(Appendix 5-3)

Current Status and Future Prospect of the KALIMANTAN Coal

1. Outline of the KALIMANTAN Coal

Low ash and low sulfer content are special feature of the KALIMANTAN Coal. It is classified as bituminous and sub-bituminous coal. Confirmed reservation is assumed more than 1,000 million tons and it reaches up to half of whole Indonesian confirmed reservation. The development plan of the nine projects are now carrying out under the contract with Perum Tambang Batubara, one of the governmental organization, and a couple of that plans have already started coal production.

The Indonesian government intend to export the almost of the coal except some minor portion of domestic use and give them a position of major export commodity. For this purpose, the government has introduced some foreign capitals with the object of promotion of development of this project with actively.

2. Current Status and Future Prospect of Production of the KALIMANTAN Coal

Several coal mines such as P.T. ARUTMIN, P.T. KALTIM PRIMA, P.T. MULTI HARAPAN UTAMA and P.T. TANITO HARUM, have already started their production. The current status of these productions are as follows:

('000 tons)

	1988	1989
P.T. ARUTMIN (Senakin)		600 to 800
(Satui)		200 to 300
P.T. KALTIM PRIMA (Prima)		500
P.T. MULTI HARAPAN UTAMA	200	1,200
P.T. TANITO HARUM		800

Since 1960's, some small mines which are located in the MAHAKAM coal basin have been invested by Indonesian entrepreneurs. Each of them have been producing several 10 thousand tons every year. A couple of above coal mines, such as P.T. KALTIM PRIMA, are carring out the trial shipment thought, all of them are on the way of development of the projects.

Meanwhile, some projects, such as P.T. BERAU, are still in the stage of engineering work, but these projects are expected to start coal production in the coming few years. The future production of the KALIMANTAN coal are prospected as follows:

('000 tons)

P.T. ARUTMAN	(Senakin)	1,000	———	———	———	———	5,000*
	(Satui)	600-700	1,000	1,000	1,000	1,000	1,000
P.T. BERAU		200	500	750	———	———	1,500*
P.T. KALTIM PRIMA	(Prima)	650	2,700	4,000	5,000	5,000	5,200
	(Pinang)	-	1,000	1,000	1,000	1,000	1,000
P.T. MULTI HARAPAN UTAMA		1,500	2,000	2,000	2,000	2,000	2,000
P.T. TANITO HARUM		1,200	———	———	———	———	2,000*
P.T. UTAH	(Petangis)	-	1,000	1,000	1,000	1,000	1,000

(Note) An asterisk (*) shows that the mine has a capability of expansion in future but the time of year for reaching it depends on market condition.

3. Transportation Issues

No loading equipments as well as no port facilities for large coal vessels are found in the KALIMANTAN island, which are indispensable for international coal trade. The KALIMANTAN island has shallow and vast offshore area and thickly growed mangrove covered all coastal line. The KALIMANTAN island has essentially disadvantage for international coal trade. At present, exportation of coal is transported by thousand tons barge to the offshore area and transhipped into the nominated vessel. In this connection, the handysize vessels should be provided with gear for loading of coal. Conquering these disadvantages, each entrepreneurs are planning large loading facilities as well as

construction of port. The outline of these plans are described hereunder:

P. T. ARUTMIN

ARUTMIN's coal pits are located at the south KALIMANTAN. New shipping port is projected at northern end (in this case, PANAMAX size vessels are available) or southern end (in this case, CAPE size vessels should be able to manage) of Plau Lau island lying very near mine site. Construction period is not defined yet but decision should be done in near future.

P. T. KALTIM PRIMA

A two kilometer length jetty, a berth which is able to be berthed more than CAPE size vessel and loading facilities are under construction at offshore area of Tanjung Bara. The completion of these facilities are scheduled as September 1991.

P. T. MULTI HARAPAN UTAMA

A new port which is located at 12 km inside of the mouth of the Balikpapan Bay is now under construction. Loading facility which has the capacity of 2.5 million tons per annum, as first stage, are planned to be put into operation in April 1991. Furthermore, another 2.5 million tons facility shall be add in future, these two facilities can handle not only MULTI HARAPAN UTAMA but also other shippers' sources. Accordingly, port operation, such as pilotage, line handling, stevedore as well as loading of coal, should be conducted by affiliated company, which is already settled by P. T. MULTI HARAPAN UTAMA as a main shareholder.

P. T. TANITO HARUM

A large capacity of coal storage yard and loading facility are under being construction adjacent to the existing loading facility for barge and is located at middle of the MAHAKAM river. This facility will be in commercial operation on April 1990 and have the capacity of 8,000 tons running laydays using 7,000 DWT barge. Transhipment to a ocean-going vessel is supposed at offshore area of the MAHAKAM river mouth. Transportation distance run up the river 100 km long.

4. On the Domestic Coal Demand in Indonesia

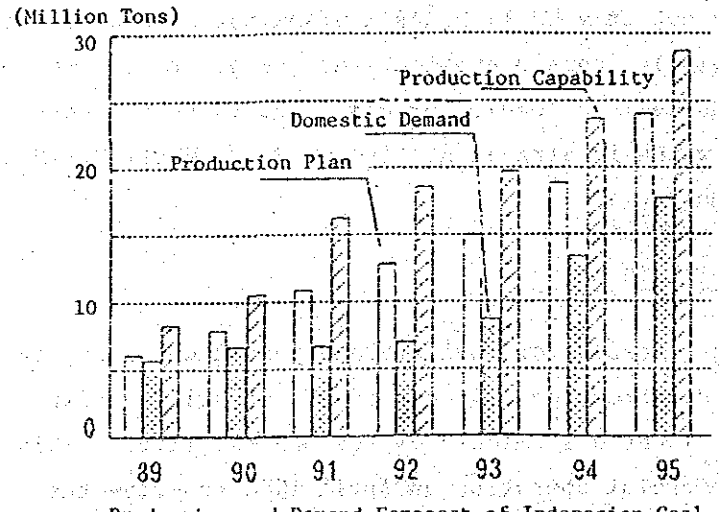
At present, Suralaya thermal power plant is the only power utility user and others are cement industry. However, following power projects are planned as coal fired, i.e., Paiton (400 MW), Suralaya #3 and #4 (800 MW), Bukit Asam (195 MW), Ombilin (100 MW). These demand are projected as follows.

Estimate of Coal Demand of power Plants

('000 tons)

Power Plant	1989	1990	1991	1992	1993
Suralaya I	3,470	4,440	4,440	4,440	4,440
Paiton I	-	-	-	-	1,100
Bukit Asam I	360	360	360	360	540
Ombilin I	-	-	-	140	280
Balikpapan I	-	-	-	140	280
Solok (Ombilin)	30	30	30	30	30
Total	3,860	4,790	4,790	5,070	6,630

Other main domestic coal users in Indonesia are cement industry, tin and nickel smelters. Estimated domestic demand, production plan and production capability are prospected as follows:



Production and Demand Foreoast of Indonesian Coal

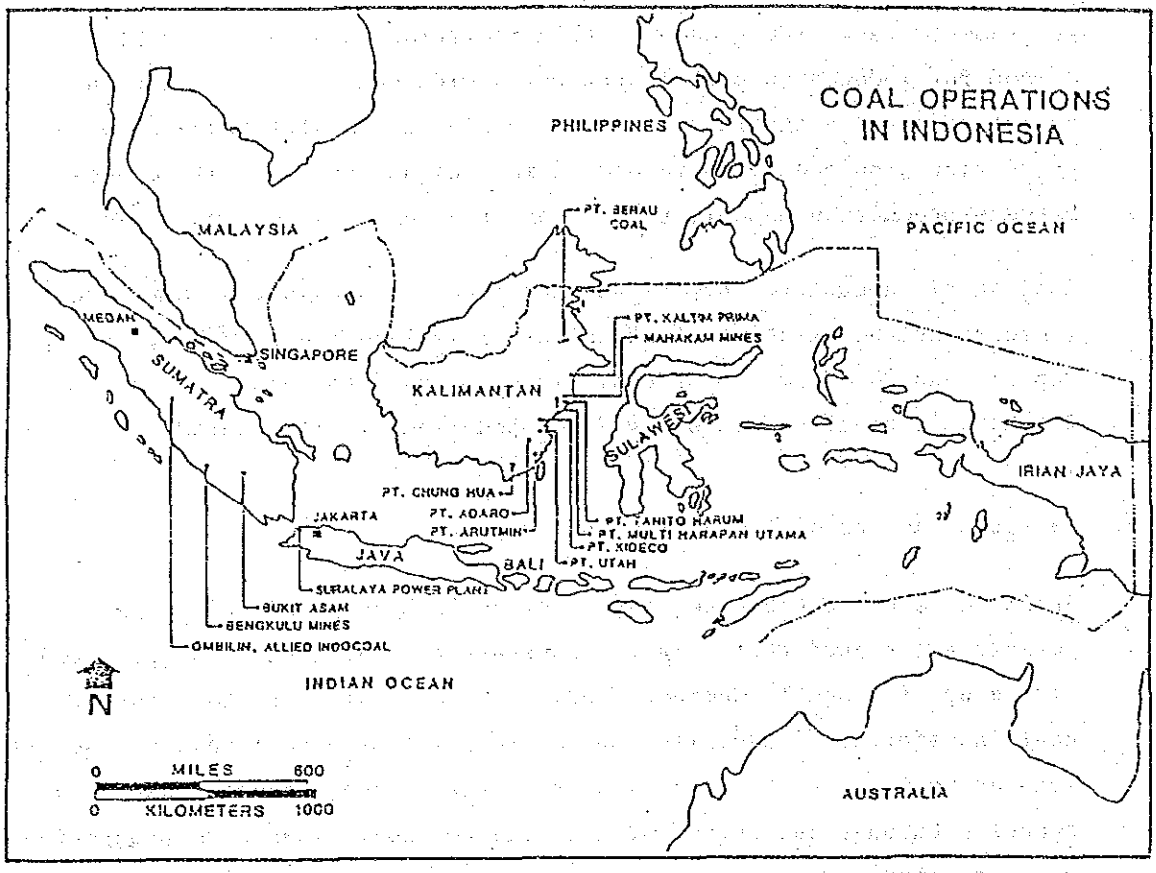
You can easily find from this figure that there is a remarkably isolation between production amount and capability of productive facilities

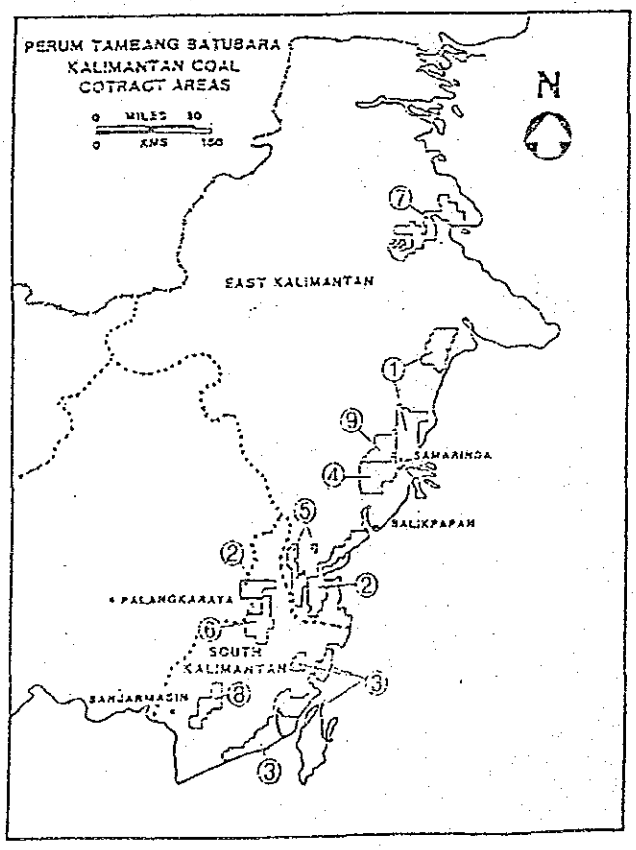
at present plan. The reason of this isolation is uncertainty of coal demand for Indonesian coal in the world wide coal market. Therefore, export reserve in the future may be considered as difference between production plan and domestic demand in minimum case, and difference between production capability and domestic demand in maximum case.

Coal supply amount to domestic demand is assumed mainly as a production increase at the existing mines in Sumatra island, such as Bukit Asam, Ombilin and 13.5% amount of coal, which is paid to Perum Tambang Batubara as royalty from newly developed mines in KALIMANTAN.

5. Unstable Factors of Indonesian Coal Export

Strike is a no obstable for export of coal, because of Indonesian workers are banned their right. However, capital investment plan and rising up of domestic demand of coal are uncertainty factors to the coal industries. Especially, there are still some more unknown factors such as reliability to operation at initial stage, countermeasure to troubles through operation and maintenance and influence to production rate at rainy season.





① PT. KALTIM PRIMA COAL
② PT. UTAH INDONESIA
③ PT. ARUTMIN INDONESIA
④ PT. MULTI HARAPAN UTAMA
⑤ PT. KIDECO JAYA AGUNG
⑥ PT. ADARO INDONESIA
⑦ PT. BERAU COAL
⑧ PT. CHUNG NUA
⑨ PT. TANITO HARUM

P.T. MULTI HARAPAN UTAMA

- Owner : - New Hope Indonesia Pty. Ltd., Australia (50%)
  - Mr. Ibrahim Risyad, Indonesia (40%)
  - P.T. Asminco Bara Utama (10%)

- Location : East Kalimantan (Kutai Regency)

- Project Status : - Construction
  - Production

- Contract Area : 123,850 Ha.

- Measured Reserve: (Busang) 13,023,000 MT

- Mining Method : Open pit

- Coal Quality : (see attached)

- Production Capacity Planning:

1989:	800,000 MT	1992:	2,000,000 MT
1990:	1,500,000 MT	1993:	2,000,000 MT
1991:	2,000,000 MT	1994:	2,000,000 MT

(Mining operation commenced April 1988,
Actual production 1988: 202,717 MT)

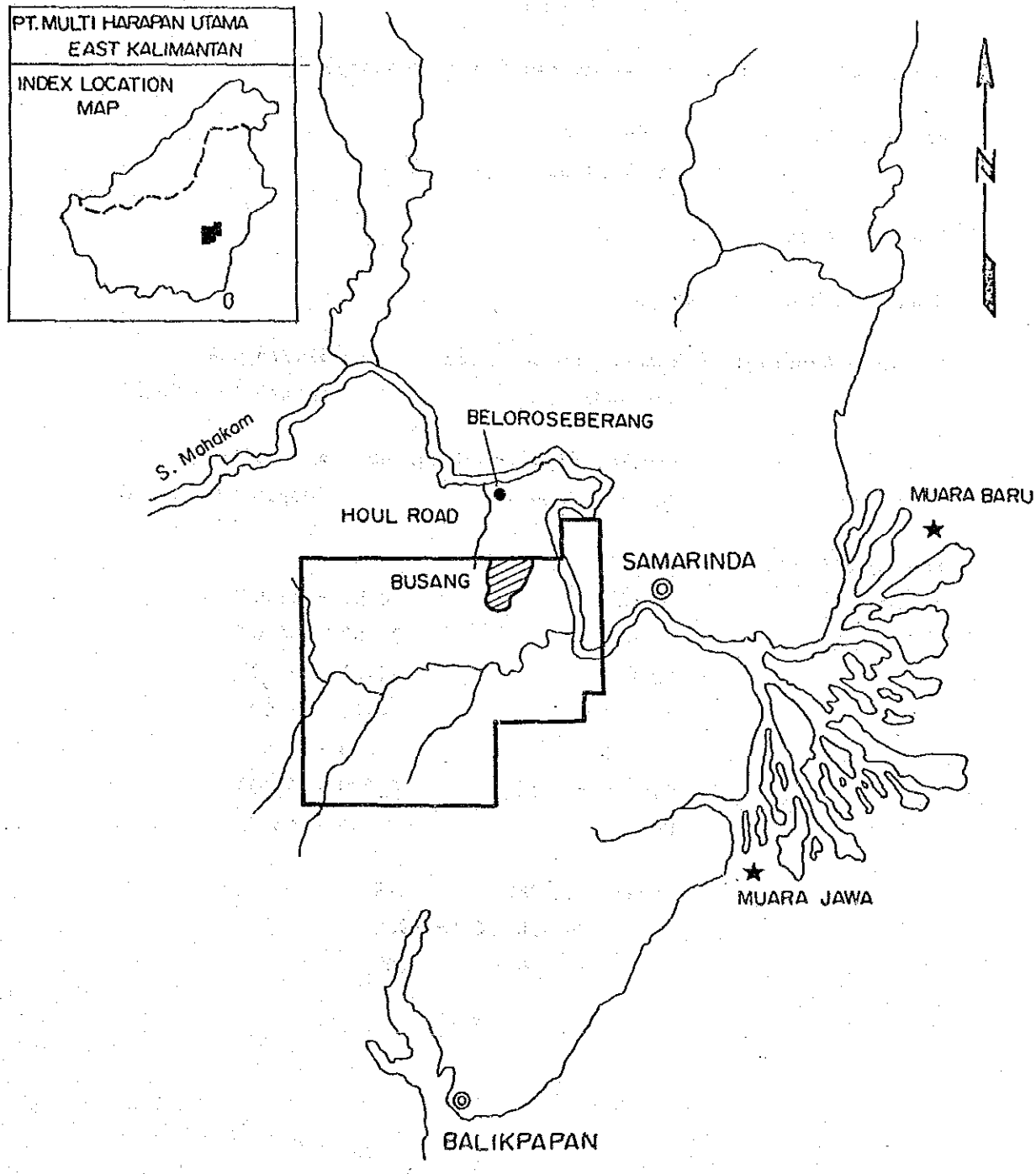
- Transportation of Coal to Port:

  - Raw coal is hauled via 20 km road to processing plant, stockpiling and barge loading facilities (up to 6,500 MT) at Beloro on the south bank of the Mahakam river.

  - From Beloro coal will be carried by barge and transhipped to ocean vessel (up to 15,000 DWT) at either Muara Baru or Muara Jawa (open sea) depending on whether condition (tranloading rate can be 4,500 MT/day).

The typicl product quality of the Multi-brand coal is as follows:

Total Moisture (as received)	%	16.00 max.
Moisture (adb)	%	11.0 approx.
Ash (adb)	%	5.0 approx.
Volatile Matter (adb)	%	40.0 approx.
Fixed Carbon (adb)	%	46.0 approx.
Total Sulphur (adb)	%	1.0 max.
Calorific Value (adb)	kcal/kg	6.250 min.
Hardgrove Grindability Index		45 approx.
Ash Fusion Temperature (Reducing)		
Initial Deformation (°C)		1,200 approx.
Hemisphere (°C)		1,320 approx.
Flow (°C)		1,350 approx.
Uttimate Analysis (daf)		
Carbon	%	76.9
Hydrogen	%	5.6
Nitrogen	%	1.9
Oxygen	%	15.9
Ash Analysis (dmmf)		
SiO_2	%	51.0
Al_2O_3	%	18.5
Fe_2O_3	%	10.3
CaO	%	3.7
MgO	%	2.16
TiO	%	0.70
K_2O	%	0.87
Na_2O	%	0.22
SO_3	%	2.42
P_2O_3	%	0.63


PT. MULTI HARAPAN UTAMA
EAST KALIMANTAN
INDEX LOCATION MAP
N
S. Mahakam
BELOROSEBERANG
HOUL ROAD
BUSANG
SAMARINDA
MUARA BARU
MUARA JAWA
BALIKPAPAN

P.T. TANITO HARUM

- Owner : - Mr. Kiki Barki
  - Mrs. Anita Barki
- Location : East Kalimantan (Kutai Regency)
- Project Status : - Production
  - Development
- Contract Area : 123,846 Ha.
- Mining Method : Open pit
- Measured Reserve:
  - Busang, Pondok Labu Sukodadi : 31,776,644 (Depth 40 - 60 m)
  - Sebulu, Sigihan, Ketapang Beloro, Seberang: 6,377,049 (Depth 40 - 60 m)
- Coal Quality : (ADB)

IM (%)	8.00 - 11.00
VM (%)	38.00 - 44.00
FC (%)	43.00 - 47.00
Ash (%)	4.00 - 8.00
S (%)	0.3 - 0.8
C.V (Kcal/kg)	6,400 - 6,600
HGI	45 - 48

Size: +50 MM 1%
+2 MM/-50 MM ±90%
-2 MM 10%

- Production Capacity Planning:

1989:	700,000 MT	1993 :	840,000 MT
1990:	720,000 MT	1994-1995 :	1,000,000 MT
1991:	720,000 MT	1996 onwards:	1,200,000 MT
1992:	840,00 MT		

- Transportation of Coal to Port:

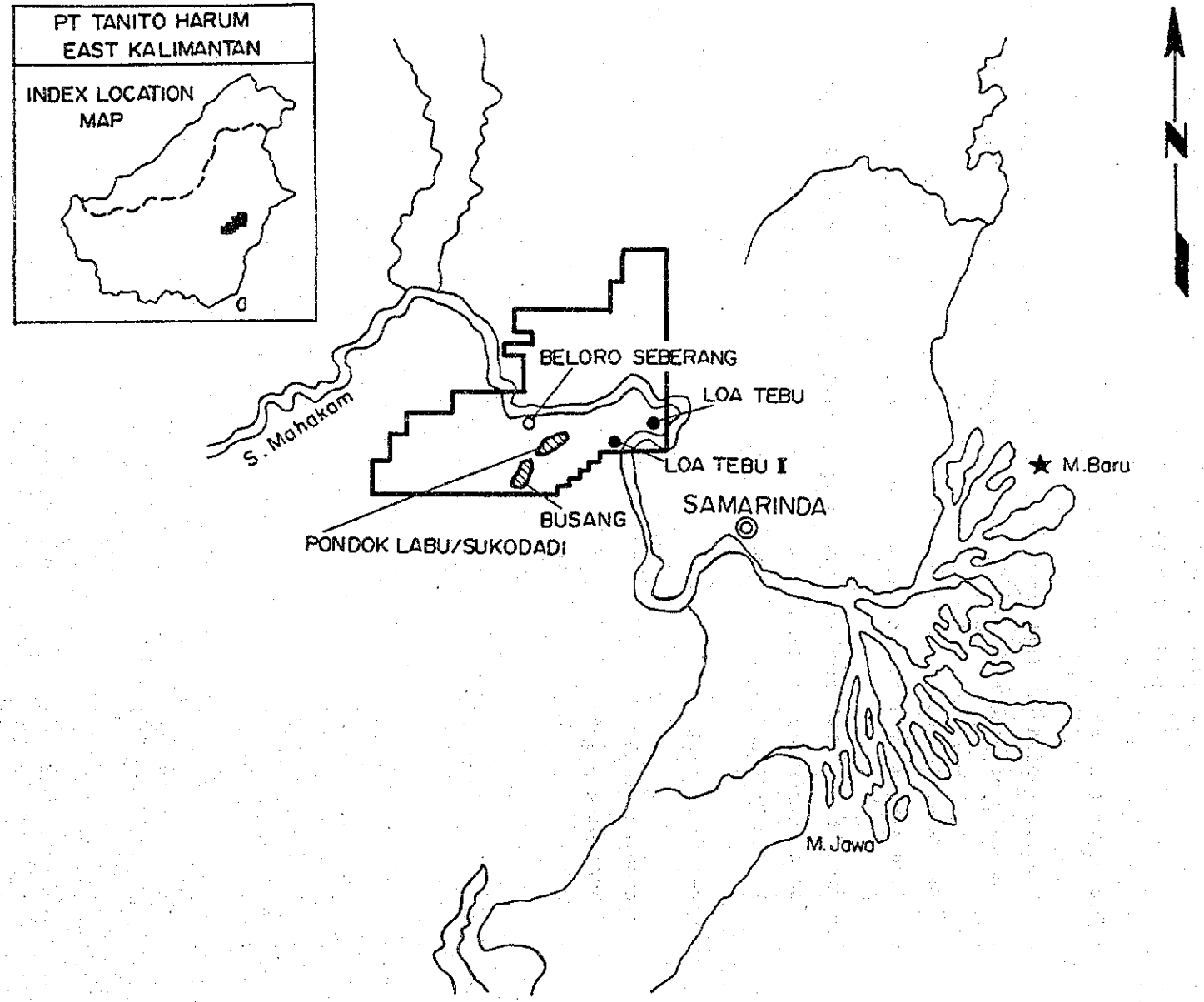
  - Coal is hauled by truck from mine to stockpile at Loa Tebu (Loa Tebu II as new stockpile and loading facilities now under construction)

  - The existing coal terminal at Loa Tebu located about 35 neutical miles down stream from Beloro can be used for barges of 5,000 MT.

  - From these facilities the coal will be transported to Mahakam Delta area (Muara Bara or Muara Jawa) for transhipment to vessel up to 10,000 MT (loading rate 1,500 MT/day)

- Other facilities:

  - Washing plant
  - Screening plant


PT TANITO HARUM
EAST KALIMANTAN
INDEX LOCATION
MAP
N
BELORO SEBERANG
LOA TEBU
LOA TEBU I
S. Mahakam
M.Baru
SAMARINDA
BUSANG
PONDOK LABU/SUKODADI
M. Jawa

P.T. ARUTMIN INDONESIA

- Owner : - BHP Australia
  - Utah International Inc.
  - P.T. Bakrie & Brothers
    (an Indonesian Company)

- Location : South Kalimantan (Regencies: Kotabaru, Banjar, Tanah Laut)

- Project Status : Construction and production

- Contract Area : 501,000 Ha.

- Recoverable Reserve: 300,000,000 Tons (Depth: 150 m)

- Production Capacity:

	Senakin	Satui
1990	1,000,000 MT	200,000 MT
1991	1,500,000 MT	800,000 MT
1992	1,500,000 MT	1,000,000 MT
1993	3,500,000 MT	1,500,000 MT
1994	5,000,000 MT	1,500,000 MT

- Current Production Level : 480,000 Tons (1989)

1990 - 1993 Production: 600,000 Tons/year

1994 - 1998 Production: 1 million tons in 1994 and gradually increase by 1 million tons/year

- Mining Method : Open pit

- Coal Quality :

(ADB)	Senakin		Satui	Sangsang	Sarongga
	Unwashed	Washed			
IM (%)	4.00	4.00	7.00	4.10	29.40
VM (%)	40.40	43.20	41.50	40.00	37.00
FC (%)	39.00	41.60	43.50	39.70	10.90
Ash (%)	16.60	11.00	8.00	16.20	2.30
S (%)	0.70	0.70	0.80	0.60	0.10
C.V (Kcal/kg)	6,250	6,620	6,800	6,300	4,344.68
HGI	37-40	37-40	40	35	

- Transportation Method from Mine to Port: Dump truck

- Port and Facilities:

  - The existing coal terminal at Air Tawar can be used for barges of 3,000 - 4,000 tons

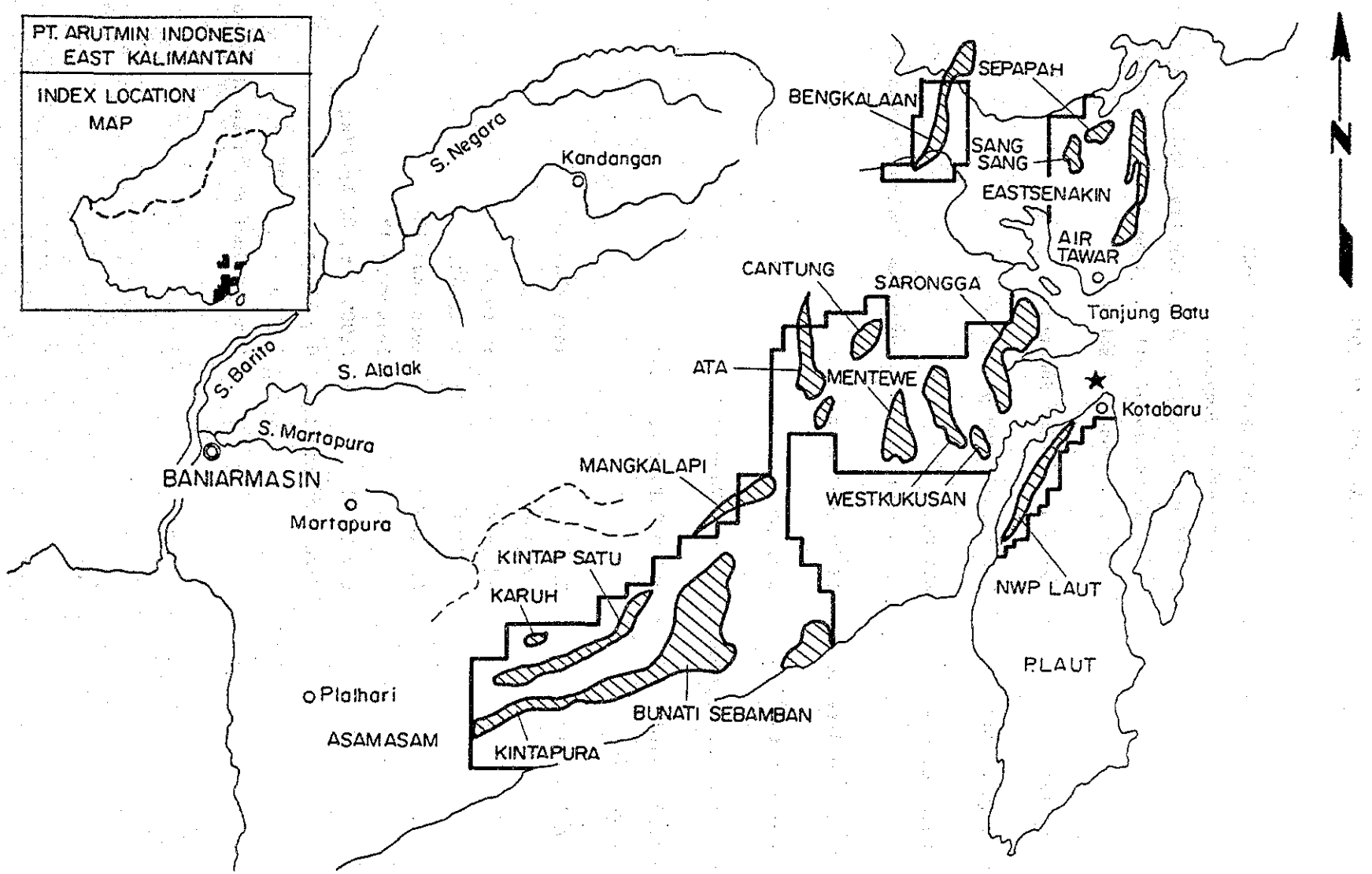
  - Coal is transported from Air Tawar to a nearby safe anchorage and self loaded by geared vessel of up to 65,000 DWT at a loading rate of 10,000 tons per day

  - Arutmin plans to establish facilities to load up to Panamax size ships from onshore stockpiles

- Current Export Destination: Philippines

- Future Domestic Market (1993/1994):

  Paiton Coal Fired P/S (First step: 2 x 400 MW in 1994/1995)


PT. ARUTMIN INDONESIA
EAST KALIMANTAN
INDEX LOCATION MAP
S. Negara
Kandangan
BENGKALAAN
SEPAPAH
SANG SANG
EASTSENAKIN
AIR TAWAR
CANTUNG
SARONGGA
Tanjung Batu
ATA
MENTEWE
Kotabaru
S. Barito
S. Alalak
S. Martapura
BANIARMASIN
Martapura
MANGKALAPI
WESTKUKUSAN
KINTAP SATU
KARUH
NWP LAUT
P.LAUT
Plaihari
ASAMASAM
BUNATI SEBAMBAN
KINTAPURA
N

P.T. ALLIED INDO COAL

- Owner : - P.T. MITRA ABADI SAKTI (20%)
  (Indonesian company)
  - Allied Indonesian Coalfields Pty. Ltd. (80%)
  (a subsidiary of Allied Queensland Coalfields Ltd., Brisbane, Australia)

- Location : Parambahan, West Sumatra

- Project Status : Development and production

- Contract Area : 884 Ha.
  (a part of coal area of Perum Tambang Batubara)

- Mineable Reserve : 12,500,000 Tons

- Mining Method : open pit

- Current Production : 500,000 Tons (1989)

- 1990 Onward Production : 500,000 Tons per year

- Coal Quality :

TM (AR)	:	less than 11%
IM (ADB)	:	5 to 8%
VM (ADB)	:	36 to 41%
FC (ADB)	:	45 to 53%
Ash (ADB)	:	less than 10%
S (ADB)	:	less than 1%
C.V (ADB)	:	6,800 - 6,700 kcal/kg
Size Distribution:		0 - 75 mm ; 100%
		0 - 5 mm ; 10%
		Size product are also produced

- *Transportation Method from Mine to Port:*
  (see Perum Tambang Batubara)

- Port : Teluk Bayur, Padang, West Sumatra

- Domestic Consumer : Cement Plant (P.T. Semen Andalas)

- Recent Export Destination : Thailand, Malaysia, S. Korea, Taiwan, India, Japan, Irlandia

- Foreign Trading Companies Engaged : SSM, Hansen Nueberg, SCM, Idemitsu, Nomura, Surefire

  (see also Perum Tambang Batubara map)

P.T. CHUNG HUA OVERSEAS MINING DEVELOPMENT

- Owner : - Taiwan and Hongkong Trading Co.
  - Mr. Hsien Dow Pai

- Location : South Kalimantan
  (Tanah Laut, Banjar and Tapin Regencies)

- Project Status : Exploration

- Contract Area : 75,000 Ha.

- Recoverable Reserve:

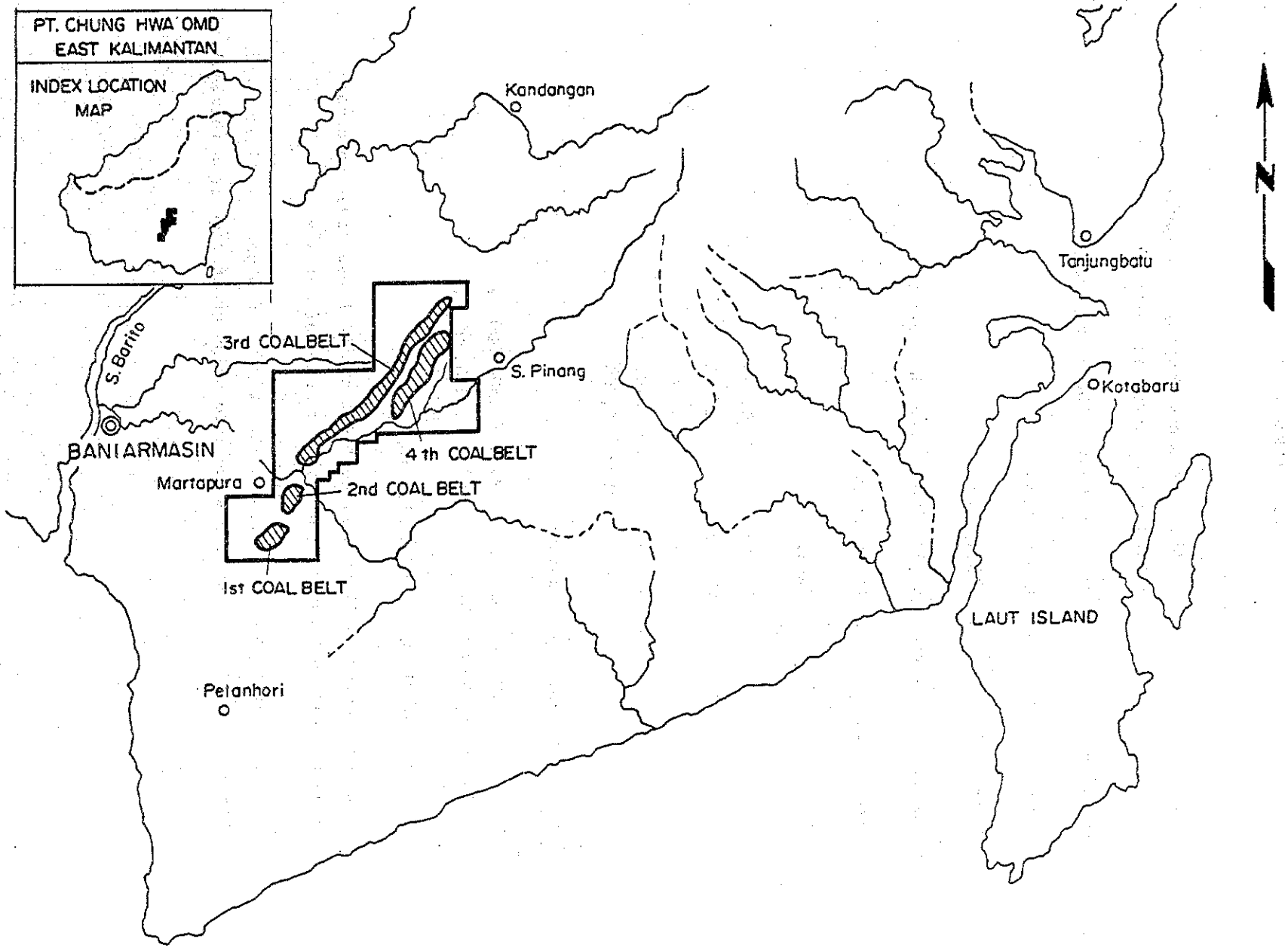
1st Belt	289,000 MT
2nd Belt	153,000 MT
3rd Belt	11,649,000 MT
4th Belt	35,863,000 MT
S. Pinang	21,396,000 MT

- Coal Quality :

(ADB)	1st	2nd	3rd	4th
IM (%)	7.40	6.60	4.80	4.10
VM (%)	43.90	39.60	44.80	44.90
FC (%)	39.00	34.30	41.70	41.50
Ash (%)	9.70	19.50	8.70	9.50
S (%)	0.93	0.31	0.72	0.73
C.V (Kcal/kg)	5,468	5,673	6,930	6,982
HGI	39	29	32	30

- Production Capacity Planning:

  - Start up: 1994
    Capacity: 200,000 MT


PT. CHUNG HWA OMD
EAST KALIMANTAN
INDEX LOCATION
MAP
Kandangan
Tanjungbatu
N
S. Barito
3rd COALBELT
S. Pinang
Kotabaru
BANJARMASIN
4 th COALBELT
Martapura
2nd COAL BELT
1st COAL BELT
LAUT ISLAND
Pelanhori

P.T. BERAU COAL

- Owner : - Mobil Petroleum Company Inc. (60%)
  - Nissho Iwai Corporation (40%)
- Location : East Kalimantan (Berau Regency)
- Project Status : Exploration
- Contract Area : 243,126 Ha.
- Recoverable Reserve: 55,500,000 MT (Depth: 100 m)
- Coal Quality : (Lati area)

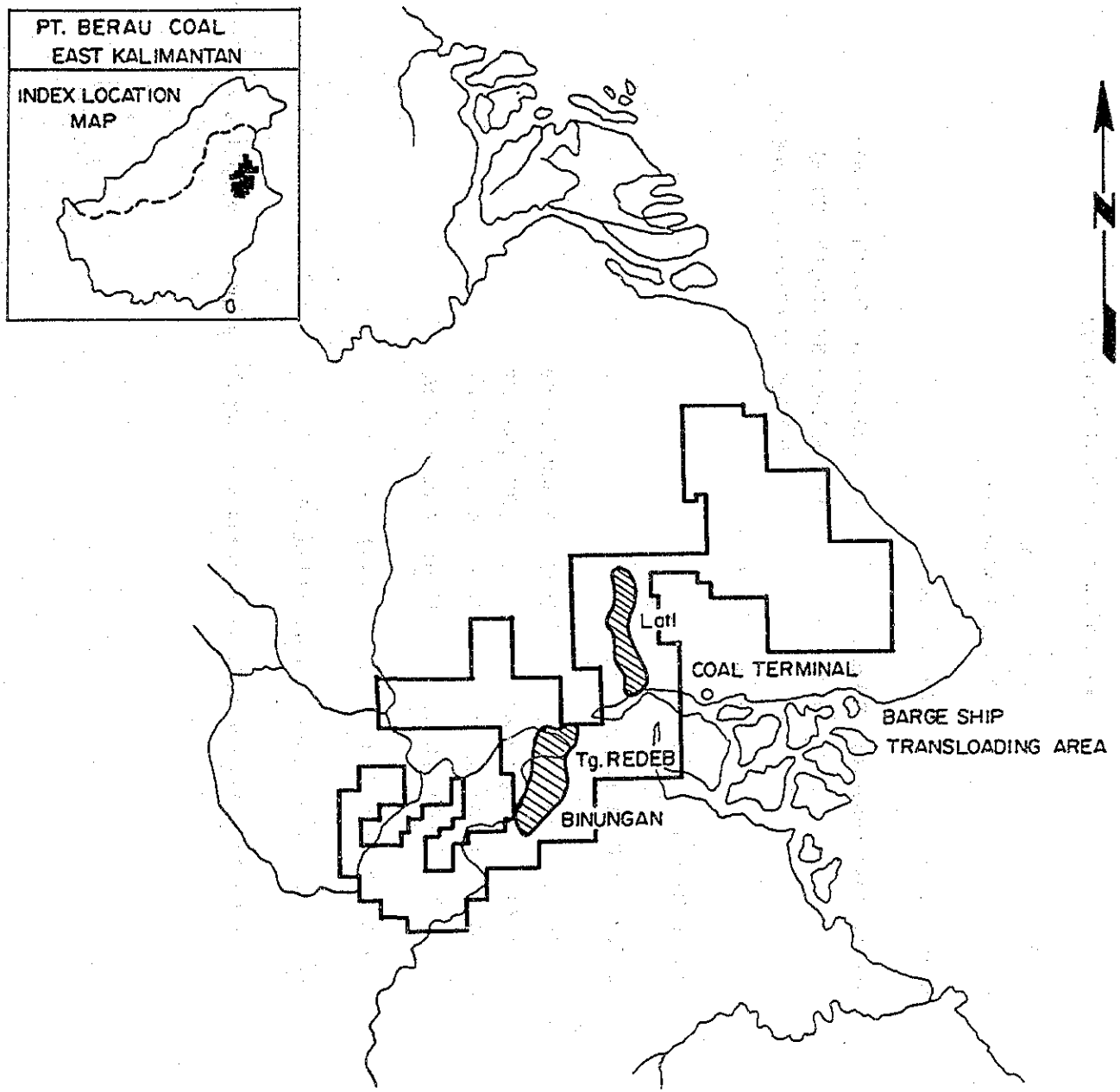
  (ADB)

IM (%)	17.8
VM (%)	37.00
FC (%)	42.00
S (%)	0.85
C.V (Kcal/kg)	5,700

- Production Capacity Planning:

1991:	500,000 MT	1993:	1,500,000 MT
1992:	1,150,000 MT	1994:	2,000,000 MT

- Coal Transportation and Port Planning:
  - A barge loading facility will be built on the Berau river to accommodate river or ocean barges with maximum draft of 4 m.
  - The barge will move the coal down the river a distance of 33 nautical miles to the sea for transloading into ships or storage in a terminal.


PT. BERAU COAL
EAST KALIMANTAN
INDEX LOCATION
MAP
N
Lati
COAL TERMINAL
BARGE SHIP
TRANSLOADING AREA
Tg. REDEB
BINUNGAN

P.T. KALTIM PRIMA COAL

- Owner : - CRA Limited, Australia (50%)
  - British Petroleum Company P.L.C. (50%)

- Location : East Kalimantan (Kutai Regency)

- Project Status : - Construction
  - Trial Production

- Contract Area : 348,000 Ha.

- Recoverable Reserve:
  - Pinang : 155,800,000 MT (Depth 150 m)
  - Bengalon : 116,000,000 MT (Depth 200 m)
  - Melawan : 104,700,000 MT (Depth 6 - 200 m)
  - Separi-Santan: -

- Mining Method : open pit

- Production Capacity Planning:

1989:	300,000 MT	1993:	5,500,000 MT
1990:	600,000 MT	1994:	6,000,000 MT
1991:	1,600,000 MT	1995:	6,500,000 MT
1992:	4,600,000 MT	1996:	7,000,000 MT

- Quality of Coal : (see attached)

- Transportation of Coal to Port (Planned):

  12.7 km overland conveyor from product stockpile to port stockpiles.

- Port (Tanjung Bara):

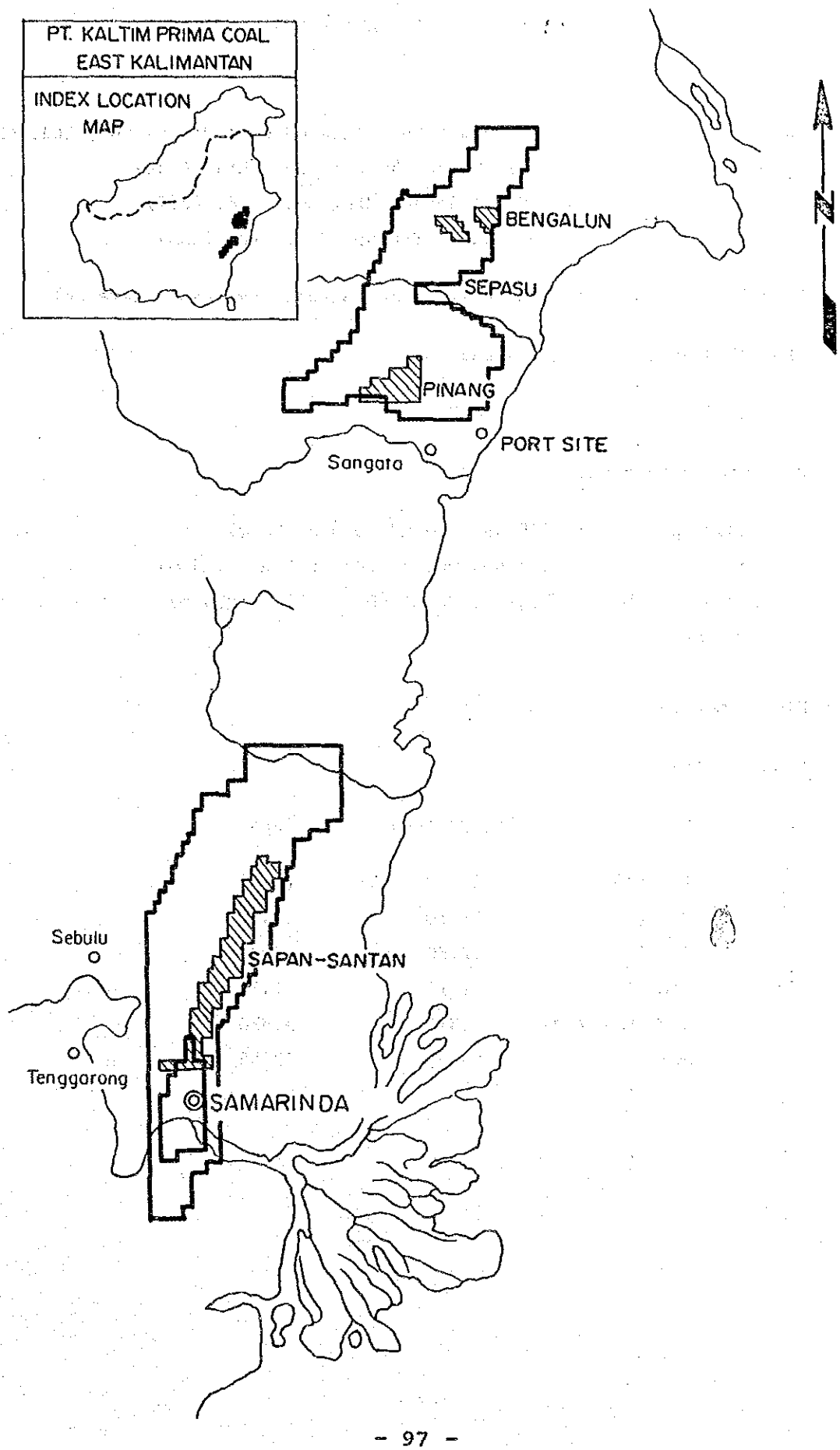
(current condition)

- Facility to load up coal to barges for trial shipment
- Vessel up to 60,000 DWT can be transloaded from barges by using vessel gear

(planning)

- A port capable to accommodate 150,000 DWT vessel will be commissioned end 1991.

	Prima Coal (a seam of Pinang)	Pinang Coal
Total Moisture %	9.5	13.5
Proximate Analysis (ADB)		
Moisture %	5	9
Ash %	4	7
Volatiles %	39	37.5
Fixed Carbon %	52	46.5
Calorific Value Kcal/kg		
Gross as Received	6,750	6,000
Gross Air Dried	7,100	6,300
Net as Received	6,500	5,750
Hardgrove Grindability Index	50	45
Sulphur	0.5	0.4
Chlorine	< 0.01	< 0.01
Phosporus	< 0.004	< 0.004
Ultimate Analysis (daf)		
Carbon	80.5	77.5
Hydrogen	5.7	5.5
Nitrogen	1.6	1.7
Sulphur	0.5	0.4
Oxygen (by diff)	11.7	14.9
Ash Fusion Temperature °C		
(Reducing Temperature)		
Deformation	1,150	1,150
Spherical	1,300	1,210
Hemisphere	1,350	1,310
Flow	1,450	1,350
(Oxidising Temperature)		
Deformation	1,250	1,200
Spherical	1,400	1,250
Hemisphere	1,450	1,350
Flow	1,500	1,400
Ash Analysis %		
SiO_2	51	37
Al_2O_3	31	20
Fe_2O_3	10	16.8
CaO	1.3	8.8
MgO	1.2	5.8
TiO_2	1.0	0.6
Na_2O	1.5	2.8
K_2O	1.8	0.9
Mn_3O_4	0.2	0.05
P_2O_5	0.5	0.5
SO_3	0.5	6.8


PT. KALTIM PRIMA COAL
EAST KALIMANTAN
INDEX LOCATION MAP
BENGALUN
SEPASU
PINANG
PORT SITE
Sangata
Sebulu
SAPAN-SANTAN
Tenggarong
SAMARINDA

P.T. KIDECO JAYA AGUNG

- Owner : - Samchock Consolidated Coal Mining Co., Ltd. (25%)
  - Pan Ocean Shipping Co., Ltd. (25%)
  - Hanil Cement Mfg. Co., Ltd. (25%)
  - Youngsan Transp. Co., Ltd. (25%)

- Location : East Kalimantan (Batusopang, Pasir Regency)

- Project Status : Construction

- Contract Area : 254,804 Ha.

- Recoverable Reserve:

  Samarangau : 339,692,000 MT (Depth 50 m)
  Roto : 117,654,000 MT (Depth 50n - 125 m)
  Susubang, Oku, Biu, Samu : 23,188,000 MT (Depth 125 - 200 m)

- Mining Method : open pit

- Coal Quality :

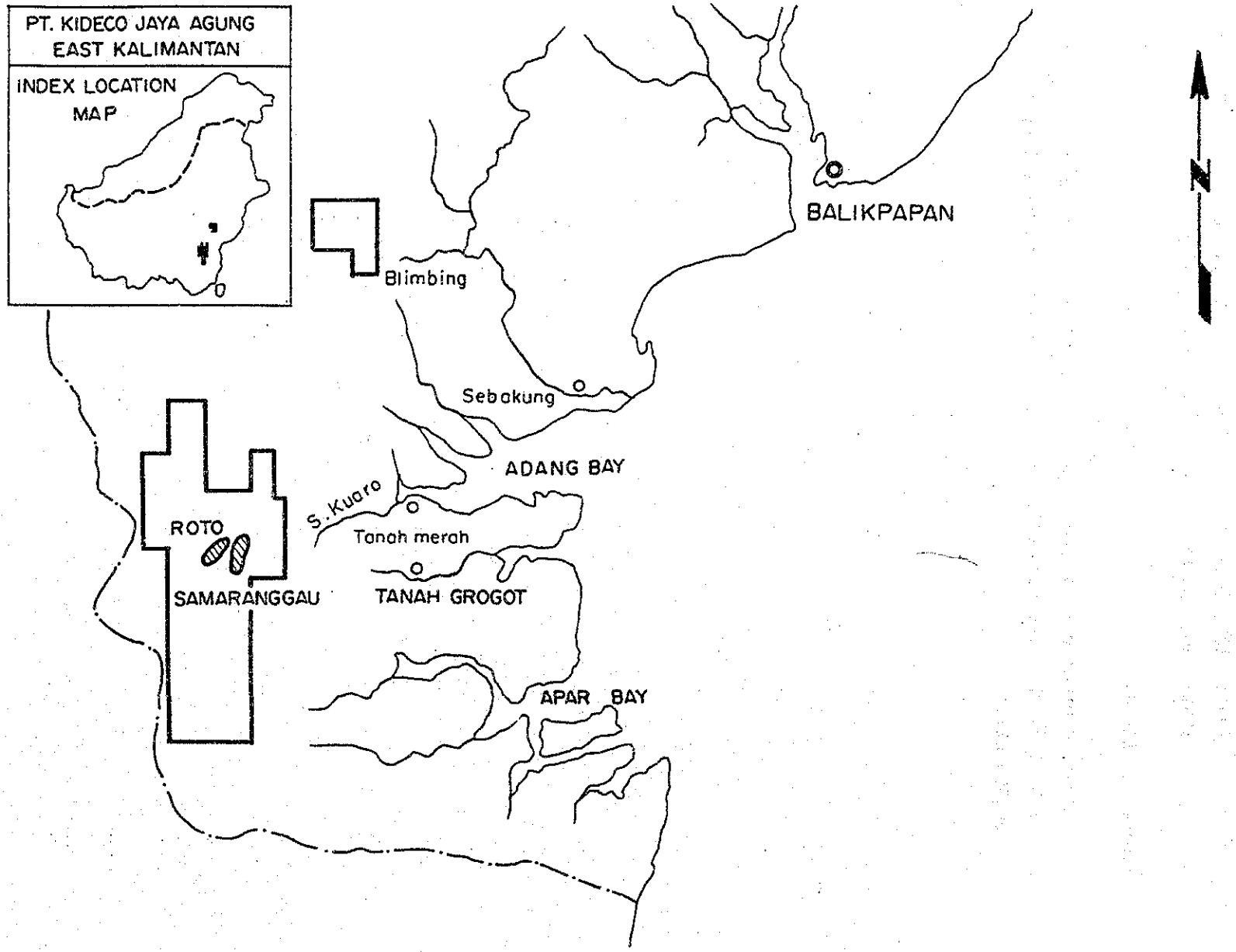
(ADB)	Samaranggau	Roto
IM (%)	22.10	14.40
VM (%)	41.10	42.10
FC (%)	37.70	42.30
Ash (%)	2.10	1.20
C.V (Kcal/kg)	4,910	5,830
HGI	50-55	50-55

- Production Capacity Planning:

1991:	100,000 MT	1993:	1,000,000 MT
1992:	500,000 MT	1994:	2,000,000 MT

- Port Facilities:

A coal terminal will be built on the Kuoro River at Tanah merah, about 41 km from the mine, and will be able to accommodate vessel up to 60,000 DWT.

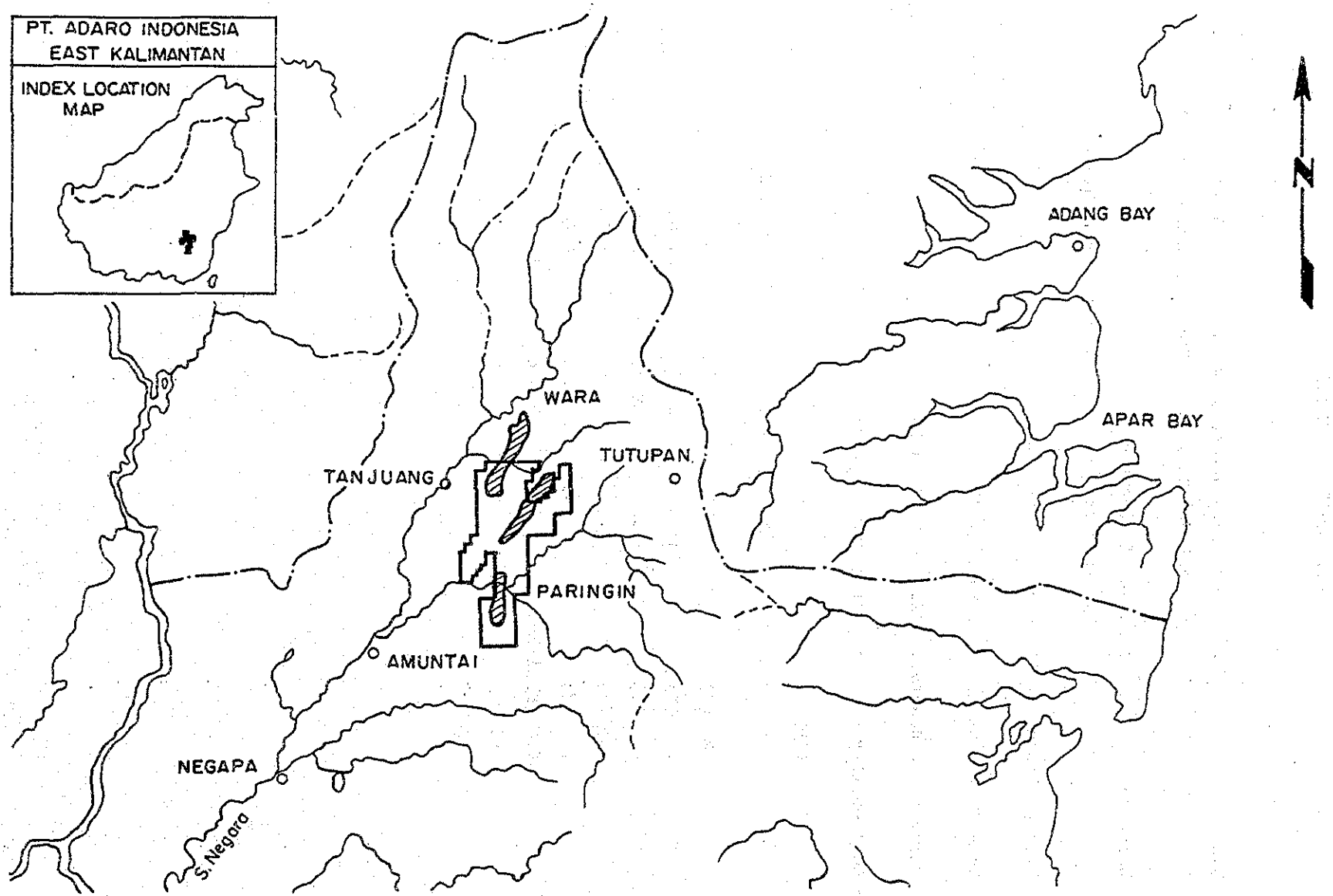

PT. KIDECO JAYA AGUNG
EAST KALIMANTAN
INDEX LOCATION MAP
BALIKPAPAN
Blimbing
Sebakung
ADANG BAY
S. Kuaro
Tanah merah
TANAH GROGOT
ROTO
SAMARANGGAU
APAR BAY
N

P.T. ADARO INDONESIA

- Owner : - Instituto Nacional De Industria (INI)
  - Instituto Geologico Minero De Espana (IGME)
- Location : South Kalimantan
  (Regency of Tabalong and Hulu Sungai Utara)
- Project Status : Feasibiloity Study
- Constract Area : 1,487 Sq. km
- Recoverable Reserve: 225,240 million tons
- Coal Quality : (from the samples)

(ADB)

	WARA I	Tutupan N	Paringin N
IM (%)	25.23	18.62	16.64
VM (%)	37.63	40.71	41.05
FC (%)	35.66	39.50	41.25
Ash (%)	2.66	1.10	1.05
S (%)	0.159	0.08	0.09
C.V (Kcal/kg)	4,844	5,584	5,903
HGI	56	38	14


PT. ADARO INDONESIA
EAST KALIMANTAN
INDEX LOCATION MAP
N
ADANG BAY
APAR BAY
WARA
TUTUPAN
TANJUANG
PARINGIN
AMUNTAI
NEGAPA
S. Negara

P.T. UTAH INDONESIA

- Owner : - BHP Australia
  - Utah Exploration Inc., USA
- Location : East Kalimantan (Pasir Regency)
- Project Status : Construction
- Constract Area : 162,234 Ha. + 92,607 Ha.
- Measured Reserve :

Petanggis	:	33,000,000 ME (Depth 100 m)
Bindu	:	29,000,000 MT (Depth 100 m)
Betitit	:	5,000,000 MT (Depth 100 m)

- Mining Method : to be open pit
- Coal Quality : (Petanggis)

(ADB)

IM (%)	4.4
VM (%)	40.5
FC (%)	43.1
Ash (%)	12.0
S (%)	0.8
C.V (Kcal/kg)	6,700
HGI	40

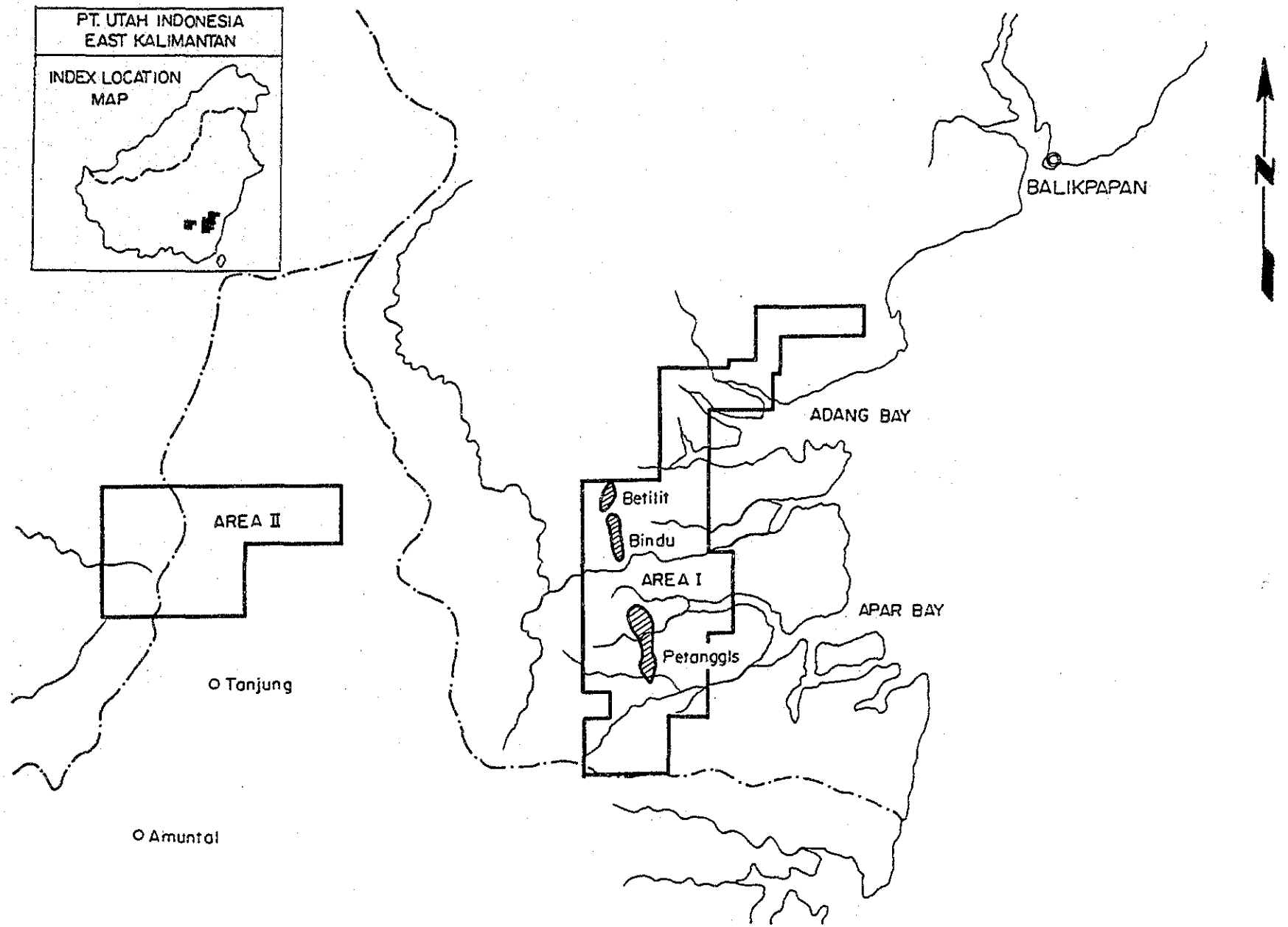
- Production Planning:

Start up: 1990
Capacity: 1,000,000 MT/year

- Coal Transportation and Port:

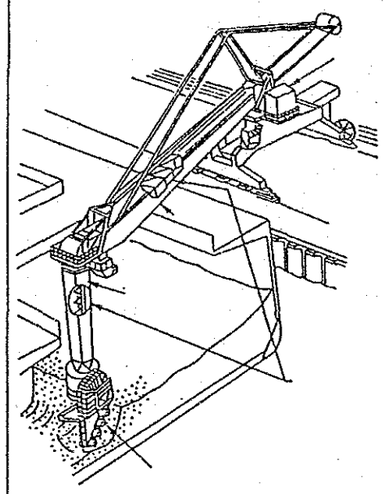
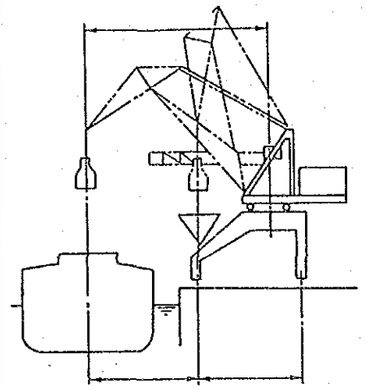
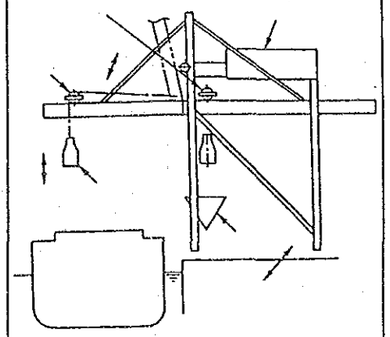
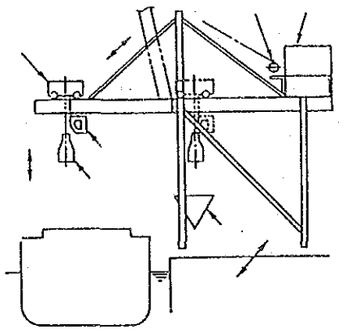
  - A barge loading facility will be built on the Apar River, 14 km from the mine site

  - Coal will be shipped direct to nearby customer in barges on transhipped into vessel of up to 65,000 DWT at loading rate up to 10,000 MT/day


PT. UTAH INDONESIA
EAST KALIMANTAN
INDEX LOCATION MAP
BALIKPAPAN
N
ADANG BAY
Betilit
Bindu
AREA I
AREA II
APAR BAY
Petanggis
Tanjung
Amuntai

(Appendix 6-1)

Comparison of Unloader Types

No.	Items \ Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
1.	Shapes and Functions (Main Movement)				
		. The slewing type small digging element which is attached to the bottom end of colum and pin supported to the forward end of the boom unloads the materials from the ship and the materials is conveyed through the vertical and the boom conveyers to the side hopper and through the conveyer in the machine, and feed to proceeding material handling facilities.	. The grab bucket which is supported by rope from the forward end of the upper frame unloads the materials from the hold of the vessel by opening and closing, winding up and down as well as luffing action, and the materials is first dumped into the hopper of the unloader. The materials is then continuously and quantitatively fed and conveyed by the feeder to the proceeding material-handling facilities.	. The grab bucket which is supported by rope from the main trolley that travels by traverse movement on top of the boom and girder, opens and closes, winds up and down and traverse moves for unloading the materials from the hold of the vessel, and the materials is first unloaded into the hopper of the unloader. The materials is then continuously and quantitatively feeded and conveyed to the proceeding material-handling facilities.	. The grab bucket which is supported by rope from a trolley that traverse travels on top of the boom and girder, opens and closes, winds up and down, and performs traverse movement for unloading the materials from the hold of the vessel. The materials is first fed into the hopper of the unloader, and then continuously and quantitatively fed and conveyed to the proceeding material-handling facilities.

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
1.	Cont'd	. The digging element itself is capable of swinging and slewing action, and the unloading position is performed by the mechanism for swinging, slewing, boom hoisting and travelling that are equipped on the unloader. . The overall dimension is small and the height is low. The center of gravity is also low.	. The drive mechanism for winding, opening and closing, and luffing is equipped in the machine room located on top of the upper frame, and the above mentioned operations are performed by a rope system. . The upper frame can perform slewing, and the unloading position adjust together with travelling of the unloader. . The overall dimension is small and the height is low. The center of gravity is also low.	. The drive mechanism for winding, opening and closing and for traverse movement is equipped in the machine room on top of the girder, and the above operations are performed by rope system. . The overall dimension is large and the height is high. The center of gravity is high.	. The drive mechanism for winding, opening and closing, and traverse movement are installed on top of the trolley, and the above operations are directly performed. The operator's cabin is installed on the trolley so that the operator travels together with the grab bucket. . The overall dimension is large and the height is high. The center of gravity is high. The weight of the man trolley type gantry unloader weighs more than the rope trolley type gantry unloader.
2.	Digging and Unloading Method	. Digging is performed continuously with small buckets, and the materials is carried upward and unloaded. . The digging method employed is the side cutting method that involves traverse movement while rotating the bucket chain for digging the materials. . The effect on the side of the ship by the reaction of digging force is limited.	. The grab bucket is moved to the position where the materials is to be grabbed, and by operating the grab bucket the materials is grabbed and picked up to be unloaded.	Same as left column	Same as left column
3.	Unloading Capacity	. Capability of unloading is from small volume to large volume, and more than 6,000 t/h with ore and more than 3,000 t/h with coal.	. Optimum unloading capacity is for medium and small up to 1,000 t/h with ore and up to 800 t/h with coal. Although luffing type unloaders with larger capacity can be made, the machine weight would generally be heavier than the gantry type unloaders due to the structural characteristics, and there would be little merit.	. Structurally appropriate up to 2,500 t/h with ore and 2,000 t/h with coal.	. Same as left column However, the machine weight is heavier than the rope trolley type gantry unloader, and unloading capacity is upto around 1,000 t/h for practical use.

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
4.	Applicable Vessel Sizes	. The maximum size of the vessel that this unloader can be used is 300,000 DWT. class.	. Good vessel sizes are up to the 50,000 to 60,000 DWT class. . The grab bucket is interchangeable, and this unloader has good adaptability for small size vessels.	. The maximum vessel size is adaptable is 300,000 DWT class. . The grab bucket is interchangeable, and this unloader has good adaptability for small size vessels.	Same as left column
5.	Materials	. This unloader can be adapted for use with almost all types of bulk cargo. . Grain size: Restriction will be by the dimension of the bucket and the pitch of bucket installation. (Example) 250mm for 500t/h class 400mm for 1,200t/h class . Wide variety of materials can be handled with one type of bucket (in some cases washing by water will be required).	. This unloader can be adapted for use with almost all types of bulk cargo. . Grain size: The grain size that can be handled is more flexible than the bucket chain type continuous unloader although this would depend upon the bucket dimension and the grain size distribution. . When handling a another materials, it will be necessary to replace the bucket size.	Same as left column	Same as left column
6.	Unloading Efficiency	0.65 to 0.72 . As the size of the vessel becomes smaller, the range that the digging element can be moved becomes narrower and unloading efficiency decreases. (Example) Unloading efficiency for each vessel size when the design capacity is for a 60,000 DWT coal carrier. Ship Size / Efficiency 60,000 / 0.70 30,000 / 0.60 5,000 / 0.35	0.5 to 0.6 . The unloading efficiency variation due to different sizes of the vessels is relatively small, but when the vessel sizes differ greatly as from 60,000 DWT to 5,000 DWT, it would be necessary to replace the grab bucket with a smaller size, and the decrease in the efficiency will also be significant. Ship Size / Efficiency 60,000 / 0.60 30,000 / 0.50 5,000 / 0.30	0.5 to 0.6 . The unloading efficiency variation due to different sizes of the vessels is relatively small, but when the vessel sizes differ greatly as from 100,000 DWT and 5,000 DWT, it would be necessary to replace the grab bucket with a smaller size, and the decrease in the capacity will also be significant. Ship Size / Efficiency 60,000 / 0.60 30,000 / 0.50 5,000 / 0.30	0.5 to 0.6 . Same as left column Ship Size / Efficiency 60,000 / 0.60 30,000 / 0.50 5,000 / 0.30

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
7.	Timing Use of Triming Bulldozer	<u>After approximately 90% of unloading has been completed per hold</u> . Digging of the materials below the deck can be performed with this unloader. The bulldozer is only required to scrape out from the corners and for gathering up the materials in the cleaning up operation.	<u>After approximately 30% of unloading has been completed per hold</u> . Scraping out the materials from below the deck will be performed entirely by the bulldozer. Also in the hatch coaming, it will be necessary for the bulldozer to level off the surface of the materials after the bucket has grabbed. The dependency upon the bulldozer operation including the cleaning up operation is substantial.	Same as left column	Same as left column
8.	Hold Clean Up	. With the catenary of the bucket chain, almost the materials entire bottom of the ship can be cleaned up without shock. . Assistance of the bulldozer is necessary to clean out the hold corners where the bucket cannot reach and to scrape the materials together during the clean up. . When the hold shape of the ship's bottom is suitably for cleaning up with bucket chain, the cleaning up with the bulldozer will be substantially reduced.	. In the hatch coaming, the bucket is placed at the ship's bottom and the materials is gathered and grabbed. However, the shock of the bucket grabing at ship's bottom is substantial, and the ship's bottom and the bucket will both be greatly damaged. . The bulldozer operation is requisite for the portion below the deck.	Same as left column	Same as left column
9.	Shock Prevention when Unloading the Ship's Bottom	. The materials of ship's bottom is cleaned out by the bucket chain which consist catenary curve, and therefore the shock between bucket against the ship's bottom due to rolling of the ship can be avoided to some extent. Safety device is equipped to absorb shocks that are caused when the ship is rolling greatly and for shocks caused by striking during unloading operation.	. It is necessary to exercise precaution when the grab bucket is crabing and contacting the ship's hold bottom (Relying on the skill of the operator). . There is no contacting of the unloader body against the ship's hold bottom.	Same as left column	Same as left column

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
10.	Operability	. Digging is performed by continuous travelling and by traverse movement at low speed running, and therefore the operation is simple.	. The grab bucket is operated by luffing movement, and therefore skill is required in the operation. . Positioning the grab bucket is somewhat difficult due to considerable stretching and slackening of the rope and the ship swinging as a consequence. . The operator's cabin protrudes out from the upper structural body, and therefore in the case of huge unloaders for use on huge size vessels, it will be difficult to retain adequate range of visibility.	. The traverse movement is fast and therefore, skill is required for the operation of the grab. . Positioning the bucket is somewhat difficult due to considerable stretching and slackening of the rope and the ship swinging as a consequence. . The operator's cabin can move to a position above the hatch, and therefore, the operator's visibility is good.	. The traverse movement is fast, and therefore, skill is required for the operation of the grab bucket. . Positioning the bucket is somewhat difficult due to considerable stretching and slackening of the rope and the ship swinging as a consequence. . The operator's cabin moves to the position above the hatch and the hopper together with the grab bucket, and therefore, the visibility is good. However, the operator is constantly moving during unloading work, and the operator will therefore become physically tired.
11.	Automating Operation	. The operation of this unloader can be readily automated. As grabing can be performed methodically, operation is systematic with little influence by the condition and shape of the materials, and therefore, the automation level that can be introduced is extensive (Semi-automatic operation). In the case of side cutting in particular, the materials in the portion under the deck will also retain the materials shape, and therefore, the range that methodical cutting can be performed is extensive.	. Automating operation is difficult due to being structurally a link mechanism and also due to the grab bucket being supported by long wire rope.	. Automatic operation has been partially put into practical use for this unloader, but automatic operation to a high degree is difficult (Semi-automatic operation). . The level that this operation can be automated would be below the level of automation of the bucket chain type continuous unloader.	Same as left column

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
12.	Operation Safety and Sanitation	. Although performing unloading work together with the bulldozer in the same hull is highly dangerous, the amount of work performed together with the bulldozer in the hold is less than in the case of grab bucket type unloader.	. With this unloader considerable amount of work is performed inside the ship, and the danger involved is working together with the bulldozer and the materials falling out of place. Also the working environment is poor due to dust.	Same as left column	Same as left column
13.	Dust Suppression	. The main dust source is generated from where digging is performed in the hold. Although dust is being continuously generated inside the hatch of the ship, and as the materials is conveyed directly on the unloader conveyer by the sealed boom conveyer, there is almost no dust being scattered to the outside. If a dust suppression device were to be installed, small capacity of that device will be adequate.	. Considerable dust will generate when the materials is being thrown into the hopper. As a large volume of materials that is being handled would be thrown into the hopper at one time, considerable amount of dust would be generated, and the amount of dust to be scattered to the outside would also be substantial and would have great influence. As a dust preventive measure a dust prevention device of a large capacity and a device to catch the materials from dropping and to recover materials that has been dropped from the grab bucket in front of the hopper would be necessary. Even these measures would not be completely effective for prevention of dust.	Same as left column	Same as left column

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
14.	Noise Control	. The main source of noise is the digging machinery, and noise can be abated by providing a noise attenuating cover. . The drive mechanism is a relatively small capacity and the noise level of the drive mechanism is low.	. The main source of noise generation is the driving noise from the machine room and the noise of feeding the hopper with the materials. However, noise control is possible.	. Same as left column . It is difficult to control the noise caused by the traverse movement of the trolley although the noise of the traverse movement of the trolley is not high. . The noise level is high, and the cost for noise control would be somewhat higher than others.	Same as left column
15.	Maintenance	(1) Necessary Maintenance Parts . Bucket . Chain bush, link, pin . Sprocket . Chute lining . Vertical belt parts (2) Ease of Maintenance Work Although there are many parts that require checking in the digging element, the entire digging element is small and the chain is short. Also check and maintenance can be readily performed on the lower ground level. (The one piece bucket chain can be replaced) (3) The lives of the bucket chain and the sprocket are more than 5 years, and can be used for along period of time. (4) There are special maintenance parts that will require some time to obtain, and it is desirable to carry spare parts in stock.	(1) Main Maintenance Parts . Grab bucket . Wire rope . Hopper lining (2) Ease of Maintenance Operation In general, the machine height is low, and the location where the main equipment is install at a low level. Therefore, maintenance can be performed with ease. Also the ropes for winding and opening and closing of the grab bucket can be easily replaced. (3) The life of the winding rope is long. (4) Same as left column	(1) Same as left column (2) Ease of Maintenance Work In general, the machine height is high, and trolley and sheaves have many places that require checking. Checking is somewhat difficult. A crane with a high lift is required, and special maintenance skill is necessary to replace the rope. (3) The winding up rope and the traverse movement rope are bent many times, and therefore, the life of these ropes are short. (4) Same as left column	(1) Same as left column (2) Ease of Maintenance Work The places to be checked are concentrated and checking can be performed with ease. The length of the rope is short in comparison to the rope trolley type gantry unloader, and the rope can be easily replaced. (3) The life of winding up rope is long. (4) Same as left column

No.	Items / Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
16.	Working Records	. Actual working records have been increasing from 200 t/h to 1,500 t/h, and reliability has been confirmed. . Installation of 5 sets of bucket chain type continuous unloaders on the ground has been recorded. . Although this is a new type, the machine is composed of combining existing technologies and there is not technical problem.	. There are records of many machines in operation, and there is no technical difficulties.	Same as left column	Same as left column
17.	Effect on the Capacities of the Facilities Provided for Handling the Materials after the unloaders	As materials is continuously unloaded, the material handling efficiency is higher than the grab bucket type unloader. The capacity of this unloader can therefore be made smaller, and the capacities of the proceeding facilities following the unloader, can be made smaller as the unloading work materials fluctuation (peak rate) is restricted. The cost of facilities can also be reduced (Capacity of facilities following the unloader 1.0 to 1.1).	Unloading is intermittent, and therefore the material handling efficiency is low. In comparison to the bucket chain type continuous unloader, the capacity must necessarily be larger. Also the unloading rate would fluctuate extensively, and the capacity of the facilities following the unloader must be increased. The cost of facilities will also increase (Capacity of facilities following the unloader 1.2 to 1.3).	Same as left column	Same as left column
18.	Weight Ratio	. The weight of the digging element at the forward end of the boom would greatly effect the entire structure. Therefore, the dimension of the digging element has been made compace, and weight of this part has been reduced. The weight of the entire unit has been made lighter as a consequence.	. As the structure of this unloader is a link mechanism, the weight would rapidly increase with the increase in the size of the vessels.	. As the grab bucket is suspended and the trolley traverse travels on top of the boom and the girder, the entire dimension of the structure becomes larger.	. The trolley is large and heavy, and therefore, the machine weight is heavier than the rope trolley type gantry unloader.

No.	Items	Types	Bucket Chain Type Continuous Unloader	Level Luffing Type Unloader	Rope Trolley Type Gantry Unloader	Man Trolley Type Gantry Unloader
19.	Wheel Weight		. The entire weight is the lowest, and the wheel load is also light.	. Although the wheel load is almost the same as the bucket chain type continuous unloader for small size vessels, the wheel load increase up to almost the weight of the gantry type unloader for large size vessels.	. Wheel load is higher than the level luffing type unloader.	. Both the forward end load and the entire load are heavy, and the wheel load is the heaviest.
20.	Capacity of the Motor (700 t/h class)	Total Motor Capacity	. Electric motor is small as the handling rate is continuous and small unloading rate variation. 100	. As the unloading is intermittent a large drive mechanism with an electric motor is necessary. 150	. Same as the level luffing type unloader. 150	. Larger than the rope trolley type gantry unloader by a high unloading rate, because of good visibility of operator. 160
21.	Economical Comparison (700 t/h class)	Facility Cost (including facilities following the unloader)	100	105	110	125
		Power Cost	100	90	90	95
22.	Overall Evaluation		. The bucket chain type continuous unloader excels the grab bucket type unloader in respect to unloading efficiency, level of automatic operation, measures against environmental pollution protection and low cost of facilities following the unloader. Although the grab bucket type unloader has more record of use in the field than the bucket chain type continuous unloader, the record of use in the field and the number of units scheduled to be manufactured for the bucket chain type continuous unloader has been steadily increasing in recent years.	. The record of the number of these unloaders used in the field is large and the technology of these types of unloaders has been established. The weak points of these unloader are their unloading efficiencies, level of automatic operation, measures against environmental pollution protection and high cost of the facilities following the unloader when compared with the continuous type unloader.		

(Appendix 6-2)

Simulation of Coal Handling Facilities

Simulation was implemented to verify optimatization of coal handiling facilities. The program used in the simulation was one developed by EPDC.

1 Condition for Simulation

The condition set for implementation of the simulation were as follows.

1.1 Arrival Distribution Model

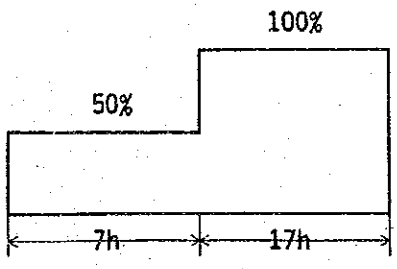
Arrival of coal carriers transporting overseas coal cannot be controlled by users. Since the arrival is known to be subjected to Poisson distribution, this distribution formula was used in the analysis of arrival distribution. although indigenous coal is supposedly controllable, the same model was employed in the related analysis.

1.2 Trial Calculation Condition

i) Plant Operating Condition

Installed Capacity	:	2×300MW
Annual Plant Utilization Factoar	:	70 %
Annual Average Thermal Efficiency	:	36 %
Duration of Annual Inspection	:	40days/ unit
Outage Factor	:	8 %
Minimum Load	:	50 %

ii) Plant Load Pattern



iii) Average Coal Heating Value : 5,262kcal/kg

iv) Annual Coal Consumption : 1,680,000ton

v) Heavy Oil Blending Ratio : 0 %

vi) Number of Berth : 1

vii) Unloader Capacity : 2 ×700 t /h

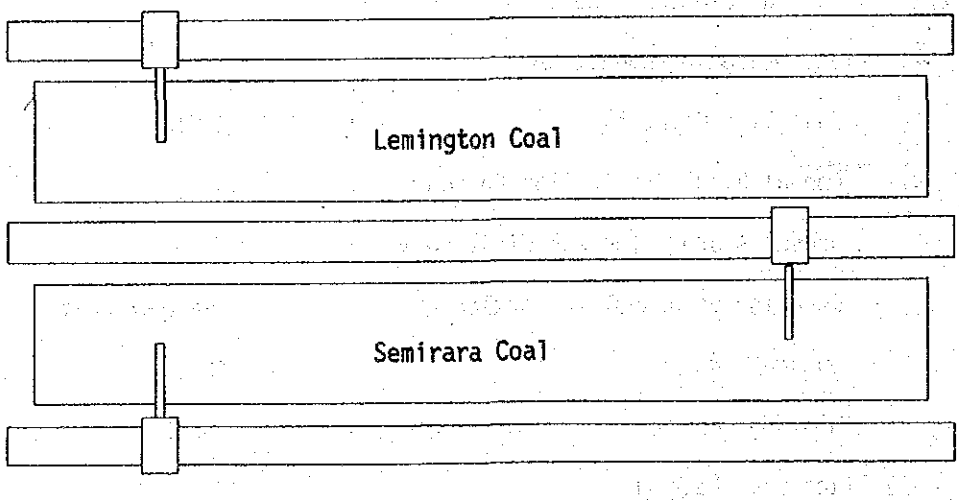
viii) Vessel Size : 60,000 DWT(for overseas coal)
5,000 DWT(for indigenous coal)

1.3 Calculation Condition

Unloader Capacity	Unloading Efficiency	
	60,000DWT	30,000DWT
2 × 700 t/h	66 %	32.5 %

1.4 Stowage Allocation of Coal Souce

The Stowage allocation of coal classified souce shall be shown as below:



1.5 Annual Coal Income and Vessel Size

Source	Annual Income		Vessel Size (DWT)	Annual Arrival of Vessel	Initial Stacking (ton)
	%	ton			
Lemingtion	50	837,000	60,000	14	100,000
Semirara	50	837,000	5,000	168	100,000

1.6 Discharging Source

(1) Blending coal (50/50) is discharged when two reclaimers are on duty.

(2) Only one source is discharged while one reclaimer on duty.

1.7 Annual Inspection of the Plant, Unloader and Reclaimers

	APR.	MAY	JUN	JUL.	AUG,	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.
Unit No.1			40days									
Unit No.2											40days	
Unloader No.1			10days									
Unloader No.2										10days		
Reclaimer No.1			10days									
Reclaimer No.2										10days		

1.8 Downtime of Facilities

Facilities	Annual downtime	Breakdown
Generating Plant	26 days	3 days×12 times
Unloader	4 days	1 days× 4 times
Reclaimer	4 days	1 days× 4 times

1.9 Port Permissible Time and Working Hours of Unloader and Reclaimer

i) Port permissible time 6:00 to 18:00

ii) Working hours of unloader 0:00 to 24:00 (actual 20 hours)

iii) Working hours of reclaimer 8:00 to 22:00 (actual 11 hours)

1.10 Impossible hours of arrival, departure and unloading due to weather are 348 hours.

1.11 Standard Unloading Time with Vessel Size

i) 60,000 DWT : 82 hours

ii) 6,000 DWT : 11 hours

1.12 Arrival Condition

	Berth condition	
	Jetty occupied	Jetty unoccupied
During permitted time	Waiting in berthing basin	On berth
Not during permitted time	Waiting at offshore	Waiting at offshore

The time necessary for port arrival and departure shall be as follows:

◇Arrival (on berth to start of unloading)

60,000DWT : 2 hours

5,000DWT : 1 hours

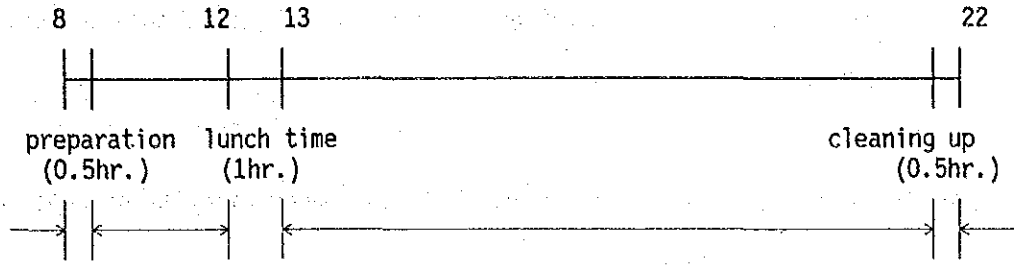
◇Departure(expiration of unloading to out of berth)

60,000DWT : 2 hours

5,000DWT : 1 hours

1.13 Discharging Condition

i) Working Hours



ii) Reclaimer Capacity : 600 t/h

iii) Coal Bunker Capacity: 1,800 t/unit

2. Simulatin Result

(1) The average number of vessel in the berthing basin is 1.0 per day, which means an ideal state.

(2) The storage capacity of overseas coal varies from 270,000ton (maximum) to 120,000ton (minimum), with the range of variation amounting to 150,000tons. Accordingly, the storage capacity of 45 days portion is appropriate so far as overseas coal is concerned.

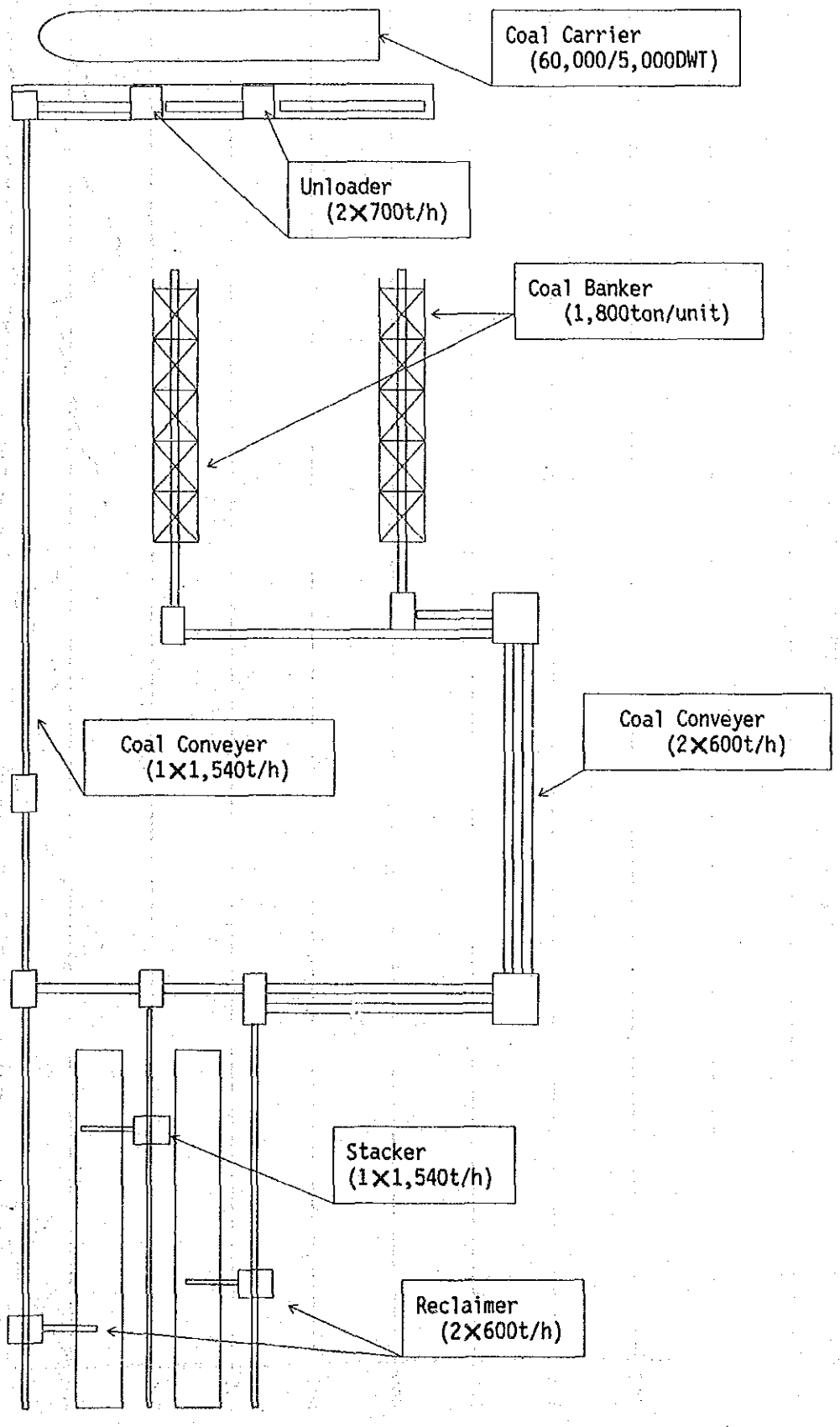
(3) The storage capacity of indigenous coal varies from 120,000ton (maximum) to 80,000ton (minimum), with the range of variation amounting to 40,000tons. Accordingly, the storage capacity of 45 days portion is excessive so far as indigenous coal is concerned.

(4) Since indigenous coal is transported with 5,000DWT vessel, the total number of carriers arriving annually is 168. If simply averaged, it signifies the state in which one vessel on unloading every two days. In other word, the vessel seems like to carries out the role of coal storage yard.

(5) Regarding the indigenous coal, there are some problems to be considered such as spontaneous combustion and dust emission, it is necessary to study limiting the coal storage capacity of indigenous coal to about 50,000tons in the future.

(6) In view of the simulation results, the unloader capacity of 2 × 700t/h is believed to be reasonable.

Fig. 6.2A-1 Schematic Diagram of Coal Handling Systems



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unit 1,000 ton

Fig. 6.2A-2 DURATION OF COAL STORAGE

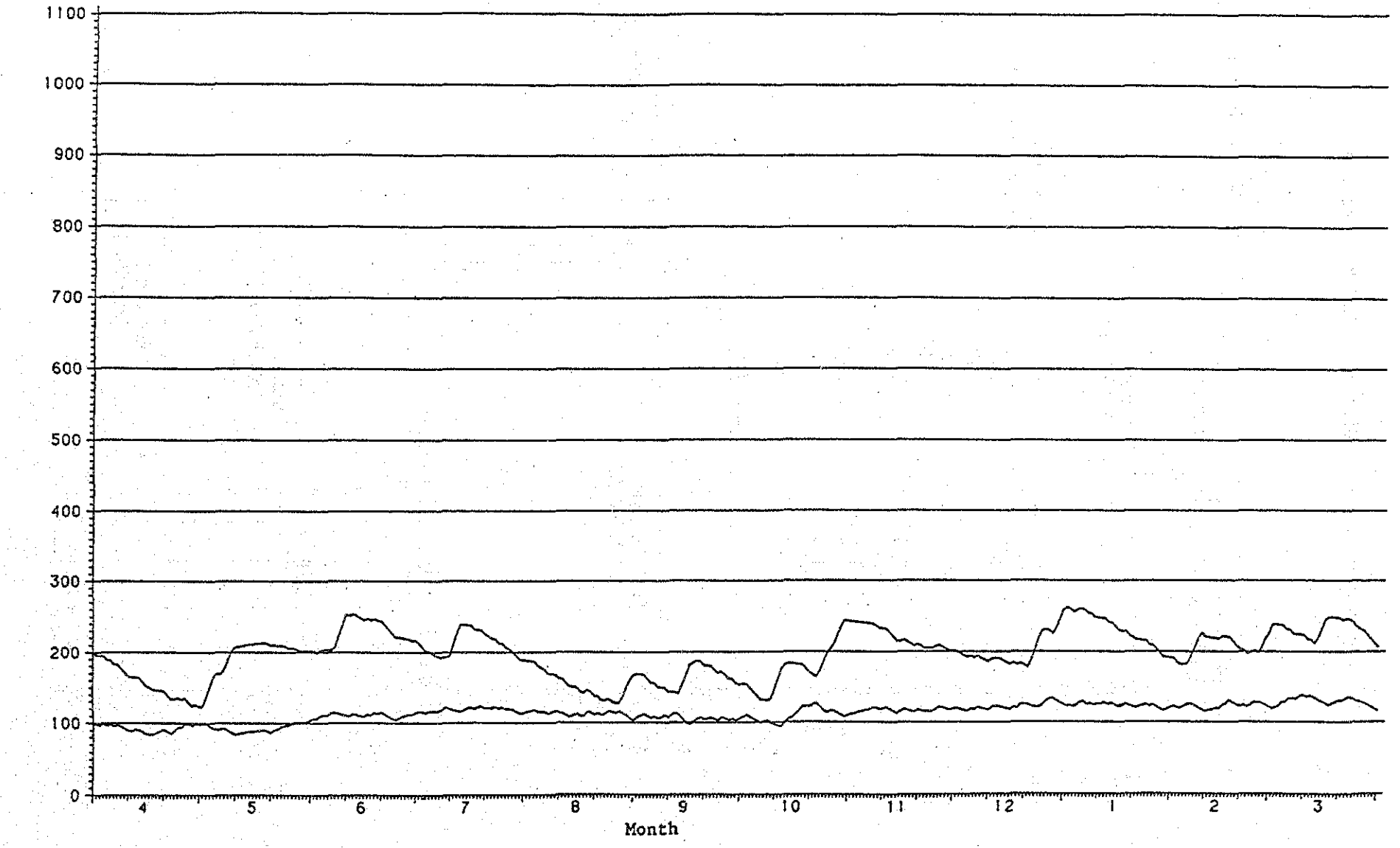

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Fig. 6.2A-3

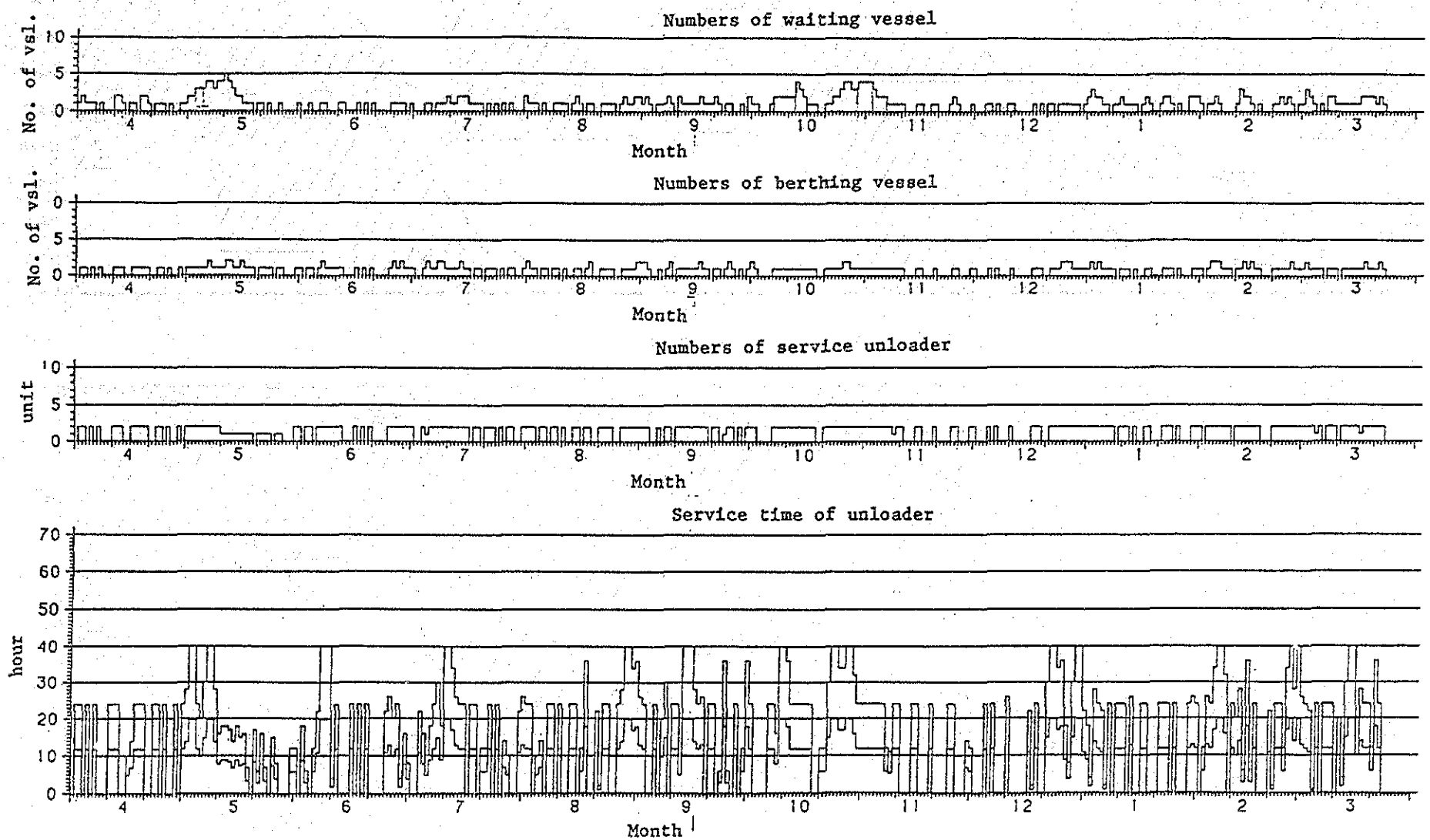

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Fig. 6.2A-4 Duration of stacking at each pile

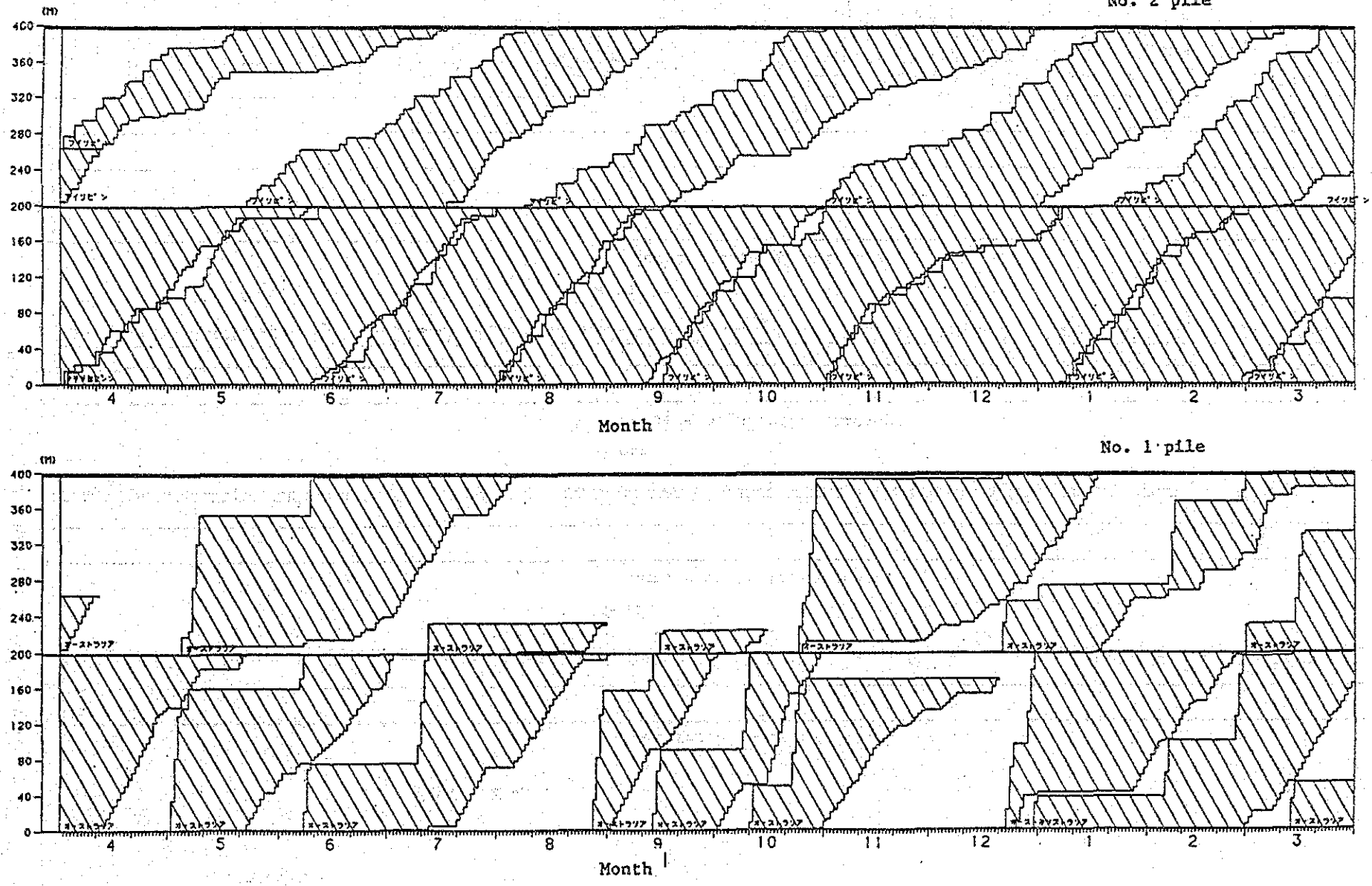

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Fig. 6.2A-5 Distribution of berthing vessels

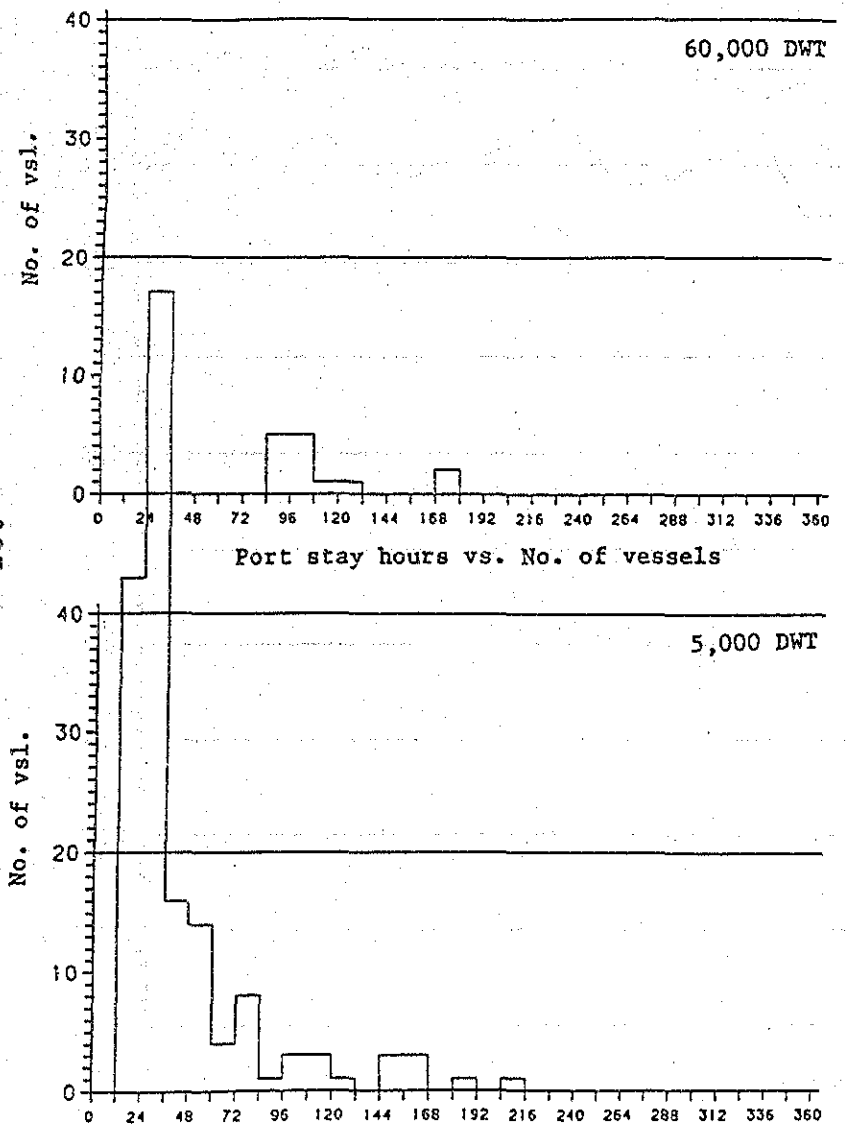

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Fig. 6.2A-6 DURATION OF COAL STORAGE

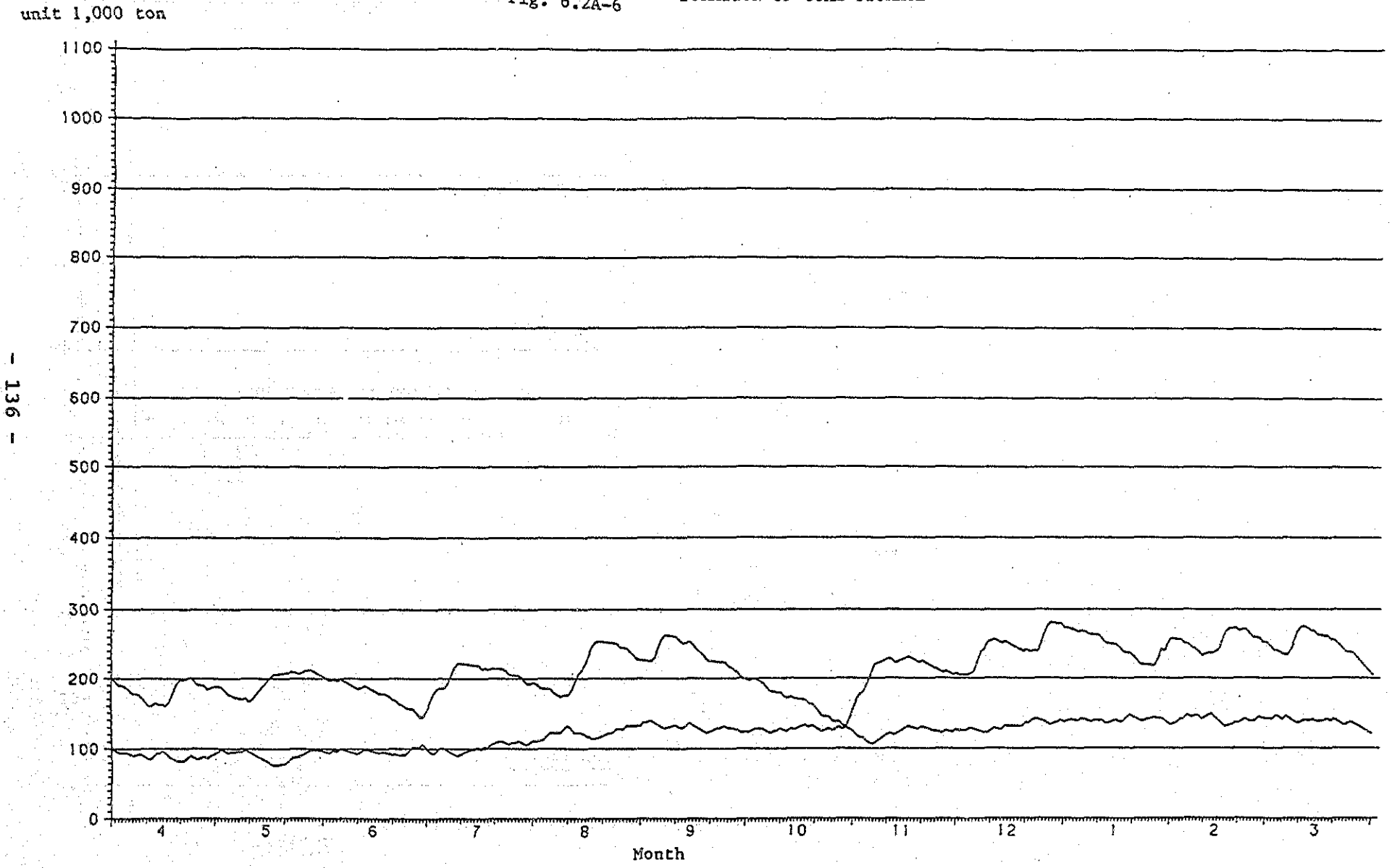

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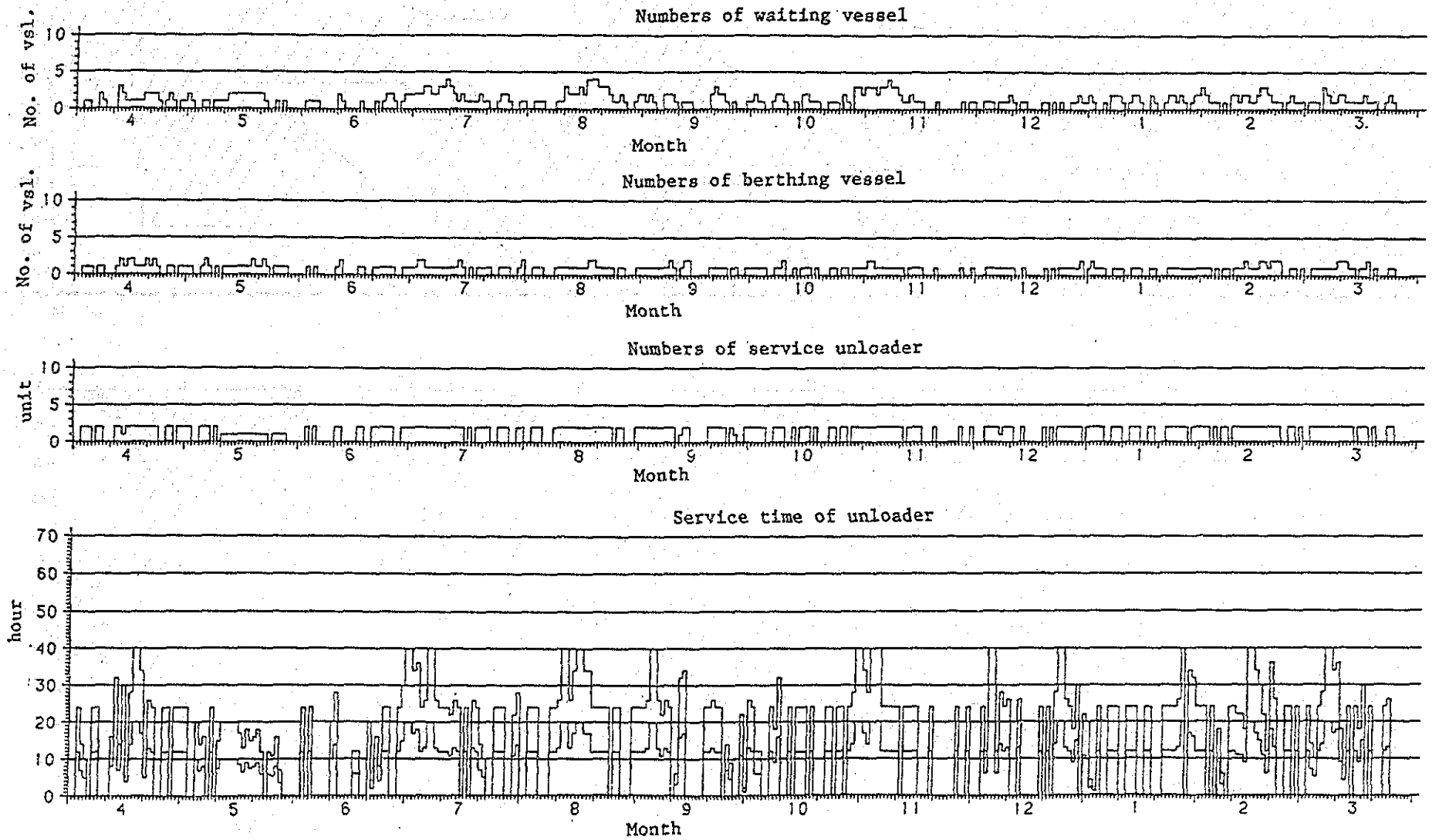
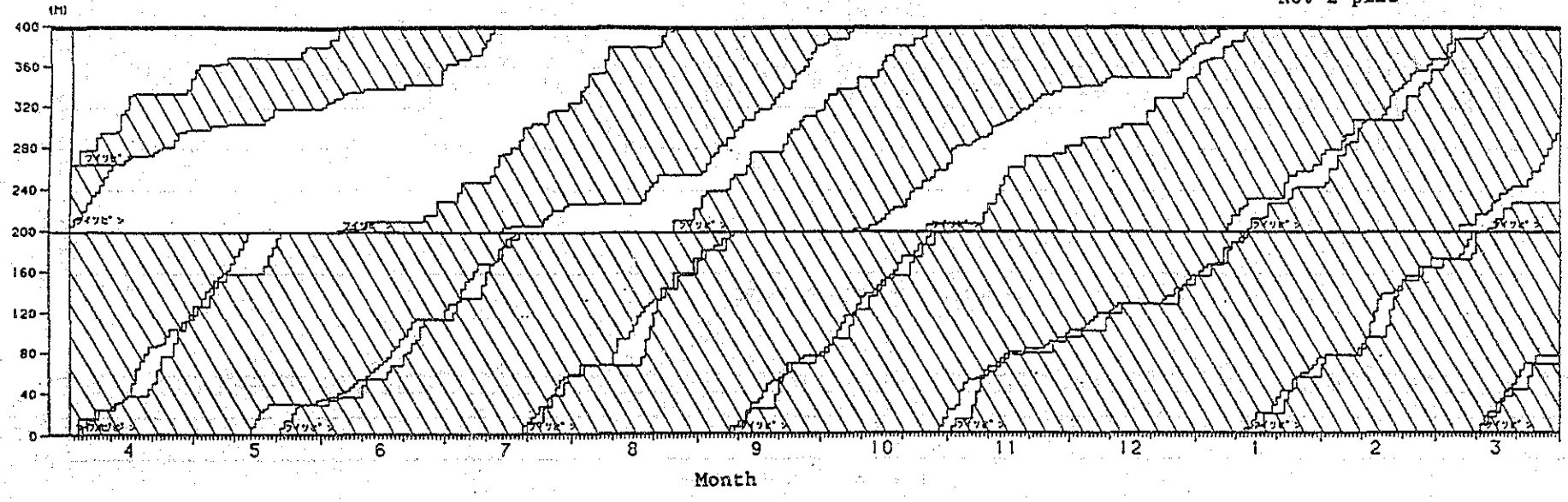
Fig. 6.2A-7



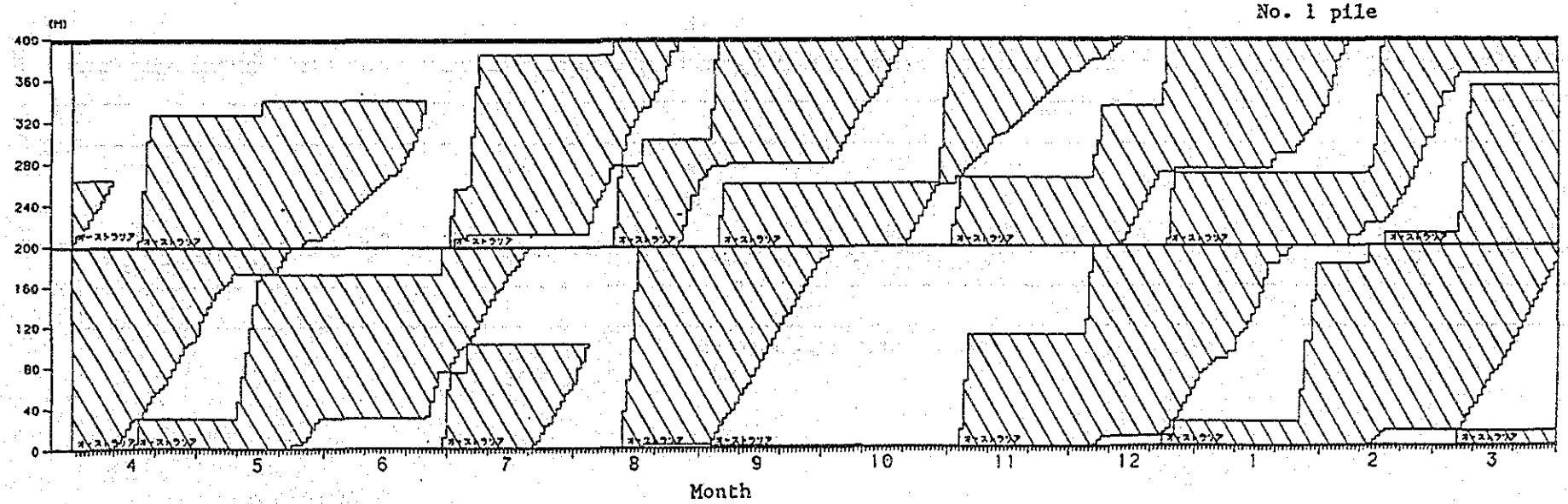
ケースNO22

Fig. 6.2A-8 Duration of stacking at each pile

No. 2 pile



No. 1 pile



ケースNO22

Fig. 6.2A-9 Distribution of berthing vessels