Bureau of Mineral Resources, Geology & Geophysics

R E C O R D

BMR RECORD 1989/42

PRELIMINARY PROPOSAL FOR GEOSCIENTIFIC ASSESSMENT FOR ZONE A OF THE TIMOR SEA ZONE OF COOPERATION

by

P E Williamson and D A Falvey
Division of Marine Geosciences & Petroleum Geology

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Purpose

. To provide for effective cooperative economic management of Area A of the Timor Sea Zone of Cooperation, including:

- an assessment of the overall petroleum exploration potential of the area to enable a rational division of the area into licensed blocks that will promote efficient commercial petroleum exploration

.. the division of the region for gazettal requires a better definition of regional geology and assessment of overall exploration potential (Appendix A) to define the range of petroleum exploration plays for particular regions of Area A.

Method

A modern resource assessment of Area A will require geophysical data (including new seismic reflection data) and geological data from wells. Such an assessment is limited particularly by the lack of modern seismic reflection data in Area A.

Data Collection

The geoscientific assessment of Area A will thus necessarily require a data collection phase and a data analysis phase. This proposal requests a six week seismic cruise by Rig Seismic, in order to collect 3100 kms of modern multichannel seismic reflection data on a 20 km square grid with 260 kms of infull data (Appendix B). The data collection would involve both Indonesian and Australian scientists. It is proposed that the seismic reflection data be collected in first half 1990. It is anticipated that data would be processed within 3 months of data collection. The cost of data acquisition, processing, interpretation and Indonesia/Australia technical cooperation is as indicated in Appendix C and would be met by the Joint Development Authority, or by BMR, with appropriate cost recovery from sale of data and products.

Analysis

Interpretation will commence upon completion of seismic data processing and will be completed in a 4 month period. Analysis of new and any usable old seismic reflection data in Area A would entail analysis of geological data from well control to define stratigraphy, source rock potential, porosity and permeability; interpretation of seismic data in conjunction with well data to construct depth structure maps of six key horizons and define leads for exploration by industry; seismic stratigraphic analysis along key cross sections to define gross changes in lithology; ten geohistory analyses of wells and representative synthetic locations to define timing of subsidence and sedimentation, and of maturation of source-rock intervals in relation to timing of rift phases and development of trapping structures.

The analysis phase would be carried out at BMR and would involve both Indonesian and Australian scientists. The cost of technical cooperation is indicated in Appendix C and should be met by the Joint Development Authority. The results of the analysis could then be used as a basis for division of Area A into individual licence or permit application areas.

Report

A comprehensive draft report on the results of the regional analysis would be produced in one month and would be finalised and drafted for public distribution in a further 3 months to coincide with gazettal of permits.

Product Sale

The data and report could then be sold to assist in project cost recovery as indicated in Appendix D.

Timetable

An indicative timetable for geoscientific assessment is given as Appendix E. Gazettal would be 16 months after agreement to proceed.

APPENDIX A: GEOLOGICAL OVERVIEW

The zone of cooperation is situated near the outer edge of the Bonaparte Basin and extends over parts of several major structural features including the Sahul Ridge, the Malita Graben and the Sahul Syncline. Sediments in the region range from Permian to Neogene in age. Little is known in detail about the petroleum prospectivity of the zone.

About 100 km west of the zone, however, in the Vulcan Sub-basin the Jabiru No 1A well encountered a significant accumulation of oil near the top of the Lower-Middle Jurassic sequence. Minor hydrocarbon indications were observed in the Cretaceous and Triassic sequences. Further west in the Vulcan Sub-basin, the Puffin wells encountered oil in the Upper Cretaceous Bathurst Island Formation, and the Swan wells encountered gas and condensate in the same formation. Regionally, sandstones with petroleum reservoir potential occur in the Upper Permian, Middle-Upper Triassic, Middle-Upper Jurassic and the Upper Cretaceous. These include the Upper Permian Hyland Bay Formation sealed by the overlying thick shales of the Lower Triassic Mount Goodwin Formation, late Middle Jurassic sandstones within the Cretaceous Petrel Formation sealed by overlying shales also in the Petrel Formation, and Upper Jurassic-Lower Cretaceous sandstones within the Petrel Formation sealed by overlying shales of the thick and widespread Bathurst Island Formation, which provides a regional seal for all potential Jurassic accumulations.

The Lower Permian section in the region is moderately rich in organic carbon. Upper Permian sediments deposited in the Petrel Sub-basin and on a large part of the Londonderry High to the west also show good source rock potential, particularly for gas, but probably also for some oil. The source-rock potential of Triassic to Lower Jurassic strata is variable but fairly low overall. The Middle Jurassic to Neocomian sequence in the region encompasses source-rock potential ranging from poor to good. Source rock potential is poor around the margins of the Bonaparte Basin but good source-rock potential is prevalent in the central parts of the grabens, where preservation of large quantities of organic carbon is due to a relatively high rate of sedimentation in the rapidly subsiding Jurassic depocentres. Shales of the Petrel Formation are probably capable of generating both oil and gas. Given suitable source rocks, hydrocarbon generation within the zone would be governed primarily by temperature and duration of burial.

Periods of faulting in the region controlled subsidence and sedimentation, which affected burial and maturity of source rocks. In addition this faulting could have helped to provide structural traps into which hydrocarbons could migrate. In the Late Carboniferous faults associated with rifting formed valleys into which the Late Palaeozoic sediments were deposited. Subsequent rifting and normal faulting in the mid-Late Jurassic were associated with the continental breakup of the northwest shelf of Australia. The collision of the Australian and Asian plates in the Miocene produced compression resulting in normal and reversed faults in the region. These Miocene faults may have been important in providing migration paths for hydrocarbons.

The prospectivity of Area A is dominated by the Kelp structure, a large faulted anticline at the edge of the continental shelf in the north of the region. As yet this structure is poorly defined.

APPENDIX B: SEISMIC ACQUISITION

Vessel: Rig Seismic
Line kilometres: 3360 km
Source: 2100 cu.in. air gun arrays
Shot spacing: 25 m
Shot interval: 9.8s
No. of channels: 240
Near offset: 231m
Far offset: 3219 m
Cable depth: 9 m
Recording fold: 60
Record length: 7 s
Sample rate: 2 ms
Filter settings: 6 Hz lowcut; 128 Hz high cut
Field tape density: 6250 bpi
Tape format: SEG-Y

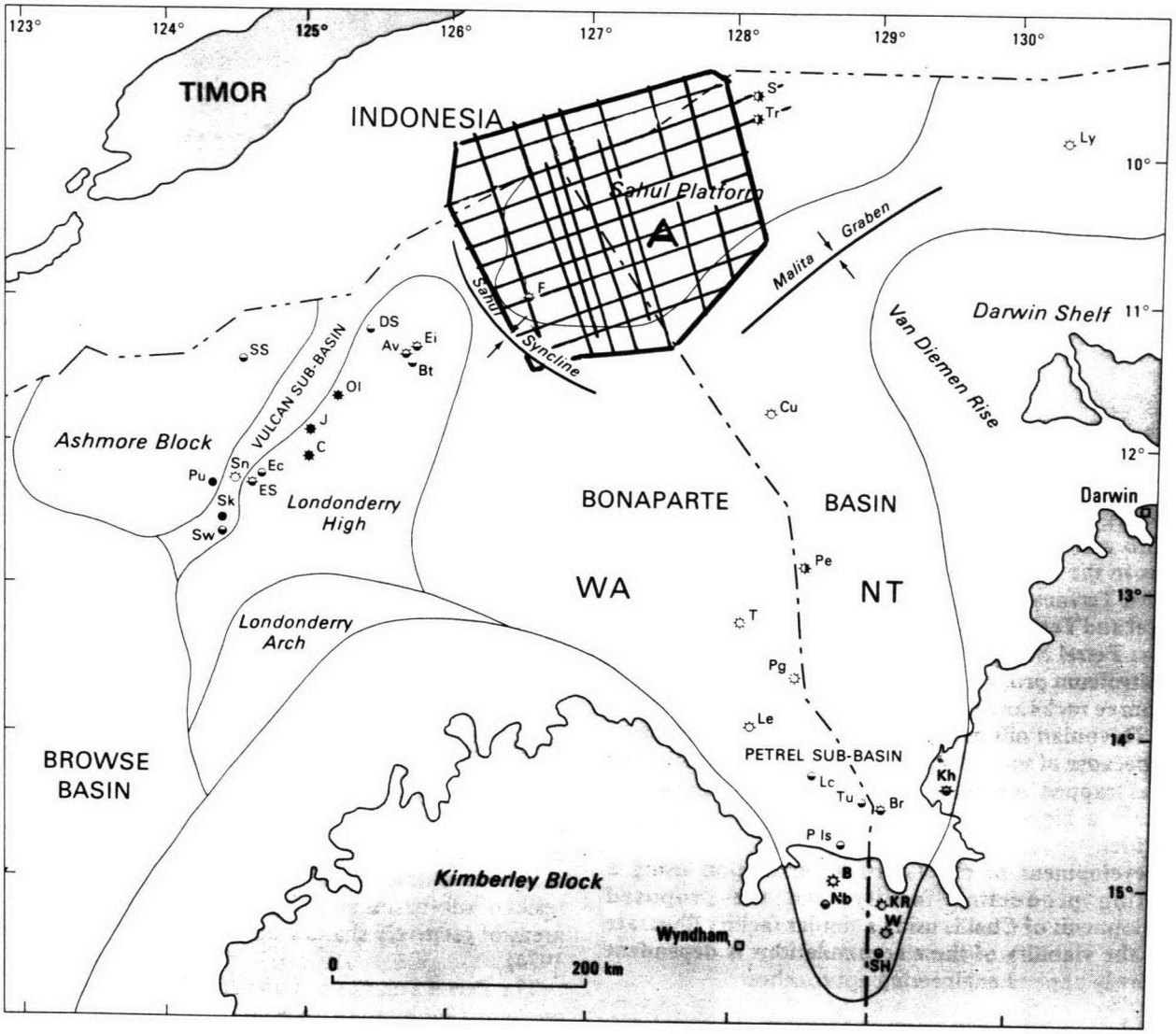


Figure 1. Proposed acquisition of modern seismic reflection data in Area A.

APPENDIX C

INDONESIA-AUSTRALIA COOPERATION

JOINT DEVELOPMENT ZONE - EVALUATION OF BASIN PETROLEUM POTENTIAL PROJECT

DETAILED BUDGET

AUSTRALIAN CONTRIBUTION (AUST $1000'S; 1988-89 BASE)

	1989-90	1990-91	1991-92	COMMENT
PROJECT MANAGEMENT				
. Salaries	23	45	23	Project Manager (Science 4/SRS/PRS).
(ASL)	(0.5)	(1.0)	(0.5)	
. Salary Overheads (22½%)	5	10	5	
. Office Services	8	16	8	
. Admin Travel	20	30	10	Project management and administration.
	56	101	46	
DATA ACQUISITION				
. Salaries	143	36	-	BMR crew of 18 for ops, plus logistics and
(ASL)	(4.0)	(1.0)	(0)	planning.
. Salary Overheads (22½%)	32	8	-	
. AILOT	165	-	-	BMR crew allowance-in-lieu-of-overtime.
. Ship Operations (45 days)	570	-	-	12½% share of annual vessel operational costs, maritime crew, fuel.
. BMR Operations (45 days)	140	70	-	Cost of up to 3360km seismic acquisition, plus travel.
. Operations Support	30	-	-	Helicopter support.
. Navigation Support	140	-	-	Provision of shore based radio navigation chain - AUSLIG.
. Insurance	75	-	-	Against total loss of seismic cable.
. Attributed Capital	-	300	-	Replacement of over-the-side equipment used in survey.
	1295	414	-	
DATA PROCESSING				
. Salaries	18	143	36	Post acquisition processing of seismic and
(ASL)	(0.5)	(4.0)	(1.0)	other data.
. Salary Overheads (22½%)	4	32	8	
. Office Consumables	5	40	20	Cost of magnetic tapes for processing and archiving.
. Computing Operations	-	45	-	Share of processing computer system maintenance cost.
	27	260	64	
DATA INTERPRETATION				
. Salaries	18	143	72	Analysis of data, mapping and resource evaluation.
(ASL)	(0.5)	(4.0)	(2.0)	
. Salary Overheads (22½%)	4	32	16	
. Office Consumables	-	20	15	Copying of data, draft map production.
. Computing Operations	-	30	14	Share of mapping computer system maintenance.
	22	225	117	
PROJECT REPORTING				
. Salaries	-	54	36	Cartographic, drafting, archiving, and
(ASL)	(0)	(1.5)	(1.0)	technical support.
. Salary Overheads (22½%)	-	12	8	
. Office Consumables	-	25	25	Report preparation and printing
. Travel	-	27	48	Promotion of project results, basin prospectivity.
	-	118	117	

INDONESIA-AUSTRALIA COOPERATION
JOINT DEVELOPMENT ZONE - EVALUATION OF BASIN PETROLEUM POTENTIAL PROJECT
DETAILED BUDGET

	1989-90	1990-91	1991-92	COMMENT
TECHNICAL COOPERATION				
(for GOI staff)				
Salaries	-	-	-	Nil BMR cost; all on-the-job training
(ASL)	(0)	(0)	(0)	provided during all phases of project implementation.
. Salary Overheads (22½%)	-	-	-	
. Courses and Conferences	-	3	3	Conference participation of GOI staff in training.
. Travel	10	60	40	Travel, T/A for GOI staff in training in Australia.
	10	63	43	
PROJECT TOTAL	1410	1181	387	AUSTRALIAN TOTAL $2 978 000

APPENDIX D: SALE OF PRODUCTS

It is proposed that, in lieu of direct funding of this project by the Joint Development Authority, BMR will market seismic data and products to affray seismic acquisition, processing, analysis and reporting costs. After full costs have been met, further marketing by BMR and the Joint Development Authority would involve revenue retention by the JDA.

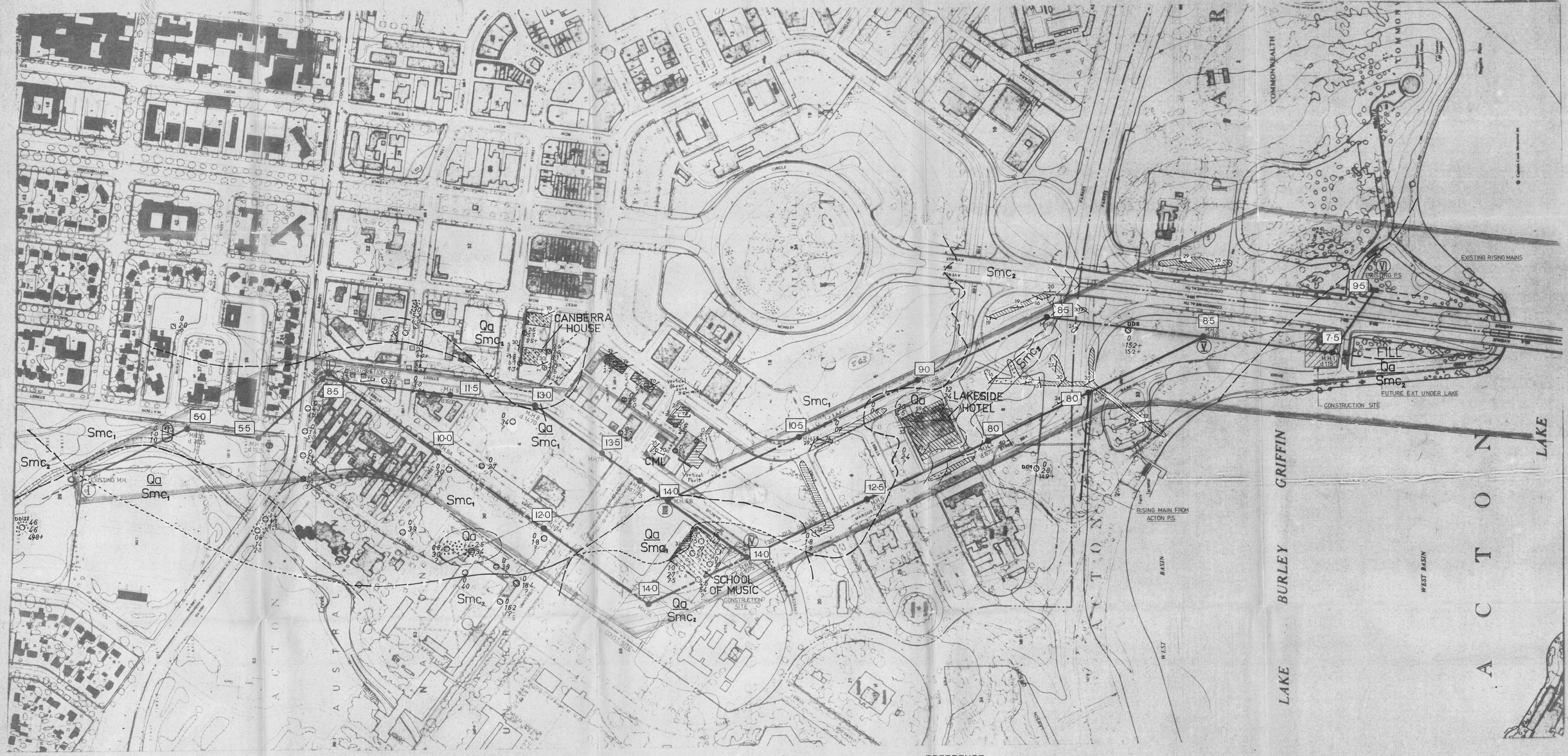
All data remains property of the JDA, with a reference copy held by BMR.

Sale of film copies of seismic reflection data (processed at BMR processing centre) by line	$ 90/km
- 25% discount on whole survey purchase, plus	
- 25% discount on price of second and subsequent copies of data to members of joint venture, or study groups, or	
- 70% discount on price of second and subsequent copies of data to parent/subsidiary companies	
Sale of stack tapes of processed data	$ 90/km
- plus $80 per tape for copying	
- discounts apply, as above	
Field tapes	$ 60/km
- plus $80 per tape for copying	
- discounts apply, as above	
Navigation tape (shot point locations)	$ 300
Geophysical parameters (Navigation/minute data, water depth, gravity and magnetics)	$ 500
Report	$10 000

APPENDIX E: TIMETABLE FOR GEOSCIENTIFIC ASSESSMENT

Agreement to proceed to beginning of Rig Seismic Cruise	2.5 months
Seismic data collection	1.5 months
Seismic data processing	3 months
Data analysis	4 months
Preparation of report	1 month
Drafting and finalising report for public distribution	4 months
Time from agreement to gazettal	16 months

PLATE 1



TN MN

OPTION 1 ROUTE I - II - III - IV - V - VI

OPTION 2 ROUTE I - II - IV - V - VI

OPTION 3 ROUTE I - II - III - V - VI

PLAN SHOWING GEOLOGICAL DATA NEAR PIPELINE ROUTES

REFERENCE

- Qa — Alluvium - gravel, sand and clay
- Smc_1 — Mudstone, shale - shallow weathered
- Smc_2 — Shale, mudstone, siltstone & minor sandstone - deeply weathered
- Smc_3 — Coarse tuff - deeply weathered
- Geological boundary, position accurate
- Geological boundary, position approximate
- Dip and str. of bedding
- Dip and strike of cleavage
- Excavation
- Drill hole
- DDB — Diamond drill hole
- 06 / 14 / 55 — Profile from drill hole or excavation showing depth of alluvium (0·6), depth to base of highly weathered rock (1·4), and depth to slightly weathered rock (5·5).
- 80 — Depth to invert at manhole

CAMP SCOTT FURPHY PTY. LTD.
CONSULTING ENGINEERS
390 ST. KILDA ROAD, MELBOURNE, VICTORIA 3004
TELEPHONE (03) 267 2800
AND AT CANBERRA, SYDNEY, PERTH, HOBART AND LAUNCESTON

SCOTT & FURPHY CONSULTING GROUP

SCALE: 1:2500
PROJECT MANAGER
DESIGN T.C.C.
DRAWN C.L.
APPROVED DATE

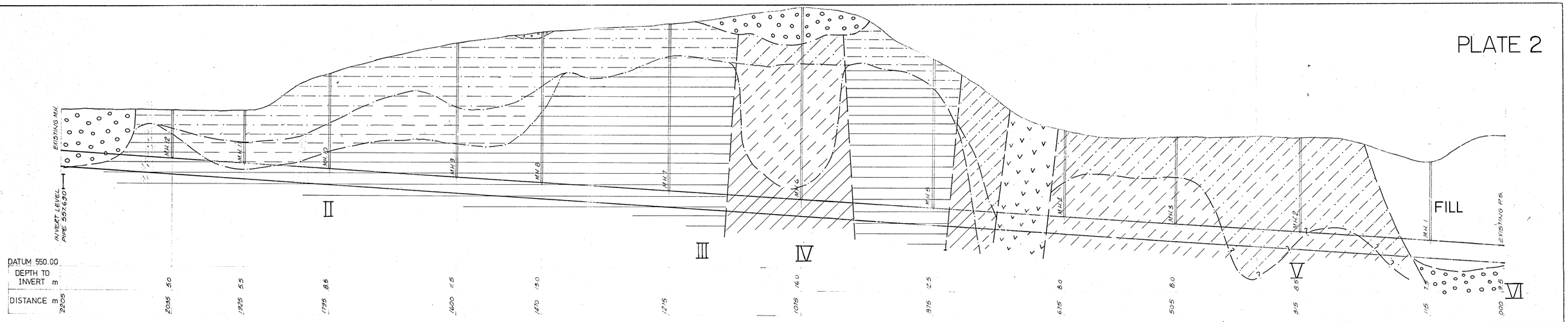
NATIONAL CAPITAL DEVELOPMENT COMMISSION

SULLIVAN'S CREEK TO C.A.P.S. SEWER AUGMENTATION
PRELIMINARY PLAN

DRAWING No. 5272-1
I55/A16/2022

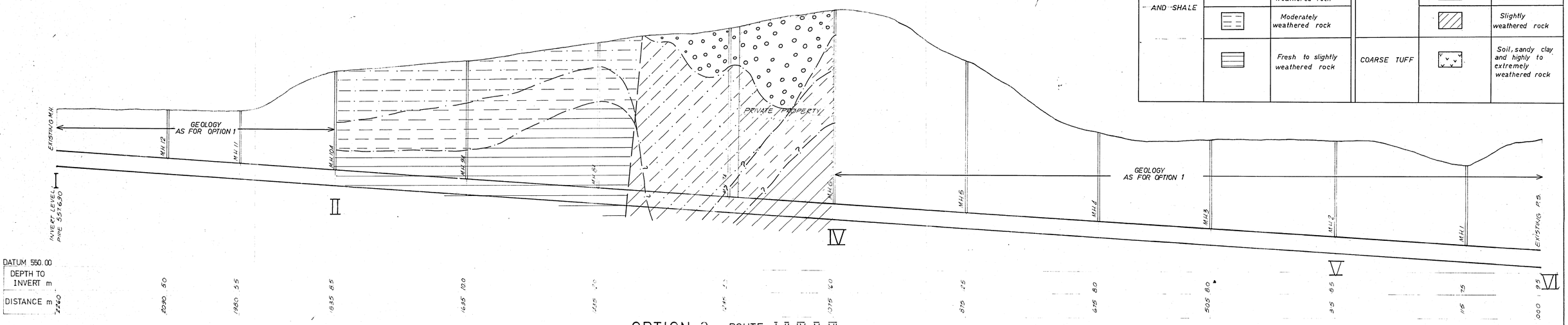
Record 1978/24

PLATE 2

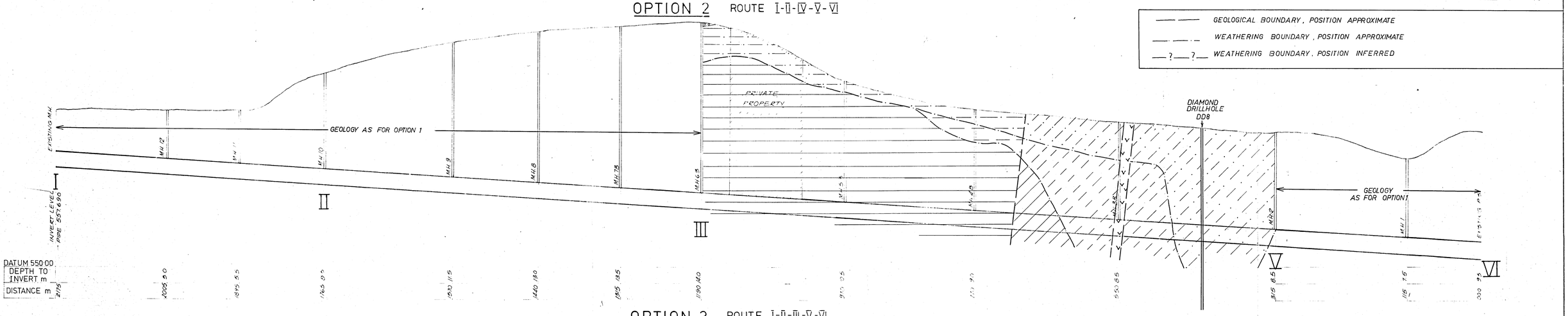


OPTION 1 ROUTE I-II-III-IV-V-VI

ALLUVIUM		Gravel, sand and clay	SHALE, MUDSTONE, SILTSTONE AND MINOR SANDSTONE		Soil, clay and highly to extremely weathered rock
MUDSTONE AND SHALE		Soil, clay and highly to extremely weathered rock			Moderately weathered rock
		Moderately weathered rock			Slightly weathered rock
		Fresh to slightly weathered rock	COARSE TUFF		Soil, sandy clay and highly to extremely weathered rock



OPTION 2 ROUTE I-II-IV-V-VI



OPTION 3 ROUTE I-II-III-V-VI

GEOLOGICAL BOUNDARY, POSITION APPROXIMATE

WEATHERING BOUNDARY, POSITION APPROXIMATE

WEATHERING BOUNDARY, POSITION INFERRED

GEOLOGICAL SECTIONS

SCOTT & FURPHY
CONSULTING ENGINEERS
ARGUS BUILDING
290 LA TROBE ST MELBOURNE VIC. 3000
AND AT CANBERRA HOBART AND LAUNCESTON

NATIONAL CAPITAL DEVELOPMENT COMMISSION

SULLIVAN'S CREEK TO C.A.P.S. SEWER AUGMENTATION
PRELIMINARY LONGITUDINAL SECTIONS

SCALES 1:125 VERT. 1:2500 HORIZ

DESIGN	T.C.G.		APPROVED
DRAWN	C.L.		
TRACED			DATE

DRAWING No 5272-2

I55/A16/2023

REVISION	DESCRIPTION	DATE

ORIENTATION

Record 1978/24