ASSOCIATED MINERALS CONSOLIDATED LIMITED

ENEABBA OPERATIONS

VISIT TO

ENEABBA OPERATIONS

ON

13TH & 14TH DECEMBER, 1988

BY

THE MINERAL SANDS AGREEMENT, REHABILITATION COORDINATING COMMITTEE

MR. ARTHUR DAFFEN	CHAIRMAN, DEPT. OF RESOURCES DEVELOPMENT
MR. JOHN QUILTY	PAST CHAIRMAN, DEPT. OF RESOURCES DEVELOPMENT
MR. PHIL KNIGHT	SECRETARY, DEPT. OF RESOURCES DEVELOPMENT
MR. MIKE MAURITZ	DEPARTMENT OF MINES
MR. KELLY GILLON	DEPARTMENT OF CONSERVATION & LAND MANAGEMENT
MS. DENISE PEGGS	ENVIRONMENTAL PROTECTION AUTHORITY
MR. GEOF FOSBERRY	W.A. DEVELOPMENT AUTHORITY
MR. LAZARUS LEONARD	GEOLOGICAL SURVEY - DEPT.OF MINES

C O N T E N T S

1. PROGRAMME

2. STAFF

3. LEASE PLAN

4. ROUTE FOR VISIT AND AERIAL PHOTO

5. BOTANICAL DATA

6. DREDGING

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P R O G R A M M E

INSPECTION PROGRAMME

TUESDAY 13TH DECEMBER

1.00PM	BRIEFING (Training Centre)	DENIS BROOKS
3.00PM	WESTERN ORE BODY	
4.00PM	JENNINGS'	

WEDNESDAY 14TH DECEMBER

9.00AM	MORNING TEA (Board Room)	DICK SCALLAN
9.30AM	MINE	
12.00 NOON	RETURN TO OFFICES	
12.30PM	BANKSIA HOUSE - LUNCH	DICK SCALLAN
1.45PM	MINE	
3.00PM	REVIEW (Board Room)	DENIS BROOKS
3.15PM	DEPART	

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ASSOCIATED MINERALS CONSOLIDATED LIMITED

ENEABBA OPERATIONS

STAFF

OPERATIONS MANAGER

DICK SCALLAN

A Mining Engineer with 33 years experience of which 22 years have been as a Manager of Gold, Uranium, Nickel, Copper, Chrome and Mineral Sands Operations.

26 years have been with the Anglo American Corporation of South Africa and 7 years with A.M.C.Ltd. as Operations Manager at Eneabba.

MANAGER ENVIRONMENTAL AFFAIRS

DENIS BROOKS

Agronomist of 25 years experience. Worked with A.M.C.Ltd. for past 15 years and responsible for Company's Environmental Management Programmes throughout Australia. Initiated the Eneabba Environmental Programme in January, 1981.

MINE PLANNING ENGINEER

PAT SCALLAN

A Management Accountant with 6 years financial systems and cost accounting experience in the Gold Mining Industry and 2 years Mine Planning experience in the Mineral Sands Industry. Joined A.M.C.Ltd. in November, 1986.

ENVIRONMENTAL SUPERINTENDENT

LES CAREY

An Officer of A.M.C.Ltd. for 26 years with experience throughout Australia. Appointed to the Environmental Department in 1978 with responsibilities in N.S.W. and Queensland. Transferred to Perth Office in September, 1984.

ENVIRONMENT SCIENTIST

MARK JEFFERIES

A Biology graduate from Western Australian Institute of Technology. Joined A.M.C.Ltd. as the Propagatio: Officer in February 1985 and was appointed to the current position in July 1988.

ENVIRONMENTAL SUPERVISOR

GRAEME O'GRADY

Holder of Bachelor of Business degree from Western Australian Institute of Technology. Joined A.M.C.Ltd. in January 1987 after 8 years managing a rural property. Appointed to current position in October, 1988.

ASSOCIATED MINERALS CONSOLIDATED LIMITED

ENEABBA OPERATIONS

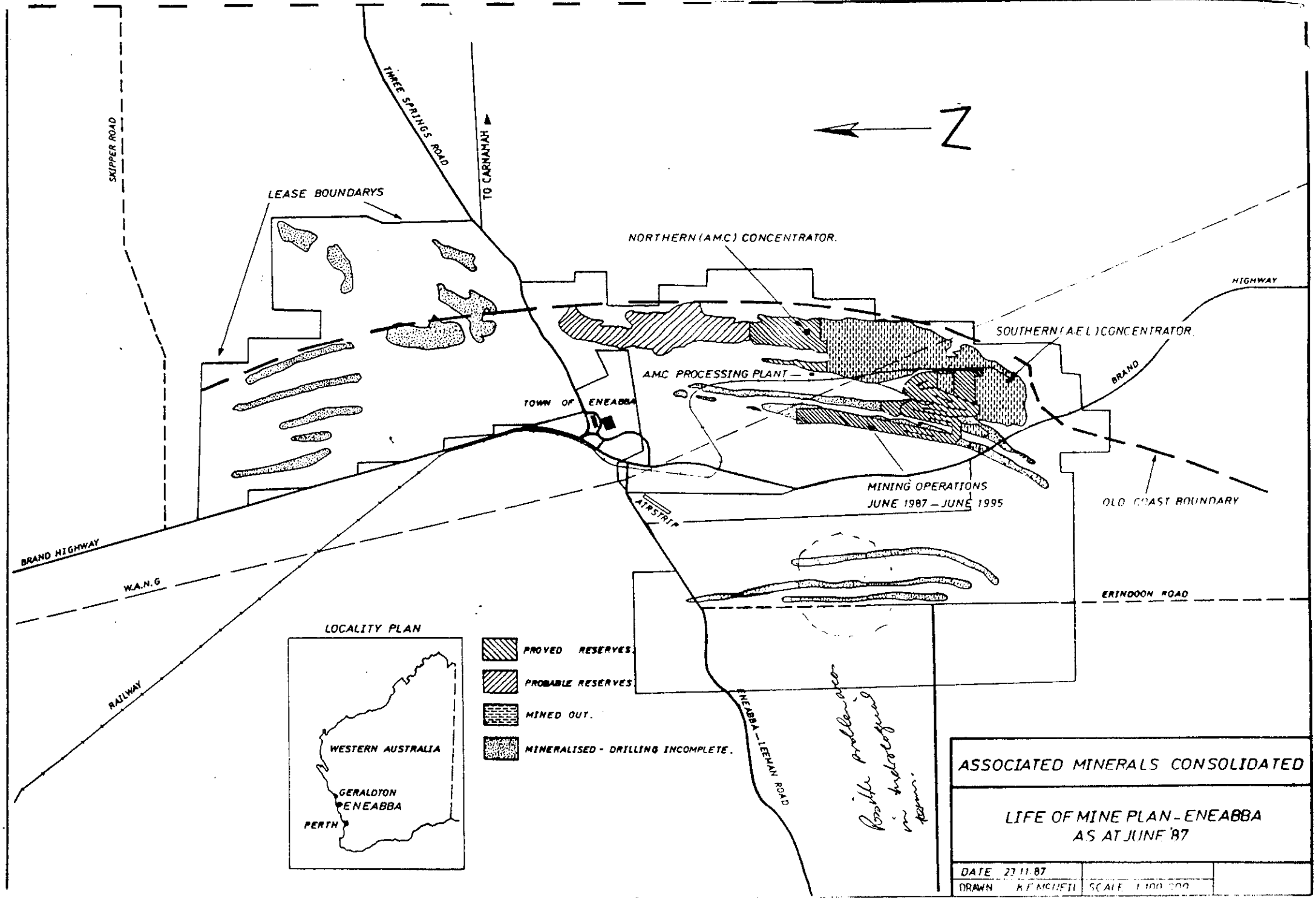
STAFF

PROPAGATION OFFICER

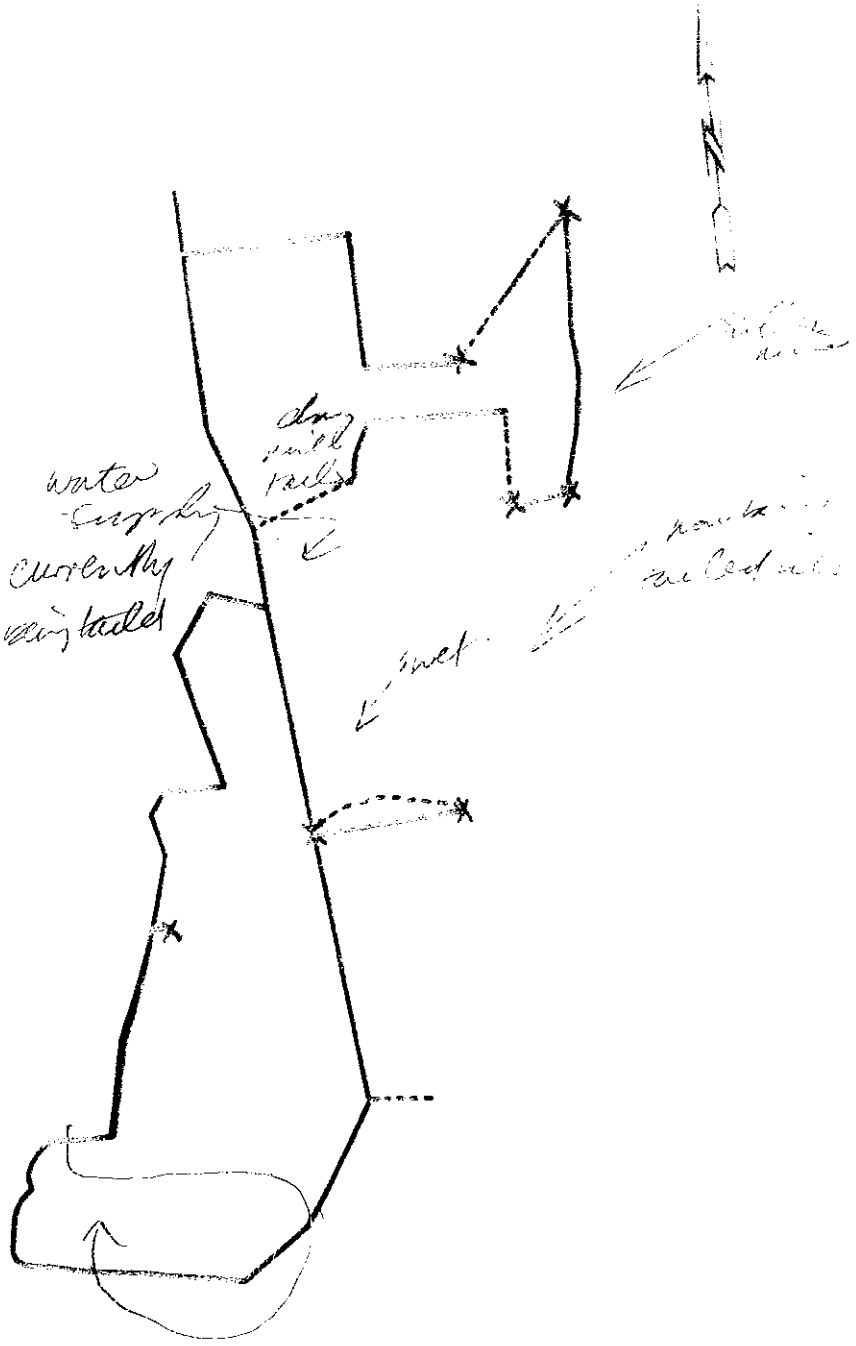
ROGER WILSON

Completed Certificate of Horticulture at Mount Lawley Tech. while working for the Kings Park Board.

After landscaping for 3 years joined A.M.C.Ltd. as Propagation Officer in 1983 to develop and implement seed collection and propogation programmes Reappointed to this position in August 1988.


SKIPPER ROAD
THREE SPRINGS ROAD
TO CARNAMAH
LEASE BOUNDARYS
NORTHERN (A.M.C) CONCENTRATOR.
HIGHWAY
SOUTHERN (A.E.L) CONCENTRATOR.
A.M.C. PROCESSING PLANT
TOWN OF ENEABBA
BRAND
MINING OPERATIONS
JUNE 1987 – JUNE 1995
AIRSTRIP
OLD COAST BOUNDARY
BRAND HIGHWAY
W.A.N.G
ERINDOON ROAD
RAILWAY
ENEABBA – LEEMAN ROAD
LOCALITY PLAN
WESTERN AUSTRALIA
GERALDTON
ENEABBA
PERTH
PROVED RESERVES
PROBABLE RESERVES
MINED OUT.
MINERALISED - DRILLING INCOMPLETE.
ASSOCIATED MINERALS CONSOLIDATED
LIFE OF MINE PLAN - ENEABBA
AS AT JUNE '87
DATE 23.11.87
DRAWN A.F. McNEIL
SCALE 1:100 000

WILD 15/4 UAG
Nr.13021 152.91
dry mill tails
wet
KL 438
ENEABBA H.L.
8254-8256
Run 1
08.05.88
U.T.
6,200m
A.S.L.
N
Kevron Aerial
Perth, W.A


water supply currently installed

• Effect / drought. length

Les show tables showing annual increase in soil stored seed. increasing the total nos alone without addition of mulch

BOTANICAL DATA

Table 1. Plant Density First Year Rehabilitation Eneabba.

YEAR SOWN	TOTAL DENSITY	BRADYSPOROUS SPECIES (= from Mulch)	SOIL STORED SPECIES	SEED SOWN GM/HA
1981	0.75	0.09	0.63	0
1982	1.77	1.0	0.77	0
1983	3.77	2.31	1.46	600
1984	0.77	0.65	0.10	380
1985	4.03	2.46	1.37	1080
1986	6.94	5.31	1.59	2360
1987	7.08	5.30	1.77	2340
1988	6.38	4.96	1.42	1958

Table 2. Monitoring Data. 1988 Rehabilitation.

YEAR	RICHNESS	DENSITY	COVER
88A	1.92	2.79	0.26
88B	3.41	5.44	0.29
* 88C	2.66	5.84	0.36
88D	3.72	10.13	0.52
88E	3.96	8.77	0.57
88F	2.32	4.66	0.33
88G	2.31	3.67	0.18
88H	4.93	9.77	0.60
TOTAL	25.23	51.07	3.11
X	3.15	6.38	0.39

* Route stop - terolds trial

Density = surface stabilization is considered to be key to high density - as seen in small blocks ie Table 6

small use of terolds - movement of sand causing deaths in early establishment

fixed vs random transect: yet to be addressed by NYC and Joan Osborne

Table 3. Monitoring Data 87A (150 dam area).

YEAR	RICHNESS	DENSITY	COVER
1987	4.23	9.68	0.14
1988	4.66	9.92	3.62

Table 4. Monitoring Data 82BE.

field inspection

YEAR	RICHNESS	DENSITY	COVER
1982	NA	1.64	NA
1987	2.49	3.07	19.82
1988	2.43	3.14	24.41

Table 5. Monitoring Data 85B (white pit).

imputed

YEAR	RICHNESS	DENSITY	COVER
1985	3.54	5.57	0.23
1986	NA	NA	NA
1987	6.19	12.29	10.48
1988	5.25	8.18	18.86

87C 3.8 4.5 >2%

Table 6. Monitoring Data 86D.

small bank well protected - note high values

YEAR	RICHNESS	DENSITY	COVER
1986	5.61	15.43	0.89
1987	6.29	13.41	6.44
1988	6.22	11.52	27.63

Table 1. The density of bradysporous species at the mulch collection site

Species	Density plants/m^2	Species	Density plants/m^2
Allocasuarina humilis	0.0475	Eremaea acutifolia	0.0756
Allocasuarina microstachya	0.0133	Eremaea violacea	0.431
Banksia hookeriana	0.0002	Eucalyptus tetragona	0.015
Banksia lanata	0.262	Hakea auriculata	0.0158
Beaufortia bracteosa	0.388	Hakea corymbosa	0.0125
Beaufortia elegans	1.25	Hakea incrassata	0.0133
Calothamnus sanguineus	0.0578	Hakea obliqua	0.00417
Calothamnus torulosus	0.0311	Isopogon linearis	0.00083
Conothamnus trinervis	0.0444	Isopogon tridens	0.0033
Dryandra sp. aff. falcata	0.0358	Leptospermum spinescens	0.0444
Dryandra carlinoides	0.0756	Melaleuca acerosa	0.680
Dryandra kippistiana	0.0267	Melaleuca trichophylla	0.0025
Dryandra nivea	0.0400	Petrophile brevifolia	0.236
Dryandra shuttleworthiana	0.169	Petrophile chrysantha	0.0356
Dryandra tridentata	0.0756	Petrophile drummondii	0.333
Dryandra vestita	0.0002	Petrophile macrostachya	0.0933

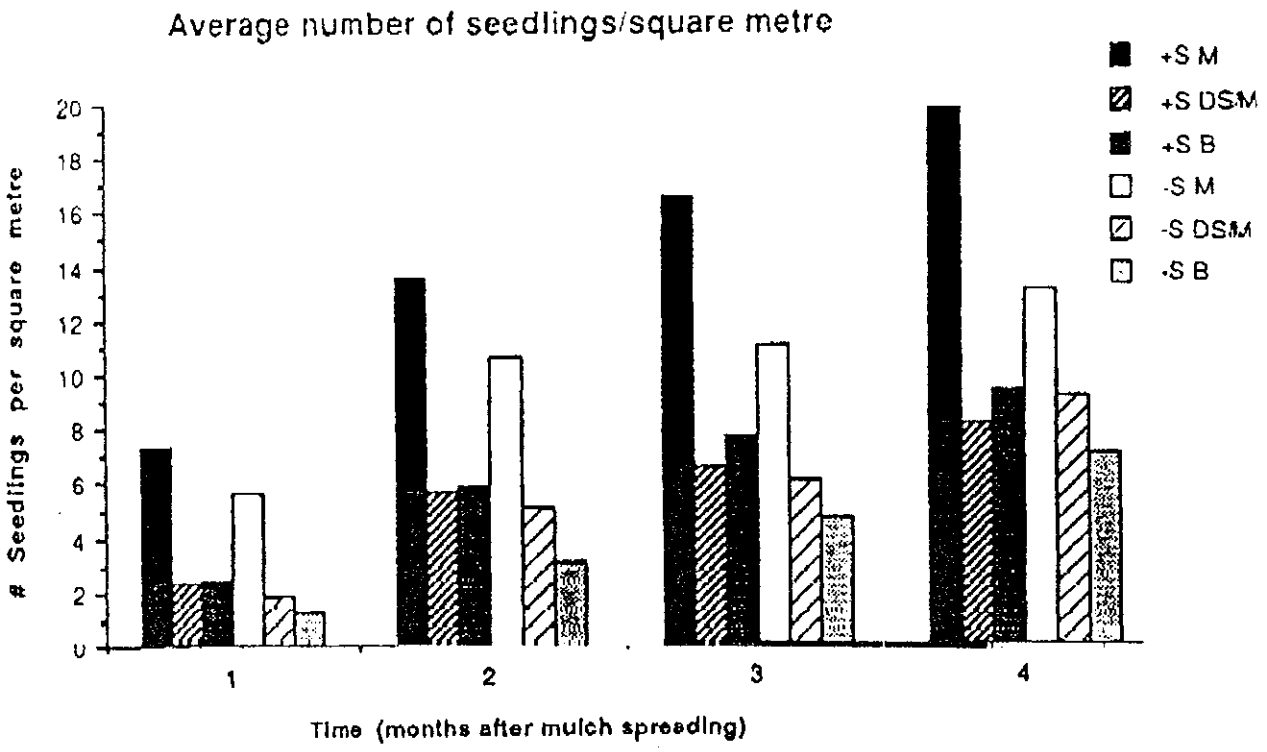
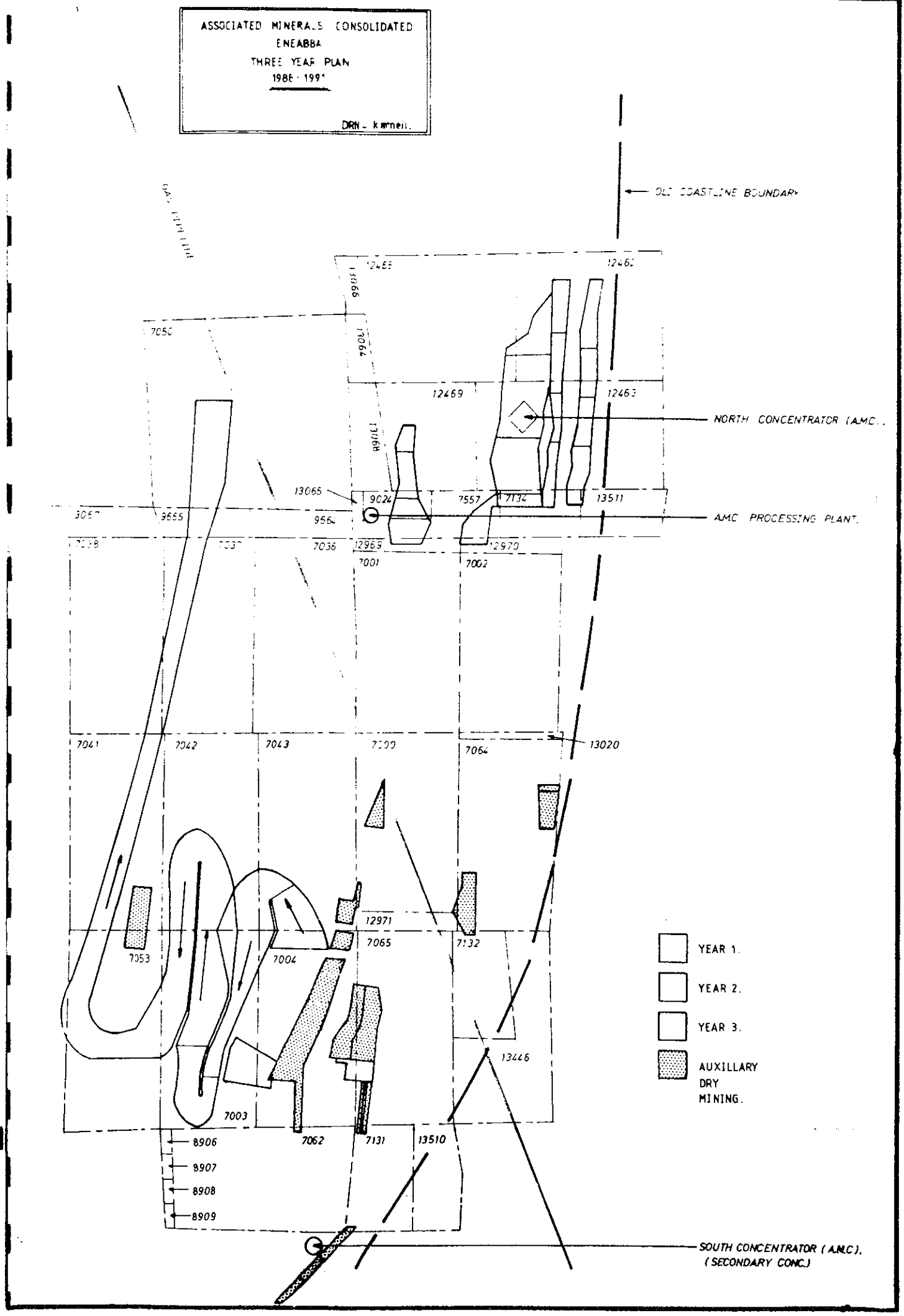
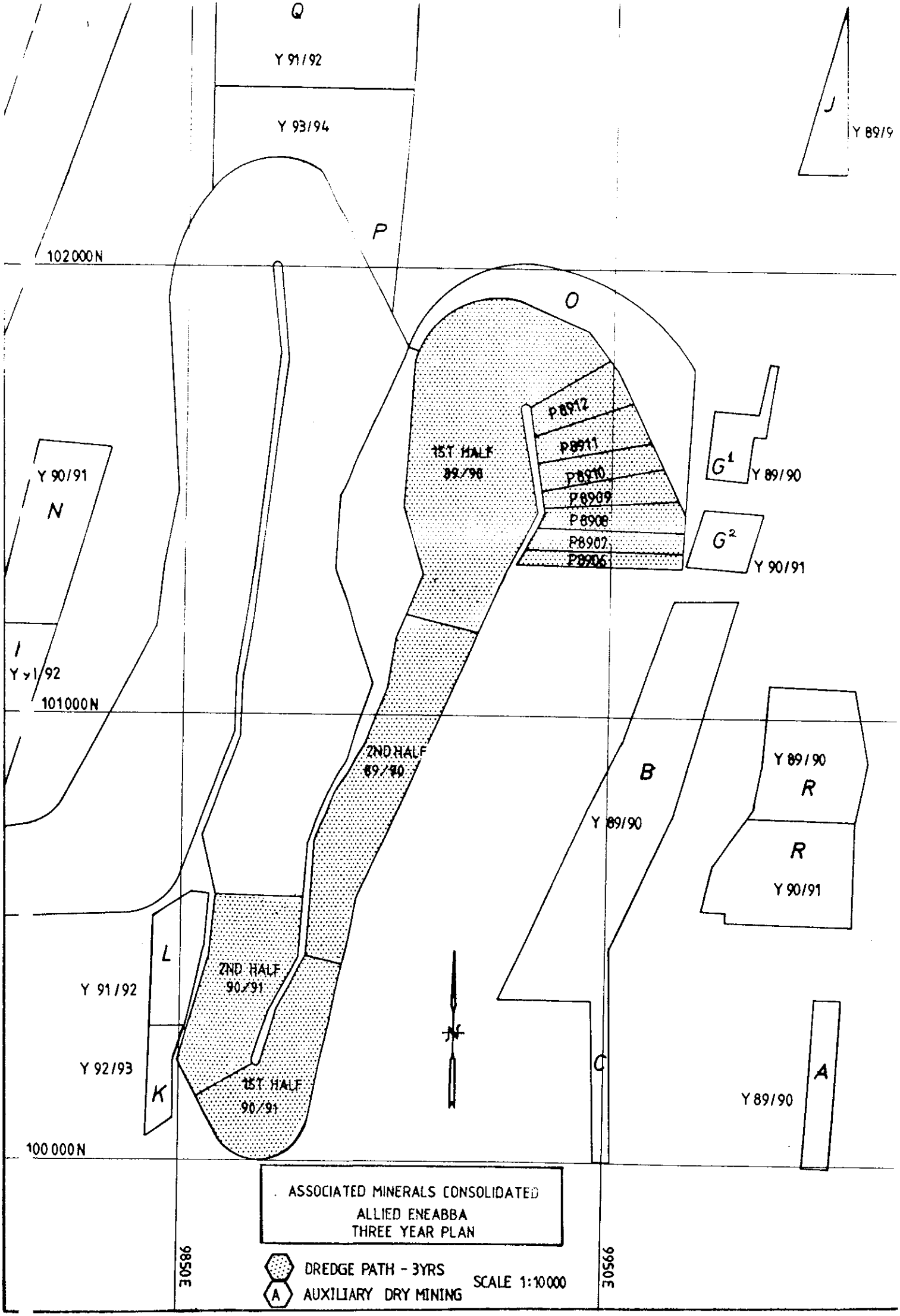
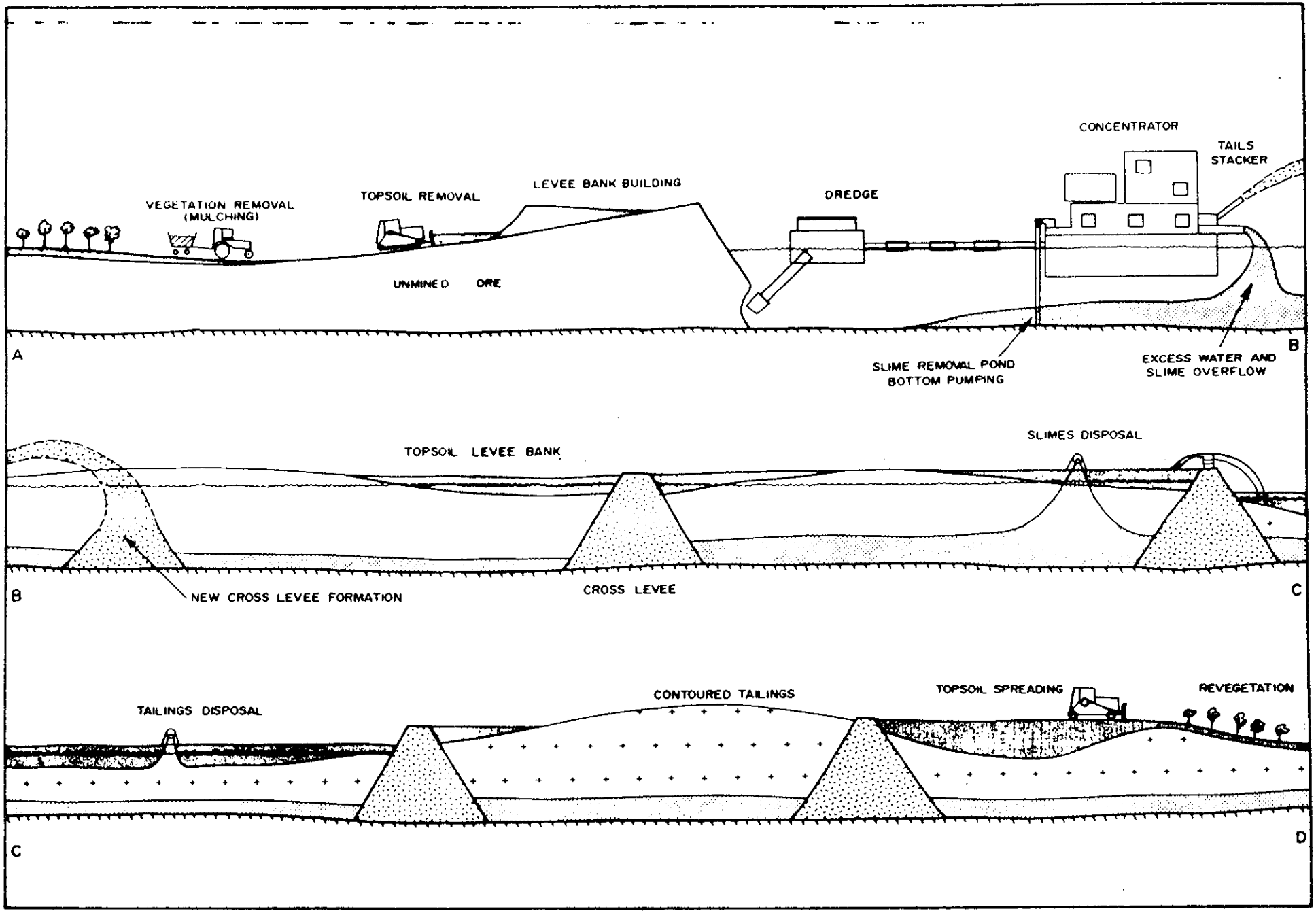


Figure 1. Comparative numbers of seedlings/m^2 showing variation between treatments.

Note: +S With additional seed collected by A.M.C. applied
-S Without above seed application
M With normal mulch application
DSM With mulch containing no seed applied
B Bare, without mulch application


ASSOCIATED MINERALS CONSOLIDATED
ENEABBA
THREE YEAR PLAN
1986 - 1991
DRN - kennell.
OLD COASTLINE BOUNDARY
NORTH CONCENTRATOR (AMC.)
AMC PROCESSING PLANT.
SOUTH CONCENTRATOR (AMC).
(SECONDARY CONC.)
YEAR 1.
YEAR 2.
YEAR 3.
AUXILLARY
DRY
MINING.
12465
12462
13066
7050
12469
12463
13064
13069
13065
9024
7557
7134
13511
9655
9564
7038
7036
12963
12970
7001
7002
7041
7042
7043
7064
13020
12971
7065
7132
7053
7004
13446
7003
8906
8907
8908
8909
7062
7131
13510


Q
Y 91/92
Y 93/94
P
J
Y 89/9
102000N
O
P8912
P8911
P8910
P8909
P8908
P8907
P8906
1ST HALF
89/90
G1
Y 89/90
G2
Y 90/91
Y 90/91
N
I
Y 91/92
101000N
2ND HALF
89/90
B
Y 89/90
Y 89/90
R
R
Y 90/91
L
Y 91/92
2ND HALF
90/91
Y 92/93
K
1ST HALF
90/91
C
A
Y 89/90
100000N
ASSOCIATED MINERALS CONSOLIDATED
ALLIED ENEABBA
THREE YEAR PLAN
DREDGE PATH - 3YRS
A AUXILIARY DRY MINING
SCALE 1:10000
30586
30566


CONCENTRATOR
TAILS STACKER
VEGETATION REMOVAL (MULCHING)
TOPSOIL REMOVAL
LEVEE BANK BUILDING
DREDGE
UNMINED ORE
A
B
SLIME REMOVAL POND BOTTOM PUMPING
EXCESS WATER AND SLIME OVERFLOW
TOPSOIL LEVEE BANK
SLIMES DISPOSAL
B
NEW CROSS LEVEE FORMATION
CROSS LEVEE
C
TAILINGS DISPOSAL
CONTOURED TAILINGS
TOPSOIL SPREADING
REVEGETATION
C
D