hoop vlei could act as sources for this purpose.

Certain developed coastal areas have in the past been threatened by invasion of sand. "Protecting of coastal resorts and roads presents no special difficulty if the zone which would normally be occupied by the littoral dune has not been built over when normal reclamation methods are applied. The presence of buildings and other structures on the beaches immediately above high water mark complicates the position on account of the resulting detrimental effects of wind deflection and abnormal sand behaviour in the littoral area."(Ref. no.5 p.77) Neither the primary or secondary dunes should be developed due to their intolerance to passage, breaching or building.(Ref.no.1 p.14 and 15) the tolerance to development of coastal duneland is

ECOLOGICAL PLANNING at SEA RANCH

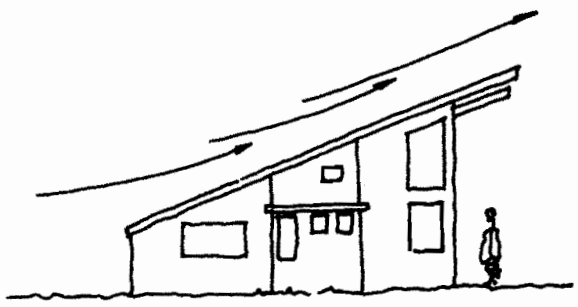
REF. NO 53 P. 133-136
REF. NO. 47 P. 127



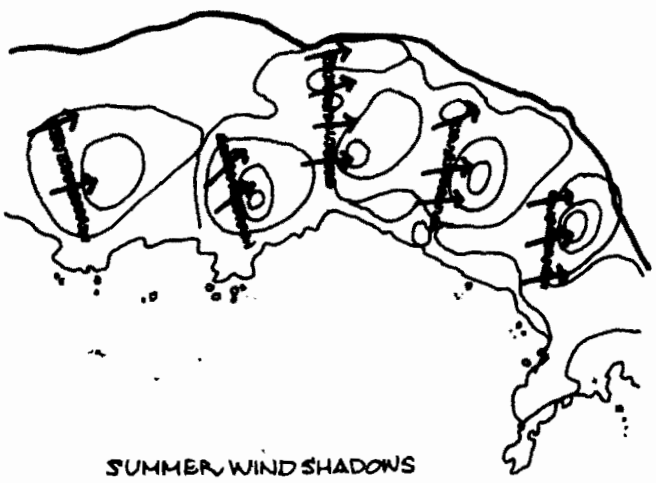


SUMMER WIND SHADOWS
wind speeds expressed as a percentage of maximum speed at the source

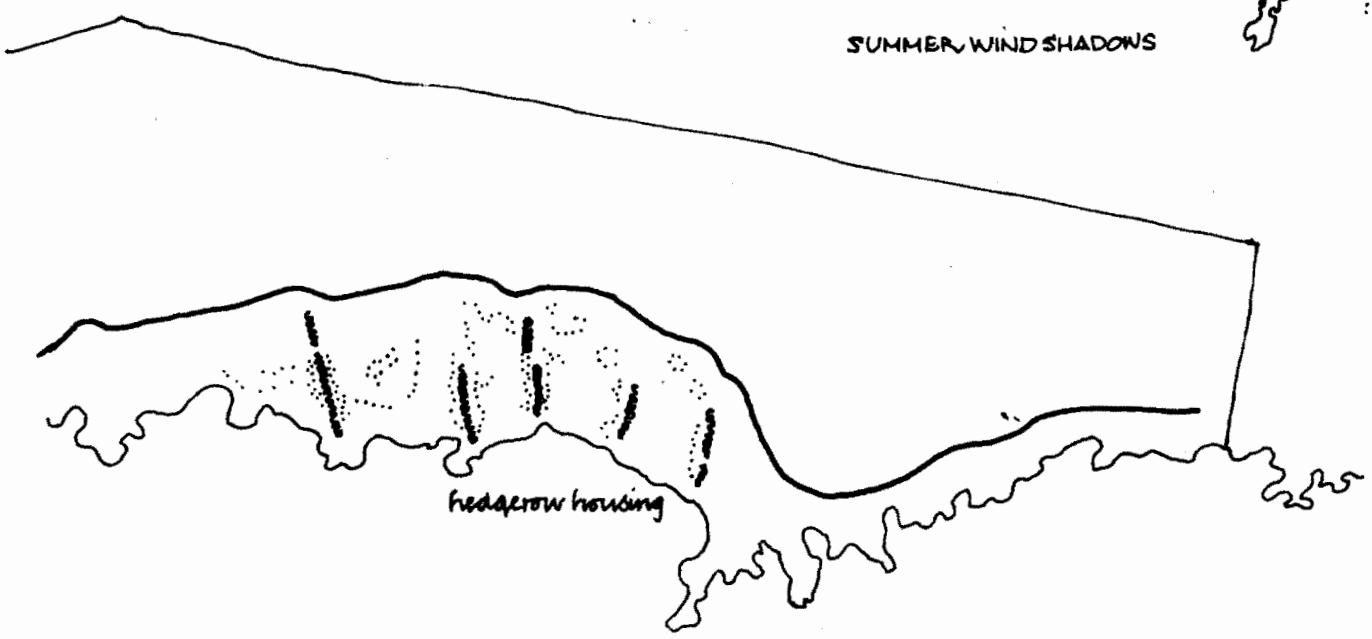
ideal profile of hedgerow as wind barrier.



the house provides its own wind protection



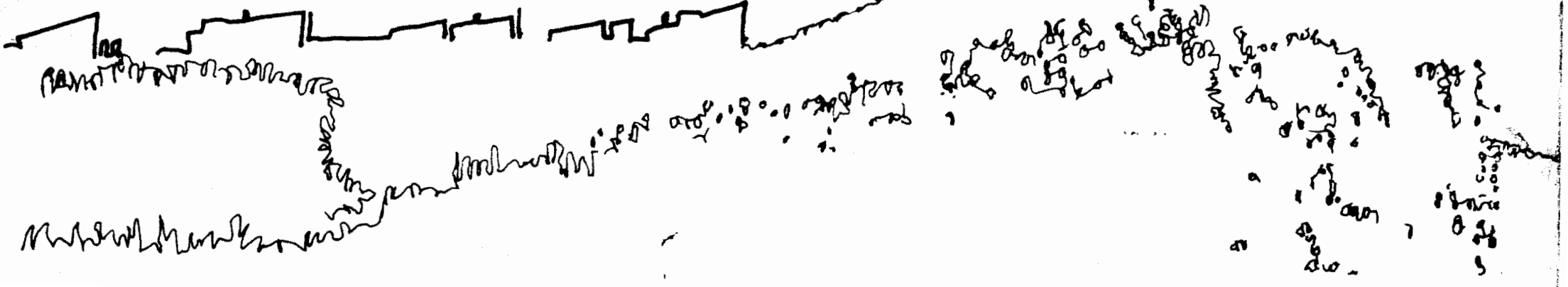
SUMMER WIND SHADOWS



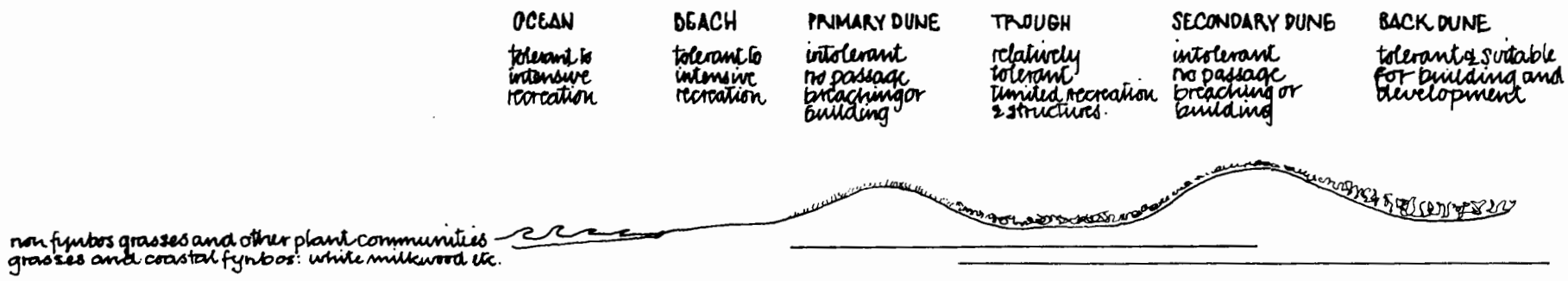
WIND STUDIES INFLUENCE LOCATION OF VACATION HOUSES

ECOLOGY DICTATES FORM

housing on windward side of hedgerow. roof slopes guide wind patterns up and over enclosed gardens in lee of houses



clarified in the following diagram.



The Indian Ocean coast between Northumberland point and Martha Point lacks vigourous physiographic features. Beaches extend between widely spaced points in long slowly curving sweeps. The most significant physiographic features are the dunes of varying heights which lend some relief to an otherwise flat landscape and provide protected areas on the leeward side.

5.1. Slope.

Slope is an important natural determinant in land use suitability for development.

Large coastal plain areas have very little fall , are located over impermiable bed rock and are consequently poorly drained and tend to be marshy in winter and unsuitable for development unless drainage systems are employed. Many hectares of coastland are also subject to flooding at about 50 year intervals. A recurrence of the extensive flooding in the Heuningnes river drainage area and in the lowlying areas surrounding the lower reaches of its tributaries the Kars river and Nuwejaars river can be obviated by continuing the process of keeping the river mouth open.

The value of land for development decreases with increasing slope. Land with slopes not exceeding 15% are highly compatible with developmental land use, land sloping more steeply up to 25% have medium compatibility and land falling more steeply is classified as having low suitability for development. (Ref.1 p. 144) The value decreases with increased slope as the cost of buildings and services, particularly roads is greater with increased gradient.

As the coast is primarily a summer recreation area north facing slopes receiving solar energy in winter do not have the high value normally associated with such areas. Again the value of north facing slopes as solar energy traps is less than in urban areas used throughout the year. Yet northern slopes on the landward side of dunes combine this value with that of protection from prevailing summer winds and often also mountain views.

6.1.4 Prospect.

Good views of nearby mountains increases land value in the vicinity of Soetanysberg, Buffeljagsberg, Wolfhuiskop and Franskraalberge. To the east of Cape Agulhas the plain is wide and the mountains too distant to enhance the prospect from the coastal zone. Land with a sea view is highly valued and the closer the sea the higher the value. For example sea fronting erven in Struisbay extension no. 1 were priced at R2.500. Sites with no view of the sea and situated about 2000 feet from the shore fetched between R1.100 and R1.700 depending on wether they faced in the direction of the sea or in the opposite direction. (Ref. 34)

6.1.5 Good quality natural vegetation.

The attractiveness of the vegetation is influenced by the rainfall and the type of vegetation. The indiginous vegetation with its greater variety of species adds amenity while the acacias detract from an areas pleasantness. Higher rainfall generally produces greener more lush vegetation.

6.2 Spatial distribution of environmental resources supporting active and passive recreation activities.

Areal incidence of resources with recreation value in their natural or developed form more than any other factor determines development suitability of land. The distribution of these resources are shown on the map of recreation suitability (map 14).

6.2.1 Bathing beaches.

The occurrence of safe bathing beaches are the single most important factor in determining the suitability of land for development. The recreation suitability map indicates the safe bathing beaches. These were determined by the perusal of aerial photographs from which the location of dangerous deep channels in the bathing zone either parallel to or at an angle to the shore were noted. This process was unnecessary in the case of beaches which are regularly used and known to be safe by experience. In a finer grained study the relative attractiveness of these beaches could be determined by accounting for the natural requirements for bathing suitability as noted in clause 5.2.1.2. Important factors affecting beach attractiveness which can be assessed at a broad level of investigation are water temperatures and exposure to wind.

6...2 Inshore water temperatures.

"Though no boundary of any natural significance can be drawn, the boundary between the Indian and Atlantic Oceans has been set by cartgraphers as the line running due south from Cape Agulhas" (Ref. no. 35 p. 5). There is however evidence in the marine plant life along the shores of the study area that the inshore water temperatures of the Indian Ocean to the east of Cape Agulhas are significantly higher than the waters of the Atlantic Ocean to the west. Kelp for instance is found only in the colder sea west of Cape Agulhas (Ref. 36) The difference in sea water temperatures between the eastern and western part of the study area is verified by skindivers acquinted with the area. (Ref. no. 37 and 38). The slope of the sea bed offshore between Struisbaai and Skipskop is more gradual, the 30 meter depth is an average of six kilometers from the coast. West of Agulhas 30 meters of water are found at an average distance of 3.5 kilometers from the coast. (Ref. no. 36). This together with stronger side currents experienced west of Cape Agulhas may influence inshore water temperatures.

The following table shows water temperatures at Arniston recorded by an unofficial source.(Ref. no. 39). No comparable data could be found for the coastal waters from Cape Agulhas to Danger Point.

Table 15

Inshore water temperatures in ^{o}c at Arniston.

	Minimum	Average	Maximum
January	22	25	
February	24	25	
March	21	21	
April			
May	19	20	
June	17	19	
July		17	
August	15		
September	15		
October		20	
November			
December		26	

The difference in water temperatures is a significant factor in the evaluation of coastal land suitability for development. The warm water of the coast from Struisbaai to Skipskop must be rated highly as a resource in determining weekend recreation potential relating to the large urban population concentration in the metropolitan area of Cape Town. Excepting for the inshore water along the inner edge of the False Bay coast and parts of Saldanha bay, water temperatures

of beaches within 2½ hours drive from Cape Town range from moderately pleasant to unpleasantly cold. The influence of the Benguella current and cold upwelling in the vicinity of Cape Town (Ref. no. 35, see map) considerably reduces the value of the sea for bathing on the west coast.

6.2.3 Sheltered beaches.

The two small areas of coast on the north side of Northumberland Point and Struis Point at Struisbaai and Arniston respectively are of higher value as summer bathing beaches due to their location in the lee of land masses, affording a measure of protection from summer winds blowing from the south east to south west.

6.2.4 Boat launching facilities.

Sea fishing from powered boats is excellent and attracts many people to this coast. Proximity to facilities for launching private boats increases the value of land. The natural environmental determinants for launching ski boats outlined in sub-section 5.2.1.1 occur at various spots along the coast as indicated on map 14.

6.2.5 Rocky coastline suitable for angling.

Practically all the rocky coast is suitable in varying degrees for angling. As anglers are prepared to travel some distance for a days fishing and fishing spots occur at fairly frequent intervals this is not considered an important determinant in the location of land suitable for development.

6.3 Non-environmental factors influencing development.

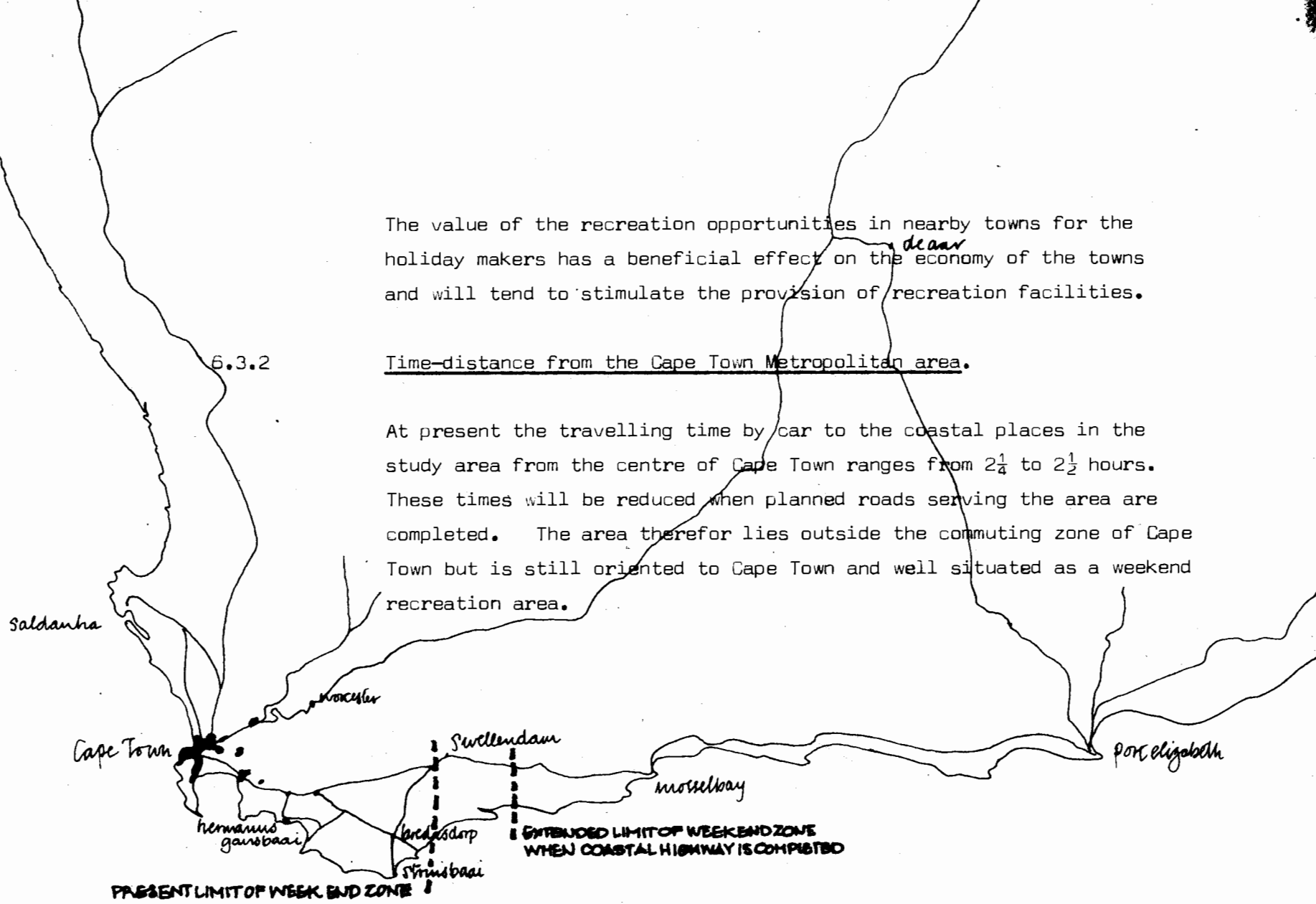
6.3.1 Availability of a range of alternative forms of recreation.

Conveniently available opportunity for alternative forms of recreation enhances development value. From this viewpoint proximity to the permanent populations particularly at Bredasdorp, and to a lesser extent Gansbaai and Napier influences development as facilities for recreation which usually occurs only in conjunction with permanently established communities can be enjoyed by holidaymakers during long vacations and weekends. Forms of recreation in this category are the outdoor activities requiring specially constructed facilities such as golf, bowls, tennis, shooting and cricket, and indoor re-creation such as the cinema, visits to the public library or local cultural history museums. The towns also have value for activities like visiting restuarants, drinking and eating places, window shopping, browsing around the town and attending church services.

The value of the recreation opportunities in nearby towns for the holiday makers has a beneficial effect on the economy of the towns and will tend to stimulate the provision of recreation facilities.

6.3.2 Time-distance from the Cape Town Metropolitan area.

At present the travelling time by car to the coastal places in the study area from the centre of Cape Town ranges from $2\frac{1}{4}$ to $2\frac{1}{2}$ hours. These times will be reduced when planned roads serving the area are completed. The area therefor lies outside the commuting zone of Cape Town but is still oriented to Cape Town and well situated as a weekend recreation area.



Essentially this falls within the zone of privately owned weekend homes and other forms of accommodation characteristic of short duration visits. In addition to its value for normal and long weekend visits is the suitability for long vacations when it draws people from a much larger area.

6.3.3 Demand for recreation outside urban areas.

The increasing demand on all "getaway places" particularly on the coast (Ref. no. 40 p.130) is a trend which must be taken into account in planning for development.

As standards of living rise and as increasing numbers of people live in flats holiday home ownership appears to increase (Ref. no. 40 p.130).

6.3.4 Influence of increasing car ownership.

Increasing ownership of cars has accelerated the trend to self catering holidays in "second homes". These include tents, caravans, boats, chalets (these could be in holiday camps) holiday cottages and flats. Plans for the area will be unrealistic if adequate provision is not made for the trend in this direction.

6.3.5 Permanent group camps.

There is a need for suitable areas for group camps used by youth organizations such as the Voortrekkers and Scouts.

6.3.6 Desirs for private individual leisure homes.

The need for individual homes has normally resulted in cutting up coastal land into unnecessarily large plots and areas developed in this way tend to result in an unsightly sprawling mass of holiday homes which tend to clutter the coastline.

6.3.7 Speculative activity.

Increased capital liquidity of the man in the street in recent years has generated investment in coastal property which by its nature is suited to small scale speculative activity. The resulting tendency to indiscriminate development detrimentally affects the natural resources of the affected areas. ".....down the length of the South Coast there is an invisible network of..... townships, each with a grandiose name and a brightly coloured map, which their promotors have skilfully held up to the public imagination as future flourishing resorts. ..... they have sterilized the land for any other use for which there may be a real need". (Ref. no.41 p. 128.)

Unrealistic land subdivision fortunately limited in extent exists in the study area. Future use of land has been frozen at De Kelders and Franskraalstrand established in 1940 and 1945 respectively where out of a total of 2.253 erven (Ref. no.29 Table V) less than half have been sold and 7.4% built on. Such "land subdivision long in advance of its intended use can be, and usually is, harmful to the public interest.....the existence of excessive vacant subdivisions is inimical to good planning, inflexible in the face of changing social and economic needs, and wasteful of public money invested in services. ..... any subdivision proposal which will merely add furthur vacant subdivisions ..... is, in its very nature undesirable." (Ref. no.41 p.129)

The use of the nations prime outdoor recreation resource as a speculative good has resulted in unstructured impractical land subdivision patterns and underlines the need for a functional and comprehensive planning of the coast.

6.3.8 Sewage Disposal.

Various forms of sewage disposal systems are possible for recreational resort development ranging from low cost primitive to high cost sophisticated. The likelihood of contamination of telluric water supplies and stormwater decreases through the range from primitive to sophisticated.

The pit system at the lowest end of the scale is no longer considered acceptable except in very isolated localities. Water closets can be

used in conjunction with privately owned conservancy tanks involving removal and disposal by tankers. This system is useful where permeability of the sub soil is low. An alternative primitive form relies on private underground septic tanks and soakaways. Operating costs are low but the system functions well only where soil permeability is adequate. Danger of pollution of telluric water supplies can be high and the system necessitates large plots and low population densities or small population concentrations. Usage gradually decreases subsoil absorbtion capabilities until the stage is reached when sewage can no longer be accepted by the ground and a more sophisticated system must be installed for the resort as a whole. In low lying coastal development with a high water table danger of pollution of the beach front where septic tanks are used is high. Private chemical closets although practical are generally disliked and accepted only in caravans.

While the primitive systems are adequate in low density areas, where medium to high densities obtain in conjunction with population of sufficient size as to render the use of primitive systems unpractical, sewerage reticulation, which depends on efficient water supply, and sewerage disposal plants are necessary. Planning provision in the initial stages is necessary for this type of system. In the traditional form of coastal township which is usually strung out along the foreshore, in many cases for miles, at virtually the same level, a waterborne sewerage reticulation system can prove very costly relative to the number of residential units served. The small differences in ground levels characteristic of waterfront situations usually involves sewerage pumping between sections of gravitational flow.

The influence of sewerage disposal on the form of recreational development appears to favour two extremes ; low population densities on the one hand associated with primitive systems for reasons of satisfactory functioning of the system and on the other hand fairly high population densities combined with large population. In the latter case there are economies of scale to the individual user through large scale use of an expensive installation. Costs increase as numbers of users increase up to the threshold level of the installation up to the point when full use of the installation is made. Due to the seasonal nature of coastal recreation full usage is possible only during vacations. Costs to the user consequently tend to be high due to the unused capacity of the system between vacations.

Other services.

Costs involved in the distribution systems required for movement of people and vehicles, telephone, sewerage, electricity, water supply and storm water services as well as the collection of refuse are

strongly influenced by the population densities of resort towns. Tightly arranged layouts ensure short reticulation systems and lower initial and maintainance costs while the converse is the case with larger plots and longer service runs.

6.3.10 Town planning and building regulations and requirements.

Amendments to the Townships Ordinance are necessary in order to allow for layouts suited to coastal development. Few coastal resorts house populations requiring facilities for schooling so that the provision of school sites appear unnecessary in most cases.

The ordinance should allow for the provision of small sites as little as 7 meters in width and 200 square meters in area with no building line restrictions relative to side boundaries. In this way a finite and scarce resource can be shared by larger numbers and ownership of coastal erven become possible to income groups who are at present excluded from this privilege. In depth staggering of buildings as adjacent sites should be made possible and building regulations imposed curtailing building elements such as windows and doors to a few carefully selected sizes. This will have an ordering effect but should allow for sufficient variation for individual expression. Restrictions of this kind will be imposed by the developers of a very large coastal development near Cape Town at present in the planning stages. Imaginative planning can result in coastal villages with much of the quality of the white walled seaside places of the Grecian islands.

The real needs of the people as a whole should be allowed for in the allocation of land. At present the people owning their own seaside homes using the coast of the study area for recreation are greatly outnumbered by those housed in rented cottages, tents and caravans. (see table 16).

6.3.11 Lack of a regional plan.

It is essential that the area be considered and planned as an entity otherwise no real basis exists for the allocation of land for various purposes and development occurs in a haphazard fashion. A regional plan must be flexible and not attempt to precisely zone all land for different categories of land use in an attempt to solve all future problems as society's social and economic needs change over time and external pressures cannot be accurately predicted particularly with rapid evolution.

A regional plan should attempt rather to establish the general pattern of development based on regional resources, present real needs and

such changes as can be reasonably deduced from trends and from the stresses to which it is subjected. Immediate development should be controlled and flexibility built in to bend to future change. It should be radical but firm at the centres of development and conservative at the outskirts. Guiding principles are necessary together with an outline of expected future development in both space and time (Ref. no.41 p.13).

6. .12 Land and building costs.

The price of land and building costs are obviously important factors in the development rate of seaside resorts, especially in the case of luxuries like beach cottages.

In 1960 the authors of Natal North Coast Survey concluded that "Comparatively few people can afford to pay R3.000 or more for a site for a beach cottage. Even fewer can afford to erect a building whose finishes and furnishings are of a quality commensurate with such a land price, especially when the building is only intermittently used by the owner and during the remainder of the year is liable to be damage by tenants." It is not surprising, therefor, that the demand for beach cottages is quickly saturated and that many who buy plots in a moment of enthusiasm never come to build on them.

In 1959 the rate per acre for beach front lots in North coast resorts varied from R3.400 to R20.000 depending on the attractiveness and popularity of the resort area. The rate per acre at a newly planned resort near De Hpop based on the price list is R30.000. In the inside area where no sea view is possible the rate is R24.000.

The application of building by-laws requiring "permanent" construction has contributed to the high cost of building and indirectly, therefore, to the slow development of many resorts. If it is accepted that holiday makers may live in tents and caravans, is there any logical reason why they should not live in static structures of the same construction. The tecnique currently used by a Cape Town firm for constructing low cost one piece prefabricated monolithic concrete garages with 60 mm. thick walls may well be applied to mass producting room elements for seaside dwellings which could be spatially arranged in building block fashion.

Convential bylaws require unnecesarily high ceilings whereas no detrimental effects would result if raking ceilings were door height at external walls with an average height of 2.75 meter. Low external walls would lower costs and tend to result in buildings of a cottage like character of a most human scale, admitably suited to coastal resorts and reminiscent, particularly if white walled, of the charming medditeranean villages.

6.5.13 Desire of the man and his family financially unable to or not wishing to own a coastal property to spend holidays on the coast.

The coastline should be seen as a national heritage and made available to all who wish to use it. The provision for and sale of seaside erven to the wealthy few on the choicest beaches and most developable spots should be drastically curtailed by the authorities. Far more provision should be made available for use by lower income groups for the type of accommodation suited to their needs than is at present the case. Overcrowding of the tent camps and caravan parks on the coast of the study area is indicative of the demand for this type of accommodation. It does not take long for a situation to be reached when little land is left available for the provision of holiday camps, caravan parks, low density hotels and motels and other forms of accommodation if townships are allowed to be established before the coast is planned as a whole. One of the strongest impressions of the commission during the Natal North Coast Survey was that there was less new land available for development than was generally thought (Ref. 41 p. 104).

The kinds of rentable accommodation already popular or likely to be in demand in coastal holiday resorts in the foreseeable future include high - density licensed hotels and boarding houses, low-density hotels, motels and small guest houses, socalled holiday camps, caravan parks, camping sites, beach cottages and flats. The proportion in which these will be required depends on a number of variable factors including the kind of resort, its popularity and stage of development, holiday habits and fashions and a complex of economic factors affecting the amount of money which holidaymakers have to spend and the cost of providing the various forms of accommodation. Uncertainty as to future needs and preferences underlines the desirability of not making subdivisional plans too far in advance.

Hotels have the disadvantage of high cost to the user and families with children are particularly vunerable. As the most intensive form of holiday accommodation hotels deserve priority in the selection of sites and should be near to the most popular part of the resort and have direct pedestrian access to the beach. Hotels require sites of between 2 and $2\frac{1}{2}$ acres. Coastal resorts should make provision for sites near the beach where smaller hotels and boarding houses can be erected as the need arises.

Areas on the coast which do not have the makings of a full scale holiday resort could be suitable for the development of low-density hotels or motels, holiday camps, miniature holiday camps, caravan parks or even camping sites. Holiday camps are usually built by an organization for the use of its members and are similar to motels as

they consist of free standing rooms, "rondawels" or chalets grouped round a central service and communal block. Visitors usually have the choice of finding his own food or using the communal dining room. Siting requirements for low-density hotels are similar to those of hotels but require a greater area. Holiday camps may range in size from a few dozen to a few thousand seperate rooms. The larger camps are virtually self contained holiday resorts providing for daily needs and organized entertainment. Sites should be large enough for all the necessary buildings and recreational facilities such as swimming baths, lawns, bowling greens and if possible walks and rides and preferably a stretch of beach frontage.

The term miniature holiday camp implies a group of a few dozen "rondawels" or cottages controlled by a manager on the site who is usually the owner. Such camps vary from a few serviced living units with possibly a communal lounge and playroom to larger concerns which include perhaps a tea room and shop and with more elaborate recreational facilities. Miniature holiday camps should have direct access to the beach and be sited in quiet areas on the outskirts of major resorts or in minor resorts.

Caravans are not as popular yet in South Africa as in Britain and America (Ref. 41 p. 109). Caravan parks need to be carefully sited as they can easily become a blight on the landscape particularly on the coast of the study area which is relatively treeless and difficulty is experienced in establishing trees near the coast. A well laid out and maintained caravan park can however be an amenity and not detract from the natural environment. Tourist caravan parks are best situated in more secluded areas away from the centres of major resorts (Ref. 41 p. 109). The locational needs of tented camp sites are practically identical to those of caravan parks (Ref. 41 p. 110). They are most appropriately situated in undeveloped parts of the coast.

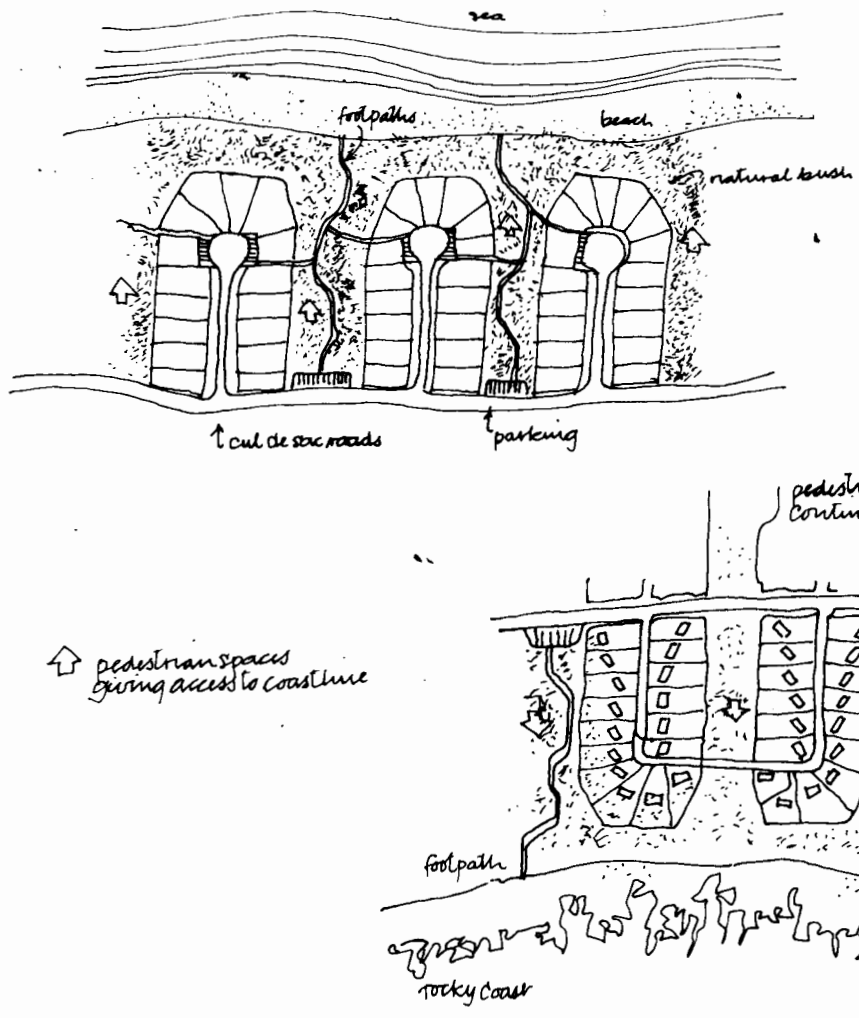
Beach cottages are intended to be occupied intermittantly for short periods by their owners, standing empty for the rest of the time, or alternatively for short periods of occupation by successive tenants. Plots should be small with grass, trees and shrubs for atmosphere shade and privacy. Building and letting beach cottages is not an attractive investment, due to the high cost of building allied to the high standards of building enforced by local authorities, water and other rates and risky short term tenancies. Ref. no. 41 p.110). In the study area cottages have been provided in association with caravan and camp sites by the local authority at Arniston and Struisbaai and are available at rents which many families can afford.

A need for homes exists at resorts for retired people and those who make a living in or near the resort. The requirements for these

classes differ in some ways. Retired persons usually prefer a situation near an established community for making social contacts and using the recreational facilities. Their greatest need is a creative occupation and congenial social life.

6.4.14 Existing development.

Table 16 outlines the existing development on the coast of the study area. Established coastal townships tend to function as development nodes as new development takes place more easily adjacent an area where plots have been bought and buildings erected. This fact however tends to detract from optimal planning of the resort as developers prefer to cut up the coastal frontage of the site in as many plots as possible so that the initial sales of sites close the shore are easily made. Further extensions to the township later occur when developed erven form an attractive node and this occurs inland of the first stage. This practise is oriented to maximizing the developers profits and inhibits optimal planning in the littoral area. The form of development that will be permitted should be ascertainable by a developer from the controlling authorities prior to purchasing of the site so that the price he pays for the land can be adjusted to expected returns. Coastal land has very low value for other than recreation uses and there appears to be no reason why the Radburn planning system or variations thereof should not be applied. The basic principle is illustrated below.



EXISTING SETTLEMENT . CHARACTER, DEVELOPMENT AND POPULATIONS.

TABLE 16

Ref. Zy table V

Hamerkop	Bokpoort	Rysgunt	Arniston	Molshoop	Struisplaat	Struisbaai	Skulpiesbaai	Agulhas	Die Dam	Buffeljagt	Pearly Beach	Lillienkraal	Franskraal	Van Dyksbaai	Kleinbaai	Birkenhead	Gansbaai	Die Kelders	Settlements in order of location from west to east
												●							Public holiday resort and camping site
					●		●				●		●	●		●		●	Registered township
																	●		Municipality
															●				Private resort with camping and living facilities
			●			●													Registered township and holiday camp
										●									Proposed Coloured township
								●											Village Management Board area
				●															Coloured township
																			Private holiday nature reserve
	●																		Group of private properties
		●							●		●								Camping site
										●									Unplanned Coloured area
																			Private cottage settlement

Date of establishment

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

100 200 300 400 500 600 700 800 900 1000 1100 1200

Erven built on
Erven sold
Erven undeveloped

Dwellings not on registered erven

TOTALS

2.301		98		38		47	5	50		12		13	3	4		2005	25	Resident population
4.802	20	250	100	780		740	60	1080		800		600	200	300	50	72	250	Temporary population in dwellings
11.240 13.070				1000		1300		400	2500	2000	4000			280		300		People accommodated in camps caravans and bungalows
243				40		93		30								60	20	Hotel and Motel accommodation
19.086																		

6.4 Evaluation of land use suitability for coastal oriented recreational development.

In order to evaluate land use suitability for coastal oriented recreational development a point system was employed. The contributary factors together with the numerical value attached to each are given in the following table. Land within 200 meters of a water body, marshland, land exceeding 25% slope, land other than grade 4 agricultural land, limestone ridges furthur than 2 kilometers from a water body and coastal mountain terrain exceeding 15% slope is excluded. Land within 1 kilometer of an inland water body is included.

Factors contributing to recreational land use suitability.		Numerical value attributed to suitability.
Slope	<15%	2
	>15% - <25%	1
Proximity to safe bathing beaches	1 km	4
	1 km - 2 km	2
Proximity to river estuary	1 km	2
or inland water body	1 km - 2 km	1
Proximity to coastline	1 km	2
	1 km - 2 km	1
Proximity to boat launching point	2 km	1
" " warm water bathing	1 km	2
beach	1 km - 2 km	1
Proximity to wind protected beach	1 km	1
" " coastline with interface between sand beach and rocky coast	1 km	1
Environmental quality ;		
Leeward side of dunes in summer		2
Good quality vegetation		1
Mountain within 5 km		1
Land with view of sea		2

The resulting values arrived at were simplified into four grades of development suitability and graphically represented on map 15.

6.5 Development potential for recreation in the hinter-land.

Not all opportunities for recreation are oriented to the coastline although this is the major attraction and in the interest of the region and its visitors alternatives could be explored.

6.5.1 Fauna and flora.

The wildlife content and potential increase in the populations presents opportunities for attracting tourism to the area. Certain development has taken place; the Salmonsdam nature reserve, the wild flower garden in the mountain above Bredasdorp, the wildlife park in the Skipskop area and De Hoop nature reserve are examples although the latter is restricted to use by orthinological specialists.

The environmental characteristics necessary for a wilderness area exist in the Potberg area. It is isolated, rich in endemic flora, suited to a variety of wildlife and bears little evidence of man's activity. The development potential requires safeguarding by the avoidance of a road traversing the sub-region.

Particularly in the coastal plain west of Soetanysberg, bounded as it is to the north by the botanically interesting Table Mountain Sandstone outcrops and limestone ridges are situations which many who find pleasure in the rich variety of flora to be experienced here would find attractive. The land is classified grade 4 agricultural ground having a very low value in this use. Legislation permitting 5 hectare sub-divisions with provision for maintaining the land predominantly under coastal fynbos would enable particulary the inland edge of the vlakte to be used for contact with nature by those with an interest in conservation. Such situations often present distant views of the sea and could be conveniently accessible to the coast by car.

6.5.2 Driving for pleasure.

Much of the area particularly the western coastal plain and the Uilenkraal river valley are attractive scenicly throughout the year while the Rûens is very impressive during winter when the rounded physiographic forms of the landscape are rich with the colours of earth and grain.

Road design should be carefully considered in relation to the environmental quality required for scenic drives. The winding character of roads in such areas should if possible be retained where this enhances the pleasure of scenic driving.

The development of roadside picnic spots in well placed situations and

signposting of features of the region should be given consideration in the interests of tourism.

5.5.3 Inland water bodies.

The inland vleis appear to present considerable opportunity for the development of various forms of water related recreation and the provision of accommodation facilities in the form of caravan parks with rentable bungalows. The proximity of the sea in some cases increases the range of recreational opportunity. The marshy areas related to most inland waters provide interesting areas for riding, hunting or the appreciation of nature. The farming activities associated with these areas adds furthur interest.

Hiking trails with the necessary rights of way along the edges of vleis and tidal rivers such as the Heuningnes river can provide a variety of experience as a link will exist between inland water, tidal rivers and the coastline. Various localities are conducive to the creation of inland water bodies which could be used for agricultural water and fresh water oriented recreation. The Uilenkraal river valley, situated in the highest rainfall area of the study area may be suitable in this respect.

5.6 Summary and conclusions.

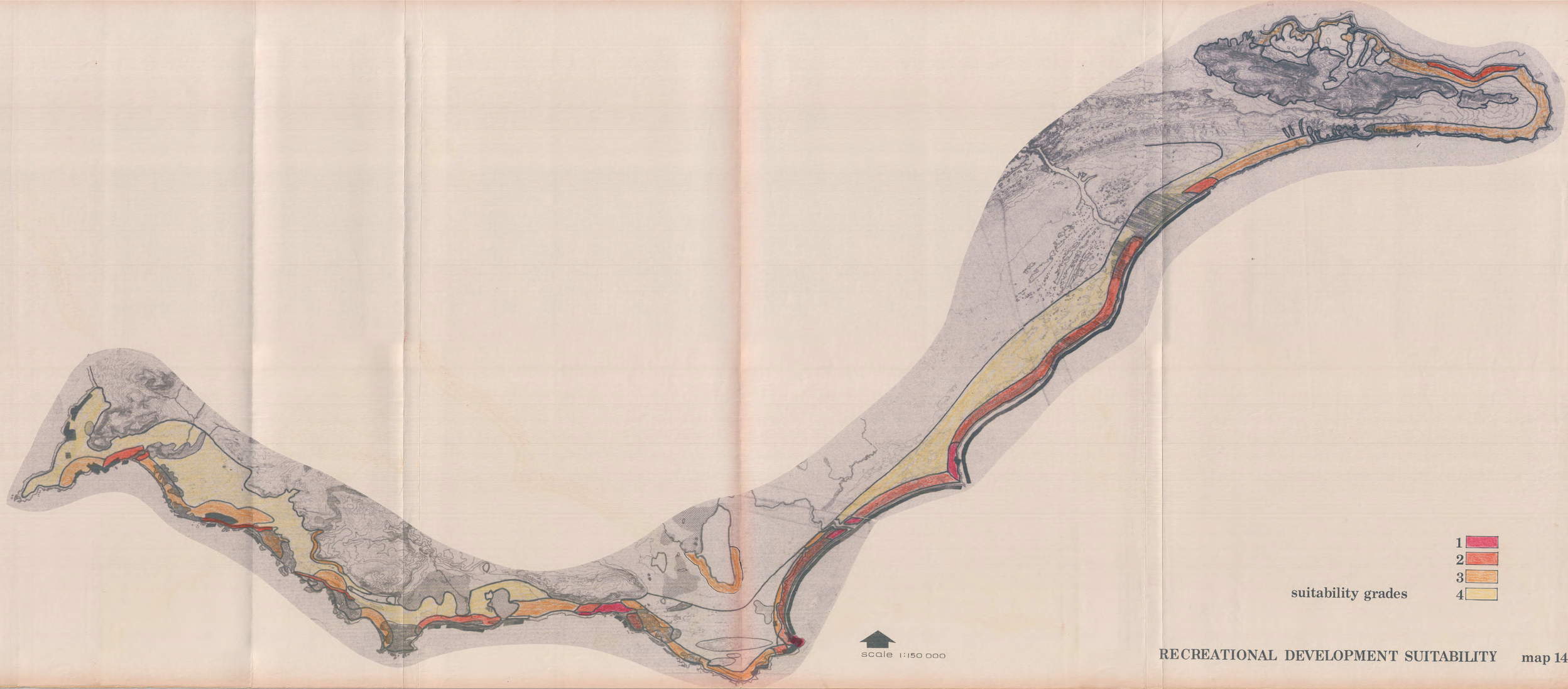
The greatest potential for recreation oriented development exists along the coast. While less opportunity is available in the hinterland a policy of balanced development suggests that recreation resources in the backland be exploited in its own right and to enrich coastal recreation experience.

The warm waters of the Indian ocean in particular will increasingly attract holiday makers to the coast east of Cape Agulhas. Restructuring of the school vacations to take advantage of the pleasanter climate during autumn will significantly increase the use made of the Bredasdorp coast for recreation.

Planning should take account of the factors which have a bearing on development potential and the emphasis should as a matter of policy be on the provision of facilities for persons who do not posess coastal properties. Future needs require careful consideration now to prevent a situation arising which inhibits the provision of adequate facilities for the lower income groups. A synoptic approach to the control of development in the region is desirable to ensure the preservation of unique areas and channel development to the most suitable areas for the form of development envisiaged.

A revision of planning standards appears desirable in order to allow

for imaginative and economical development of the coastal area in respect of site sizes and building restrictions. Provision is necessary for appropriate forms of development suited to real needs. It appears that the public-sector will to an increasing extent in the future be involved in the provision of certain forms of accommodation such as bungalows, caravan and tent parks in isolated popular places or in conjunction with resort townships, as such ventures due to the relatively short holiday season are not normally economically viable and will therefor not be provided by the private sector to any great extent.



suitability grades

1
2
3
4

scale 1:150 000

RECREATIONAL DEVELOPMENT SUITABILITY map 14

section 7 LAND-USE STRUCTURE

7.1 Synthesis of land-use suitabilities.

The land-use suitability values arrived at in the foregoing three sections were compounded on a single map (see synthesis of land-use suitabilities map 16). The colours used clarify the main suitabilities associated with each parcel of land and in this way land of high value for agriculture, recreation, recreational development and conservation are readily appreciated and simultaneously the values for other uses may be ascertained.

The map clarified a number of areas with high value for conservation, recreation and recreational development.

7.2 Inter-compatibility of land-uses.

The same parcel of land may be utilized for more than one purpose. Uses may be completely compatible, compatible in varying degrees or clash completely. An understanding of the intercompatibility of land-uses which now occur and are likely to occur in future was achieved through the medium of a matrix of intercompatibility of land-uses (see table 17). On the same table the intercompatibility of land-uses and the natural determinants for land-uses were reflected.

7.3 Theoretical structuring for coastal land-use.

To provide a basis for land-use planning in the coastal zone a theoretical framework was prepared (see Map 17) in which the relationships of development, natural use areas and the road structure was optimised within the fabric of goals for coastal planning.

The following planning goals and objectives were first determined. The primary goal is to achieve a balanced exploitation of the social values inherent in the man made features and natural resource endowment of the region within the bounds of sound economy and tempered by conservation criteria.

Taking into account the primary purpose of coastal development namely the use of the area for recreation, the optimisation of recreation experiences, was considered important. The opportunity for variety of recreational experiences is necessary. With this in mind variety in intensity of human use was regarded as fundamental to the model of coastal land-use. The model requires opportunity of access to recreation experiences ranging from highly intensive in a natural area to relative isolation with nature. A range of intensity of use was considered desirable in both natural areas and urbanized places. In effect this requirement

TABLE 17

MATRIX OF INCOMPATIBILITY OF LAND USES.

KEY:

- INCOMPATIBLE
- LOW COMPATIBILITY
- MEDIUM COMPATIBILITY
- FULL COMPATIBILITY

	Vacation settlement	Industrial	Limited use classification	Urban	Quarrying	Agriculture	Wild flowers	Recreation	Water management	Dune reclamation management	Dune management after reclamation
Vacation settlement											
Pollution producing											
Non pollution producing											
Limestone											
Sand & gravel											
Livestock on cultivated land											
Livestock on natural pasture											
Grain crops											
Sugar production											
Natural											
Cultivated											
Salt water oriented											
Fresh water oriented											
Wilderness											
Wildlife oriented											
Cultural recreation											
Driving for pleasure											
Reservoir											
Watershed management											
Littoral areas											
Back dunes											

NATURAL DETERMINENTS.

0-5%																							
5-15%																							
15-25%																							
25-100%																							
Over 100%																							
I.W.S.																							
Limestone																							
8,9,10 & 11																							
12																							
14																							
15																							
16																							
17																							

0-5%	Slope
5-15%	
15-25%	
25-100%	
Over 100%	
I.W.S.	Soil ass'n areas
Limestone	
8,9,10 & 11	
12	
14	
15	
16	
17	
	Aquifer recharge areas
	Water supply dependability
	Vehicular accessibility

calls for nodalization of development, with the highest degree of development related spatially to agglomeration of recreation and amenity producing natural resources and smaller nodes spatially related to topographically significant or visually interesting places with a lower recreational resource content than the primary nodes.

Although this is not reflected in the model, development should however be curtailed at existing unique places such as Arniston where the charm of the place is likely to be spoilt by extensions even if a high degree of agglomeration of recreational resources exists which is capable of supporting a larger population.

The model calls for continuity of the coastal natural use area broken only at points where contact with the sea for the purpose of launching marine craft and jeep access to the shore is desirable, elsewhere the road structure is divorced from the coastal natural use area.

The model is primarily concerned with the coastal development of low-grade agricultural land for recreation but allows for inland water oriented recreational development and indicates the relationship of coastal development to the central place of the agricultural region which will progressively increase in value as the venue of supplementary recreation and other services to the coast as development takes place.

7.4

Land-use structure for the region.

Application of the structuring principles implicit in the model to the realities of land form, coastline profile and resource endowment involved reference to the synthesis map of land-use suitabilities, the matrix of intercompatibility of land-use and the model itself. Land-use was ordered into two groups; agriculture on the one hand and a graded series of land-uses classes each determining the intensity of human use of the respective classification. In this fashion the models built in principles are effected in the structure plan to make available for example within convenient distance from any point, experience related to completely natural areas, or to any degree of intensity of human use preferred by the participant.

The four basic land-use classifications proposed other than agriculture are Natural Use areas, Limited use areas, Moderate use areas and Intensive use areas. These were derived from the system of classification employed by the State of Maryland for state and local preservation of scenic rivers in terms of the Scenic Rivers Act (Ref. 45 p. 35 etc.) adapted to the problems of coastal development and elaborated upon.

NATURAL USE AREAS are devised to preserve areas in their natural form as far as possible. Protective measures applied with discretion are permitted. These include firebreaks and in natural use areas devoted to scientific research, buildings for this use will be permitted but siting and character carefully controlled in the interests of the natural environment. The whole length of the coastline, estuaries and tidal reaches of rivers and the land periferal to inland vleis will be conserved for a distance of 150 meters above high water mark or the waters edge at its highest level in the case of vleis. The environmental quality of these invariably attractive areas will be preserved inviolate and the distracting influence of unsightly structures diminished. Mchargs reccommendation that the littoral dunes be kept free of buildings will be implemented in this way. Land proposed for use as a wilderness fall in this classification. Areas of exceptional natural beauty may be conserved through the use of this classification.

LIMITED USE AREAS are primarily intended to provide environments where natural features prevail. The emphasis is on nature as the dominant environmental influence. Such areas have an important function in acting as a buffer or transitional space between natural use areas and areas of more intensive human use. Opportunities for human recreation and residential activities are subject to stringent controls in limited use areas.

MODERATE USE AREAS are intended to foster an environment for human use and natural preservation. Uses are predominantly residential and temporary vacation accommodation facilities with natural areas still predominant. Development may be spread out in the manner of the Sea Ranch layout (see Appendix D) or concentrated in smallish nodalized holiday resorts (see development at Glyfada - Appendix D).

INTENSIVE USE AREAS either exist as or are intended to develop as urban places to function as a central place to either an agricultural area and/or smaller scale coastal development. Intensive use areas on the coast are located where the natural resource endowment for recreation offers a large range of recreation opportunities and where capital input would significantly enhance these.

D2.R1.A1

land use suitability for high recreation-oriented development in the publicly owned De Hoop Nature Reserve is not reflected

URBAN EXPANSION POSSIBLE : requires detailed land-use suitability analysis, outside the scope of this study

scale 1:300,000

DEVELOPMENT / RECREATION DOMINANTS
Development and Recreational values where Agriculture=A4

D1,R1,A4	D2,R1,A4	D3,R1,A4	D4,R1,A4
			D4,R2,A4
	D2,R3,A4	D3,R3,A4	D4,R3,A4
		D3,R4,A4	D4,R4,A4

AGRICULTURE / RECREATION DOMINANTS
Agricultural and Recreational values where Development=D4

		A3,R1,D4	A4,R1,D4
	A2,R2,D4	A3,R2,D4	A4,R2,D4
			A4,R3,D4
A1,R4,D4	A2,R4,D4	A3,R4,D4	A4,R4,D4

CONSERVATION DOMINANT

C1
C2
C3
C4

SYNTHESIS OF LAND-USE SUITABILITY

MAP 16

GRADE 1, 2 or 3
AGRICULTURAL LAND
Essentially arable lan

GRADE 4 AGRICULTU
Essentially Natural
and Wild flowers

VICINAGE

SHORELAND

BEACH ZONE

NERETIC ZONE

Medium & small holdings

NUMBER AND SPACING OF MINOR NATURAL USE AREAS VARIES ACCORDING TO LOCAL CONDITIONS

Development Node

DIAGRAM

high grade agricultural land

low grade agricultural land on coast

Central place of agricultural area

Minor Development Nodes

Major Development Node

SIMULATED APPLICATION

higher grade agricultural land

low grade agricultural land

Small holdings

resort

marina

resort

Sea

COASTAL LAND-USE MODEL

MAP 17

AREA OBJECTIVES

	LAND USE CLASSIFICATIONS		
PROVIDE ENVIRONMENT DOMINATED BY PRIMITIVE QUALITIES : USER TO FEEL ISOLATED FROM THE WORLD OF MAN	NATURAL USE	A	
TO PRESERVE THE NATURAL QUALITIES OF THE AREA OF VALUE FOR SCIENTIFIC RESEARCH AND EDUCATION	NATURAL USE	B	SCIENCE INTEREST
TO CONSERVE THE UNIQUE BEAUTY OF THE AREA INVIOLATE FOR THE SPIRITUAL ENRICHMENT OF MAN			OUTSTANDING NATURAL BEAUTY
TO PRESERVE AND IMPROVE THE SCENIC VALUE OF THE AREA			SCENIC VALUE
TO PRESERVE THE NATURAL HABITAT OF INDIGINOUS FLORA AND FAUNA			NATURE RESERVE
TO PROVIDE ENVIRONMENT WHERE NATURAL FEATURES PREVAIL: RECREATION AND RESIDENCE HIGHLY CONTROLLED	LIMITED USE		
TO FOSTER AN ENVIRONMENT FOR HUMAN USE & NATURAL PRESERVATION see Appendix D, Sea Ranch and Glyfada Bay for appropriate development forms	MODERATE USE		
TO FOSTER A FULL RANGE OF URBAN EXPERIENCE & CENTRAL PLACE FUNCTIONS SERVING AN AGRICULTURAL REGION &/OR SMALLER SCALE COASTAL PLACES	INTENSIVE USE		
TO OPTIMISE INHERENT AGRICULTURAL POTENTIAL	AGRICULTURE		

KEY

R1	Effective screening by trees
R2	No marring of landscape; approved site selection
R3	Two storey limit
R4	On perifery
R5	Limited in areas subject to wind erosion
R6	outside catchment area of Heuningnes River & tributaries.

PERMITTED USE

OTHER USES COMPATIBLE WITH CLASSIFICATIONS & OBJECTIVES

VACATION SETTLEMENT

INDUSTRY
- OF VALUE FOR TOURISM
- POLLUTION PRODUCING
- NON-POLLUTION PRODUCING

INSTITUTIONAL

URBAN

QUARRYING
- LIMESTONE
- SAND OR GRAVEL

AGRICULTURE
- LIVESTOCK ON CULTIVATED LAND
- LIVESTOCK ON NAT. PASTURE
- GRAIN CROPS
- SILVICULTURE

WILD FLOWERS
- NATURAL
- CULTIVATED

RECREATION
- SALT WATER ORIENTED
- FRESH WATER ORIENTED
- WILDERNESS
- WILD LIFE (PASSIVE)
- WILD LIFE (HUNTING)
- CULTURAL
- DRIVING FOR PLEASURE
- RESERVOIR
- WATERSHED MANAGEMENT

WATER MANAGEMENT

DUNE RECLAMATION MANAGEMENT
- DUNE PLANT AFTER RECLAMATION

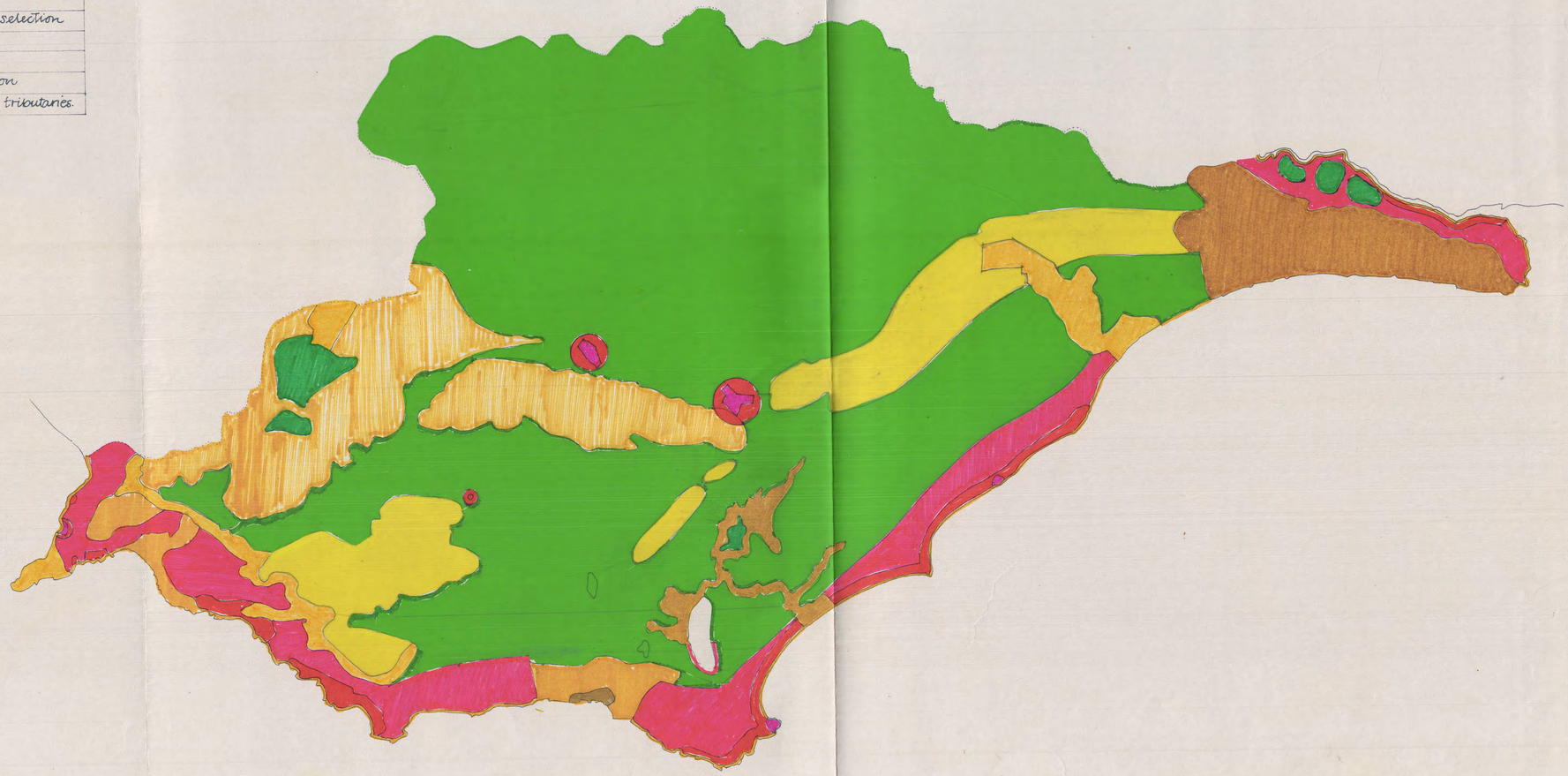
ROADS
- LITORAL DUNES
- BACK-DUNES
- HIGHWAY
- SEC. MAIN & LOCAL DISTRIBUTOR.

PARKING

SHOPS
- CONVENIENCE
- DURABLE GOODS

OWNERSHIP
- PUBLIC
- PRIVATE

BUILDINGS
- HOTELS
- HOTELS
- CARAVAN PARKS
- CAMP SITES
- COTTAGES, BUNGALOWS/CHALETS
- PRIVATE DWELLINGS



scale 1:300,000

LAND USE STRUCTURE PLAN

MAP 18

worcester
montagu
robertson
bonnievale
barrydale
capetown
stellenbosch
villiersdorp
swellendam
george
knysna
plettenberg bay
somerset west
strand
stormsrivier
riversonderend
riversdale
caledon
albertinia
mosselbaai
witsand
stilbaai
stanford
hermanus
klein
karwyderskraal
gansbaai
elim
arniston
struisbaai
agulhas
napier
bredasdorp
skipskop
tygspunt
gansbaai
franskraal
arniston
dyer island
struisbaai
cape agulhas

scale 1:1,000,000

DE HOOP NATURE RESERVE
value as wild life sanctuary dependson remoteness and free movement of wildlife
coastal highway bypasses to the north of the lime stone ridge

WILDERNESS AREA
value depends on absence of roads.
coastal highway passes to the north of the Potberg.

NATURE RESERVE VALUE
marshy area, tidal extent of Uilenkraal river suited to development as wild life, particularly bird sanctuary.
accessibility decreased and uninterrupted connection with sea and Quinefontein forest reserve ensured by.
locating local authority main road to the north but with views of the estuary area.

MARSHLAND VALUE
road passes to the north of the main marsh area and on the south edge of the grade 2 agricultural land.

AREA OF OUTSTANDING NATURAL BEAUTY
of highly sensitive character
treated as essentially pedestrian area
no through road.
local authority main road by passes to the north of Soetanysberg following roughly the south edge of the grade 2 agricultural land.
at the western tip of Soetanysberg the change of altitude of the road is hidden to view from the coast

AREA OF SPECIAL SCIENTIFIC INTEREST
value depends on absence of pollution in the Heuningnes river system
treated as a pedestrian area.
no through road. pedestrian bridge only
high accessibility causes mechanical pollution

LIMITED ACCESS COASTAL HIGHWAY
MAIN ROAD
LOCAL ROAD

scale 1:300,000

ROAD STRUCTURE MAP 19

APPENDIX A.

LIST OF MAMMALS OF THE BREDASDORP DISTRICT.

Key to symbols.

X	Occurring at present time.
E	Extinct in a feral state.
E 1	Extinct but reintroduced.
?	Occurrence possible.
1	Introduced.
R(?)	Probably extinct.

Ref. no. 44.

Order - Insectivora.
Family - Macroscelididae.

Short-eared Elephant Shrew	?

Family - Soricidae.

Forest Shrew	X
Reddish Grey Musk	X
Giant Musk Shrew	X

Family - Chrysochloridae.

Hottentot Golden Mole	X
Cape Golden Mole	X

Order - Chiroptera.
Sub-order - Megachiroptera.
Family - Pteropodidae.
Sub-family - Pteropodinae.

Yellow Fruit Bat	X
Cape Fruit Bat	X

Sub-order - Microchiroptera.
Family - Emballonuridae.

South African Tomb Bat	X

Family - Nycteridae.

Cape Slit-faced Bat	X

Family - Rhinolophidae.

Horseshoe Bat	X
Cape Horseshoe Bat	X

Family - Molossidae.

Flat Headed Free-tailed Bat	X
Egyptian Free-tailed Bat	X

Family - Verspitilionidae.

Cape Hairy Bat	X
Lesufeur's Wing-gland Bat	X
Long-tailed House Bat	X
Melck's House Bat	X
Honeyskin Bat	?
Schreiber's Bat	X
Lesser Wooly Bat	?

Order - Primates.
Sub-order - Anthropoidea.
Family - Dercopithecidae.
Sub-family - Cercopithecinae.

Velvet Monkey	?
Chacma Baboon	X

Order - Carnivora.
Family - Canidae.
Sub-family - Otocyinae.

Delande's Fox	X
Silver Fox	X
Black-backed Jackal	X
Hunting Dog	E

Family - Mustelidae.
Sub-family - Mustelinae.

Striped Polecat	X

Sub-family - Mellivorinae.

Honey Badger	X

Sub-family - Lutrinae.

Spotted-necked Otter	X
Clawless Otter	X

Family-Viverridae.
Sub-family - Viverrinae.

Small Spotted Genet	X
Large Spotted Genet	X

Sub-family - Herpestinae.

Cape Grey Mongoose	X
Water Mongoose	X
Red Meerkat	X
Grey Meerkat	?

Family - Protelidae.

Maanhaar Jackal	X

Family - Hyaenidae.

Brown Hyaena	E
Spotted Hyaena	E

Family - Felidae.

African Grey Cat	X
Serval	E
Xaracal Lynx	X
Leopard	X
Lion	E
Cheetah	E

Order - Tubilidentata.
Family - Orycteropodidae.

Antbear	?

Order - Prosboscidea.
Family - Elephantididae.

African Elephant	E

Order - Hyracoidea.
Family - Procavidae.

Rock Dassie	X

Order - Perissodactyla.
Sub-order - Ceratomorpha.
Family - Rhinocerotidae.

Linnaeus.. Black Rhinoceros	E

Sub-order - Hippomorpha.
Family - Equidae.

Quagga	E

Order - Artiodactyla.
Sub-order - Suiformes.
Family - Suidae.

Bushpig	?
Warthog	E

Family - Hippopotamidae.

Hippopatamus	E

Sub-order - Ruminantia.
Family - Bovidae.

Common Duiker	X
Steenbok	X
Grysbok	X
Klipspringer	E (?)
Vaal Ribbok	X
Springbok	E 1
Bontebok	X
Red Hartebeest	E
Bushbuck	X
Kudu	E
Eland	E
African Buffalo	E

Order - Lagomorpha.
Family - Leporidae.

Cape Hare	X
Bush Hare	X

Order - Rodentia.
Family - Bathyergidae.

Cape Sand Mole	X
Cape Mole Rat	X
Common Mole Rat	X

Family - Hystricidae.

Porcupine	X

Family - Graphiurinae.

Forest Dormouse	X
Black and White Dormouse	X

Family - Murinae.

Black House Rat	1
Verreaux's Rat	X
Namaqua Rock Rat	X
Four Striped Rat	1
Pygmy Mouse	X
African Water Rat	?
Cape Spiny Mouse	?
Cape Pouched Mouse	X

Sub-family - Dendromurinae.

Fat Mouse	X
Chestnut Tree Mouse	?
Grey Pygmy Tree Mouse	?

Sub-family - Otomyinae.

Vlei Rat	X
Saunder's Vlei Rat	?
Bush Karoo Rat	X

Sub-family - Gerbillinae.

Short-tailed Gerbil	?
Lesser Gerbil	X
Cape Greater Gerbil	X

APPENDIX B. Ref. no. 30.

THE AVIFAUNA SPECIES PREDOMINATING IN THE MAIN HABITAT OF THE DE HOOP REGION (1957 - 1966).

Permanent.

Main vlei - Crested and Eared Grebes, Dabchick, Rosy Pelican, White-breasted Cormorant, Reed Cormorant, African Darter, Grey Heron, Little and Yellow-billed Egrets, Spoonbill, Sacred Ibis, Greater and Lesser Flamingoes, Spurwing and Egyptian Geese, Shelduck, Cape Shoveller, Yellow-billed Duck, Pochard and Maccoa Duck, Fish Eagle, Coot, Treble-banded Plover, Blacksmith Plover, Curlew Sandpiper, Little Stint, Ruff, Greenshank, Wood Sandpiper, Water Dikkop, Black-backed and Grey-headed Gulls, White-winged Lake Tern, Giant Kingfisher, White-throated Swallow, Roack and Sand Martin and Wagtail.

Fresh water vlei - Wood Sandpiper, Reed and Sedge Warblers and Cape Weaver.

Riverine bush - Cape Francolin, Cape Dikkop, Roack Pigeon, Rameron Pigeon, Red-eyed Dove, Turtle Dove, Laughing Dove, South African Nightjar, Speckled and Red-faced Colies, Pied Barbet, Cardinal and Olive Woodpeckers, Cape and Sombre Bulbuls, Cape Robin, Apalis, Karoo Prinia, Fiscal Flycatcher, Cape Batis, Boubou and Tchagra Shrikes, Cape Weaver and White-throated Seedeater.

Coastal fynbos - Grey-winged partridge, Cape Francolin, Black Korhaan, Crowned Plover, Cape Dikkop, Cape Turtle Dove, Speckled and Red-faced Colies, Clapper Lark, European Swallow, Black Crow, Cape Raven, Cape Bulbul, Cape Robin, Grassbird, Crombec, Prinia, Fiscal Shrike, Bokmakierie, Pied and Red-winged Starlings, Sugarbird, Orange-breasted and Lesser Double-collared Sunbirds, Cape White-eye, Cape Sparrow, White-throated Seedeater and Cape Bunting.

Temporary (Inundated Area.)

Fresh water - Crested and Eared Grebes, Dabchick, Spoonbill, Sacred Ibis, Greater and Lesser Flamingoes, Egyptian Goose, Yellow-billed Duck, Shoveller, Coot, Three-banded Plover, Curlew, Avocet and Stilt.

Salt pans.- Spoonbill, Sacred Ibis, Greater and Lesser Flamingoes, Kitlitz's Plover, Blacksmith Plover, Curlew Sandpiper, Little Stint, Ruff, Curlew, Whimbrel, Avocet, Stilt, Black-backed Gull and Grey-headed Gull.

Salt flats - White-fronted Kittlitz's and Chestnut-banded Plovers and Red-capped Lark.

Grass flats - Egyptian Goose, Kittlitz's Plover, Crowned Plover, Red-capped Thick-billed and Long-billed Larks and Pipit.

LIST OF BIRDS OBSERVED IN THE VICINITY OF THE HEUNINGNES RESEARCH STATION BY BARHAM SENIOR RESEARCH OFFICE.

Spotted Eagle Owl.
Blue Crane.
Dusky Fly Catcher.
Black Shouldered Kite.
Hoepoe.
Wood Sandpiper.
Little Stint.
Spike Heeled Lark.
Great White Egret.
Bar Throated Appalis.
European Starling.
Cape Canary.
Black-eyed Bulbul.
Oyster Catcher.
Cattle Egret.
Cape Rock Thrush.
Ruff.
Guinea Fowl.
Lesser Double Collared Sunbird.
Spurwing Goose.
Crowned Guinea Fowl.
Blue Crane.
Black Korhaan.
Crowned Plover.
Rock Riglen.
African Hoepoe.
Giant Kingfisher.
Cape Bulbul.
Familiar Chat.
Crombek.
Bokmakierie.
Cape White-eye.
White Throated Seed-eater.
Cinnamon Dove.
Fish Eagle.
Swift Tern.
Grey Backed Cisticola.
Black Headed Heron.
Ringed Plover.
Fiscal Fly Catcher.
Jackal Buzzard.
Pied Crow.
Giant Kingfisher.
Namaqua Dove.
Rock Martin.
Sand Martin.
Cape Vulture.
Black Smith Plover.
Three Banded Plover.
Curlew.
Cape White-eye.
Cattle Egret.
Grey-winged Francolin.
Black Oystercatcher.
Stanley Bustard.
Ringed Plover.
Hartlaubs Gull.
Namaqua Dove.
Larger Striped Swallow.
Malachile Kingfisher.
Cape Trush.
Cape Robin.
Cape Long Claw.
Sugarbird.
Bally Seed-eater.

Typical coastline bordering Potberg wilderness area.

BREDASDORP. Conveniently situated to present and future coastal development from De Daan to Skipskop to provide additional recreation not economically justified in smaller coastal resort towns - eg. golf

NAPIER. town has a pleasant unified character due to the overall similarity of the domestic buildings. 30-45 galvanized iron roofs & plastered walls. ensure that future growth does not mar. control roof pitches, wall finishes and building elements

vulture colony.

remnant forest

high potential along south bank of river. Sites face north with back to the wind. Coastal highway will bring the area within weekend range from Cape Town.

vulture colony on kranse could be developed as tourist attraction. feeding could be viewed from concealed observation points.

coastal highway

Potberg - rich in endemic flora.

Breede river

parking

parking

WILDERNESS AREA
no development
no roads

Spectacular views from cliff top walk

parking

S.E. wind

purchase of low value farmland necessary to create wilderness area.
de hoop reserve incorporated into wilderness area

investigate feasability of closing outlet from de Hoop Vlei to sea under sand dunes to flood areas at X to provide base for water oriented recreation.
no development between Skipskop and De Hoop Coast to reduce pressure on De Hoop Nature reserve and vlei for recreation purposes.
De Hoop as part of Wilderness area will be accessible only to members of the public sympathetic to the concept of a wilderness and relative isolation. Bird watching will involve long walk.

opportunity along limestone ridges for altering ± 5 morgen subdivisions for people who seek contact with unique vegetation and physiographic forms with distant view of the sea and possibility of driving to coast

Keep Uilenkraal river valley as a scenic area. Retain the winding road - do not upgrade except for surface.

Consider these possible dam sites as source of water for future development on coast. Could have recreation value.

prime agricultural land.

extend future water scheme for agricultural area to provide coastal development

NAPIER.

BREDASDORP.

nature garden

Elim

prime agricultural land.

de hoop vlei.

Skipskop

spit

wreck visible

Arniston

restore Kassiesdorp cottages and keep Arniston the size it is at present to retain present character.

de mond

vlei

develop recreation centres as the need arises to exploit warm water resource also between Arniston & Skipskop.

Struisbaai

develop large marina as centre for skiboat activities here

Cape Agulhas

Cange. Strandloper cave

spectacular view along sand beach.

A number of caves at water level along the coast

Cliff top walk from Gansbaai to Strandloper Cave - obtain legal right of way

DE KELDERS

Stanford's cove

develop caravan park with tidal basin

harbour

gansbaai.

Road.

dense distribution of Strandlopers middens (data)

nature reserve

lighthouse feature

The town has hardly developed in 30 years has ± 40 houses. legislation required to restrict/direct township into a compact form round the hotel.

FRANSKRAAL
no further expansion of the township.
Reconsider when 75% of the erven have been developed.
Small ish beach is shared by holidaymakers at Uilenkraal campsite. Consider extending the campsite & caravan park along the north edge of the estuary in preference to extending the township

visible wreck

future campsites and caravan park with cottages oriented to safe bathing beaches

Ratelfontein Could develop as a guest farm with coastal recreation, hunting, riding →

ELIM. - Coloured mission village
Consider improving economic life.
Home crafts related to products of the region - leather - simple type shoes
Pottery jam manufacture
Preserve architectural quality & restore where necessary.
Control new development from aesthetic viewpoints to perpetuate harmony.

6 mile beach

PEARLY BEACH.
2 beaches available
extend township when 75% built and encourage expansion of campsite & caravan park.
Consider excavation in vicinity of blocked Klaarkraal river behind dunes to form water body for recreation purposes - link with remnant forest as park land.

area between Soetanysberg and the sea - This is by far the most important area for conservation & complete exclusion of all development in the whole Bredasdorp region. It results from years of devoted conservation, is highly vulnerable to activity and a nearby through road should be avoided at all costs. Destruction of its rare beauty would be an act of vandalism and any act leading to its deterioration, likewise.

12 mile beach

outfall works

access road

dunes

beach

parking & facilities.

Sea.

Stabilise wind blown Shifting dunes prior to development & control
use of these areas. Can Soetendalsvlei water be used?
Consider slurry production on dunes after stabilization.
Consider use of outfall works relative to dune fertilization
beach facilities &
parking in hollows behind front dunes.

TYPICAL OF DEVELOPMENT IN DUNE AREA BETWEEN STRUISBAAI & SKIPSKOP.

..... hiking or pony trails (obtain legal rights of way)
existing townships.
possible future development.
Scenic drive.
* action areas relating to eradication of exotic vegetation

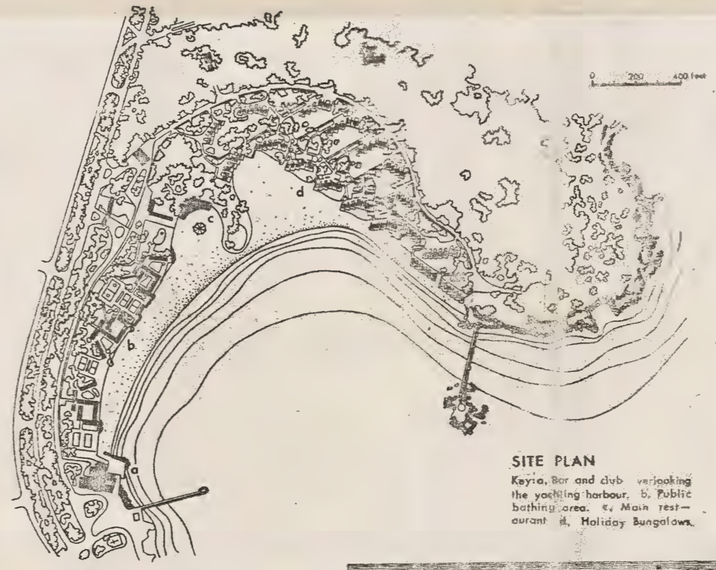
UNTESTED DEVELOPMENT PROPOSALS

appendix C

SEA RANCH REF 33 p123

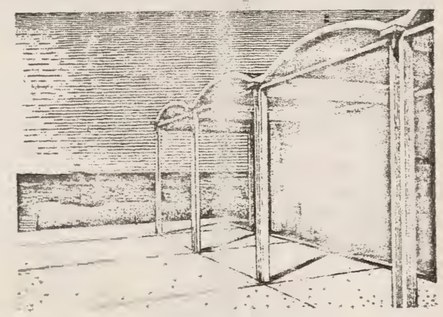
***Master Plan** (above)*

The development begins at the south end of the property, where the road approaches the shore and the land is most spectacular. Here, the variety in topography permitted the simultaneous development of different kinds of housing and facilities: Rougher terrain southward was suitable for larger house lots; next to them, the open fields with spectacular views were excellent for a close-knit condominium development providing its own protection. A restaurant or hotel to accommodate prospective buyers might be situated nearby, and the ocean-terrace housing along the hedgerows could begin to the north in front of one of the most beautiful beaches on the property. Above is forest housing, and a flat space in the woods was suitable for an airport, a future golf course was situated at the north end of the first increment. The meadows between the hedgerows, the lower slopes of the hills below the forest were to be kept relatively free of housing.

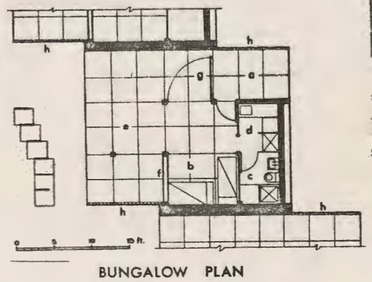


SITE PLAN

Key to site plan: a, Bar and club verlooking the yachting harbour. b, Public bathing area. c, Main restaurant d, Holiday Bungalows.



Sketch: changing rooms at Glyfada



BUNGALOW PLAN

Key to typical bungalow at Glyfada: a, Entrance. b, Sleeping area. c, Bathroom. d, Kitchen. e, Terrace. f, Sliding doors. g, Swing door closing terrace from entrance on third side of sleeping area. h, Slatted fence.

A HOLIDAY RESORT AT GLYFADA BAY NEAR ATHENS, GREECE

REF. NO. 41. P. 116

COASTAL DEVELOPMENT FORMS

appendix D

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