THE SHIRE OF SHARK BAY
Hughes Street, Denham
Western Australia

P.O. Box 126, W.A. 6537
Telephone (099) 481 218
Fax: (099) 481237
All communication to the Shire clerk

Your Ref: 1/90/18

Our Ref: SH110

CONSULTATIVE ENVIRONMENTAL REVIEW STATEMENT

EXPANSION OF RESERVE NO. 41076

(QUARRY - SHELL GRIT)

L'HARIDON BIGHT

SHARK BAY

LIBRARY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WESTRALIA SQUARE
141 ST. GEORGE'S TERRACE, PERTH

August, 1992

Expansion of Reserve No. 41076

(Quarry - Shell Grit)

L'Haridon Bight

Shark Bay

This report has been prepared for the Environmental Protection Authority, Perth, Western Australia as part of the Consultative Environmental Review process (Reference 1/90/18).

Special mention is made of the work done towards this report by Messrs L R Moss and L H Green.

LIBRARY
DEPARTMENT OF ENVIRONMENTAL PROTECTIO.I
WESTRALIA SQUARE
141 ST. GEORGE'S TERRACE, PERTH

CONSULTATIVE ENVIRONMENTAL REVIEW

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

The Consultative Environmental Review (CER) for the Expansion of Reserve 41076 (Quarry - Shell Grit), L'Haridon Bight, Shark Bay, has been prepared in accordance with Western Australian Government procedures. The report will be available for comment for four weeks beginning Monday 3rd August, 1992.

Comments from government agencies and from the public will assist the EPA to prepare an Assessment Report in which it will make recommendations to the Government.

Following receipt of comments from government agencies and the public, the EPA will discuss the issues raised with the proponent and may ask for further information. The EPA will then prepare its assessment, report with recommendations to the Government taking into account issues raised in the public submissions.

The proposal deals with an intention by the Shire of Shark Bay to extend the area under which shell grit is extracted and to alter the method of extraction from pit to layer harvesting.

Why Write a Submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action, including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received will be acknowledged.

Developing a Submission

You may agree or disagree, or comment on, the general issues discussed in the CER or with specific proposals. It helps if you give reasons for your conclusions, supported by relevant data.

You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the CER:

clearly state your point of view;

indicate your source of information or argument if this is applicable; and

suggest recommendations, safeguards or alternatives.

Points to Keep in Mind

By keeping the following points in mind, you will make it easier for your submission to be analysed.

Attempt to list points so that the issues raised are clear. A summary of your submission is helpful. Refer each point to the appropriate section, chapter or recommendation in the CER. If you discuss sections of the CER, keep them distinct and separate, so that there is no confusion as to which section you are considering.

Attach any factual information you wish to provide and give details of the source. Make sure your information is accurate.

Please indicate whether your submission can be quoted in full or in part, by the EPA in its Assessment Report.

Remember to include your name, address and the date of the submission.

Submissions should be addressed to:

The Chairman
Environmental Protection Authority
38 Mounts Bay Road
PERTH

Attn: Ms Jane Aberdeen

Submissions will close on Friday, ~~28th August~~ 3rd September, 1992.

CONTENTS

SUMMARY

It is proposed that existing Reserve 41076, vested in the Shire of Shark Bay for the purpose of "Quarry (Shell Grit)", be extended Northwards along the beach for a distance of 13.4 kilometres at an approximate width of 150 metres.

Due to existing vegetation and other physical restrictions, only a maximum of 9.25 kilometres of beach would ultimately be used for quarry activities.

The shell or shell grit (coquina shell) is self replenishing from the adjoining waters of L'Haridon Bight.

The extended area will allow the method of shell extraction to change, reducing the environmental impact.

The proponent is the Shire of Shark Bay who will also be responsible for the management of the area.

The proponent predicts that no negative environmental impacts will arise from the extension proposal.

1. INTRODUCTION

1.1 BACKGROUND

Approximately 200 kilometres of coquina shell (shell grit) beach occur adjacent to the hypersaline habitats of Shark Bay The coquinites (sedimentary deposits with high concentrations of shell) are of a size and grandeur unequalled in Australia and occurs only at one other location in the World - that in South America.

The coquina deposits are up to 10 metres deep but generally in the order of 3 metres.

Previous reports outlining coquina shell deposits in Shark Bay, if carried out, certainly have not been made public or published. The purpose of this report is to demonstrate the level of actual usable deposits without affecting the integrity of the surrounding environment; to demonstrate a more acceptable method of extraction to achieve a wiser and economic use of the resource; and to illustrate that ongoing management can achieve aesthetically acceptable environmental approaches to the extraction.

1.2 PROPONENT

This proposal is being made by:

Shire of Shark Bay
42 Hughes Street
Denham WA 6537
Telephone: 099 481218
Facsimile: 099 481237

M G Oliver
Shire Clerk

1.3 LOCATION AND SITE DESCRIPTION

Reserve No. 41076 (Edel location 69) is vested in the Shire of Shark Bay for the purpose of "Quarry (Shell Grit)". The Reserve is situated on the Taillefer Isthmus on the North Western corner of the Nanga pastoral lease (lease number 3114/884). Across the lease boundary is vacant crown land and, on the coast, the cancelled Reserve No. 36640 (Quarry 1980-1989) known as "Shell Beach", a popular tourist destination.

Reserve No. 41076 is located 700 metres north of the Hamelin Pool-Denham Road and extends for a distance of approximately 1.75 kilometres along the Eastern shoreline of L'Haridon Bight, northward towards Petit Point and back from L'Haridon Bight at varying widths of between 90 metres and 180 metres with an average of approximately 150 metres.

It has been recommended (Shark Bay Regional Plan, 1988) that the northern end of Petit Point (2,000 ha) should be established as the Nicolas Petit Nature Reserve. If the Nature Reserve is created and Reserve No. 41076 extended, a distance of approximately 10 kilometres will separate the two areas.

Reserve No. 41076 was established in 1989 following a review in 1986 by the E.P.A., C.A.L.M and the Shire of Shark Bay into the operation of Reserve No 36640 and its ultimate closure. The main concerns centred around the close proximity of the extraction operation to the tourist site.

1.4 RESPONSIBLE AUTHORITIES

The land is under the control of the Department of Land Administration and the subject of a pastoral lease (lease No. 3114/884).

The Shark Bay Regional Plan (1988) was prepared by the State Planning Commission and the Department of Conservation and Land Management in consultation with various other government agencies, scientists and locals. The Report, under the heading of "Strategies for Achieving Economic Development - Mining Development" notes that Coquinite mining should continue under E.P.A. guidelines to ensure extraction is not excessive.

2. PROPOSAL

2.1 FORMAL DESCRIPTION

It is proposed that the existing Reserve (No. 41076) be extended northwards by a distance of 11.4 kilometres at a width similar to the existing Reserve to allow the present quarrying method of pit extraction to cease and be replaced by a method of layer (0.3 metres) harvesting down to a maximum of 1.6 metres over a larger area.

2.2 OBJECTIVES

Pit extraction has proven both unsightly and difficult to control with rehabilitation almost impossible. The "harvesting method" will allow the remaining deposit to be finished at an appropriate contour in order that fresh shell can be deposited on the beach. In fact the area in "harvest" will be rehabilitated, in the process avoiding the current open exposed pits.

In the extension proposed, approximately 909,380 tonnes of shell grit is available, assuming extraction is limited to 1.6 metres. This figure has been calculated on the visible surface area - ie. that area not included in the vegetation zones. These vegetation zones will be excluded from the extraction areas, reducing the effective extraction area from 13.4 kilometres to 9.25 kilometres.

2.3 ALTERNATIVES CONSIDERED

Alternative sites were researched by the Department of Land Administration in 1990 in conjunction with the Department of Conservation and Land Management. Three alternatives emerged:

Option 1

Extend the boundary of the existing reserve (Reserve No. 41076) northward approximately 7.3 kilometres to an existing shell bank spit.

Option 2

Extend the boundary of the existing reserve (Reserve No. 41076) northward approximately 13.3 kilometres to the start of another large shell bank spit, noting that it is considered of minimal purpose to extend past this point due to the shell deposits diminishing significantly.

Option 3

Open a new area on the Western side of L'Haridon Bight.

A compromise near Option 2 was selected by Council due to the long term advantages over Option 1 and the advantages of the continuation of the existing pit over Option 3.

2.4 END USES

The shell grit is used locally as a dust suppressant on footpaths and parking areas and also for its aesthetic value on landscaping the surrounds of buildings.

The shell grit is also screened (to remove the "fines") and exported from the area for use in poultry farms to provide the necessary minerals for hard egg shells.

Processes have also been developed which form the shell into high quality and attractive plant holders and pottery.

3. EXISTING ENVIRONMENT

3.1 PHYSICAL

3.1.1 Landscape

The Hamelin Coquina was the name give by Dr Brian Logan in 1974 to a system of beach ridges and wind blown deposits of dead shells on the margins of Hamelin Pool and L'Haridon Bight which lie over sedimentary deposits to a depth of up to 10 metres. It is thought that the deposition of these shells began about 4,000 years ago and continues to this day.

The dominant component of this coquina is the small cardiid *Fragum (Afrocardium) erugatum* (Tate, 1989). Cockles of this species from Shark Bay differ from others in their shape and smaller size and were described as a distinct species, *Fragum hamelini* by Iredale in 1949.

Though the thicker coquina beds consist almost exclusively of *Fragum* shells, some of the thinner beds also include small gastropod shells of various species, foraminfer skeletons and even fossils of various types reworked from adjacent deposits.

The Coquina Land System is described (Department of Agriculture - Rangeland Survey

Report) as mostly unvegetated ridges of shell grit backed by coastal dunes supporting scattered tall acacia shrublands.

Geology: Holocene coquina - supra tidal deposits of shells from the bivalve mollusc *Fragum erugatum* and low dunes of calcareous sands and gravels.

3.1.2 Geomorphology

Storm ridges formed during the Bibra Marine phase of the final Pleistocene interglacial transgression, with older calcreted benches and ridges.

The shoreline beach deposits do not have a diversity of "shell dune formation" or interesting geographical formations. Principally the beaches have consistent level profiles with minor undulations except for the minor rocky headlands and shell spits.

The entrance road to shell deposits is mainly confined to the shoreline areas, however, there are small sections that enter the fringe of the vegetation zone.

3.2 BIOLOGICAL

3.2.1 Flora

The flora is described as typical for the region by Beard (1976). The principal flora communities are thought to be *Acacia ramulosa* (bowgada) scrub and the *Trioda plurinervata*, hummock grassland and typical of the arid desert flora of the Eremeaean Botanical Province.

The proposed extension area is devoid of vegetation, however, shell deposits extend into the low dunes sloping toward the shoreline. Whilst these areas contain vegetation zones they are not under consideration for extraction activities, now or in the future.

3.2.2 Fauna

The fauna is distinctive of the region, birdlife being representative of the arid zone avifauna (G M Storr). The rich deposits of the shell limit the diversity of habitat, subsequently it is not usual to see a diversity or high levels of birdlife. The Eastern shores of L'Haridon Bight are conspicuously absent of seabird resting areas and rookeries.

It is not unusual to see emus wandering along the coastal areas of L'Haridon Bight as in most other coastal areas of Shark Bay.

Kangaroos do occur in the locality but again are confined in the vegetation zone and are rarely seen on the foreshore. The species are *Macropus robustus* and *fuliginosus*. Although it is said that the Western Grey may overlap in the area, this species has not been observed.

The lack of diversity in habitat is of such contrast from the vegetation dune area that the shell beaches are certainly described as a niche of low priority for animal habitats as well as flora representation.

3.3 SOCIAL

3.3.1 Human Use

The area of L'Haridon Bight is restricted insofar as the human environment, to tourists visiting Shell Beach (cancelled Reserve No 36640). This is a popular stopping point, attracting most passing tourists travelling on Hamelin-Denham Road, the only road access to Denham and Monkey Mia.

Commercial fishing does take place in L'Haridon Bight but occurring mainly in the shallow banks which abut the deepwater areas well off-shore. It is therefore unusual to see commercial fishermen using the shoreline in the proposed area.

Recreational fishing is rare, the occasional "set net" may be placed in close proximity of the shorelines in the proposed area.

The quarry entrance road is part of the station access to pastoral pursuits (Point Petit Bore and No.2 or Chinamens Bore).

The nearest habitation is at the Nanga Station homestead and the Nanga Bay Caravan Park both which are situated 12 kilometres to the South and on the opposite side of the Taillefer Isthmus.

The nearest township, Denham, is situated 46 kilometres to the north.

3.3.2 Ethnographical

No sites of significance to Aboriginals (Tindale 1974) registered as at 1st October, 1984 are within the immediate locality.

No new sites in the area proposed or immediate vicinity have been identified by Professor Sandra Bowdler of the University of Western Australia. (Department of Conservation and Land Management, February, 1992.)

The WA Museum does not release information giving specific details as to where the sites are located. They have suggested that consultation with local Aboriginal groups would be the proper course of action. As a result of further enquiries and additional consultation with local people, sites that are now in negotiation stages are all some considerable distance from the proposed area.

3.4 OTHER

3.4.1 Land Use Policies

District Coastal Management Plan

Consideration has been given to this publication of the Department of Conservation and Land Management (June, 1985) and although some concern was expressed to mining generally, none of the disbenefits referred to are relevant to the shell grit quarry operation. However, the following quotation is fundamentally connected to .pa
the proposal:

"Conclusions:

1. *the existing mining operations provide a number of social and economic benefits to the region;*

2. *mining operations are limited in size, and if appropriately managed, need not create widespread environmental degradation;*

3. *the inclusion of mining operations subject to agreement on conditions need not necessarily conflict with the aims of a multi-purpose park;*

4. *mining operations can be of interest to tourists and if an attempt is made to accommodate both, benefits to both may occur;*

5. *just because a mining lease exists, there is no justification for not attempting to combine management of those lands with those of the adjacent lands and waters."*

At the time of publication of this report the inner and outer boundaries of the then proposed Marine Park were unknown. Although the existing Reserve (No. 41076) and the proposed extension are outside the Shark Bay Marine Park, they are adjoining one another making the comments of the Department of Conservation and Land Management relevant.

Shark Bay Regional Plan

Careful consideration has also been given to the Plan jointly published by the State Planning Commission and the Department of Conservation and Land Management (June, 1988) which suggests that a more unobtrusive approach to excavation should be undertaken. This will be achieved by the cessation of the "pit" approach and the introduction of the "harvesting" method.

Environmental Management of Quarries

Referring to the Department of Mines publication (March, 1991) the main issues to be addressed have been included in the Appendix.

Shark Bay Marine Park

The recently gazetted Shark Bay Marine Park extends the full area of the L'Haridon Bight up to the high water mark. Mining is proposed down only to the high water mark, although the shell reserves extend into the water. The area adjacent to the existing Reserve (No 41076) and the proposed extension are proposed by the Department of Conservation and Land Management in their document "Shark Bay Marine Park - Preliminary Draft Management Plan" as a sanctuary zone to protect the marine environment. Management of the sanctuary zone, as with the rest of the Park, would be effected by the Department of Conservation and Land Management.

No conflict with this intention is foreseen.

4. ENVIRONMENTAL IMPACTS AND MANAGEMENT

4.1 LANDSCAPE AND REGENERATION

Aggregations of living Coquina *Fragum erugatum* may be so dense that the cockles lie four deep in places. Juveniles have been observed attached to seaweeds but older animals lie free, moving actively with a long eversible foot. There is no data on their growth rate, their breeding location, age or activity.

Coquina Shell is found in most of the hypersaline marine environment of Shark Bay although no detailed examination of their distribution in space and time has been carried out. Persistent populations can be found off Petit Point in 2 metres of water or more.

It is thought that the high carbonate levels in the local waters, preventing the shell dissolving, cause their accumulation. Wave and storm actions transport the shell to the shoreline where wind forms the shell into dunes.

Between June 1990 and June 1991 the Eastern shoreline in the proximity of high and low water mark has been observed, measured and photographed (page 19). The conclusion to this observation is that the hypersaline nursery adjacent to the proposed areas have given up approximately 18,500 cubic metres or 11,500 tonnes of shell. It is recorded that Shark Bay has experienced fairly mild weather conditions during this period, with very few Northerly blows and an absence of cyclones.

This has confirmed the previously held local belief that the shell was self-replenishing by the action of wind and water. Reports of the coastline in Hamelin Pool and L'Haridon Bight taking on major changes after big storms and cyclones is well known and in the advent of this weather reoccurring it is more than probable the profile of the shell beaches will change significantly.

Extracting the dead shell from the shoreline deposits can not pose the remotest threat to the species' existence.

A list of exclusion areas proposed, for the various reasons noted, is included in Item 7.4 (page 14). It is important that these areas are not extracted or changed in any way by the proposed activity.

In particular, the Department of Land Administration has advised that all spits would need to be exclusion areas as they play an important role in the hydrodynamics of the area and any disturbance could alter the system.

Removal of overburden and flora communities will not be undertaken due to the deposit situation. Whilst minimal in occurrence, interesting deposit formations sculpted by the wind and/or water will not be disturbed. Shell shorelines in Shark Bay change according to weather cycles and cyclones - as such it can not be argued that unique and interesting geological formations are being disturbed.

4.2 MANAGEMENT

The Shire of Shark Bay will be responsible for the full management of the Reserve, in consultation with the relevant authorities (e.g. Mines Department).

Access to the current site has been restricted to the three local consumption cartage contractors, the exporter from the Shire and the owner of Nanga Station by way of a padlocked gate.

The exclusion sites, where no mining would occur, will be clearly marked to restrict access and prevent extraction.

4.3 OPERATIONAL CONSTRAINTS

Council allows local contractors to extract unlimited quantities of shell for use within the Shire. This is extracted and used in the raw form. Records show that some 671 tonnes were extracted in this form in 1991. In reality, the minimal local market provides a practical limitation on extraction for this purpose.

Additionally, Council allows one contractor to export the shell outside the Shire. This contract is put out to tender. The conditions of the existing contract, which is one year into a five year term, provides for:

Royalty rate review after three years;
Maximum tonnage extracted to be 2,500 tonnes each year;
Three months notice of termination by either party;
Annual review, particularly relating to the rehabilitation of the site; and
Access track to be sited on stable ground with no interference with vegetation or fauna movement.

The shell is extracted, sieved, graded and bagged on site before being transported to various destinations outside the Shire. Some 437 tonnes were exported from the Shire in 1991.

Whilst the Shire of Shark Bay has no current intentions of altering the extraction quantity limitations, it has been demonstrated elsewhere in this report the available deposit is considerable. Currently no external controls exist on the quantity of grit able to be extracted from the site however, it is accepted that any significant operational change proposed (to take total quantity extracted over 5,000 tonnes per year) would require referral to the Environmental Protection Authority for environmental review.

4.4 BY-LAWS

The Council of the Shire of Shark Bay has resolved to promulgate the new model By-Laws relating to Extractive Industries currently being developed by the West Australian Municipal Association in conjunction with the Mines Department.

4.5 AGREEMENTS

Formal agreement has been obtained from the Nanga Pastoral Station lessee, Mr Ted Sears, for the extension of the Reserve across the pastoral lease.

Approval has also been given by the responsible government department, the Department of Land Administration.

Additionally, general consent for the activity is contained in the Shark Bay Regional

Plan.

4.6 SUMMARY OF ENVIRONMENTAL COMMITMENTS

The Shire of Shark Bay makes the following commitments in relation to the proposal:

Mining method will be changed from "pit excavation" to "layer harvesting";

No extraction will occur in the areas included in the exclusion list;

Exclusion sites will be clearly marked to restrict access and prevent extraction;

No overburden or flora communities will be removed;

Interesting deposit formations will not be disturbed;

No additional traffic will be generated as no increase in extraction quantities are proposed; and

No rehabilitation programme is detailed as the regeneration of the shell beach is expected to occur naturally according to wind and water action.

5. CONCLUSION

The Reserve extension, allowing a changed approach to the method of shell removal, is environmentally responsible. The proposal does not impact in any way with recommendations for the area already published, including the Shark Bay Regional Plan. Coquina shell extraction can continue, providing the activity is approached within the guidelines of this report.

Extracting shell from the shoreline deposits does not appear to pose the remotest threat to the species' existence.

The shorelines covered in the shell in Shark Bay change according to weather cycles and cyclones and it can not be argued that unique and interesting geological formations are being disturbed.

The extraction of this natural resource would certainly be classified as a unique mining operation where the mined material is reproducing and self replenishing in totally protected environments.

It is important to the Shire of Shark Bay that the proposal proceed, that the lease extension form part of Reserve No. 41076 and be set aside for the purpose of quarrying (shell grit extraction) under the same conditions as the current Reserve. This will ensure access to this local resource is allowed to continue without the existing degradation problems.

6. SOURCES AND REFERENCES

Logan, B.W. 1974 Inventory of diagenesis in Holocene-Recent carbonate sediments, Shark Bay, Western Australia. *Amer. Assoc. Petroleum Geologists, Mem.* 22: 195-246.

Slack-Smith, S.M. The Bivalves of Shark Bay, Western Australia *in Research in Shark Bay: Report of the France/Australe Expedition Workshop.*

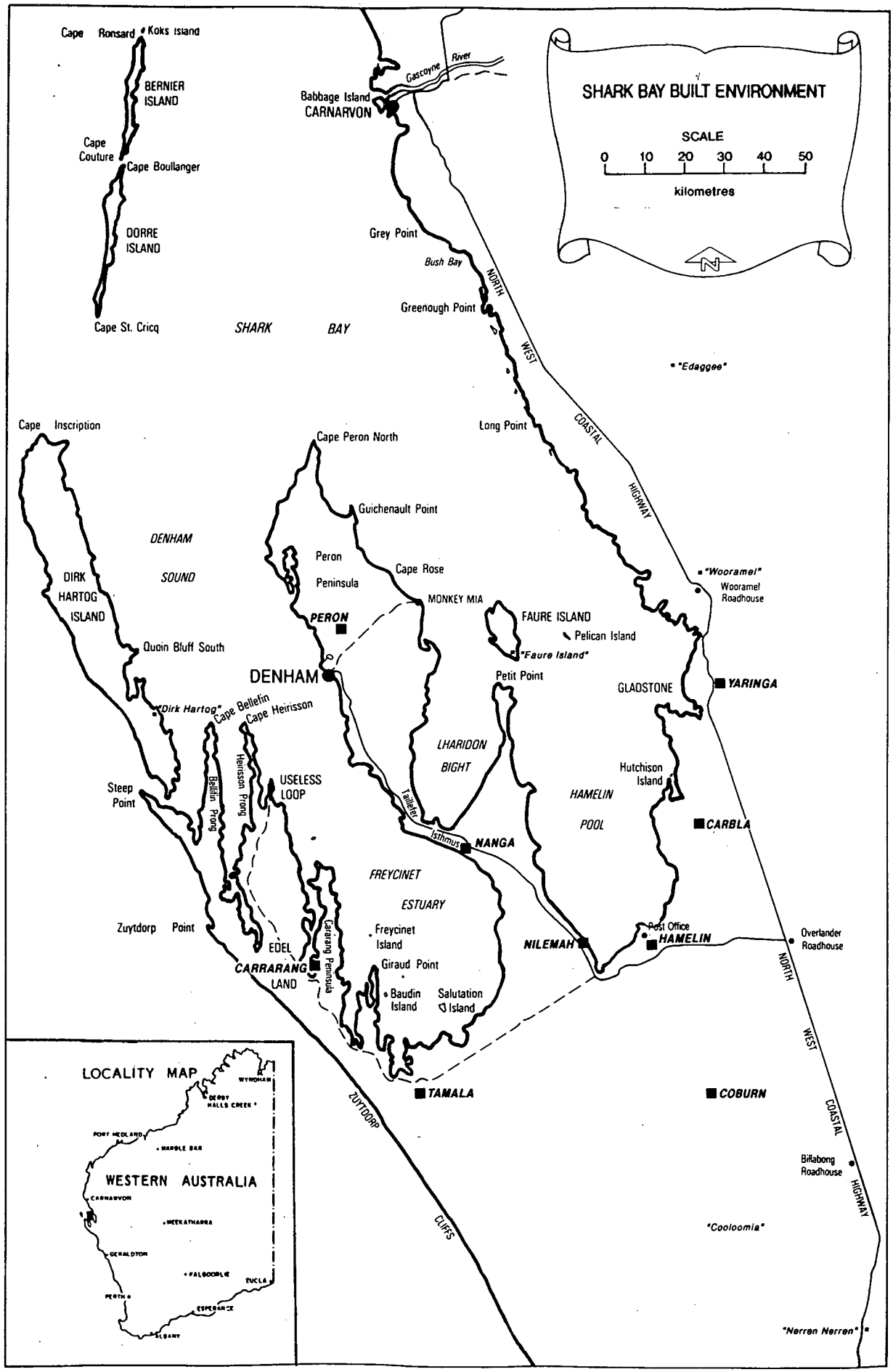
Wilson, B.R. & Stevenson, S.E. 1977. Cardiidae (Mollusca, Bivalvia) of Western Australia. *W. Aust. Mus., Spec. Publ.* No. 9: 1-114.

Kendrick, G.W. Palaeontology Department, Western Australian Museum.

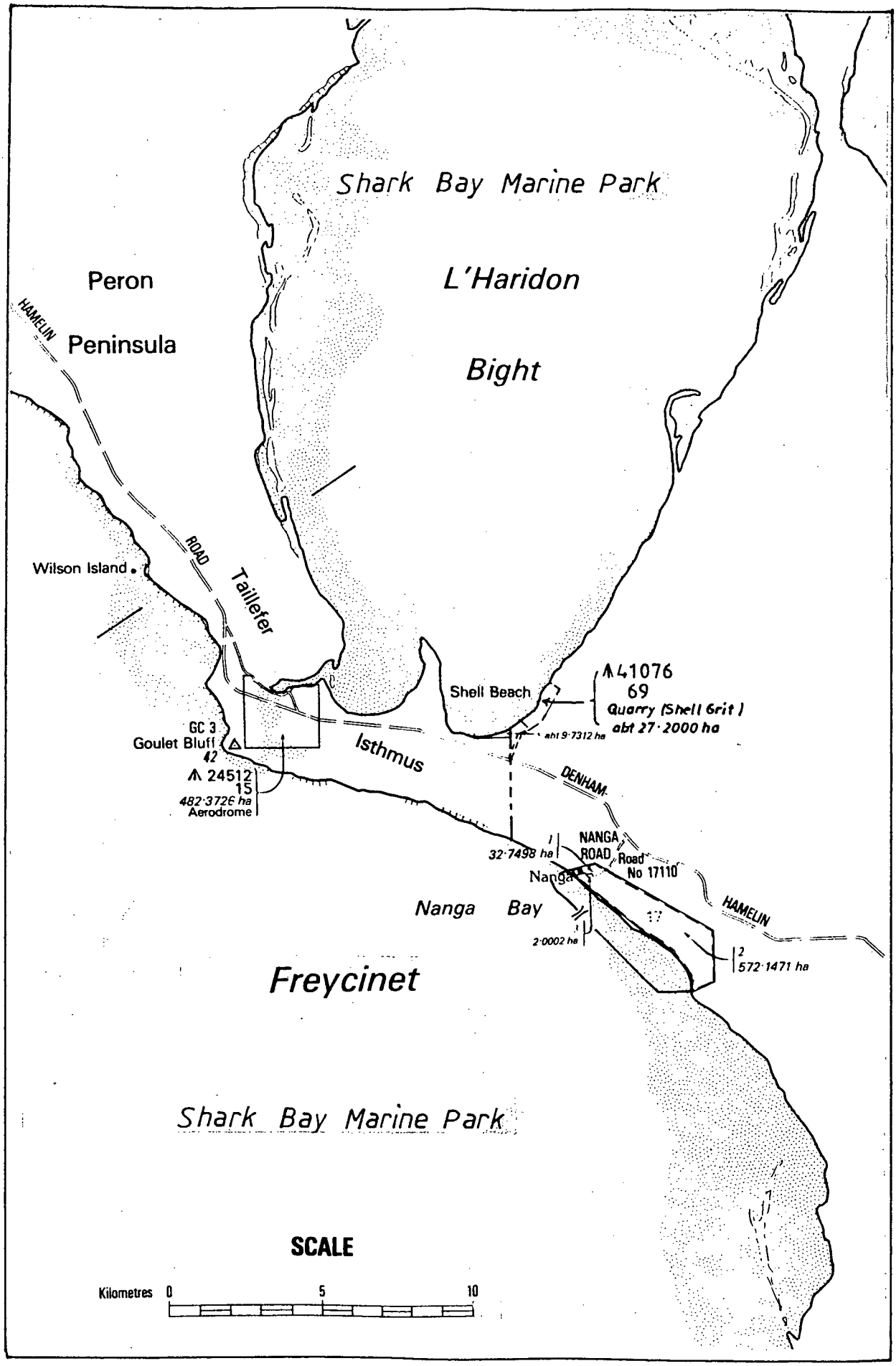
Department of Agriculture. Rangeland Survey Report

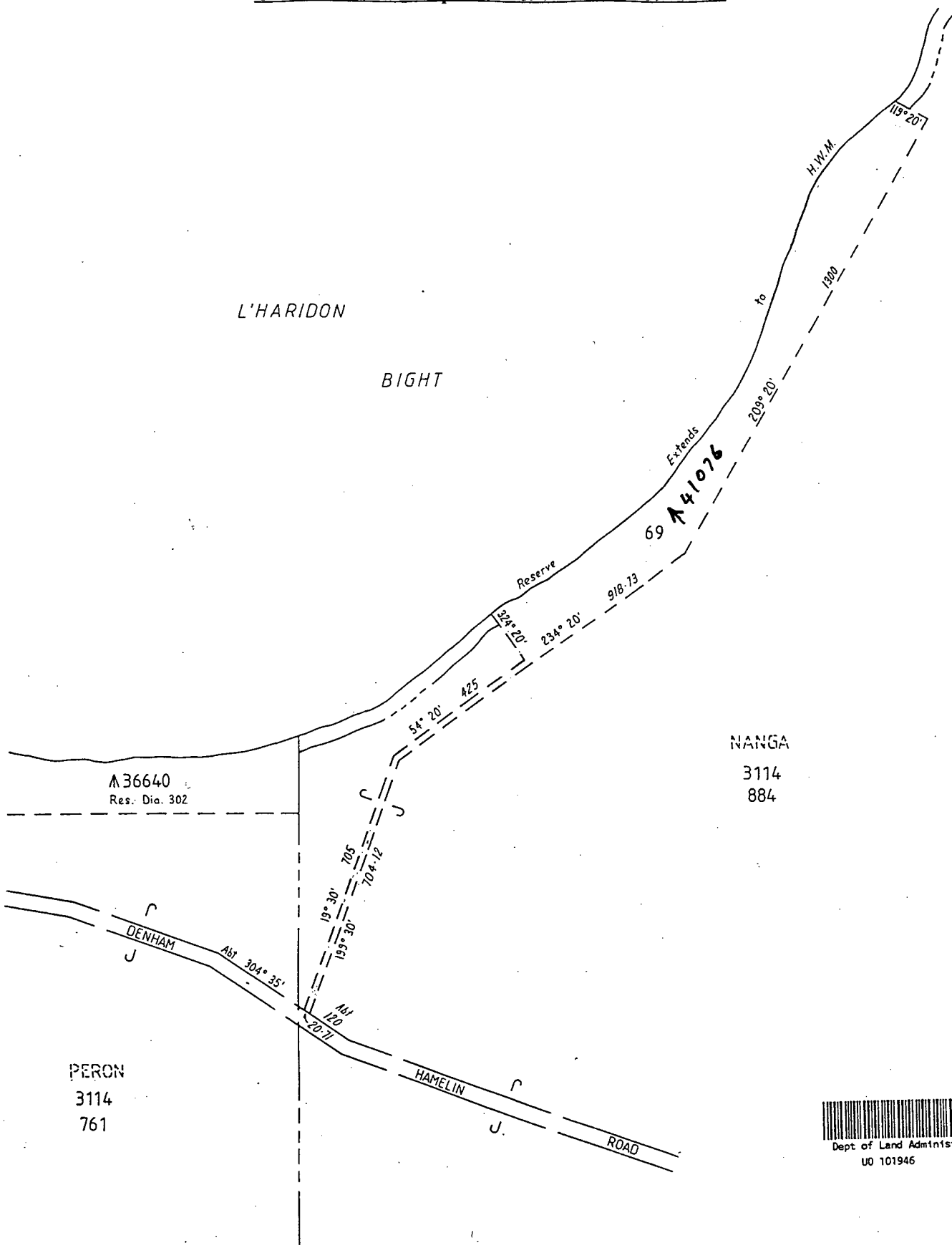
Department of Conservation and Land Management June, 1985. District Coastal Management Plan.

State Planning Commission & The Department of Conservation and Land Management 1988. Shark Bay Regional Plan.



LOCATION PLAN


Shark Bay Marine Park
Peron
Peninsula
L'Haridon
Bight
HAMELIN
ROAD
Wilson Island
Taillefer
Shell Beach
41076
69
Quarry (Shell Grit)
abt 27·2000 ha
abt 9·7312 ha
GC 3
Goulet Bluff
42
24512
15
482·3726 ha
Aerodrome
Isthmus
DENHAM
NANGA
ROAD
Road
No 17110
32·7498 ha
Nanga
Nanga Bay
2·0002 ha
HAMELIN
2
572·1471 ha
Freycinet
Shark Bay Marine Park
SCALE
Kilometres 0 5 10



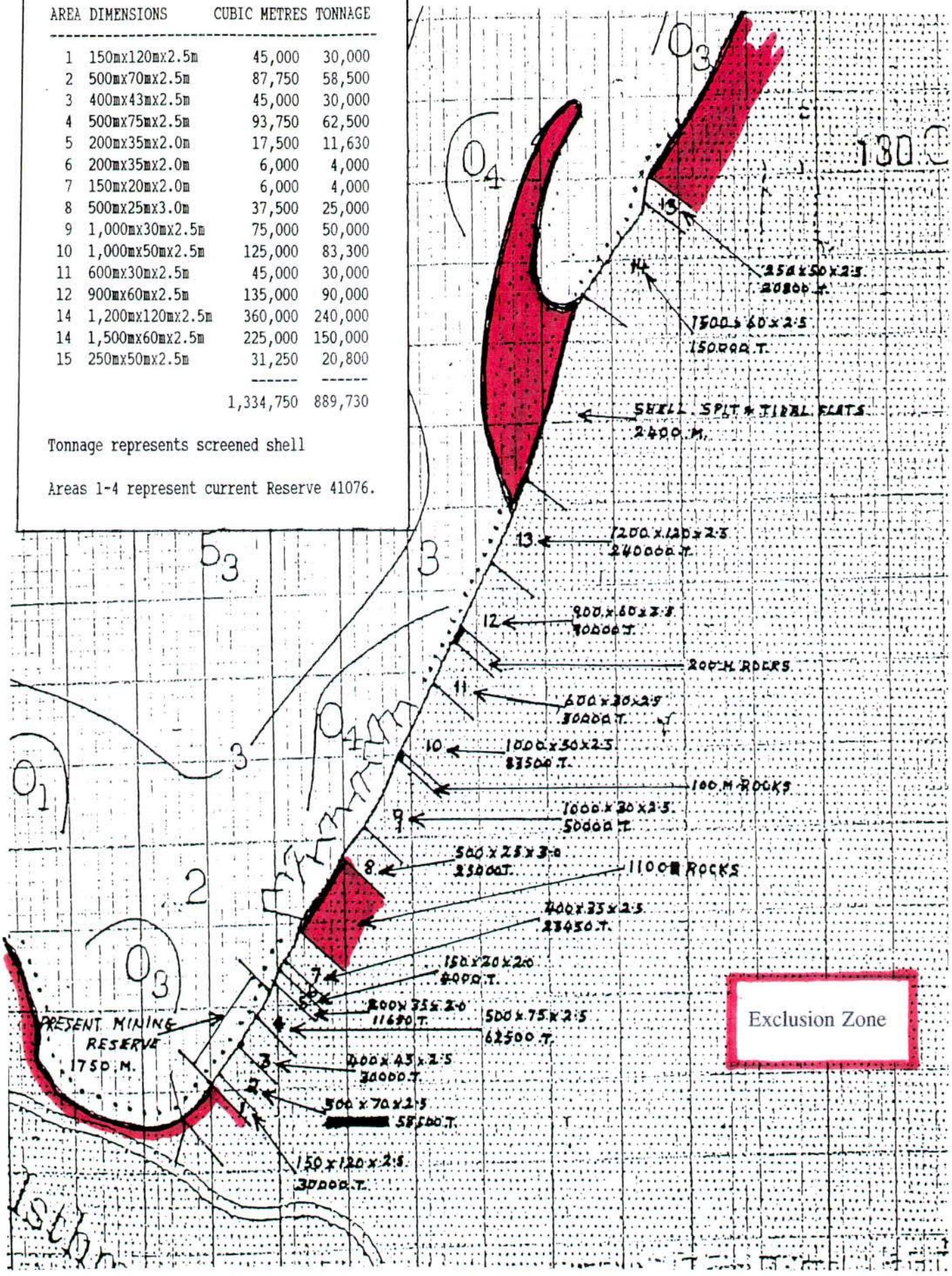
WATER LINES SHOWN ON THIS DIAGRAM DO NOT NECESSARILY DEPICT AN EXACT CADASTRAL BOUNDARY

RESERVE No. 41076 Purpose QUARRY Area abt 27·2000 h

	AREA DIMENSIONS	CUBIC METRES	TONNAGE
1	150mx120mx2.5m	45,000	30,000
2	500mx70mx2.5m	87,750	58,500
3	400mx43mx2.5m	45,000	30,000
4	500mx75mx2.5m	93,750	62,500
5	200mx35mx2.0m	17,500	11,630
6	200mx35mx2.0m	6,000	4,000
7	150mx20mx2.0m	6,000	4,000
8	500mx25mx3.0m	37,500	25,000
9	1,000mx30mx2.5m	75,000	50,000
10	1,000mx50mx2.5m	125,000	83,300
11	600mx30mx2.5m	45,000	30,000
12	900mx60mx2.5m	135,000	90,000
14	1,200mx120mx2.5m	360,000	240,000
14	1,500mx60mx2.5m	225,000	150,000
15	250mx50mx2.5m	31,250	20,800
		1,334,750	889,730

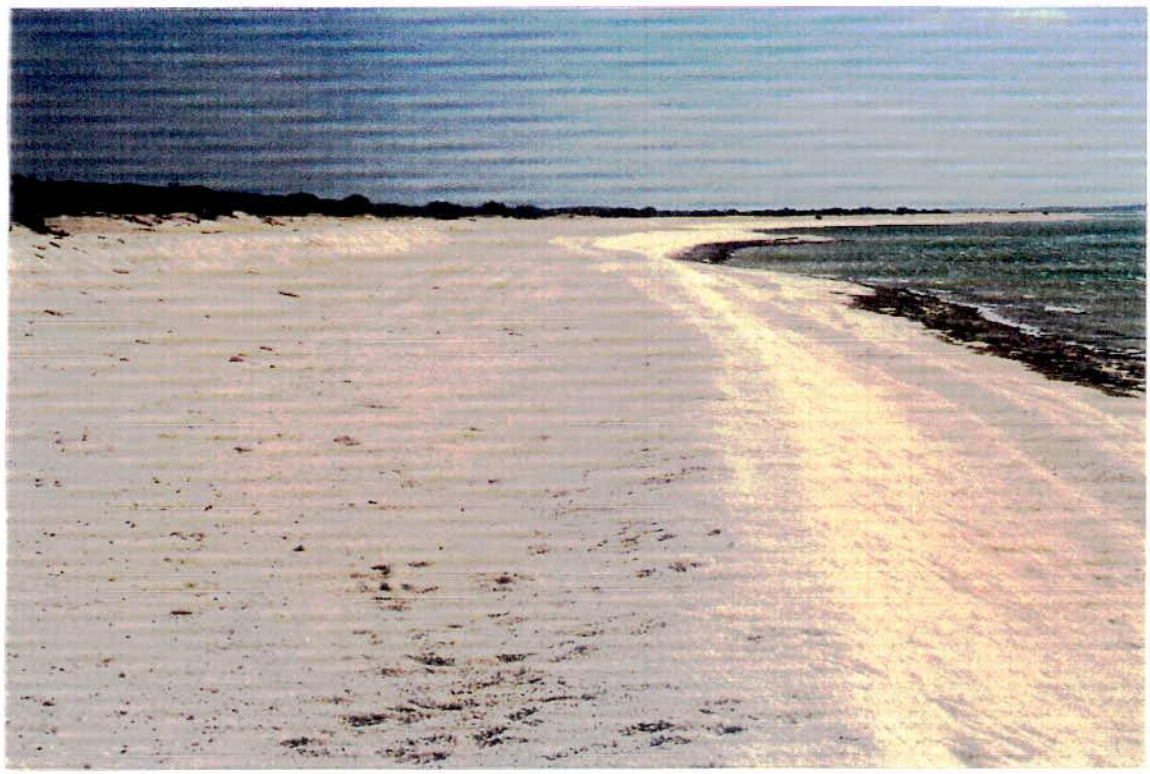
Tonnage represents screened shell

Areas 1-4 represent current Reserve 41076.



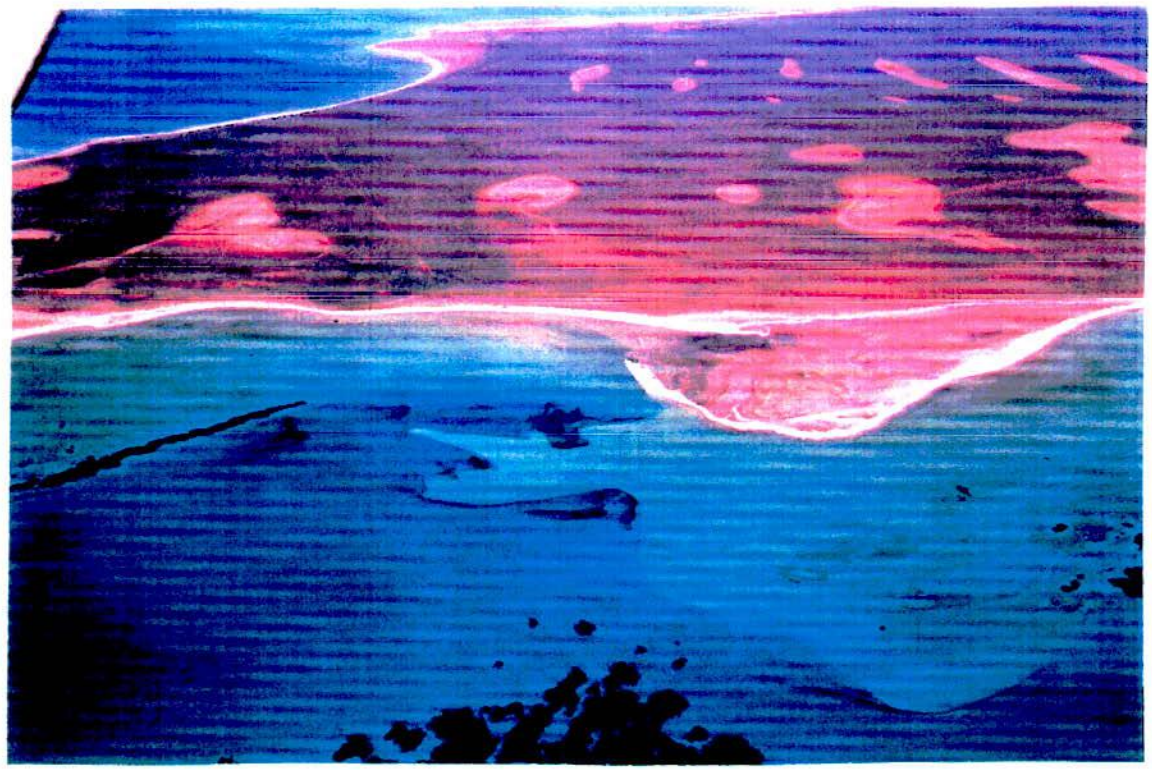
To scale taken from Marine Charts for the area.
The existing lease area extension illustrate actual estimated quantities with surface area in metres

EXAMPLES OF INTERESTING FORMATIONS



TYPICAL BEACH

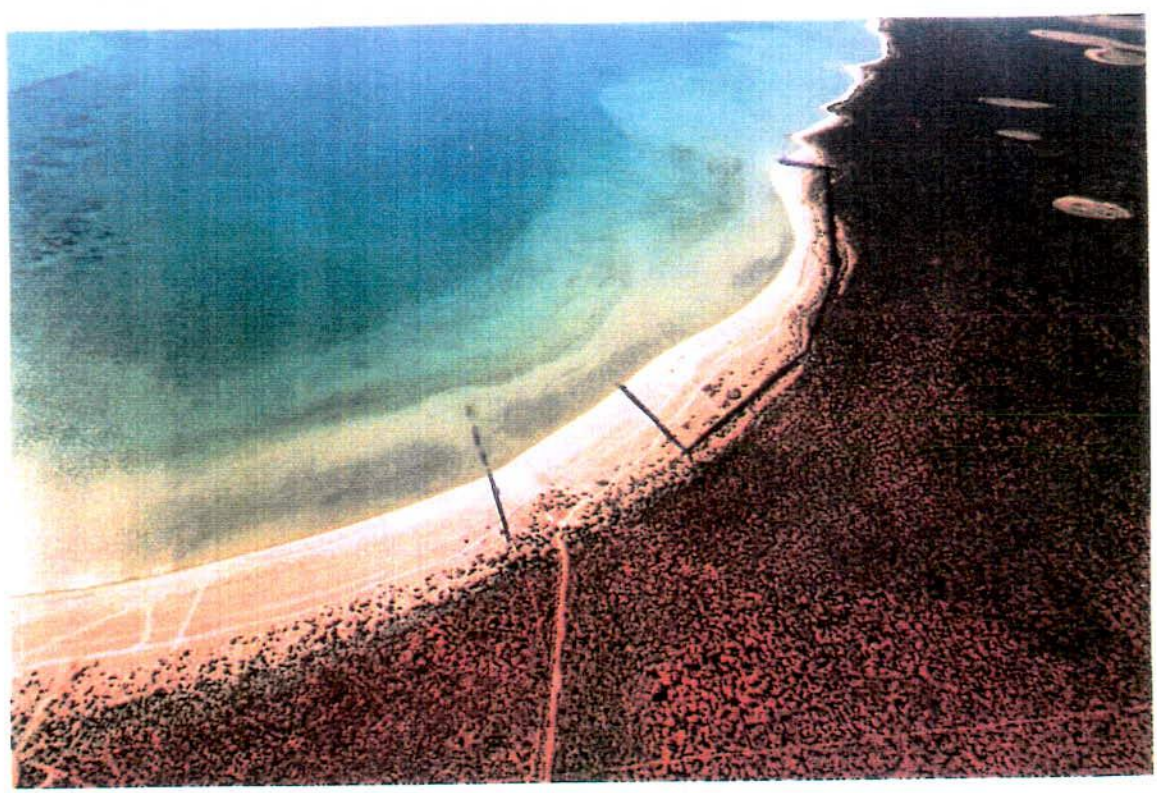
EXAMPLE OF "HARVESTING" IN PROGRESS



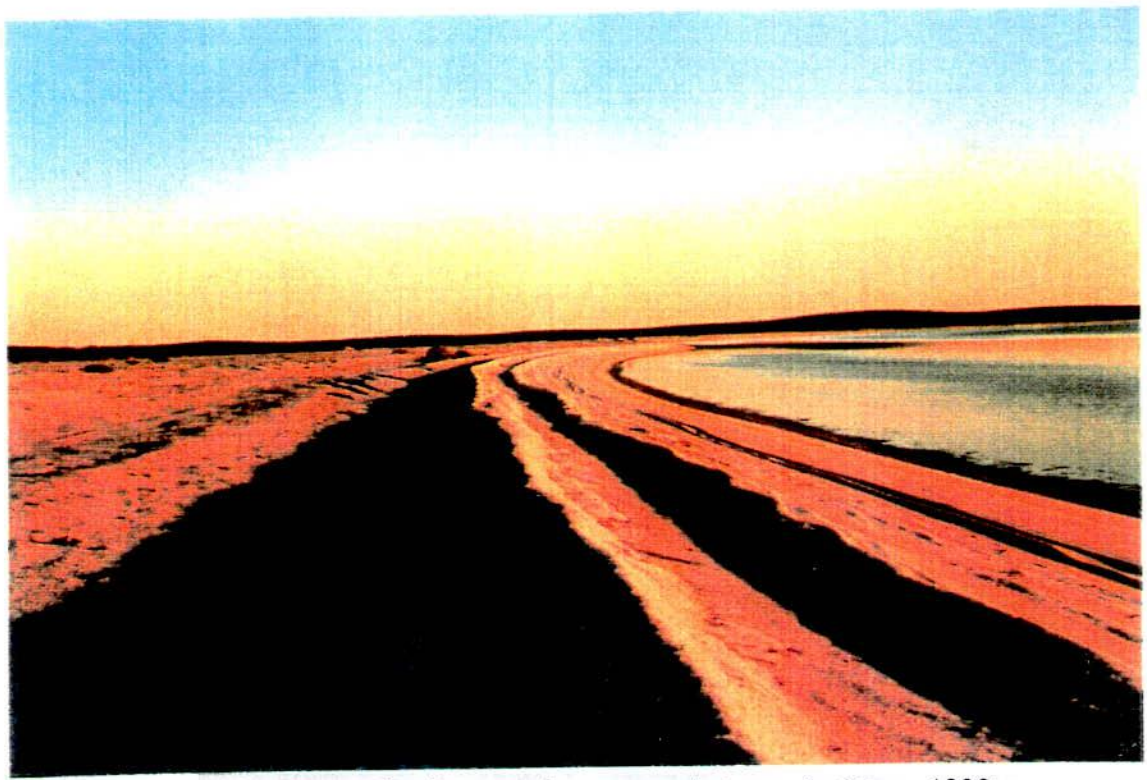
SPIT ON NORTHERN END OF PROPOSED EXTENSION (LOOKING EAST)

SPIT ON NORTHERN END OF PROPOSED EXTENSION (LOOKING NORTH)

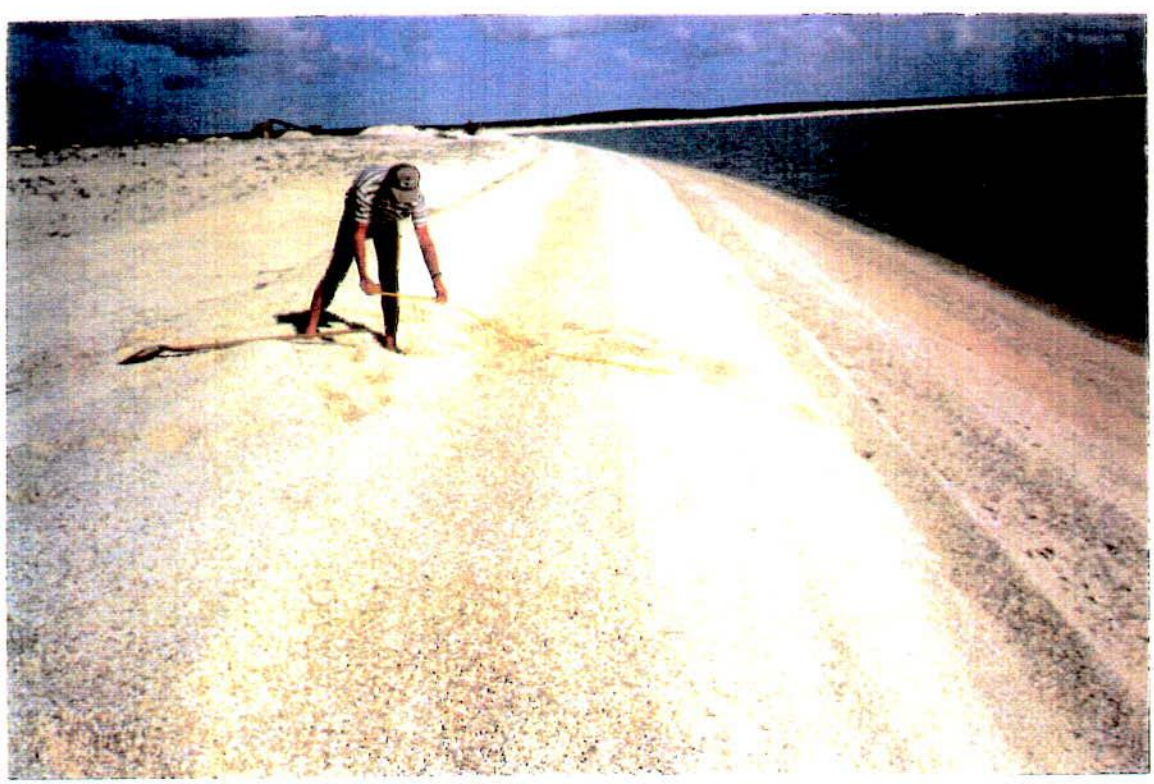
RESERVE 41076 LOOKING SOUTH EAST



RESERVE 41076 LOOKING NORTH



This area north of current lease was photographed June 1990.



Same area June 1991. Shell build up with normal weather patterns.

COQUINA SHELL

SHELL GRIT SCREENING PLANT

APPENDIX

ENVIRONMENTAL IMPACTS

Destruction of habitat;	Temporary impact on a depauperate beach habitat which is naturally regenerated.
Reduction of landscape amenity;	Minimal impact as area remote. Similar landscape abounds.
Water erosion and consequent sediment mobilisation and stream pollution;	No impact due to low rainfall, no streams and adjacent ocean.
Wind erosion and dust generation;	No impact due to isolation, land protection from wind and minimal dust generation.
Noise and vibration;	No additional traffic generation as no increase in extraction quantities proposed.
Impact on lifestyle and land values of neighbouring property;	No impact due to remoteness of area and broad acres involved.
Traffic generation;	No additional traffic generation as no increase in extraction quantities.
Long term aesthetic, ecological and erosion impacts;	Impact resulting from increase in area minimal due to improved extraction (harvesting) method and natural regeneration.
Long term changes in land use.	No impact as long term area will be regenerated.