

MINERAL RESOURCE ASSESSMENT OF THE WESTERN HARDWOODS REGION, CENTRAL-SOUTHERN QUEENSLAND

A report prepared by the Queensland Department of Natural Resources and Mines,
as part of a Statewide Forest Planning Process

MINERAL RESOURCE ASSESSMENT OF THE WESTERN HARDWOODS REGION, CENTRAL-SOUTHERN QUEENSLAND

This report compiles information on the mineral resources within the Western Hardwoods Region, central-southern Queensland, including: currently operating mines, known resources, abandoned mines, mineral occurrences, and undiscovered mineral resources.

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1/8/2002

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INTRODUCTION

This report provides an assessment of the mineral resources of the Western Hardwoods Region (WHR) to help consider alternative uses of the land. In this instance crown land currently classified as State Forest or Timber Reserve is being considered for transfer to Conservation Park status. The implication of this in terms of exploration and mining is that, whilst activities involving machinery can be undertaken in State Forests, Timber Reserves and Forest Reserves following consultation with the relevant administering authority and undertaking conditions deemed necessary, in Conservation Parks and similar environmentally sensitive areas (categories A and B) mining/exploration activities would be totally excluded (refer Schedule 1A of the Environmental Protection Regulation 1998).

A decision process that has the potential to exclude exploration/mining development projects needs to recognise that the continued generation of new mineral resource projects is of vital importance to Queensland, and that the discovery of future mineral deposits requires access to prospective land and prolonged periods of intensive investigation by exploration companies. ***The issue of sustainable mineral wealth generation provides the focus for the following report.*** Other areas of government policy that would be adversely affected by the exclusion of exploration and mining include the creation of jobs and support for regional communities. Mining is recognised as important to many regional centres, providing much needed boosts to local economies, further opportunities for employment and, in the case of the gemfields, tourism.

The following facts are significant in the discussion:

- 1) It will not be possible to maintain present levels of production from Queensland's major base and precious metal mines in the medium to long term, with current base metal operations expected to close or near the end of their economic life before 2015.
- 2) In 2001, the State's two main gold producers, Kidston and Mount Leyshon closed, significantly reducing future gold production despite expansion and development of existing operations elsewhere and potential projects such as Cracow.
- 3) Small to medium scale base metal and gold projects currently under appraisal will contribute to the State's wealth in the medium term.

Because of the probability that the majority of mineral deposits exposed at the surface have already been discovered in Queensland, a concern of this study has been the possible occurrence of mineralised systems under cover and at depth. Therefore the focus of this report has been on identifying what types of mineral deposits may occur in the area and where they are likely to occur. Specific locations of undiscovered/potential resources are not identified, but general regions where deposits could occur are defined and described using the terms 'High', 'Medium', 'Low' potential or gradations such as 'Medium-High'.

In order to construct the boundaries of these areas, a number of data types were integrated: geological maps, geophysical data, and mineral occurrence data.

Geological maps are the foundation of the analysis, simply because they represent geology that is exposed and therefore best known. These maps are used to delineate areas that may contain particular deposit models as inferred by analogy with deposits in the same or similar geological settings elsewhere. An issue that arose in the assessment has been the need to use

data sets that varied in age and scale, and in some instances simply did not exist (for example an interpretation of geology under recent cover in the Drummond Basin). This has meant that in some instances broad groupings of rock units have had to be used to ensure the inclusion of all prospective units, and that remotely sensed data has been used to interpret the geology hidden under cover. Inconsistencies across map junctions have affected the effectiveness of the analysis. Problems of using geological data of variable quality are apparent in the figures produced for this report where, for example, map boundaries are clearly indicated by abrupt and artificial terminations of some rock units. A similar issue arose with the need to stitch together geophysical datasets of varying resolution. Geophysical magnetic data are used in the analysis to identify the distribution of near surface magnetic sources in order to delineate shallowly buried magnetic rocks – typically volcanic rocks and unexposed intrusive bodies. This additional information is particularly important for the mineral resource analysis in that numerous types of mineral deposits could be associated with possible volcanic and intrusive rocks hidden under cover. Knowledge of where these rocks occur is therefore critical in identifying where particular styles of mineralisation could exist. Geophysical data are also used to interpret structural features that can localise mineralisation. Mineral occurrence data on the types of mineral deposits and occurrences within the WHR confirms that the region is prospective for the same deposit types, and also suggest the possibility of genetically related deposit types.

All geological data used in the analysis are listed in Appendix 1. A series of GIS projects have been compiled for the assessment process and will be provided with the report (including primary datasets: exploration and mining lease tenure, geology, mineral occurrences, geophysics, forested crown land and infrastructure; and derivative analyses).

The link between these diverse information sets is the mineral deposit model. Deposit models form the link because: (1) they describe the different environments (rock types etc) in which specific types of mineralisation can be expected, and (2) they form the basis of exploration rationale.

To identify what deposit models are relevant to the WHR two approaches were used. Firstly a listing of exploration models used by companies and their target rock units was constructed from exploration permit applications (Appendix 2). The geological settings in the WHR were then assessed to determine if there were any other deposit types that could occur in the area but were not being considered by industry (reference – Cox and Singer, 1986: USGS Bulletin 1693). Figures 2-20 in the text highlight regions where rock types are compatible with specific deposit models.

This report is organised on a commodity basis – petroleum, industrial minerals, metallic minerals, and others (gemstones and lateritic bauxite). For each commodity, an overview provides a general discussion of the significance of the commodity to Queensland, including current uses and markets as well as recent developments that are significant to production, for example the introduction of new technology. Following this is a discussion of the WHR identifying: (1) operating mines and new projects being developed; (2) past mining activity and mineral occurrences; (3) areas currently deemed to be prospective based on company activity; and (4) in the case of metalliferous commodities, the exploration models currently being applied. These data form the basic input to the assessment of prospectivity. Criteria used to define and rank areas as ‘High’, ‘Medium’, or ‘Low’ prospectivity are defined in the text. The results of this analysis are then considered in terms of the specific areas of interest within the WHR - forested crown land (Figure 1) - and recommendations have been made.

A qualitative approach to the assessment of mineral resources in the WHR has been taken because of the constraints of a short time frame and limited resources. It is recognised that such an approach is far from comprehensive and fails to fully convey geoscientific knowledge of the region.

To provide some economic framework for areas identified as likely to have undiscovered metallic mineral resources, frequency distributions of tonnages and average grades of well-explored deposits of each type from around the world are

provided in Appendix 3. Grade and tonnage models have been included only for deposit types that are assessed as having the potential to occur within forested areas. These models give an indication of the possible grades and tonnages that could occur should a discovery be made and thus provide the connection between deposit models and economics. It needs to be recognised that these grade and tonnage models have not been adjusted to better suit local characteristics and that they serve merely as a preliminary guide.

ACKNOWLEDGEMENTS

A number of officers in the Department of Natural Resources and Mines contributed to this report: J. Draper – petroleum; J. Smart – metallic and industrial mines/projects; D. Coffey – coal; L.Cranfield, T.Denaro, P.Donchak, L.Hutton, I.Withnall – geology/mineral occurrence; C.Carniel, E.Abbott, J.Mannix – statistics of mine production and royalties; T.Moore and L.Blight – cartographic support; R.Huber – geophysics; Dr C. Murray , P.Burrows – editorial.

Figure 1: Locality Plan - Western Hardwoods Region (WHR)

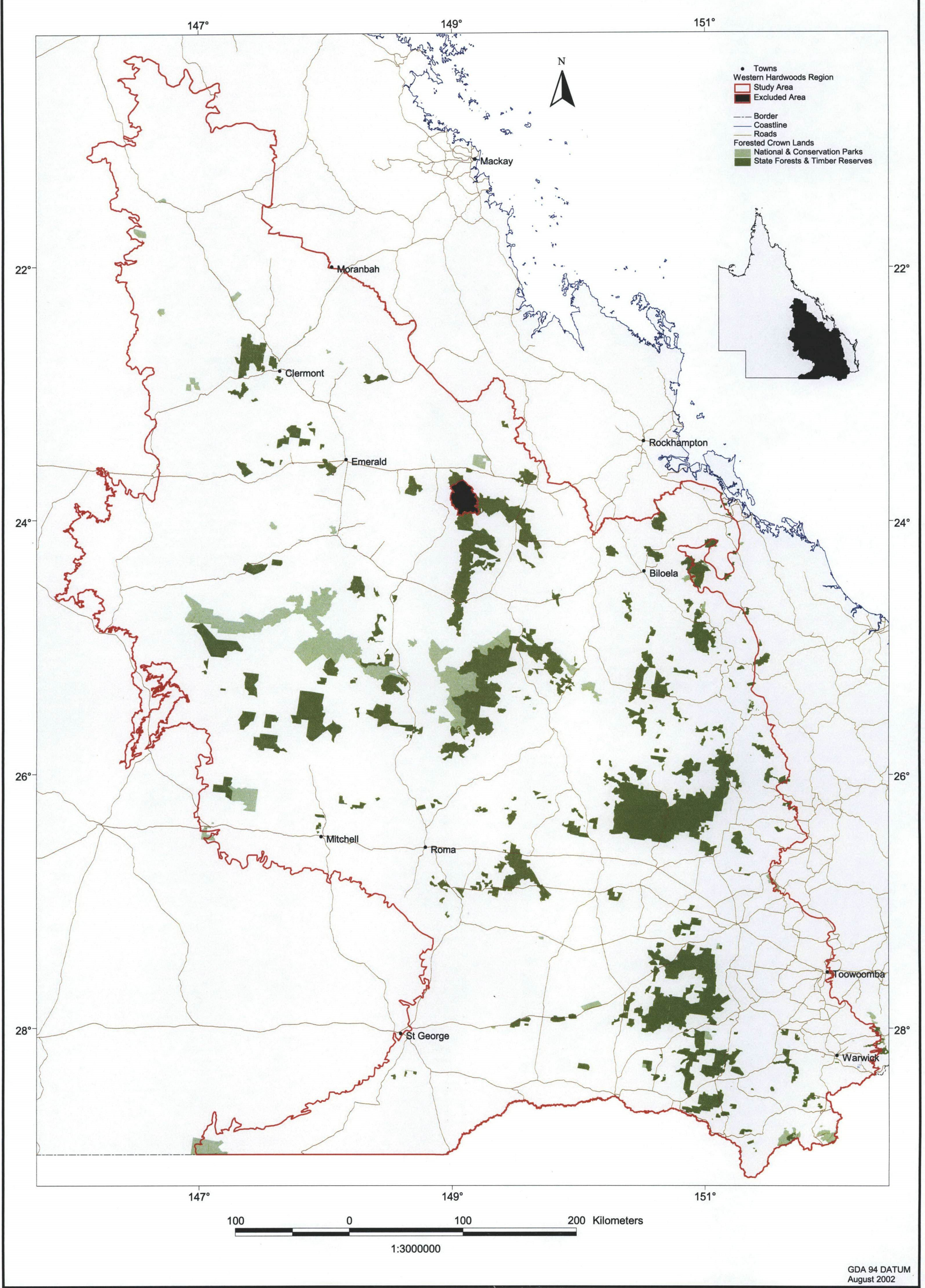
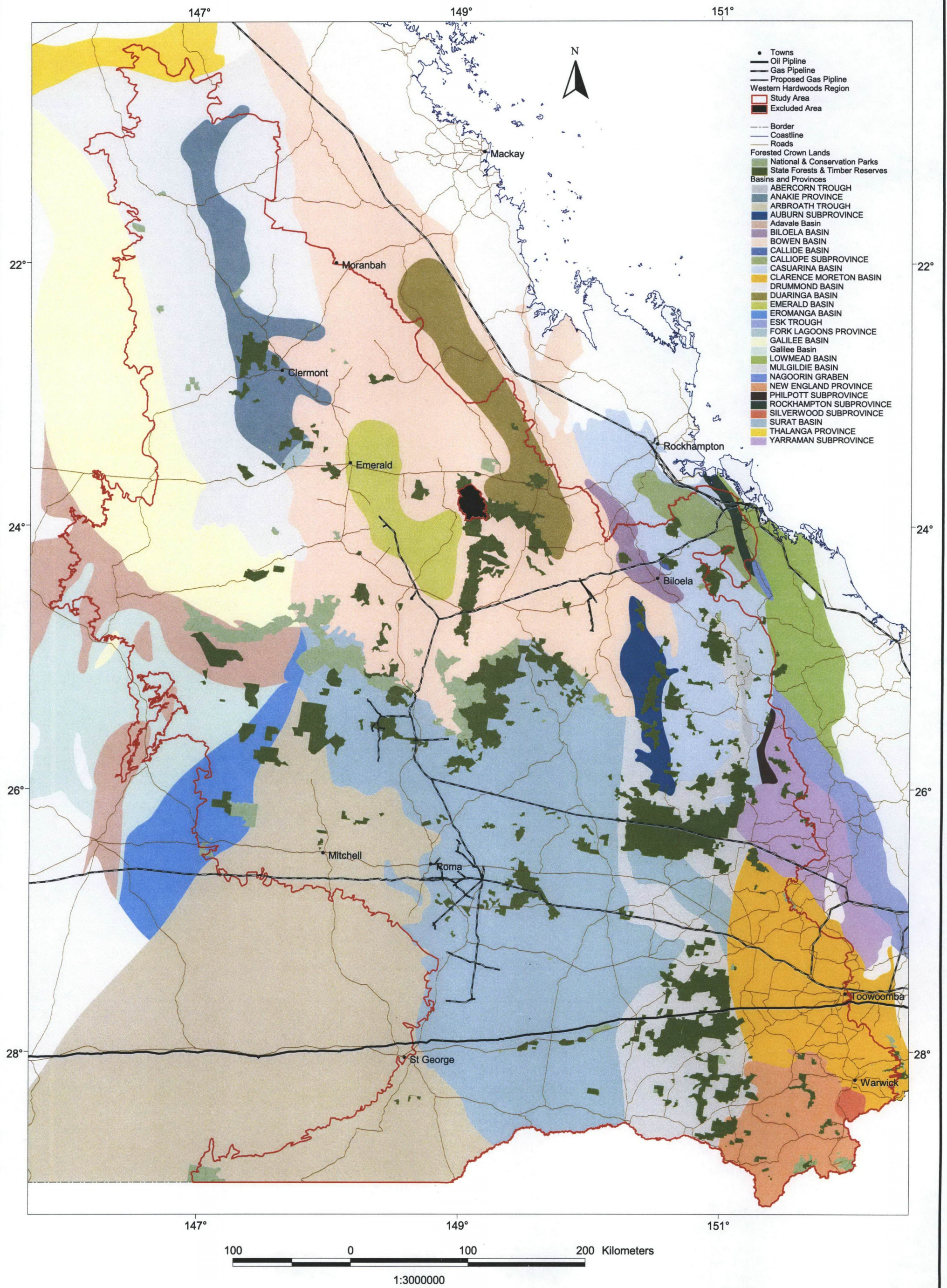


Figure 2: Sedimentary Basins and Tectonic Provinces in the WHR



EXECUTIVE SUMMARY

Critical to sustainable mine development in Queensland is the generation of new mineral resource projects that require access to prospective ground. Prospective ground has been identified for undiscovered mineral resources that are likely to occur within the WHR and these areas are ranked using the terms ‘High’, ‘High-medium’, ‘Medium’ and ‘Low’. The definition of these terms varies between commodity groups and in some cases by deposit type. A generalisation of these criteria follows:

High: refers to areas that are considered to have the greatest exploration potential and highest potential for future developments or expansions (ie having identified resources or covered by granted mining tenures or applications).

High-Medium: refers to areas outside known deposits or currently held mining titles that contain prospective rock units. In the case of petroleum and coal, they may have potential for development in the short to medium term (<15 years). For metallic minerals, these areas include currently held exploration permits (EPs) and contain or are near mineral occurrences that indicate the presence of a mineralising system.

Medium: refers to areas that are outside known deposits or EPs, but are closely associated with mineral occurrences. For petroleum and coal, these areas have potential for development in the long term (>15 years).

Low: refers to areas that contain prospective rock units but have no other indicators of mineralisation, or in the case of petroleum and coal, either have a low potential to contain prospective units or have their prospectivity diminished by factors such as quality, proximity to established infrastructure or geological constraints.

Table A identifies State Forest and Timber/Forest Reserves that contain either operating mines or proposed developments held under mining leases (MLs) and mine development leases (MDLs).

TABLE A - Mines/proposed development within forested areas.

Lease Name	MD/MDL	Commodity	Forest name (estate_070)
BLAIR ATHOL	ML1804	COAL	APSLEY STATE FOREST (3747, 3757), BLAIR ATHOL STATE FOREST (3697, 3705, 3713, 3714, 3720)
TRAP GULLY 2	ML5662	COAL	CALLIDE TIMBER RESERVE (4503)
CALLIDE 12	ML6993	COAL	CALLIDE TIMBER RESERVE (4503)
CALLIDE	ML80030	COAL	CALLIDE TIMBER RESERVE (4503)
CALLIDE 13	ML80092	COAL	CALLIDE TIMBER RESERVE (4503)
HUT	ML5654	COAL	CALLIDE TIMBER RESERVE (4503)
STUART	ML80003	OIL SHALE	TARGINIE STATE FOREST (4257, 4258, 4259)
STUART 2	ML80081	OIL SHALE	TARGINIE STATE FOREST (4257, 4258, 4259)
HURLEY'S NO 1	ML1866	GOLD	BLAIR ATHOL STATE FOREST (3705, 3733, 3740,)
HURLEY'S NO 2	ML1867	GOLD	BLAIR ATHOL STATE FOREST (3705)
LOWER CAMP	ML1868	GOLD	BLAIR ATHOL STATE FOREST (3697)
SEVEN MILE	ML01869	GOLD	BLAIR ATHOL STATE FOREST (3701)
COCKATOO	ML01870	GOLD	BLAIR ATHOL STATE FOREST (3705)
SPECIMEN GULLY	ML01875	GOLD	BLAIR ATHOL STATE FOREST (3713, 3714, 3720)
JUMBO	ML01833	GOLD	APSLEY STATE FOREST(3792)
NOBBY	ML1876	GOLD	APSLEY STATE FOREST(3792)
TOM	ML01877	GOLD	APSLEY STATE FOREST(3792)
WOLFANG EXTENDED	ML01904	INFRASTRUCTURE (PIPELINE ETC)	APSLEY STATE FOREST(3766)
JOANNE	ML1952	GOLD	BLAIR ATHOL STATE FOREST (3705)
SNUFFLERS	ML6715	GOLD	BLAIR ATHOL STATE FOREST (3697)
THOMPSON'S DAM	ML70071	GOLD	BLAIR ATHOL STATE FOREST (3734)
DARKY	ML70239	GOLD AND GEMS (SAPPHIRE, ZIRCON)	KETTLE TIMBER RESERVE (4075)

LADY DONELLA	ML50024	GOLD AND SILVER	BORONIA STATE FOREST (6016)
GOLDEN GATE	ML6009	GOLD AND BASE METALS	TALGAI STATE FOREST (10882)
YELLOW SUBMARINE 2	ML3613	COPPER AND NICKEL	TARGINIE STATE FOREST (4257)
-	MDL 174	COAL	DALBY STATE FOREST (9808)
-	MDL 203	COAL	CALLIDE TIMBER RESERVE (4476, 4479, 4481, 4494, 4498, 4502, 4508, 4509, 4513, 4514, 4515, 4516, 4517, 4518, 4519, 4520, 4522, 4523)
-	MDL 219	COAL	LLANDILLO STATE FOREST (3990), KETTLE STATE FOREST (4009)
-	MDL 299	COAL	DOMVILLE STATE FOREST (10754, 10768, 10776, 10777) MILLMERRAN STATE FOREST (10872)
-	MDL 177	CLAY – GENERAL, KAOLINE, OIL SHALE, IRON ORE	TARGINIE STATE FOREST (4257, 4258, 4259, 4265)
-	MDL 179	OIL SHALE	MOUNT LARCOOM STATE FOREST (4246)
-	MDL 225	CLAY, IRON ORE, KAOLIN, OIL SHALE	TARGINIE STATE FOREST 4257)
-	MDL 291	SODA ASH	BANDANA STATE FOREST (5278, 5294,)
-	MDL 297	CLAY, DIATOMITE, IRON ORE, KAOLINITE, OIL SHALE	MOULTRIE STATE FOREST (3989, 4000, 4001, 4002, 4003, 4004, 4005,)
-	MDL 296	CLAY, DIATOMITE, IRON ORE, KAOLINITE, OIL SHALE	DUARINGA STATE FOREST (4172, 4179, 4185, 4186, 4187, 4188, 4190, 4194, 4195, 4201, 4202, 4203, 4204, 4205, 4209, 4210, 4211, 4213, 4214, 4219, 4220, 4221, 4222, 4223, 4224, 4225, 4226, 4227, 4230, 4231, 4232, 4233, 4235,)

Table B identifies State Forest and Timber/Forest Reserves that contain ground prospective for one or more deposit models.

TABLE B - Areas deemed to be high or high-medium potential, and with EP/PLs intersecting forested areas.

Commodity	Deposit Model	Forest name (estate_070/Segpar no.)
COAL		GURULMUNDI (8142), BARAKULA (7385, 7516, 7519, 7614, 7616, 7690, 7692, 7696, 7895, 7932, 7933, 7939, 7940, 7974, 7976, 8015, 8018, 8019, 8025, 8030, 8031, 8041, 8044, 8080, 8081, 8082, 8087, 8088, 7402, 7494, 7495, 7516, 7940, 7952, 7961, 7965, 7974, 7976, 8024, 8026, 8029, 8031, 8034, 8044, 8062, 8064, 8065, 8066, 8067, 8068, 8072, 8073, 8075, 8076, 8078, 8079, 8090, 8091, 8092, 8093, 8100, 8105, 8144, 8150, 8151, 8153, 8154, 8162, 8163, 8184, 8211, 8216, 8238, 8239, 8240, 8242, 8244, 7616, 8080, 8081, 8082, 8087, 8088, 8095, 8096, 8119, 8122, 8126, 8127, 7385, 7519), QUANDONG (7391), MAZEPPA (3642), BLAIR ATHOL (3690), TAUNTON (4132), DUARINGA (4200), WALTON (4168, 4173, 4174), AUTHURS BLUFF (4176), BLACKWATER CONSERVATION PARK (4165), AMAROO (4193), MINERVA HILLS (4418), CAIRDBEIGN (4469), MOUNT HOPE (4627), SERCOLD (5080, 4986, 5072, 5079, 5080), BANDANA (5294), COOMINGLAH (5038, 5047, 5059, 5060, 5071, 5103, 5104, 5149, 5151, 5152, 5153), CARRABA CONSERVATION PARK (6703), MOUNT ORGAN (7206, 7233, 7206, 7233, 7311, 7315), BINKEY (7660, 7923, 7925), HINCHLEY (7325, 7329, 7330); JUANDAH (7388, 7389, 7390), CHERWONDAH (7491, 7506, 7534, 7557,), BURNCLUITH (8481), COOAGA (7093), DALBY (9808), BRAEMAR (9937, 9944, 9945, 9946), DAWES RANGE (4315, 4325, 4334, 4336, 4337, 4338, 4339, 4340, 4341), CALLIDE TIMBER RESERVE (4476, 4479, 4481, 4494, 4498, 4502, 4503, 4508, 4509, 4513, 4514, 4515, 4516, 4517, 4518, 4519, 4520, 4521, 4522, 4523, 4524), MOUNT PLEASANT (4692, 4725, 4692), TELLEBANG (5206), DAANDINE (9989), LAKE BROADWATER CONSERVATION PARK (10118, 10134, 10140, 10161, 10162, 10163, 10164), KUMBARILLA (10122, 10138, 10139, 10165, 10178, 10182, 10280, 10281, 10313, 10425), DUNMORE (10432, 10438, 10441, 10473, 10484, 10485, 10486), IRONGATE CONSERVATION PARK (10478), WESTERN CREEK (10535, 10566, 10567, 10609, 10611, 10613, 10637, 10639), DOMVILLE (10754, 10768, 10776, 10777), MILLMERRAN (10872).

COAL SEAM GAS		MAZEPPA NATIONAL PARK (5737), BLAIR ATHOL (5788), TAUNTON NATIONAL PARK (SCIENTIFIC), BLACKWATER CONSERVATION PARK, WALTON (6460, 6467) ARTHURS BLUFF (6472), AMAROO (6491), DUARINGA (6500), DAWES RANGE (6692, 6707, 6710, 6714), MINERVA HILLS NATIONAL PARK, CAIRDBEIGN (6923), CALLIDE TIMBER RESERVE (253, 255, 257, 259, 266, 275), MOUNT HOPE (7166), CARNARVON NATIONAL PARK, MOUNT PLEASANT (7230, 7255), SEROCOLD (7645, 7789), COOMINGLAH (311, 315, 319, 321, 324, 326), TELLEBANG (3069), BANDANA, (8104), PRECIPICE NATIONAL PARK, CARRABA CONSERVATION PARK, COOAGA (584), MOUNT ORGAN (11209, 11272, 11421), HINCHLEY (11450), BARAKULA (678, 683, 707, 708, 719, 739, 747, 749, 767, 770, 776, 781, 791, 792, 794, 798, 802, 804, 806,808, 817, 826, 833, 837, 854, 858, 859), JUANDAH (11565, 11568), QUANDONG (679), CHERWONDAH (695, 703, 711, 716) BINKEY(720, 735) GURULMUNDI (825) BURNCLUITH (885), DALBY(927), BRAEMAR (930, 931) DAANDINE (954), LAKE BROADWATER CONSERVATION PARK, KUMBARILLA (959, 963, 970, 972, 979, 1024), DUNMORE (1031, 1037, 1045, 1050), IRONGATE CONSERVATION PARK, WESTERN CREEK (1075, 1093, 1124, 1135), DOMVILLE (1179), MILLMERRAN (1231) EXPEDITION NATIONAL PARK (6014,6091,6185,6192, 6197, 6401, 6412, 6451, 6454, 6460, 6461, 6412, 6451, 6454, 6461), BEILBA (6538), DOONKUNA (6550), HALLETT (6655, 6666, 6685, 6700, 6728, 6749, 6777, 6655, 6685) STEPHENTON (6615, 6674, 6691) CHERWONDAH (7491, 7506, 7534, 7557) CONDAMINE (9443, 9518, 9539)
GOLD	EPITHERMAL	BLAIR ATHOL (5788, 5846) APSLEY (5914, 5918), COPPERFIELD (5980, 5992, 5997, 6002, 6027, 6029, 6031), REDROCK (6036), OVERDEEN (263), BELMONT (282, 286, 295), MONTOUR (308), BORANIA (384, 393), ROCKYBAR (409, 410), BINKEY (741), GURULMUNDI (752), ARCOT (1579, 1582), GUNYAN (1623)
GOLD AND BASE METALS	HYDROTHERMAL VEIN DEPOSITS	BLAIR ATHOL (5788, 5803, 5809, 5841, 5846), CALLIDE TIMBER RESERVE (259), KROOMBIT TOPS FOREST RESERVE (338), TALGAI (1240, 1251, 1254, 1258, 1260) DURIKAI (1364, 1366, 1369), ARCOT (1579)
GOLD AND BASE METALS	PORPHYRY TYPE DEPOSITS	ULAM RANGE (234), DON RIVER (238), BELMONT (282, 286,295), GREVILLEA (283) MONTOUR (312, 320), TREVETHAN (344, 351), HEFFERON (345) CALROSSIE (359, 366, 368, 370,380, 387) YULE (361) ARCOT (1579)
GOLD AND BASE METALS	REPLACEMENT	BINKEY (7942), GURULMUNDI (7992)
BASE METALS	VOLCANOGENIC MSSIVE SLPHIDES	BLAIR ATHOL (5799), ULAM RANGE (230, 232, 234), DON RIVER (238), CALLIDE TIMBER RESERVE (259), KROOMBIT TOPS FOREST RESERVE (338,) DEGALGIL FOREST RESERVE (376), TEXAS 1 (1571, 1572), TEXAS 2 (1575)
PLATINUM GROUP ELEMENTS	LAYERED UTRAMAFIC ROCKS	CANNINDAH (3005), BANIA (547), BAYWULLA (3180), OAKVALE (9059),DYKEHEAD (420) DELEMBRA (434, 444), KOKO (480, 491)
GEMSTONES	SAPPHIRE/OPAL/DIAMOND	KETTLE TIMBER RESERVE (6327,6338,6370, 6374), WITHERSFIELD (6425, 6438, 6452, 6453), KEILAMBETE (6435), ZAMIA (6436), PASSCHENDAELE (1468,1469,1500,1501,1502,1510, 1520,1521,1524,1532,1541,1543)
DIMENSION STONE	-	DELEMBRA (434), ALLIES CREEK (458),
LIMESTONE	-	TEXAS 1(1571,1572), TEXAS 2 (1575)
CLAY/SILICA/MINERAL SANDS	-	DUARINGA (4172, 4179, 4185, 4186, 4187, 4188, 4190, 4191, 4194, 4195, 4201, 4202, 4203, 4204, 4205, 4209, 4210, 4211, 4213, 4214, 4219, 4220, 4221, 4222, 4223, 4224, 4225, 4226, 4227, 4230, 4231, 4232, 4233, 4235); MOULTRIE (3989, 4000, 4001, 4002, 4003, 4004, 4005); YULEBA (8773); GURULMUNDI (7770, 7992,) WALHALLOW (7347); GUBBERAMUNDA (7367, 7377, 7416, 7433, 7474, 7475, 7501,7503, 7508, 7510, 7520, 7521, 7416, 7433, 7770, 7900, 7990, 7991, 7992, 8016, 8017, 8021, 8022, 8023, 8142); STONES COUNTRY RESOURCES RESERVE (7858); WESTERN CREEK (10535, 10545, 10547, 10549, 10566, 10567, 10570, 10571, 10578, 10592, 10598, 10601, 10605, 10608, 10609, 10610, 10611, 10613, 10619, 10627, 10629, 10632, 10634, 10635, 10636, 10637, 10639, 10640, 10642, 10643, 10644, 10645, 10651, 10653, 10654, 10655, 10657, 10677, 10714, 10715, 10535, 10535, 10541, 10542, 10545, 10547, 10549, 10570, 10571, 10639, 10645, 10651, 10653, 10678, 10680, 10714, 10715, 10718, 10719, 10720,); DUNMORE (10559, 10432, 10473, 10484, 10485, 10486, 10543, 10432, 10438, 10439, 10440, 10441, 10442, 10443, 10473, 10515, 10517, 10518, 10520, 10522, 10523, 10525, 10543); KUMBARILLA (10281, 10425, 10178, 10280, 10281, 10425), DOOKUNA (6505, 6510, 6511, 6526, 6527, 6528, 6529, 6532, 6548, 6550, 6557, 6561, 6562, 6587)

Significant areas of forested crown land coincide with areas identified as having high and medium potential for hydrocarbon. However, precedents have been set in Queensland with exploration (drilling) having been carried out in several National Parks (eg Lakefield National Park). Coal seam gas is considered separately as there are important differences with conventional hydrocarbon fields. The drillhole spacing for coal seam gas is less and water management is a significant issue, factors that may restrict resource development within Category A and B Conservation Areas depending on the environmental management process currently being finalised by the Environmental Protection Agency (EPA).

Recommendations:

- **No change should be made to the classification of crown owned forested land where MLs or MDLs exist.**
- **Crown owned forested areas that are identified as high or high-medium potential, particularly where EPs are currently held, should have no change to their classification.**
- **Because of the economic significance of coal and the potential contribution of coal seam gas to the future energy/greenhouse requirements of the State, forested areas identified as having high, high-medium and medium potential for these resources should have no change to their classification.**

PETROLEUM (liquid and gas)

Overview

The future for the petroleum exploration industry in Queensland is very encouraging due to developing gas markets, relatively favourable oil prices, and an expanding pipeline network throughout the State. For 2000/01, gas production was approximately 130 petajoules (PJ) of which 80 PJ were consumed within the State. The remaining 50 PJ were transported interstate to meet the ever-increasing gas demand in south-eastern Australia. The market for gas in eastern Australia is predicted to increase significantly in the next few years as a result of deregulation to enable growth in the interstate trade. Potential shortfalls in supply have been identified, indicating a need to develop additional gas resources. In May 2000, the Government released its 'Queensland Energy policy – A Cleaner Strategy'. This strategy will see the increasing use of gas as an energy source with the Government committed to requiring, by January 2005, that 15 percent of electricity sold in Queensland is derived from gas or renewable energy.

Since the release of the energy policy, agreements have been signed between gas producers and electricity generators for the supply of gas (Scotia to Swanbank; Surat to Swanbank). The construction of the Papua New Guinea to Gladstone pipeline is seen as a means of introducing competitively priced gas into Queensland. The Townsville-Gladstone section of the pipeline will enable development of gas-fired base-load power stations and the establishment of gas related industries (eg Townsville power station, Gladstone alumina refinery). Whilst the pipelines will introduce gas from other sources, it is expected that Queensland's gas resources will also be needed to meet growing demand. Delays to the construction of the pipelines (Timor Sea and Papua New Guinea) are providing an opportunity for gas explorers in Queensland to make and market further discoveries.

Coal seam gas exploration and production is now an established part of the oil and gas industry in Queensland with the first commercial production occurring in 1996. Coal seam gas exploration has increased significantly in the last few years with 30 exploration wells being drilled in 2000/01 compared with one in the previous year. Twenty-four development wells and 19 appraisal wells were also drilled in 2000. The increase in activity results from a combination of new exploration companies with new ideas (eg medium radius drilling), and the availability of markets for coal seam gas.

The establishment of a significant coal seam gas industry will be greatly enhanced if the development of pipelines connecting the Bowen Basin coal fields to existing pipelines is realised. Production is also likely to be increased as aggregation of production and sales is realised through agreements between gas suppliers and energy providers.

The majority of identified **oil shale** resources in Australia are located in Queensland with more than 36.7 billion barrels of *in-situ* shale oil identified. Oil is produced from oil shale through the physical or chemical treatment of the rock to break down organic solids into a form that can be extracted as oil. One such physical process is being trialed by Southern Pacific Petroleum NL (SPP) at Stuart, north of Gladstone with the commissioning of the \$300 million Stuart Oil Shale Project stage one plant in progress.

Although oil shale extraction technology has yet to be proven, most of the holders of oil shale deposits in Queensland have applied for mineral development licences so they can retain titles until the technology to economically extract it is developed and the deposits become viable. Whilst there is currently no commercial production of petroleum products from the Stuart plant, hot commissioning of the stage one retort has resulted in intermittent production. As at 30 January 2002, stage one of

the Stuart project had produced over 270,000 barrels of high quality oil products valued at more than \$A13 million. Once stage one reaches full capacity of 4500 barrels per day, it will boost Queensland's oil production by more than 25 percent. A mining lease application was lodged over the potential stage two resource in September 1999. If stage two were to proceed, it would directly employ 550 people during construction and 127 during operation, and would require a further \$400 million investment in Queensland.

Australia produces about 230 million barrels of oil and consumes about 280 million barrels per year, which is unsustainable. On the achievement of full production, Stuart stage three would lift Australia's production by 13 percent and its self-sufficiency to more than 90 percent. Development of an oil shale industry, however, is dependent on the ability of stage one at Stuart oil shale project to demonstrate its economic and environmental viability.

Western Hardwoods Region

Estimated royalty revenue from petroleum for the WHR in 2000/01 was \$2,495,159.

A number of basins that fall partially or totally within the WHR are currently producing or have the potential to produce *oil and gas* (Figure 4). The *Eromanga* Basin is presently the major hydrocarbon producing basin with large areas as yet unexplored. The *Bowen* and *Surat* Basins underpinned the establishment of petroleum exploration and development in Queensland and have been the State's most productive centres for over 20 years. Although a number of regions within the basins have been actively explored, potential still exists for additional discoveries in developed areas and in deeper parts of the basins. The *Clarence-Moreton* Basin has potential to be a major gas bearing region. There has been one small gas discovery in the New South Wales' section of this basin. There is also some potential for the discovery of oil. The *Galilee* Basin is considered to have the potential to be a major hydrocarbon producing region as it contains a similar succession of rock types and ages to the Cooper and Bowen Basins, but has been only sparsely explored.

Figure 3 defines the main areas of potential for liquid petroleum and gas in the WHR. Ranking of regions has been determined using the following criteria:

- 1.High: areas containing numerous fields (shown by existing PLs). These areas contain reservoir rock, are updip from the source rocks, and are considered to have the greatest exploration potential and highest potential for future developments or expansions.
- 2.Medium-High: areas containing minor fields. These areas contain reservoir rocks, are updip from the source rocks, and are considered to have potential for eventual development in the short to medium term (<15 years).
3. Medium-Low: areas outside known fields. These areas contain less permeable reservoir rocks. They are considered to have most potential for gas production, with eventual development being driven by technological advances.

Prior to late 2000, the Permian Bowen and Galilee Basins were the major targets for *coal seam methane* explorers and producers. By the end of 2000, however, exploration had also begun in the Surat Basin. Exploration licenses now also cover the Clarence-Moreton, Eromanga, and Hillsborough Basins. Production in Queensland currently occurs from fields at Durham (Oil Company of Australia – OCA), Peat (OCA), Dawson Valley (OCA), Scotia (Santos) and at the Moura coal mine (Anglo Coal/Mitsui) – all within the WHR.

In the Surat and Clarence-Moreton Basins, the success of the Queensland Gas Company's Argyle 1 well near Chinchilla, with a flow rate exceeding 28,320 cubic metres per day, has demonstrated that the Walloon Coal Measures contain a significant coal seam gas resource. Queensland Gas Company undertook a major exploration program with the Walloon Coal Measures being their sole target. Arrow Energy encountered thick permeable and gas saturated coal seam sequences within the Walloon Coal Measures in three exploration wells close to Chinchilla.

During 2001/02 the Scotia resource was commercialised with the signing of an agreement with CS Energy to supply up to 120PJ of gas over a 10 to 15 year period to its Swanbank power station. OCA's Peat field was developed and supplies coal seam gas to the BP refinery in Brisbane, and OCA acquired the interests of Transfield and Tristar in the Durham and Fairview projects. CH4 Pty Ltd has been exploring in the Bowen Basin and has drilled a number of medium radius wells linked to vertical wells in the Grosvenor area with promising results. The development of this project is the first step in the development of pipelines connecting Bowen Basin coalfields to existing pipelines or markets that will be necessary for coal seam gas development in this area to be fully realised.

The majority (95%) of coal seam gas exploration and development currently occurs under the *Petroleum Act 1923*, but the utilisation of coal seam gas produced in association with coal mining is also being actively considered. Presently the only coal mine producing gas is Moura. The other underground mines, all in the western Bowen Basin, are remote from pipelines and their gas production is either vented or flared. However, over the past few years greenhouse gas concerns have become a powerful driver for the capture and utilisation of methane associated with coal mining. There is now a strong focus on pre-draining of gas from the surface, in advance of mining to produce a pipeline quality gas.

Exploration is expected to continue mainly in the Bowen and Surat Basins. However, lesser explored basins such as the Clarence-Moreton Basin have also been flagged as of interest (Arrow Energy NL with BNG Pty Ltd). Arrow Energy NL has additional interests in the Surat Basin, Hillsborough Basin and Nagoorin Graben.

Table 1 defines the criteria used to classify areas in terms of coal seam gas potential.

Table 1 SUMMARY TABLE – WHR COAL SEAM METHANE PROSPECTIVITY

Basins	Prospective Rock unit/s	Ranking Criteria
Surat Basin	Walloon Coal Measures	Low: coal present <100m or >1000m Medium: coal present >400m <1000m High: coal present >100m <400m Prospectivity enhanced by proximity to pipeline infrastructure.
Bowen Basin	Blackwater Group - Moranbah and Rangal Coal Measures, German Creek Formation, Bandanna Formation; Reids Dome beds	Low: coal present <100m or >1000m Medium: coal present >400m <1000m High: coal present >100m <400m
Galilee Basin	Bandanna Formation	Low: coal present <100m or >1000m Medium: coal present >400m <1000m High: coal present >100m <400m
Eromanga Basin (Eastern edge)	Westbourne Formation	No potential

o/cut

Mining Rec $\sim 95\%$
irregularity of Basin

Yield %

CtHP

$\sim 70\%$ for Bowen/ coals

$\sim 70\%$ ~~Callal~~ Callal coals (domestic)
if domestic spec

$\sim 50\%$ for Surat/ Monar
(export spec)

if export $\sim 70\%$

u/c

IN-SITU EST

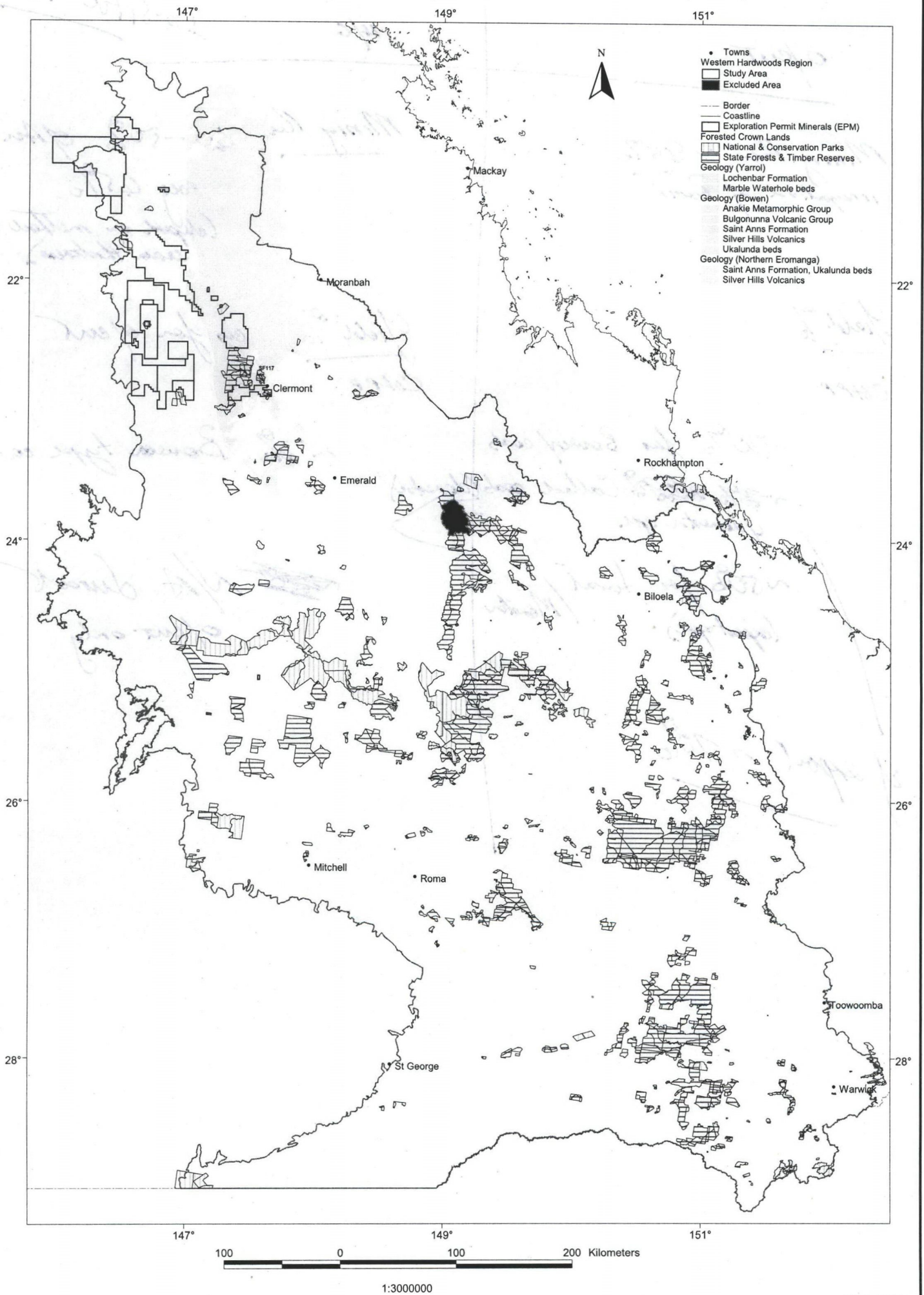
Mining Rec 40-50% of the
say 45%
(depends on method of
seam thickness)

Yield % on for o/cut
CtHP

$\sim 70\%$ Bowen type coals

~~N/A~~ N/A Surat
o/cut only

Fig 10A: Geological Units with Potential for Sediment-Hosted (Gold) and Homestake-type Deposits



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Callide Basin	Callide Coal Measures; Callide Coal Measure equivalents	Medium: within opencut coal deposits
Mulgildie Basin	Mulgildie Coal Measures	Medium: shallow coal measures
Horrane Trough	?Permian coal measures	Low: >1000m
Clarence-Moreton Basin	Walloon Coal Measures	Low: coal present <100m or >1000m Medium: coal present >400m <1000m High: coal present >100m <400m

Refer Figures 4A & 4B – Areas of coal seam methane gas potential and proposed pipeline access routes within WHR.

Medium to high grade torbanite rich **oil shales** occur in Permian strata in the Galilee and Bowen Basins. Alpha, the highest grade resource in Queensland, is located in Permian torbanite in the south-eastern margin of the Galilee Basin. Thin oil shale seams of Jurassic age are present in the Surat and Moreton Basins. Oil shales are also widespread in marine sediments of the Toolebuc Limestone in the Eromanga Basin. However, the majority of Queensland's oil shale resources are located in nine small Tertiary basins adjacent to the eastern coastline. The Nagoorin Graben and Casuarina Basin abutt the WHR. Exploration has also identified oil shale resources in a number of inland Tertiary basins within the WHR at Mount Coolon, Duaringa, Emerald and Biloela. Estimated *in-situ* resources in the Duaringa area are 4.1 billion barrels and for Mount Coolon, 0.17 billion barrels.

The potential for future development of oil shale in Queensland is very dependent on the success or otherwise of the Stuart Oil Shale Project. Consequently, the criteria used in this assessment of potential are simply based on distance from infrastructure, size and quality of deposit.

The assessment defines oil shale resources within the WHR as of 'High-Medium', 'Medium' or 'Low' potential (refer Figure 3).

1. High-Medium: Duaringa Basin – currently held as EPMs 3458/3459/3460/10622; MDL296A/297A. This basin contains significant resources that may have potential for eventual development in the short to medium term (<15 years).
2. Medium: Mount Coolon Basin and Alpha – currently held as EPM 12307 and 12049; Alpha is not currently held. Both these resources are relatively small, but because of their quality they may have potential for eventual development in the long term (>15 years).
3. Low: Toolebuc Limestone is considered to have low potential as the oil shale resource is modest in size, variable in quality, and is not in close proximity to established infrastructure.

Conclusions:

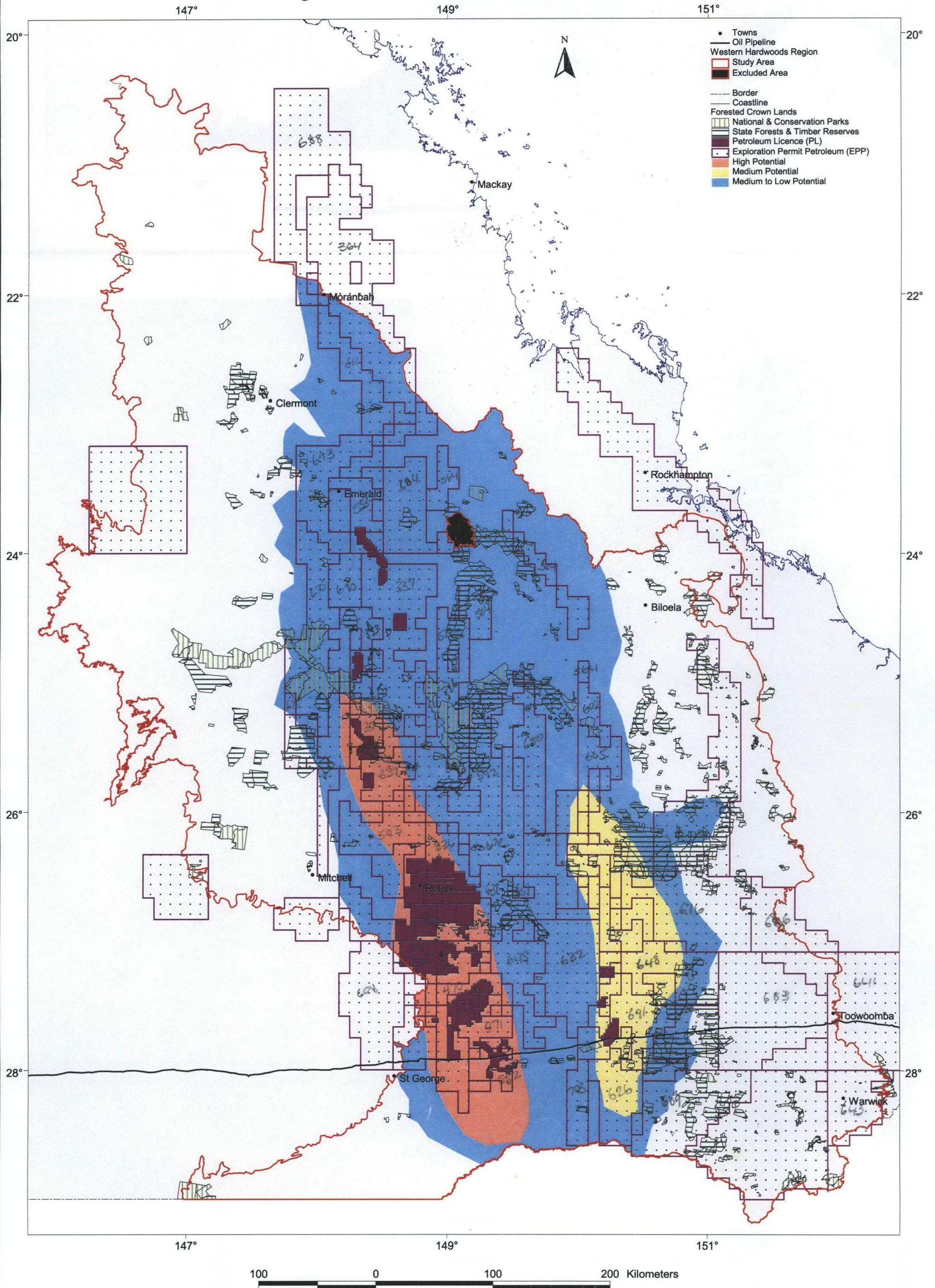
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- State Forest and Forest/Timber Reserves coincide with areas identified as having high and medium potential for hydrocarbon., however, petroleum exploration can be undertaken within National Parks (eg drilling within Lakefield National Park).
- Large areas of the WHR are also identified as having high or medium potential for coal seam gas production. An important difference from petroleum is that coal seam gas can currently be explored for and developed under both the *Mineral Resources Act 1989* and the *Petroleum Act 1923*. It is anticipated that an outcome of the current review of the Petroleum Act is that coal seam gas will be covered legislatively and administratively solely by this Act. Relevant to

the WHR assessment is that, compared with conventional hydrocarbon fields, drillhole spacing for coal seam gas is less and water management is a significant issue that may restrict development within Category A and B Conservation Areas depending on the environmental management process currently being finalised by the Environmental Protection Agency (EPA).

- The Duaringa oil shale deposit, rated as high-medium potential, covers the Duaringa and Moultrie State Forests.

Figure 3: Petroleum Reservoirs in the WHR



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Figure 4A: Areas with Potential for Coal Seam Methane
(Walloon) Oil Shale Potential and Proposed Pipeline Routes

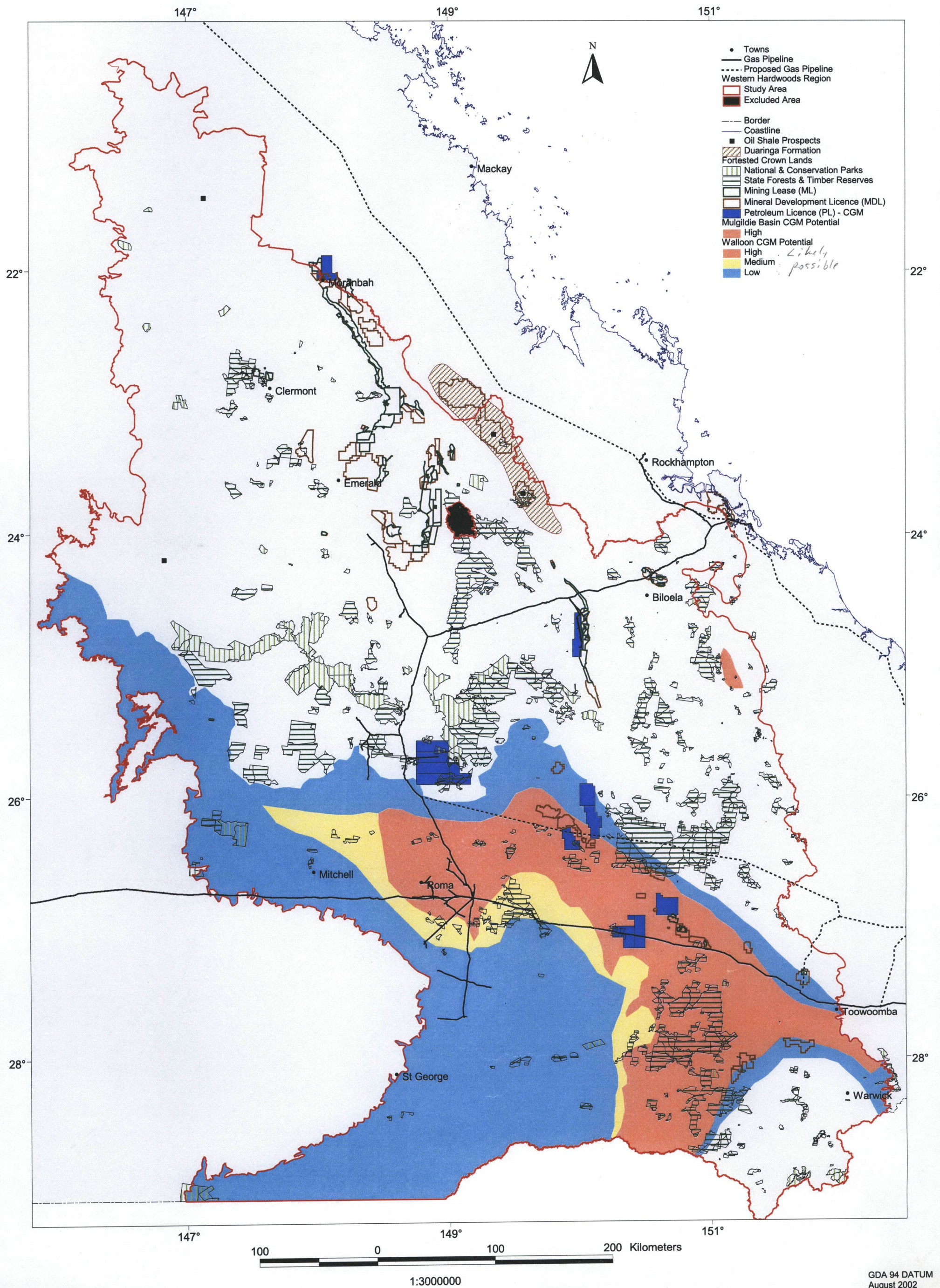
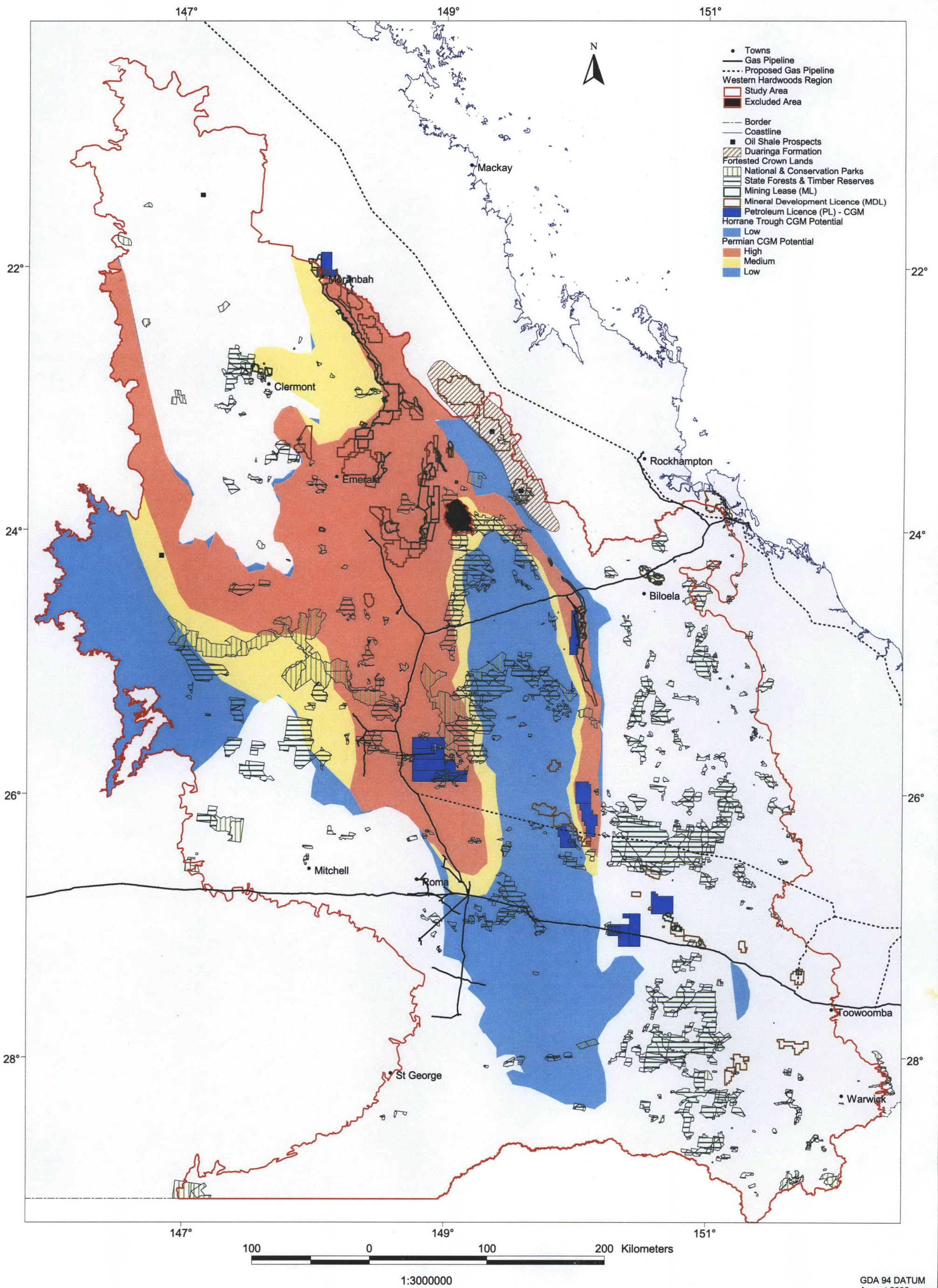


Figure 4B: Areas with Potential for Coal Seam Methane (Permian) Oil Shale Potential and Proposed Pipeline Routes



COAL

Overview

Coal is Queensland's highest export earner and in 2000/01 the industry achieved export earnings of \$6.7 billion. In addition, domestic sales within Queensland totalled 20.89Mt and sales interstate amounted to 0.13Mt. The coal industry, last year, directly employed in excess of 8900 people in 42 mines throughout the State.

Queensland coal exports amounted to 117.56Mt in 2000/01. Japan continued to rate as the largest importer of Queensland coals, buying 48.5Mt representing some 40.7% of the State's coal exports for the year. In addition to Asia (32.4Mt), European countries are also major importers of Queensland coals, collectively taking 26.9Mt (22.9% of the State's exports). Forecasts are for Australian production levels to reach 275Mt per annum by 2020 (EIA, 2002), with the Queensland industry having the potential to capture a significant share of this market growth.

Queensland has a large inventory of identified coal resources that is currently estimated to be in excess of 37 billion tonnes of raw coal *in-situ*, approximately 75% of which are located in the Bowen Basin (Table 2). Whilst a substantial resource, over 45% of the identified coal deposits are at depths that are currently considered to be amenable to extraction by underground methods only. These deposits require longer lead times, higher capital costs, greater operating costs and have less operational flexibility – factors that mitigate against their short-term development. The Bowen Basin is currently the only province in Queensland where coal is being extracted by underground mining methods, and here it is expected to increase over the forthcoming years. Opencut mining is likely to predominate in Queensland's other coal basins.

In 2000/01, expenditure on coal exploration in Queensland increased to \$23.4 million, up from a four-year low of \$20.1 million during 1999/00. Current exploration activity is focused on the central and northern parts of the Bowen Basin, with some work in the Denison Trough adjacent to the Rolleston deposit in the southern Bowen Basin and numerous EPC applications over much of the Surat and Moreton Basins. At present, the majority of potentially productive coal bearing strata within the Bowen, Callide, Moreton, Mulgildie and Surat Basins (east of Injune) are covered by EPCs as well as other retention and coal mining tenures.

Table 2

Queensland Coal Inventory 2001 - Summary
(million tonnes; raw coal *in-situ*)

PERIOD/ Basin	Coking Coal						Thermal Coal						Total
	Opencut			Underground			Opencut			Underground			
	M	I	M+I	M	I	M+I	M	I	M+I	M	I	M+I	
<u>PERMIAN</u>													
Bowen*	3240	400	3640	4340	6970	11310	2300	840	3140	2210	5380	7590	25680
Galilee*	-	-	-	-	-	-	1270	950	2220	530	-	530	2750
Sub-Total	3240	400	3640	4340	6970	11310	3570	1790	5360	2740	5380	8120	28430
<u>MESOZOIC</u>													
Callide*	-	-	-	-	-	-	370	190	560	245	20	265	825
Ipswich	-	-	-	-	-	-				480	80	560	560
Laura	-	-	-	-	50	50	-	-	-	-	-	-	50
Moreton*	-	-	-	-	-	-	1370	1030	2400	15		15	2415
Mulgildie*	-	-	-	-	-	-	50	60	110	-	-	-	110
Styx	-	-	-	-	-	-	-	-	-	5	-	5	5
Surat*	-	-	-	-	-	-	1670	2610	4280	-	-	-	4280
Tarong	-	-	-	-	-	-	825	280	1105	-	-	-	1105
Sub-Total	-	-	-	-	50	50	4285	4170	8455	745	100	845	9350
	3240	400	3640	4340	7020	11360	7855	5960	13820	3485	5480	8965	37780

M = Measured, I = Indicated *Partly or wholly within Western Hardwood Area

Western Hardwoods Region

Estimated royalty revenue from coal from the WHR for 2000/01 was \$270,387,442.

Basins of relevance to the WHR are the central and southern portions of the Bowen Basin, the southern and eastern margin of the central Galilee Basin, the Callide Basin, Surat Basin, Moreton Basin (western portion between the Toowoomba Range and the Kumbarilla Ridge) and the Mulgildie Basin.

Coal bearing strata occur at numerous stratigraphic levels throughout the **Bowen Basin**. However, deposits of economic importance are restricted to four age groups, ranging from Early to Late Permian (refer Appendix 4). There are 32 coal mines operating in the Bowen Basin, 23 of which are located within the WHR (Figures 5A&B). Most of these operations are expected to have 'life-spans' in excess of 10-15 years with some likely to be greater than 20 years.

The **Galilee Basin** contains large quantities of non-coking coal of Permian age at relatively shallow depths. Currently identified deposits are located at Alpha, Kevin's Corner and Pentland. These identified deposits collectively contain in excess of 2 billion tonnes of low-rank thermal coal, which are currently held under tenure either as MDLs or EPCs. The majority of the basin, however, is located outside of the WHR.

The Walloon Coal Measures of the **Moreton Basin** and the Juandah Coal Measures and Taroom Coal Measures of the **Surat Basin** contain large resources of undeveloped opencut, high volatile, clean-burning thermal coal. The environmental advantages in the utilisation of these coals are now recognised and strong growth in production is expected in the near future for supply for both the domestic and export markets. Establishment of new rail and road infrastructure is required to support the development of large scale mining operations in this region.

The Moreton and Surat Basins are estimated to contain more than 6 billion tonnes *in-situ* high volatile thermal coal at shallow depths. Current production is relatively small and is from five opencut mines: Ebenezer, Jeebropilly, and Oakleigh, located in the Amberley-Rosewood district of the Moreton Basin, the Wilkie Creek Mine located about 40km west of Dalby in the Surat Basin, and the Commodore mine adjacent to the newly commissioned Millmerran power station 180kms west-southwest of Brisbane.

Burnett Coal Pty Ltd holds tenure over a portion of the **Mulgildie Basin** and has undertaken considerable exploration and evaluation of the coal development potential. The company estimates that around 420Mt of raw coal resources are located *in-situ* at depth of less than 100m. A result of this work has been the joint agreement with Macarthur Coal Ltd to develop an opencut coal mine south of Monto. Production is planned to commence in late 2002 or 2003 and will be contingent upon obtaining the necessary statutory approvals together with the establishment of supporting infrastructure. The coal is non-coking with a high volatile matter content and is suitable for use in power generation. These per-hydrous coals have superior combustion characteristics and environmental performance than virtually all other thermal coals imported into Japan including those from the Hunter Valley and Bowen Basin.

In the **Callide Basin**, of principal economic significance is the Callide Seam within the Callide Coal Measures. The high volatile, low-sulphur coal it contains is mined by opencut methods throughout the current mining leases (Boundary Hill, Trap Gully, The Hut) to provide feedstock into the nearby Callide Power Station for domestic power generation. Prospective coal

measures within the basin are currently held under a combination of exploration and mining titles by Anglo Coal (Callide) Pty Ltd. Company exploration has also identified additional areas containing coal resources within the basin that are currently the subject of two MDL applications (203, 241).

Future developments within the WHR are anticipated with a major increase in production forecast over the next 15 years or so. Development is expected to come from expansion of operations on existing mining leases with a smaller proportion expected to be obtained from the development of new deposits currently held under MDLs. Exploration for coal in the Bowen, Surat and Moreton Basins is currently at very high levels, and consequently there is also potential for this work not only to be successful in delineating additional resources of coal but for some of these – particularly those near suitable infrastructure – to be rapidly developed. An estimate of the probable time to development has been a consideration in assigning priorities to each of the coal provinces considered in this assessment.

Figure 6 defines potential coal resources within the WHR as ‘High’, ‘High-Medium’, ‘Medium’ or ‘Low’. Ranking of regions has been determined using the following criteria:

1. High: areas of known coal bearing measures that are considered to have the greatest exploration potential and highest potential for future coal mine developments or expansions (ie having identified coal resources or covered by granted mining tenures or applications). An exception is the Cullin la Ringo coal prospect in the Reids Dome province of the south-western Bowen Basin which has been assigned a high priority and is presently held as a Restricted Area No 279.
2. High-Medium: areas outside known coal deposits or mining titles currently held as EPCs (including applications) which contain coal seams with the potential for development in the short to medium term (<15 years).
3. Medium: areas outside known coal deposits or mining titles (and in the case of the Bowen Basin only, those areas also outside EPCs and applications) which contain coal bearing measures that are considered to be prospective for seams with the potential for eventual development in the long term (>15 years).
4. Low: areas considered either have a low potential to contain prospective coal measures or those areas containing coal bearing measures which due to a combination of factors (such as coal quality, proximity to established infrastructure, geological constraints or other modifying factors), are not considered to be prospective for coal seams having potential for eventual development in the long term.

Note that within the Bowen Basin, those areas within current EPCs which appear to be marginally outside the interpreted/inferred extent of the coal measures are in many cases, still considered to have some level of prospectivity since the confidence in geological boundary placement is considered to be quite low in certain areas. Consequently, in the case of the Bowen Basin only, these areas which otherwise might have been assigned a ‘not prospective’ status, have (until the results of current exploration suggest otherwise) been assigned a level of prospectivity as either Medium (within the central portion and parts of eastern margin of the basin) or low (over and adjacent to the western margin of the basin and the eastern basin margin to the point where it extends beneath the Tertiary Duaringa Basin). Of particular note are the extensive EPC applications lodged by BHP Billiton in late June 2002 over and beyond the western margin of the Basin. At this point, these areas have been assigned a low protection priority.

Figure 5A – Operating Coal Mines within WHR

Central Queensland coal

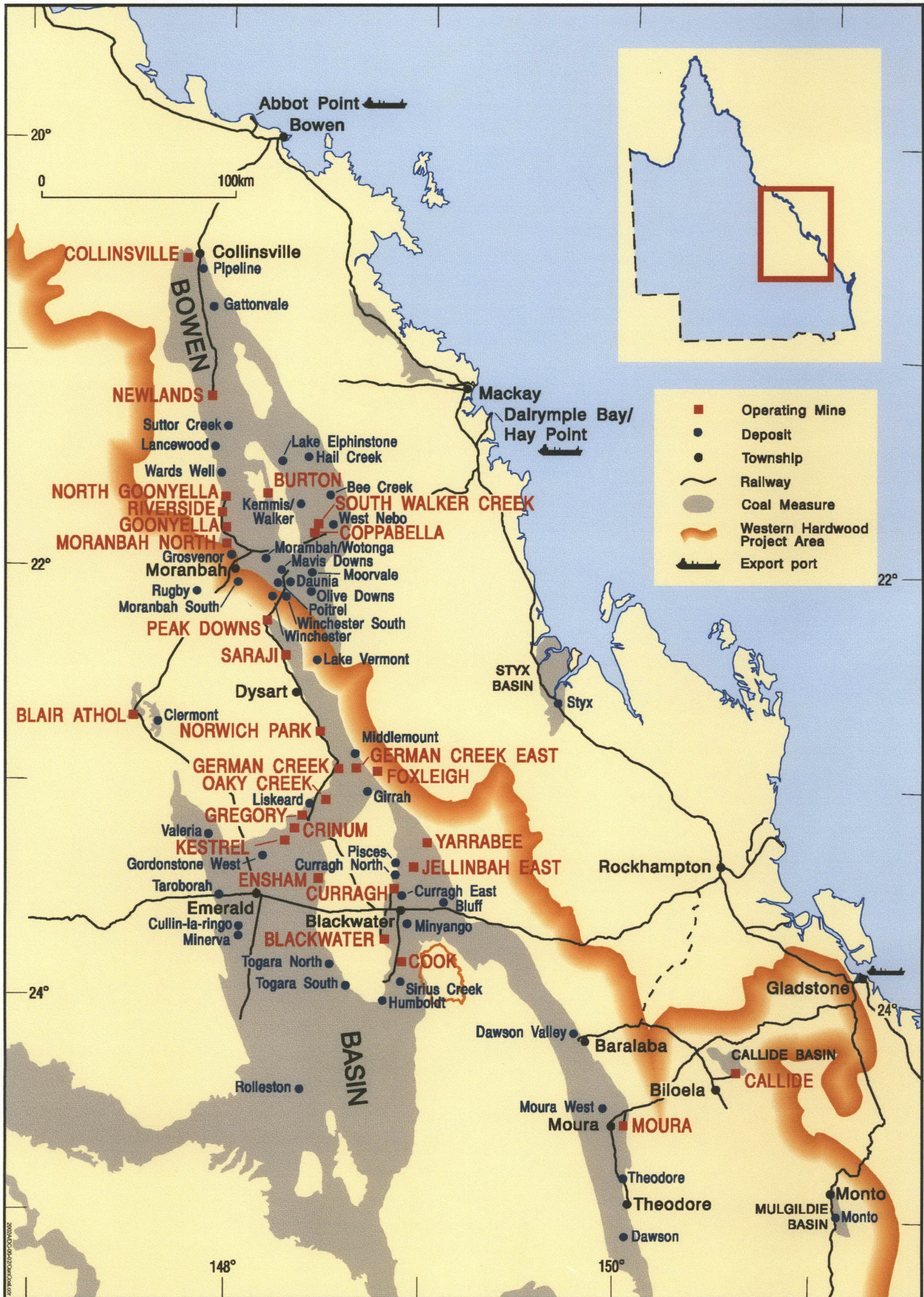


Figure 5B – Operating coal mines within WHR

South-East Queensland coal



The following table outlines the currently identified underground and opencut coal deposits where development within the short to medium (<15years) and longer term (15-25 + years) is considered a reasonable possibility. These have been assigned as highest potential.

Table 3

Possible underground mine developments – short to medium term			
Mine	Tenure	Owner	Comment
Newlands North	ML4754, 4774	MIM	Feasibility study in progress
Goonyella	ML 1763 MDL 307	BHP Billiton Mitsubishi	Experimental drifts have been developed to lease boundary
*Grosvenor	MDLs 273, 274	Anglo	Adjoins company's Moranbah North mine
*Grasstree	ML 1831	Anglo	Under development as replacement for dwindling reserves at Southern Colliery
*Ensham	MDLs 217, 218	Idemitsu	Still considerable opencut available
*Togara North	MLA 70149, 70162	Togara North Joint Venture	Thermal coal
Possible underground mine developments – long term (>15 year timeframe)			
Mine	Tenure	Owner	Comment
Burton	MDL 315 & ML 70109	RAG	Unlikely until opencut reserves are depleted
Wards Well	ML 1790	BHP/Mitsui	Coking coal
*Moranbah South	MDL 277		Coking coal
*Togara South	MDL (Appl'n) 340	BHP Billiton Mitsubishi	Thermal coal
*Humboldt	MDLs 155, 189	BHP Billiton Mitsubishi	Thermal coal
*Moura	MLs	Anglo/Mitsui	Coking coal
*Dawson	MDL 216	Anglo	Thermal coal
Possible opencut mine developments - short to medium term			
Deposit	Tenure	Owner	Comment
North Bowen Basin			
Hail Creek	ML 4738	Rio Tinto	Under construction
Moorvale	EPC, MLA	Macarthur Coal	Lease applications lodged - Development by 2003 anticipated
*Clermont	MLs 1884,1904	Rio Tinto	Replacement for Blair Athol (from 2006).
Suttor Creek	ML 4761	MIM	Replacement capacity for Newlands opencut coal
Burton	MLs, MDLs	RAG	Satellite shallow deposits to be developed adjacent to current mining operation.
Daunia	MLs1781, 70115	BHP Billiton Mitsubishi	
Poitrel	ML4749	BHP Mitsui	
Unnamed	EPCs	MacArthur Coal	Exploration of other deposits (eg Olive Downs) south and east of the Coppabella Mine in progress with a view to sequential development as markets and economics allow.
Various unnamed	EPCs	Various	Possibility also exists for some small scale opencut operations being developed by other small mine developers (eg Foxleigh South by CAML; unnamed areas held by Millennium Coal).
Central and Southern Bowen Basin			
*Rolleston	MDL 227, EPCs		Feasibility study in progress – bulk sampling proposed with development of a large scale opencut planned from 2003
*Girrah	MDL	Wesfarmers	Augment coal supply to the Curragh operation
*Pisces	MDL 162	Stanwell Corporation	For long term supply of Stanwell Power Station
*Theodore/Dawson	ML 5657,	Anglo/Mitsui	JV keen to progress as part of combined Moura - Theodore operation

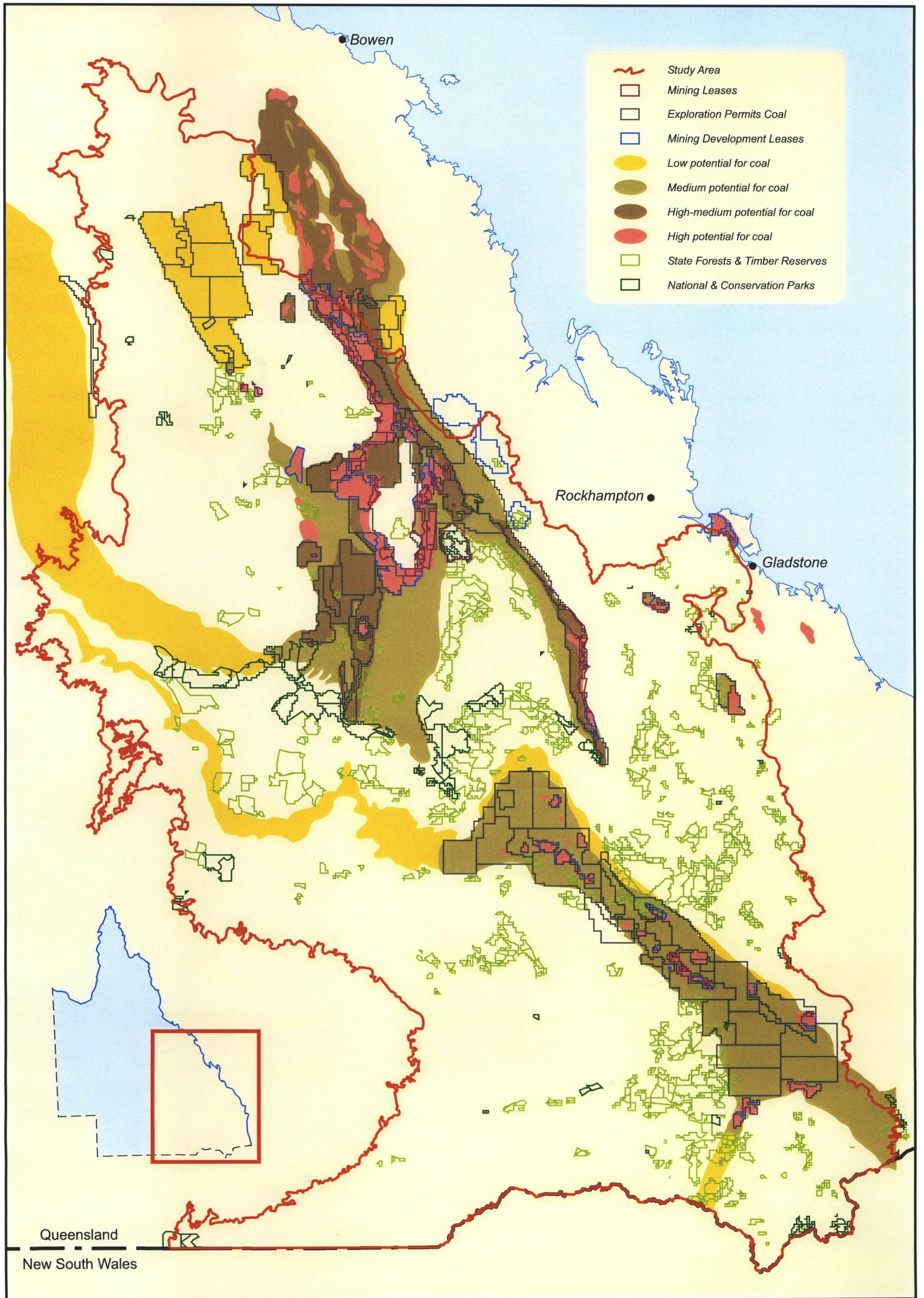
Possible underground mine developments – short to medium term			
Mine	Tenure	Owner	Comment
	MDL 216		Theodore operation
Mulgildie Basin			
*Monto	EPC 613, ML (Appl'n) 80101		Feasibility study in progress - Mining lease application lodged. Development of small scale operation (<1Mtpa) likely by 2003
Callide Basin			
*Killburnie /Giles Peak etc	EPC 188 MDL (Appl'ns) 203, 241	Anglo	Satellite deposits to be developed adjacent to current mining operations as existing economic reserves are depleted.
Surat Basin			
*Taroom	MDLs 158, 275	Anglo	Export coal production dependant on rail infrastructure
*Wandoan	MDLs 221,-224	MIM	Export coal production dependant on rail infrastructure
*Glen Wilga	MDL, MLa	Tarong Energy	Possible alternative / supplementary supply to Tarong Power Station
*Kogan	ML 50074, MDL 332	CS Energy	Would supply future on site power station
Moreton Basin			
*Acland	ML 50170, MDL 244	New Hope Group	Under construction. Thermal coal for the domestic and export markets

- ***Within Western Hardwood Area**

Conclusions:

- Areas identified as having high potential for coal resources are present within the Bowen, Callide, Surat, Moreton and Mulgildie basins being those areas held under mining title (MLs or MDLs) or if untenured, recorded as an identified coal deposit - MLs are Blair Athol, Callide, Callide 12, Callide 13, Hut, Trap Gully and MDLs: 162, 173, 174, 203, 219, 241, 299. .Medium-High potential areas are only present within the Bowen and Mulgildie basins corresponding to that area currently held either as EPCs or as an EPC application. The following State Forests and Forest/Timber Reserves are intersected: Gurulmundi, Barakula, Quandong, Mazeppa, Blair Athol, Taunton, Duaringa, Walton, Aurthurs Bluff, Blackwater Conservation Park, Amaroo, Minerva Hills, Cairbeign, Mount Hope, Sercold, Bandana, Coomingleh, Carraba Conservation Park, Mount Organ, Binkey, Hinchley, Juandah, Cherwondah, Burncluith, Cooaga, Dalby, Braemar, Dawes Range, Callide Timber Reserve, Mount Pleasant, Daandine, Lake Broadwater Conservation Park, Kumbarilla, Dunmore, Irongate Conservation Park, Western Creek, Domville, Millmerran.

Figure 6: Potential Coal Areas within the WHR



INDUSTRIAL MINERALS

Overview

This section covers a diverse group of minerals: common and specialty (bentonite and kaolin) clays and zeolite; dimension stone; limestone; mineral sands; and silica.

In Queensland **common clay** is exported as value-added products such as cement, bricks and pavers, with an estimated value for the entire State of about \$15 million. Structural and ceramic clay production in 2000/01 was 1.33Mt with an estimated value of \$4.2M. Production is tied to local and interstate economic activity, particularly in construction. The main producers are located in the southeast of the State in proximity to the Brisbane region, but significant production also occurs at Maryborough.

Bentonite, a specialty clay, has sales valued at about \$7.8 million. The main producer is Unimin Australia Ltd, with a 100,000tpa processing plant at Gurulmundi. Production was also recorded in 2000/01 by Bioclay Pty Ltd at Miles and PCP Douglass at Yarraman. **Kaolin** production for Queensland is valued at about \$3.9 million. The main producers are Kingaroy Kaolin Pty Ltd, with sales of filter-grade product and Supersorb Minerals NL, which markets a wide range of absorbent clay products for industrial, domestic and agricultural applications. The potential growth for specialty clays is mixed, with growth in sales dependent on further penetration of export markets and the development of new applications for bentonite and kaolin products.

Natural commercial **zeolite** is used world-wide in pet litter, animal feed, horticultural applications, waste water clean up, odour control, gas absorbents, catalysts, oil absorbents, and aquaculture. It is anticipated that research will continue to expand markets for zeolite products with their diverse commercial uses due to the ability to absorb ammonia, potassium and other cations. One application is a waste water treatment product called 'zeofloc' being developed by Zeolite Australia Pty and Brisbane Water (part of Brisbane City Enterprises, a commercial arm of the Brisbane City Council). Research into other uses of zeolite is being conducted by CSIRO, and Universities of Adelaide and Queensland. It has been suggested that there is also potential to generate significant tradeable carbon credits in the agriculture industry with increased nutrient uptake efficiency from applying activated zeolite technology resulting in reduced nitrous oxide gas emissions.

The demand for zeolite is growing due to an increasing awareness of its versatility and use in industrial and agricultural applications. However, natural zeolite is being challenged by synthetic products which can be mass-produced to exact specifications. The long-term outlook rests with a number of new applications. Queensland's economic position in the world in terms of comparative advantages of low energy costs, modern transport infrastructure and proximity to the large Asian markets will continue to attract a variety of industrial mineral processing developments.

Sandstone and siltstone are the main types of **dimension stone** produced currently in Queensland with production of sandstone valued at \$5.1 million in 2000/01. Queensland stone is exported to Italy, Taiwan, Japan, China and New Zealand. However, the industry has been hampered by under-capitalisation and high transport costs. This has made it difficult for suppliers to market their products. Substantial resources of high quality dimension stone remain in Queensland, however, most of the better quality resources remain undeveloped or partly developed because of their remote location. Several new projects are underway including Lochaber near Eidsvold.

The world demand for dimension stone is expected to grow during the next five years because of improved technology, variety and the increased costs of alternative construction materials. With this comes potential for greater local production.

Limestone is the second largest non-metallic mineral produced in Queensland with production of 2.6Mt valued at \$26.4 million in 2000/01. Limestone is used in cement production, as a flux in zinc, copper and lead smelting and as raw material in glass manufacturing. The Sun Metals zinc refinery in Townsville uses about 1000t of lime (calcined limestone) at its facility. Other uses of limestone are as an aggregate, in agriculture, as a filler, in asphalt, paper, paint, rubber and plastics extrusion, and as dust stone in underground coal mines. Lime is used in the aluminium, sugar and building industries, in water treatment, for road stabilisation, and gold and base metal processing. New uses for limestone are emerging in mineral processing, waste-water treatment and environmental rehabilitation.

The demand for limestone is related to economic activity, particularly when it is associated with growth in the construction and industrial sectors. Demand is forecast in the short-term to parallel industrial growth but in the medium and long-term several major projects in the State and the Pacific region could increase demand significantly.

Queensland's **mineral sands** production will continue to be underpinned by CRL's North Stradbroke Island operation for the foreseeable future with probable reserves as at December 2000 of 1.994Mt of rutile, 1.642Mt of zircon and 6.452Mt of ilmenite. Production in Queensland of titanium minerals (ilmenite, rutile) is valued at about \$58 million. A new project under development, the Goondicum Crater, has identified potential offshore markets for its ilmenite product and globally it will partly fill the gap caused by the closure of BHP's Beenup operation in Western Australia.

Queenslands salt production for 2000/01 was 245,400t, valued at \$22.5M. Cheetham Salt Ltd produces salt by seawater and groundwater brine evaporation at Bajool, Port Alma and Bowen.

Western Hardwoods Region

The Western Hardwoods area has diverse clay resources, which include ceramic clays for brick, pipe, paver and tile manufacture and the specialty clays bentonite and kaolin. A significant zeolite resource also occurs in the region.

Common clay resources are mostly identified in coastal regions of high population density where there are markets for ceramic products including cement, bricks, tiles and pavers. Two opencut operations held by Monier PGH Holdings Ltd (ML5974) and Warwick Brick Works Pty Ltd (ML50065) occur in shales and sandstones of the Marburg Formation in the Toowoomba-Warwick district within the WHR.

The most important resources of **bentonite** in Queensland occur in the Miles-Gurulmundi region of the Darling Downs, about 300km west of Brisbane. The total resource base exceeds 35Mt and is of premium grade sodium bentonite with exceptional water absorbency and cation exchange capacity. This bentonite source occurs as lenticular bedded deposits near the top of the Orallo Formation, just below its contact with the Mooga Sandstone. Other bentonite resources occur in the middle Walloon Coal Measures in the Rosewood district, west of Brisbane. Bentonitic clays are also present in altered Tertiary volcanic ash deposits of the Black Alley Shale in the Yarraman district, 130km north-west of Brisbane where the indicated resource is 20Mt. Calcium-rich montmorillonite occurs in seams up to 2.5m thick within Permian sediments in the Springsure district

330km west-south-west of Rockhampton. The Miles area, because of its resources of bentonite within the Walloon Coal Measures and Orallo Formation, was identified in the 1980's early 1990's as having potential for toxic waste disposal.

Queensland producers are continuing to look for opportunities to expand export sales, mainly to south-east Asia. Current exploration permits (including applications) indicate that the Orallo Formation in the Miles district remains the most prospective area for bentonite.

Substantial **kaolin** resources occur in the Kingaroy district, 150km north-west of Brisbane and on Cape York Peninsula, in the far north of the State. Resources in these two provinces exceed 150Mt.

In the WHR a kaolin resource has been identified near Duaringa, where Supersorb Minerals NL has an indicated resource of about 1Mt of kaolin within weathered fine-grained ash fall tuff in the Duaringa Formation. Other reported occurrences of kaolin occur in the Mundubbera, Toowoomba and Warwick districts. Exploration permits indicates that interest in future kaolin resources remains focused on the Duaringa Formation (EPMs 3458, 3460, 10622).

Total known resources of **zeolite** in Queensland are about 26Mt, located principally west of Emerald near the Willows. These resources lie within the Drummond Basin in altered, water-lain, ash-fall tuffs of the Ducabrook Formation. Supersorb Minerals NL recently commissioned a major new activated zeolite production facility near Emerald and intends to become the leading supplier of zeolite-based products to Australian agricultural and horticultural industries.

The WHR has both operating mines and identified future resources of **dimension stone**. A fine-grained sandstone is produced from the Marburg Formation at Yangan, near Warwick. Near Eidsvold, the Lochaber siltstone (Evergreen Formation), which contains a mixture of sandstone and mudstone is about to be developed as a resource. Near Mundubbera a fine-grained black-green quartz gabbro, the Hawkwood-Delubra Gabbro (Rawbelle Batholith) has been recognised as being a potential resource and has been partly developed to produce blocks for export. Also in the Mundubbera area the Cadaraga Creek Granodiorite has also been targeted by EPM applications. Other important granite varieties in southern Queensland occur near Crows Nest (Crows Nest Granite) and near Warwick (Greymare Granodiorite). At Stanthorpe, suitable stone is present in the Stanthorpe Granite and the Ruby Creek Granite, and in the medium-grained, dark grey gabbro near Wallangarra. Near Nanango, the Boondooma Igneous Complex contains a variety of granodiorites, adamellites, granites, tonalites, quartz diorites and gabbros that have potential for use as dimension stone. Similar rock types and potential occurs further east in the Taromeo Igneous Complex near Blackbutt.

Limestone is produced in the WHR at East End, Taragoola and Bajool (Ulam) in the Erebus beds, and in the Warwick –Texas region at Warwick and Riverton from the Texas beds. At the Queensland Cement Limited East End mine limestone is railed 24km to the cement clinker plant at Gladstone. This dry plant, Australia's largest, has the capacity to produce 2.5Mtpa of clinker since the completion of a \$200M expansion project. In Brisbane, Sunstate Cement Pty Ltd produces cement at its Fisherman's Island milling plant. QCL has a similar cement plant at Bulwer Island. Both plants use limestone from the Warwick region as a mineral filler in cement manufacture. The Riverton mine produces high grade low iron content limestone used as a filler and in glass manufacture at ACI Glass, Brisbane. Limestone from Taragoola on Comalco's leases near Gladstone, supplies the Queensland Alumina Limited refinery for use in bauxite processing, however the raising of the Awoonga Dam will submerge this resource. Near Bajool (Ulam), Omya Australia Pty Ltd produces high quality white calcium carbonate from its mine in the Erebus beds. Milled products include stone dust for the underground coal mines of the Bowen Basin as well as ground limestone for stock feed and agriculture. Blends of Bajool limestone and local magnesite

from Kunwarara meet the requirements for sugar cane cultivation, and for other crops. Dolomite (a magnesium calcium carbonate) has been quarried from Tertiary basalt in the Anakie Inlier near Clermont. This occurrence is a weathering product of the basalt and has been used, like the Bajool limestone, as an agricultural additive.

In the medium term the consumption of limestone products from the WHR should rise significantly, particularly by 2005 with the new stage one Comalco alumina refinery in Gladstone in operation. In addition, the demand for limestone products is likely to increase with major proposals of mineral value adding projects in Queensland and in the Pacific region. QCL has completed an expansion program at Gladstone. Also in the Gladstone area, David Mitchell Limited is considering a joint venture lime manufacturing plant with Frost Enterprises at Taragoola, near Calliope. In the longer term, proposed major industrial and mining projects in Queensland and the immediate Pacific region have the potential to significantly increase demand.

Monto Minerals NL has **mineral sand** (ilmenite and titano-magnetite) resources near Mt Goondicum, 30km east of Monto. The deposit contained, as at October 2000, a measured and indicated resource of 79Mt, averaging 5.0 percent ilmenite and 2.8 percent titano-magnetite. The \$65 million Goondicum project conducted a successful pilot plant trial to establish techniques to treat tailings and provide concentrates for synthetic rutile pilot plant test work. Preliminary process flow charts indicate the project would provide an annual production of 310000t of sulphatable ilmenite at 50.6 percent titanium dioxide, 180000t of titano-magnetite, 200000t of apatite and 500000t feldspar. A joint venture project with the Monadelphous Group should enable project funding to be secured. In March 2002 Monto Minerals signed a memorandum of understanding with CS Energy dealing with an energy and land package for the development of a plant to produce an upgraded titaniferous product at the Callide Energy Park. The mine development is anticipated to employ 55 permanent employees over a 10 year period with an additional 100 during the initial construction phase. Monto Minerals has also reported a measured and indicated resource of 4.05Mt of mineral sand bearing alluvium in the upper Burnett River (MLA80040), and resources at Eulogie Park (EPM 9541) are estimated to be very similar to that at Goodicum. EPM 13410 suggests there is potential for intrusive related rutile within the Chahpingah Meta-igneous Complex in the Yarraman district.

Potential exists for the identification of strandline shore facies ilmenite and rutile in the Gubberamunda Sandstone and Kumbarilla beds as indicated by current EPMs 12870, 12871, 12980, 12981, 13484, 13486, 13488, 13492, 13497.

A **silica sands** resource at Yuleba has been identified in the WHR. This operation has an indicated reserve of 12.1Mt and an inferred resource of over 30Mt. Production is under an extractive industries permit with material sold into the construction industry.

Mount Sawnee garnet resources have reserves measured in excess of 750000t of garnet ore. The area is currently held under EPM 12809 by Central Queensland Magnetite Pty Ltd and has been marketed as a garnet/magnetite resource.

EPM 12447 in the Casuarina Basin is focused on the location of brines for the extraction of salt.

Figures 7A-9A show the spatial relationship between prospective rock units, current EPMs (including applications), known mineral occurrences, and State Forest, Timber Reserve and Forest Reserve. Figures 7B-9B identify regions in terms of their prospectivity.

Prospective regions are described as either:

1. High: areas of known resources that are considered to have the greatest exploration potential and highest potential for future developments or expansions (ie having identified resources or covered by granted mining tenures or applications).
2. High-Medium: areas outside known deposits or mines currently held as EPs (including applications). These areas either contain or are near known mineral occurrences.
3. Medium: areas that contain prospective rock units, but are not closely associated with known mines or mineral occurrences; or where isolated EPMs occur at considerable distance from what are identified as prospective rock units in this report.
4. Low: areas that contain prospective rock units but due to a combination of factors (such as quality, proximity to established infrastructure or other modifying factors), are not considered to be prospective in the short to medium term.

Conclusions:

- Areas of high-medium potential for clay, zeolite, and or mineral sands occur within the following forested areas: Moultrie, Duaringa, Yuleba, Gurulmundi, Walhallow, Gubberamunda, Western Creek, Dunmore, Kumbarilla, Dookuna, Stones Country Resources Reserve, Dawes Range State Forests.
- Intersections of high-medium potential for dimension stone resources occur within Cynthia, Dalgsngal, Auburn, Dykehead, Delembra, Allies Creek State Forests and Morgan Park Resources Reserve.
- Areas of high potential for the occurrence of future limestone resources are identified within the following State Forests: Ulam Range, Don River, Boyne Range, Greenup, Texas 1 and 2, Arcot, Gunyan, Claremont. Areas of medium potential occur within the Borania State Forest.

Figure 7A : Geological Units with Potential for Clays, Zeolite, Mineral Sands and Silica Sands

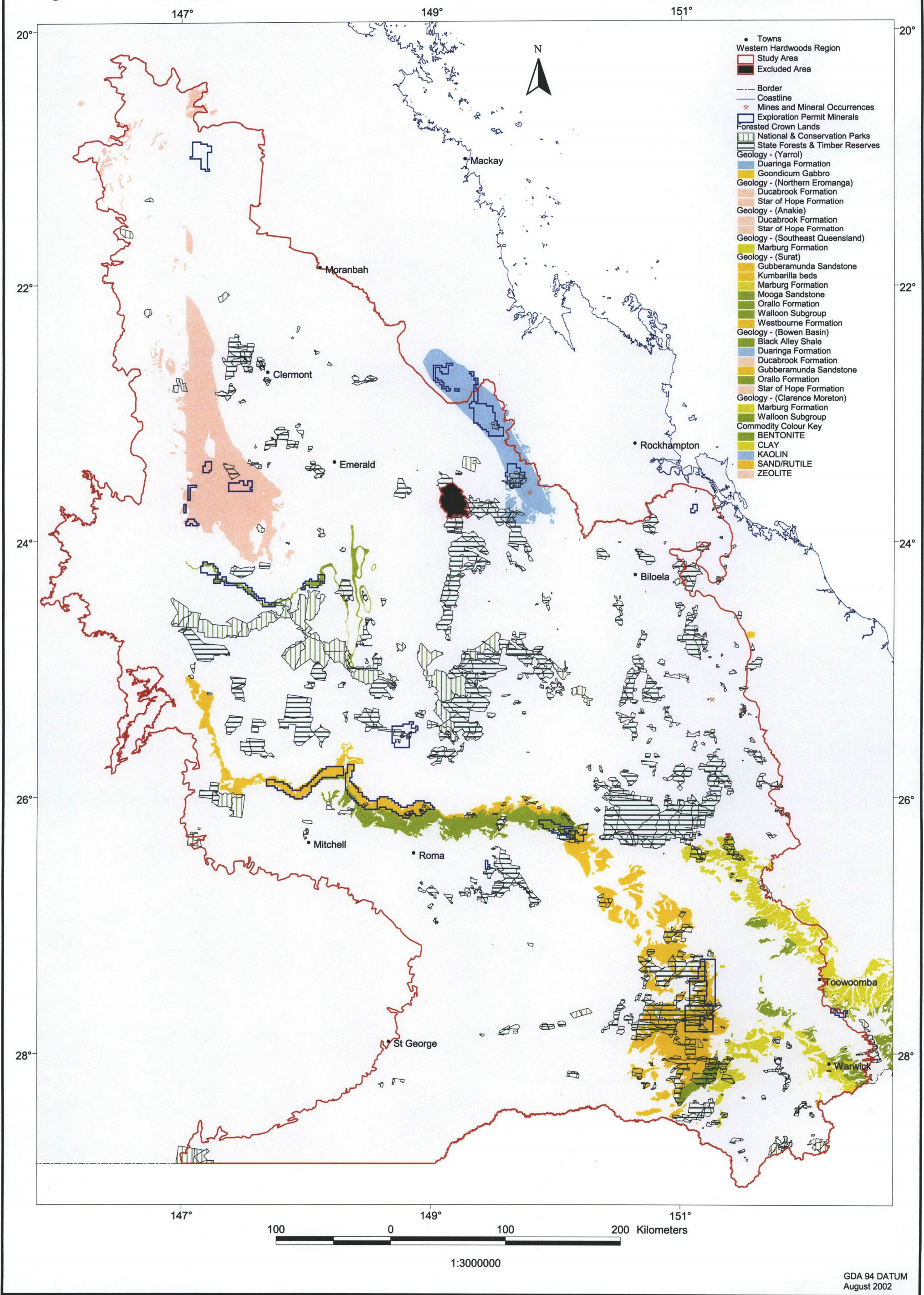


Figure 7B : Areas with Potential for Clays, Zeolite, Mineral Sands and Silica Sands

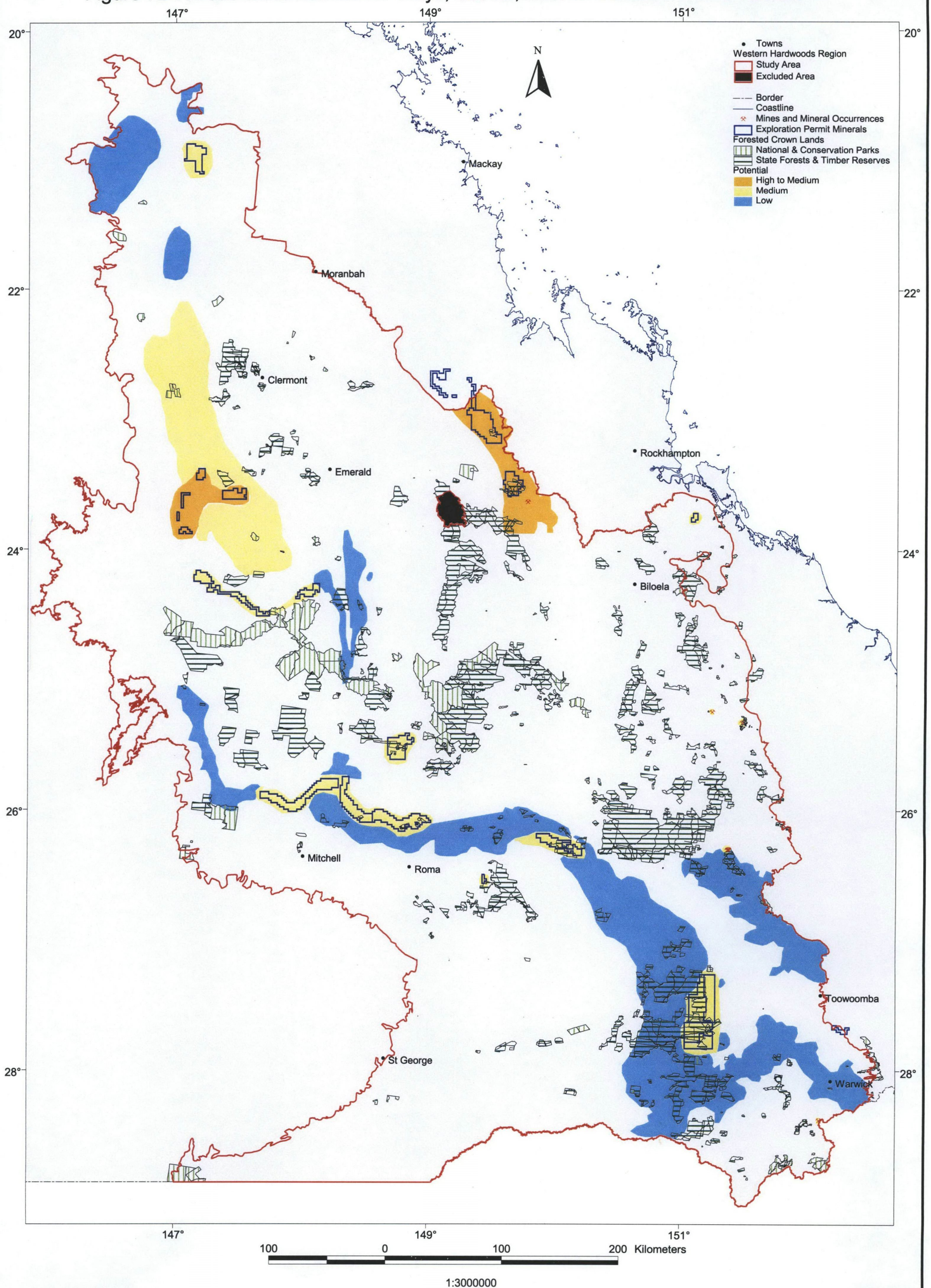


Figure 8A: Geological Units with Potential for Dimension Stone

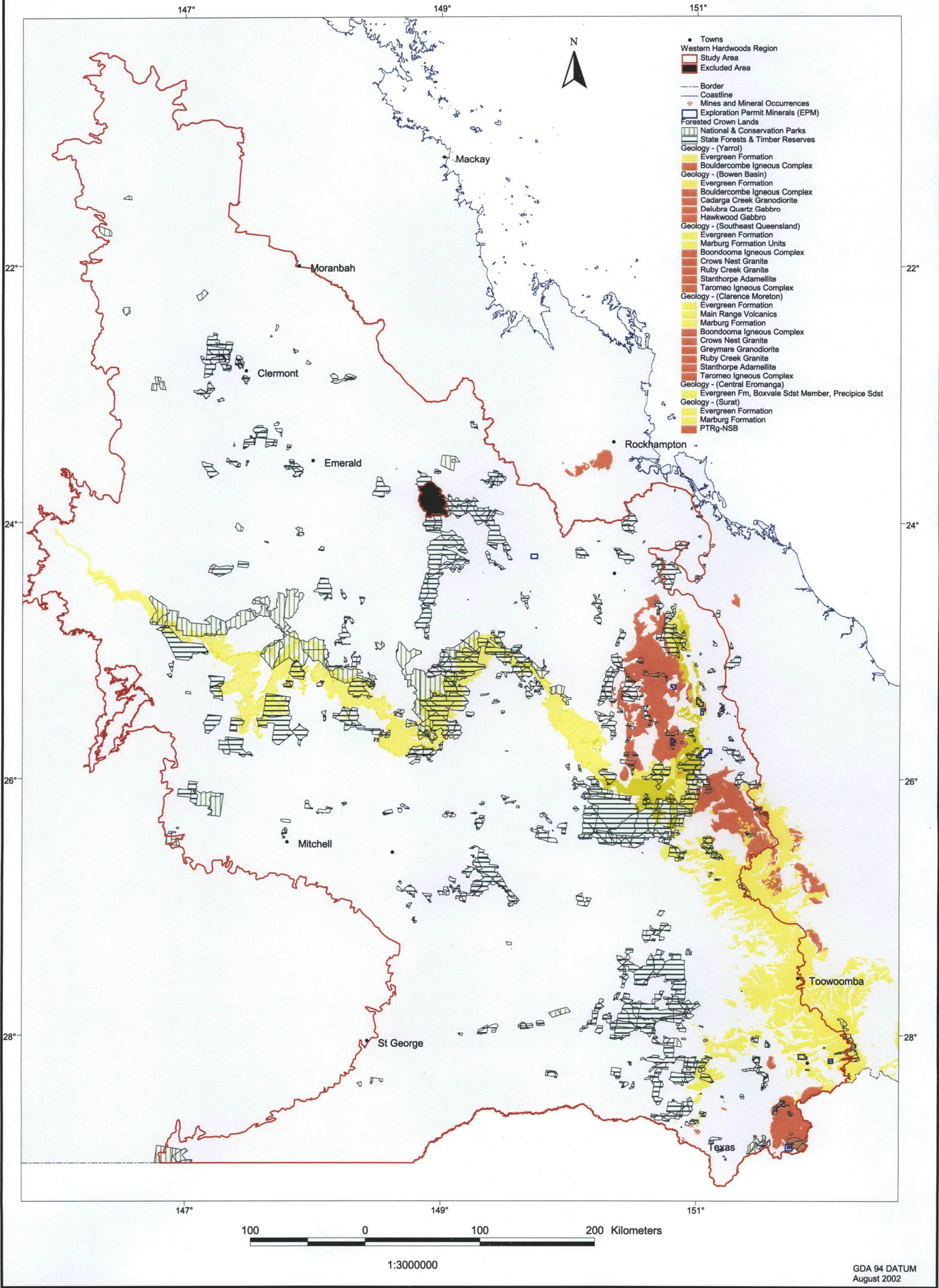


Figure 8B: Areas with Potential for Dimension Stone

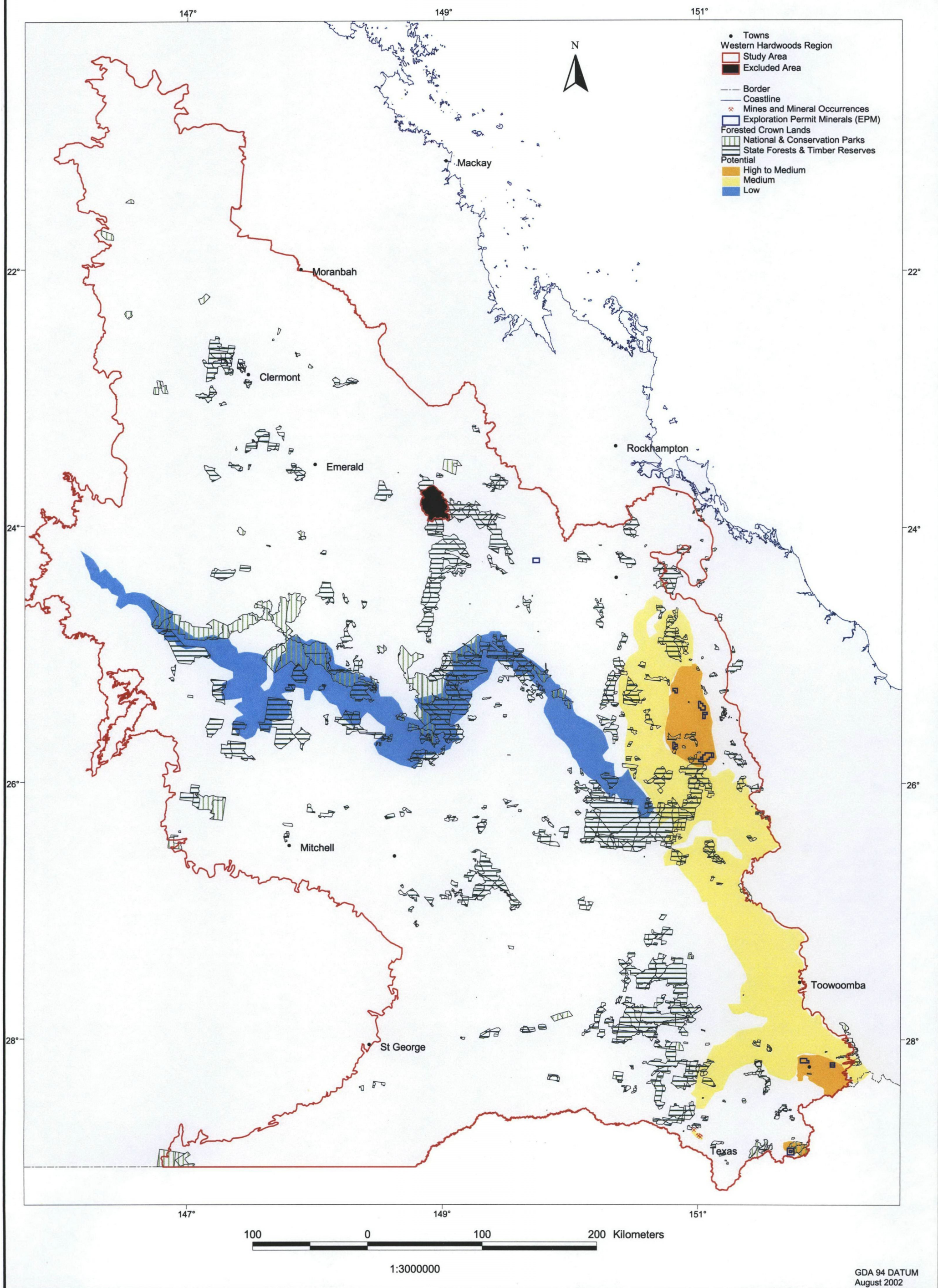


Figure 9A: Geological Units with Potential for Limestone Resources

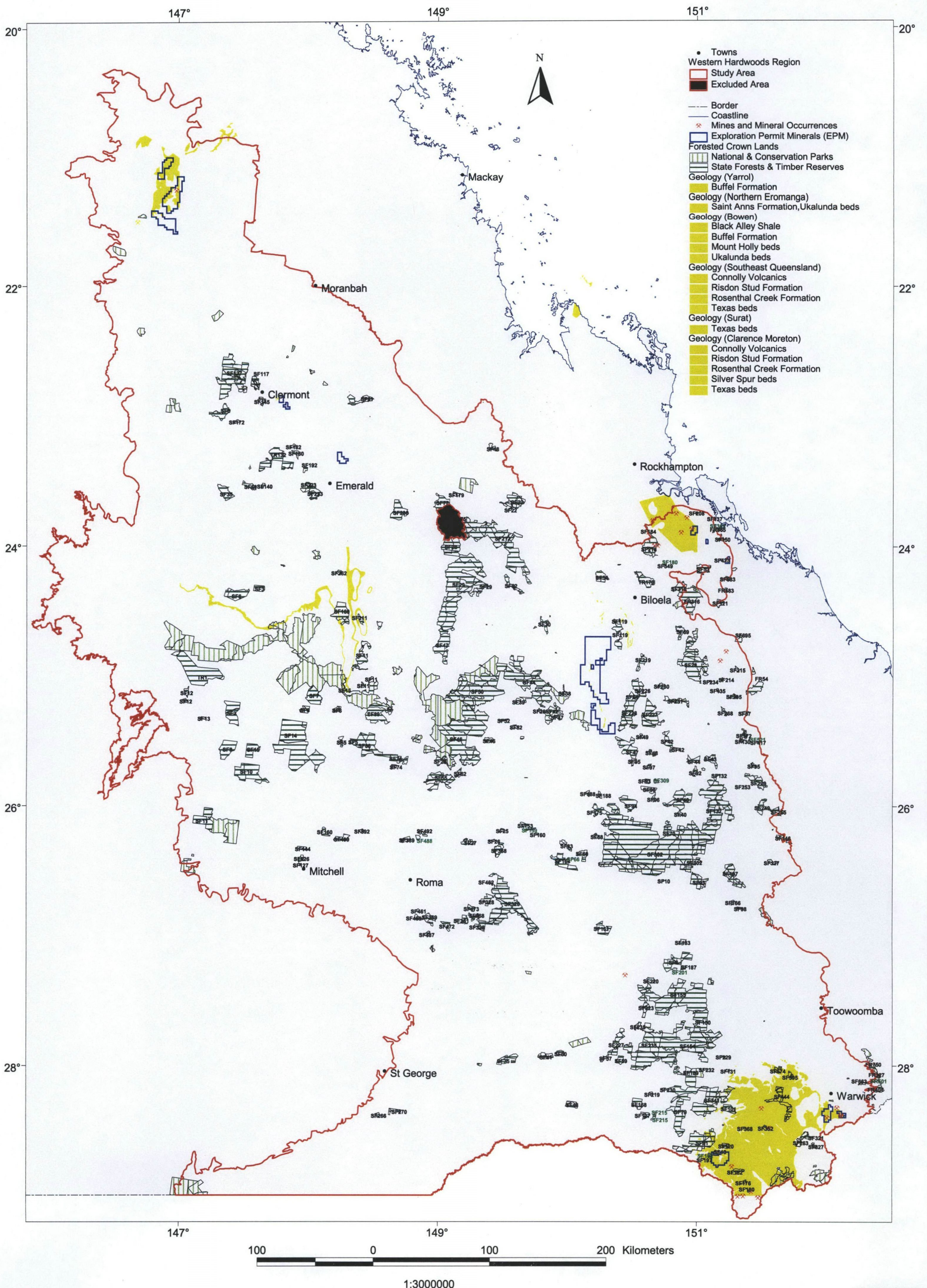
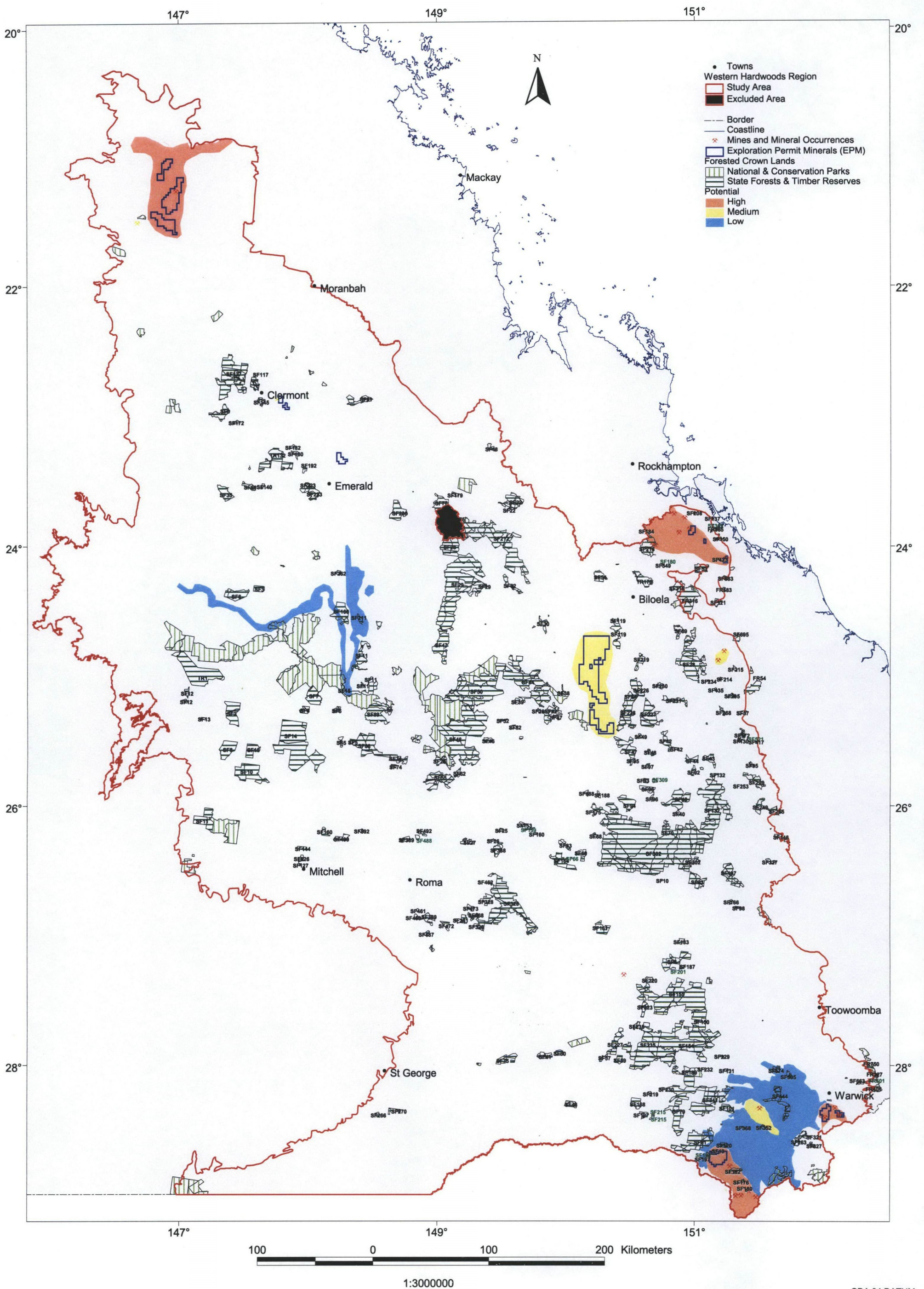


Figure 9B: Areas with Potential for Limestone Resources



METALLIC MINERALS

Overview

The following section discusses gold, base metals (copper, lead, zinc, silver), nickel-cobalt and platinum group metals (PGE).

Queensland is Australia's second-largest **gold** producer with a value of approximately \$395 million for 2000/01. Total annual demand for gold has increased with the effects of 11 September 2001. This trend in overall demand is due to investment buying, resulting from gold's status as a safe-haven commodity in times of world political instability. The price of gold during 2001/02 remained low averaging \$551.62. However, many major gold producers have developed strategies involving new business units related to gold that are intended to stimulate demand through direct access to a number of gold-product markets.

During 2000/01 Mount Leyshon and Kidston, Queensland's former premier gold producers, ceased mining operations after depleting all known resources. These closures will result in the loss of about 500000oz of gold production per year, which will be only partly offset by new production from Mount Rawdon. Whilst additional resources of gold were identified at Mount Rawdon, Gympie and Cracow/Klondyke, the medium future of gold production will depend on the discovery of new ore bodies. This is of concern in view of the last 6 consecutive years of falling exploration expenditures for gold, suggesting that Queensland's future rate of discoveries of deposits for development is likely to remain low.

North-west Queensland is Australia's premier **base metal** province. The region is particularly well endowed, with the area being the largest known repository of economically mineable zinc in the world. In 2000/01 export earnings for silver, lead and zinc mining were \$820 million. Whilst Queensland should remain Australia's leading producer of copper, silver, lead and zinc over the medium-term, the State's base metal operations are expected to close or be near the end of their economic life in the next two decades unless new ore reserves are found. New discoveries are essential to sustain the viability of these Queensland industries over the long-term. As the large deposits of the north-west have now been developed it is likely that new base metal projects will be medium-sized mines, unless a major discovery is made. New discoveries are expected to be more evenly distributed across the state and will come on stream more slowly because of low metal prices and delays caused by native title claims.

The short-term outlook for **nickel-cobalt** mine production in Queensland is not certain. Weakening world economics and falling demand for stainless steel have seen nickel prices drop to less than 50% of their cyclic highs in the past 18 months. Cobalt prices have also been driven down by falling demand and recent supply growth. QNI remained the States' sole producer of nickel and cobalt and production was from imported ores processed at its Yabulu refinery near Townsville. A feasibility study of the Yabulu expansion project continues. However, progress on Queensland's nickel-cobalt projects is slow. Preston Resources Ltd's \$688 million Marlborough Nickel lateritic nickel-cobalt project is on hold awaiting project finance. Development of cost-effective, front-end processing technology for treatment of lateritic ores, possibly using atmospheric acid leach technology, and the availability of spare refining capacity at Yabulu may be needed before remaining resources in the State are economically developed.

Platinum group elements (PGE) are not commercially produced in Queensland.

Western Hardwoods Region

Relevant to the assessment of the WHR is that by 2015 much of the State's known base metal and gold resources will be exhausted. It is anticipated that small to medium scale base metal and gold mines under appraisal and discoveries yet to be made, will contribute to the State's wealth in the medium and long-term. The rocks of the WHR are prospective for base metals and gold. Deposits found in this region to-date have generally been in the small to medium size range, with the exception of the world class Mount Morgan gold-copper deposit.

Major metallic metal projects under various stages of development in this region include: Twin Hills (silver) near Texas, Cracow (gold) located centrally in the WHR, and Pajingo (gold) located west of Mackay.

The State's main **gold** producer, Pajingo, is operated by Newcrest Mining Limited and produced 229777oz of gold in 2000/01. The deposit is hosted in undifferentiated Devonian-Carboniferous volcanics that are probable equivalents to the Silver Hills volcanics. Using current resource estimates the expected economic life of Pajingo is 9 years. Newcrest Mining Limited and Sedimentary Holdings NL have completed a successful exploration program at the \$50 million Cracow project. Pre-feasibility studies at Cracow have identified a preferred decline portal site to develop inferred resources of 2.6Mt @ 9.5g/t gold for 820000oz. This project is anticipated to have a life of 7 years. Other identified gold resources in the WHR are Twin Hills (Lone Sister, Anomaly 309) located in Silver Hills Volcanics and held by Base Metals of Australia NL (EPM8693), and Miclere, which is located in Permian conglomerates unconformably overlying the Anakie Metamorphic Group and held by Sedimentary Holdings Ltd. Twin Hills has an inferred gold resource of 5.8Mt@1.80g/t gold and Miclere has an inferred resource of 1Mt @ 7.7g/t gold. There are also a number of closed gold operations within the WHR including: Yandan, Wirralie, Koala-Golden Bar and Glen Eva. Wirralie has a total remaining resource of about 6Mt of refractory ore at 1.7g/t gold. A number of significant gold deposits are known to occur outside of the WHR in the Yarrol and Thalanga Provinces, deposits such as Mount Morgan and Reward/Highway both now mined out. Relevant to this assessment is that, although these deposits are outside the WHR, the prospective rock units that hosted these deposits extend into the WHR.

Table 4 summarises deposit models, associated rock units and source of the model.

Table 4 **DEPOSIT MODELS AND PROSPECTIVE ROCK UNITS FOR GOLD MINERALISATION IN WHR**

<i>Deposit Model</i>	<i>Rock Unit/type</i>	<i>Model Source</i>
<i>Epithermal</i>	<i>Undivided Late Devonian - early Carboniferous volcanics (equivalent to Silver Hills Volcanics), Silver Spur beds, Silver Hills Volcanics, Mount Coolon Andesite, Camboon Volcanics, Saint Anns Formation, Mount Wyatt Formation</i>	<i>eg Pajingo, – operating; Twin Hills – proposed project; Cracow/Klondyke – resource</i>

<i>Potential Epithermal</i>	<i>Silver Hills Volcanics, Bulgonnuna Volcanics, Camboon Volcanics, Torsdale beds, Texas beds, Mount Wyatt Formation, Three Moon Conglomerate, Ukalunda beds, Saint Anns Formation, Devonian-Carboniferous units in Thalanga Province, Star of Hope Formation, Greybank Volcanics, Llanarth Volcanic Member, Torsdale Volcanics, Silver Spur beds, Silverwood Group, Chalmers Formation, Mt Salmon Volcanics, Winterbourne Volcanics, Owl Gully Volcanics, undifferentiated Lower Permian volcanics</i>	<i>309, Conway, Dawn, Glen Eva, Koala-Golden Bar, Lone Sister – abandoned/occurrences</i>
<i>Potential Gold-Silver-Telluride Veins</i>	<i>As above</i>	<i>USGS Bulletin 1693</i>
<i>Mesothermal/Hydrothermal veins</i>	<i>Intrusives and surrounds eg. Eidsvold Complex, Rocky Point Granodiorite, Coonambula Grandiorite, Ravenswood-Lolworth Batholith, Permo-Carboniferous rhyolitic intrusives, Eidsvold Igneous Complex-Mount Eagle Volcanics-Rawbelle Batholith, Targinie Quartz Monzonite, Kariboe Layered Gabbro, Dumgre Tonalite, Wingfield Granite, Chahpingah Meta-Igneous Complex, undifferentiated Permo-Triassic intrusives</i>	<i>eg Mount Rainbow, St Johns Goldfield, Burnett Squatters Mine - abandoned; Britannia, Bluff, Warrawee, Lighthouse – mineral occurrences</i>
<i>Alluvial/Placer</i>	<i>Alluvium</i>	<i>eg, Cockatoo, Cumberland, Daylight Gully, Five Mile Creek - abandoned</i>
<i>Potential/Alluvial Placer</i>	<i>Alluvium</i>	<i>EPM 12282; 12293; 12557; 12744; 13226; 13457; 13499;</i>
<i>Deep Lead/Placer</i>	<i>Blair Athol Coal Measures</i>	<i>Miclere – resource; Denny Gully - abandoned</i>
<i>Potential Deep Lead/Placer</i>	<i>Alluvium</i>	<i>Company exploration model</i>

<i>Porphyry type (Copper-Molybdenum-Gold; Copper-Gold)</i>	<i>Surrounds and within intrusive bodies eg Unnamed Granodiorites/Diorites; Cadarga Creek Granodiorite, Diglum Granodiorite, Wingfield Granite, Eidsvold Complex, Mannersley Granodiorite, Mount Saul Quartz Monzonite, Monal Granodiorite,</i>	<i>Eg Briggs-Riverhead, Booreco Creek Prospect, Mt Cannindah - occurrence</i>
<i>Potential Porphyry type</i>	<i>Surrounds and within intrusive bodies eg Wingfield Adamellite, Glandore Granodiorite, unnamed Permo- Triassic Intrusives; Bajool Quartzdiorite, Cecilwood Quartz Diorite; Cretaceous intrusives;</i>	<i>Company Exploration models; Yarrol data</i>
<i>Potential Carlin-style</i>	<i>Back Creek Group – the belt between Cracow and Banana</i>	<i>Company exploration model</i>
<i>Gold Skarn</i>	<i>Intrusives (eg Mount Seaview Complex, Diglum Granodiorite) and limestone/calcareous surrounding (eg Rockhampton Group)</i>	<i>eg Ajax, Bullseye prospect, PA No 51 , Company exploration model</i>
<i>Potential Sediment-hosted (gold)/Homestake</i>	<i>Silver Hills Volcanics, Bulgonnuna Volcanics, Bimurra Volcanics, Anakie Metamorphic Group, Lochenbar Formation, Marble Waterhole beds, Ukalunda beds, Saint Anns Formation</i>	<i>Company Exploration model</i>
<i>Potential Low Sulphide Gold Quartz Veins/Turbidite hosted Gold/Listwanite</i>	<i>Wandilla Formation, Doonside Formation, Calliope beds, Erebus beds, Marble Waterhole beds, Mt Dick beds, Mt Warner Volcanics, Raspberry Creek Formation, Shoalwater Formation; Anakie Metamorphic Group, Serpentinised ultramafics</i>	<i>Yarrol and Anakie data</i>
<i>Low Angle Fault Hosted</i>	<i>Erebus beds, Mount Alma Formation, Calliope beds, Doonside Formation</i>	<i>eg. Duke of York, Mount Holly, Mount Raglan, Mount Hiron – abandoned; Yarrol data</i>

It should be noted that the Miclere prospect is described in the GSQ Mineral Occurrence Database as a uranium-gold deep lead deposit. The Bowen Basin contains permeable channel and bar sandstones with characteristics that are favourable for hosting sedimentary uranium deposits. There was considerable exploration during the 1970's for this type of mineralisation but all proved unsuccessful. Based on the earlier exploration and the absence of any current EPMs looking for uranium, this deposit type was not included in the current assessment in the WHR.

Alluvial resources in the Texas-Warwick region, historically are the most intensively worked for alluvial tin and some gold. State Forests affected in this area are: Passchendale, Poziers, Broadwater and Sundown Resources Reserve. Alluvial gold workings in the Anakie Inlier are known to occur in the Blair Athol and Apsley State Forests. Elsewhere in the WHR isolated alluvial tin and gold occurrences are identified in the Allies Creek, Durikai, and Talgai State Forests.

Figures 10A- 14A show the spatial relationship between prospective rock units, current EPMs (including applications), known mineral occurrences, and State Forest, Timber Reserves and Forest Reserves. Figures 10B-14B identify regions in terms of their prospectivity. Deposit models that are genetically associated with intrusive rock units, but may occur some distance from the intrusive body (eg porphyry, skarn, mesothermal/hydrothermal veins, polymetallic veins), have prospective rock units defined on the basis of a 'buffer' around the intrusive. A 1 km buffer has been used for porphyry and skarn deposit models and for the more distal mesothermal/hydrothermal deposit types, a 3 km buffer was used.

In delineating prospective rock units an inclusive approach has been taken. For example, it is recognised that some preferred relationships exist between pluton age and certain deposit types (eg copper-molybdenum porphyries tend to occur in Permo-Triassic granitoid intrusives). However, these relationships have important exceptions, and serve only as a general guide. To apply these generalisations would exclude areas that are in fact prospective (eg the Burns Spur porphyry prospect located in the Cretaceous Burns Spur Nepheline Monzosyenite). Consequently, in this assessment, all intrusive bodies within the WHR are considered to have potential to source hydrothermal/mesothermal and skarn deposits, and all granitoid intrusives are considered potential sources for porphyry deposits.

Prospective regions are described as either:

- 1.High: areas of known resources that are considered to have the greatest exploration potential and highest potential for future developments or expansions (ie having identified resources or covered by granted mining tenures or applications).
- 2.High-Medium: areas outside known deposits or mines but containing currently held EPs (including applications). These areas either contain or are near known mineral occurrences.
3. Medium: areas that are outside known deposits or EPs but contain prospective rock units, and are closely associated with known mines or mineral occurrences; or where isolated EPMs occur at considerable distance from what are identified as prospective rock units in this report.
4. Low: areas that contain prospective rock units but have no other indicators of mineralisation.

Fig 10A: Geological Units with Potential for Sediment-Hosted (Gold) and Homestake-type Deposits

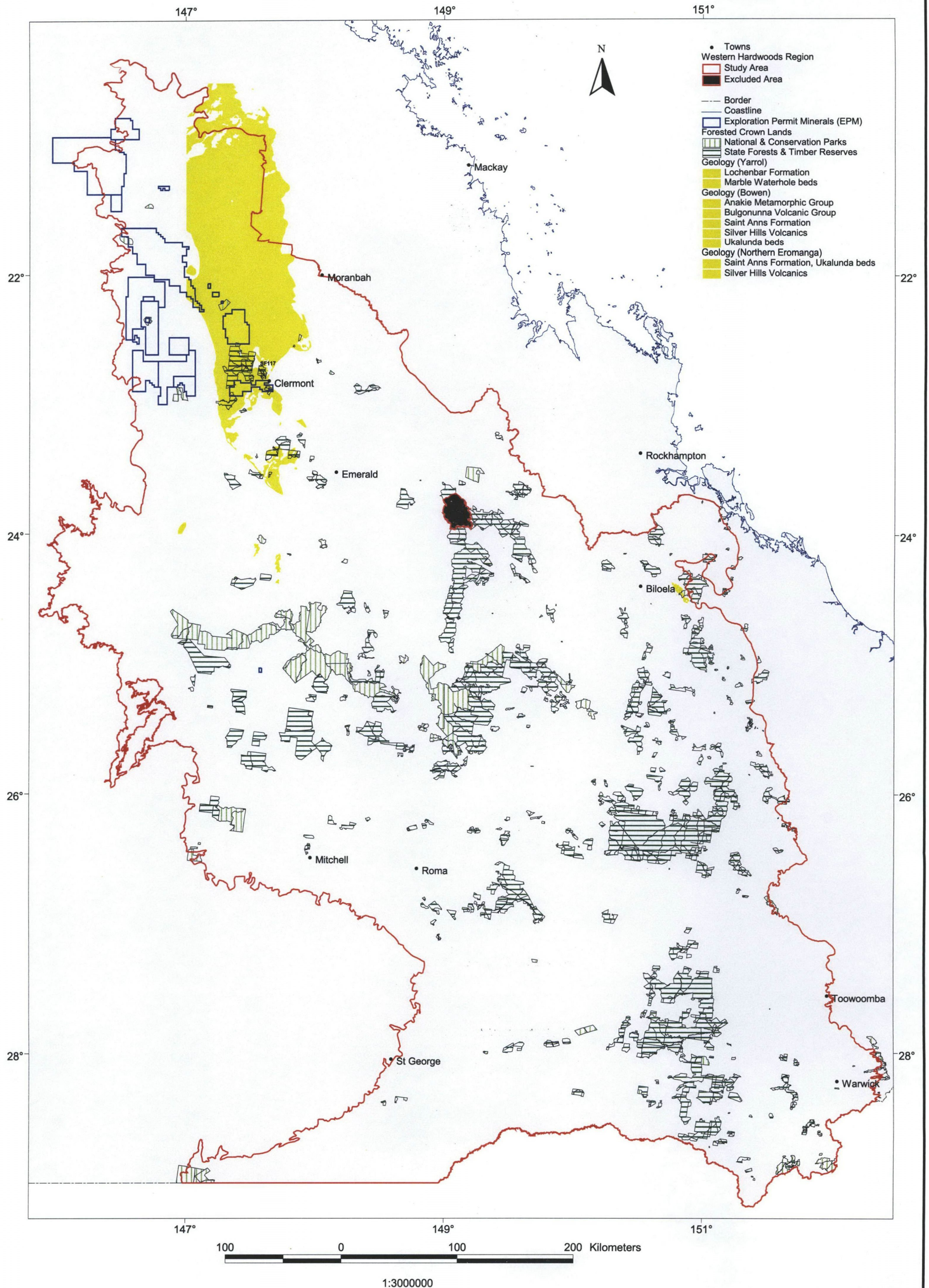


Fig 10B: Areas with Potential for Sediment-hosted (Gold) and Homestake-type Deposits

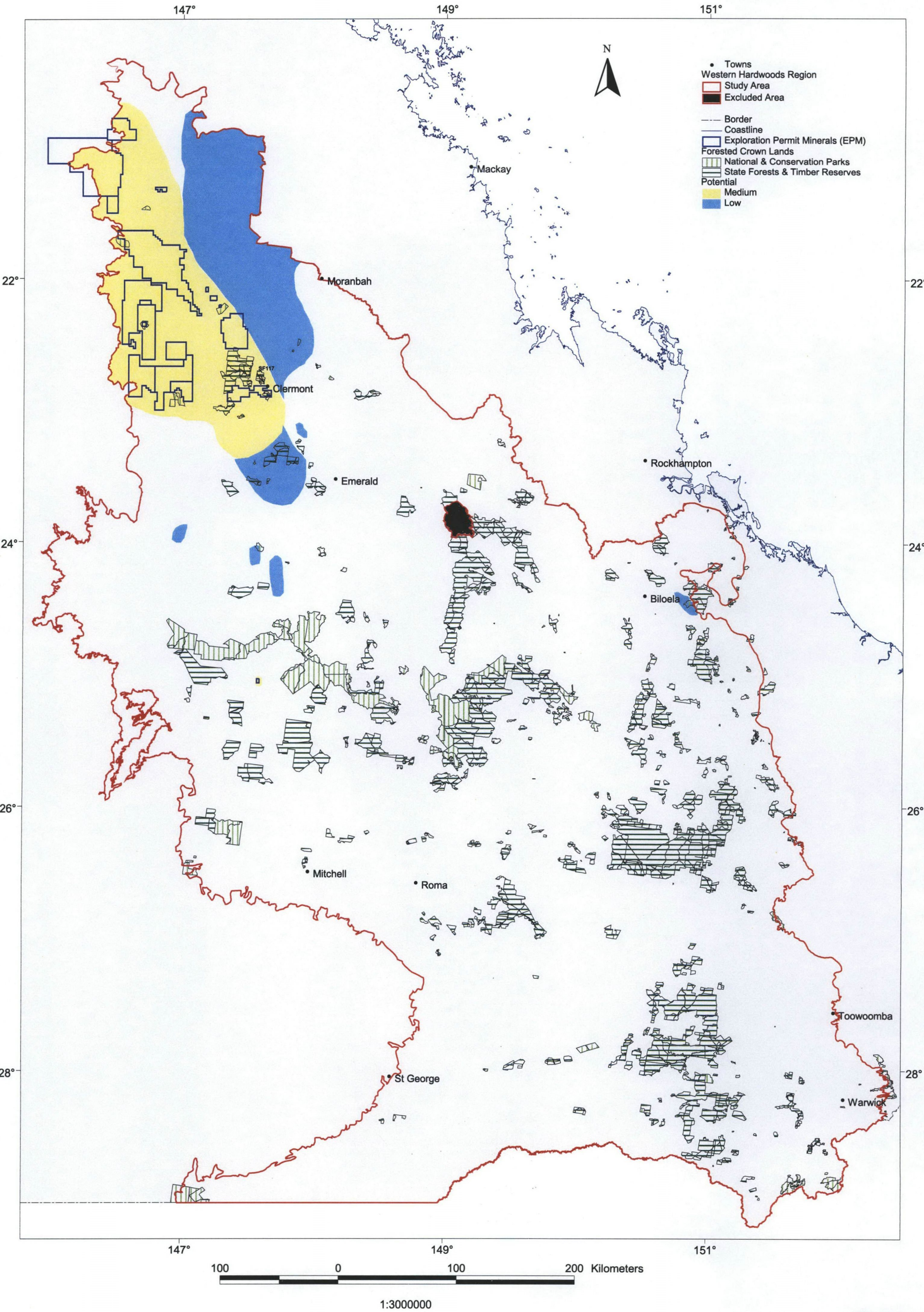


Figure 11A- Geological Units with Potential for Replacement-type Gold Deposits - Skarn /Carlin style

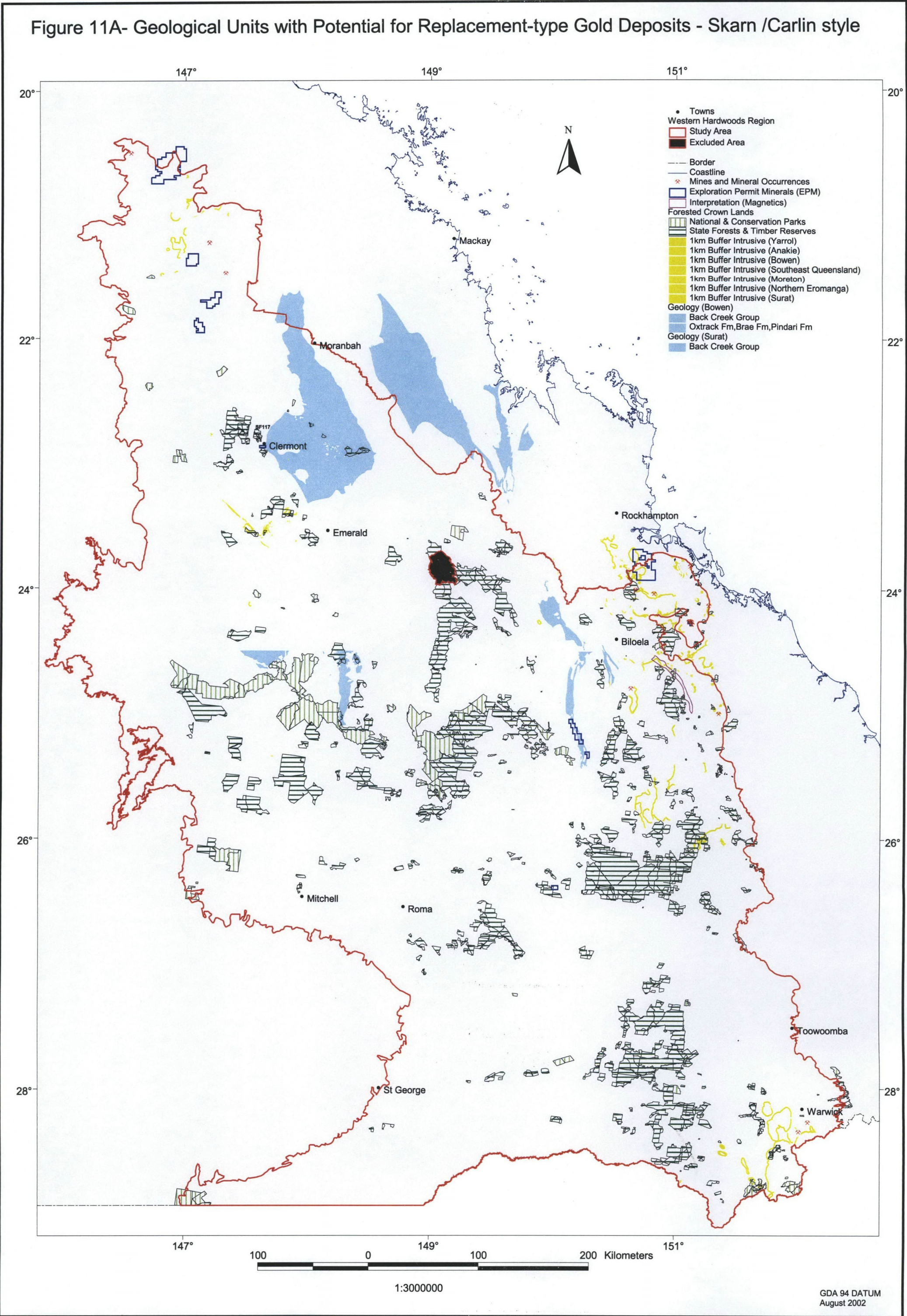


Figure 11B- Areas with Potential for Replacement-type Gold Deposits - Skarn /Carlin style

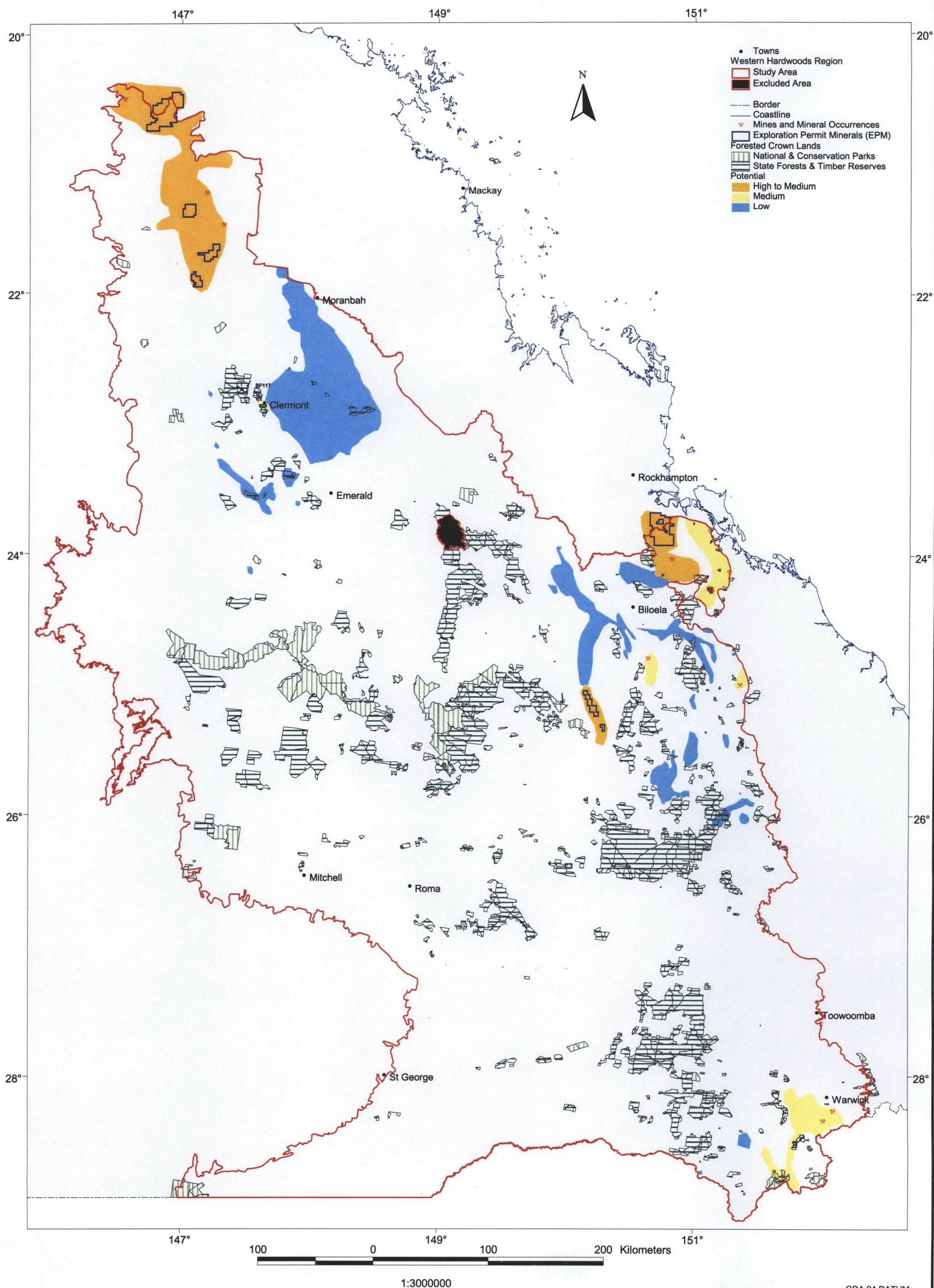


Figure 12A- Geological Units with Potential for Epithermal-type Deposits

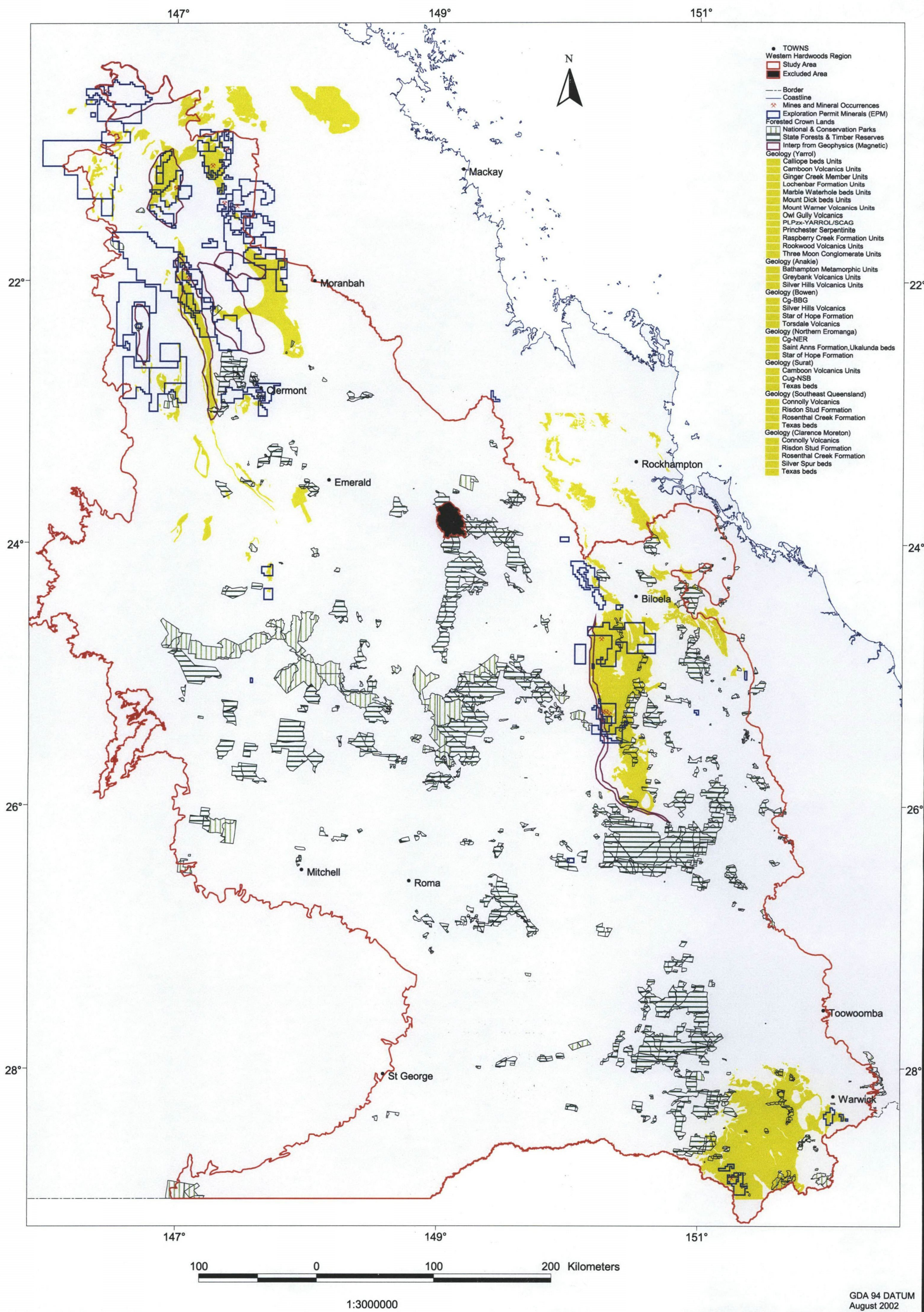


Figure 12B- Areas with Potential for Epithermal-type Deposits

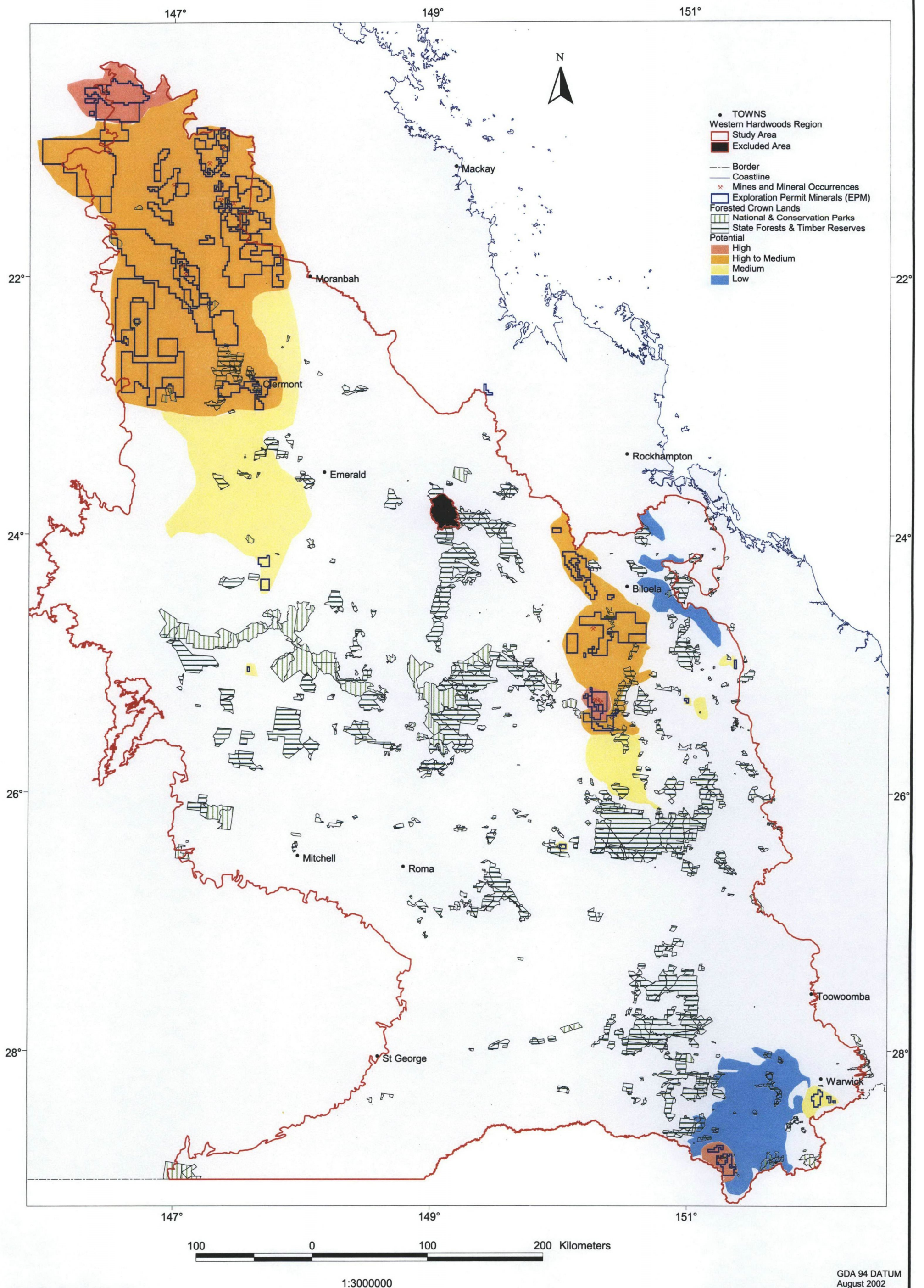


Figure 13A: Geological Units with Potential for Mesothermal/Hydrothermal Gold/Polymetallic Vein Deposits

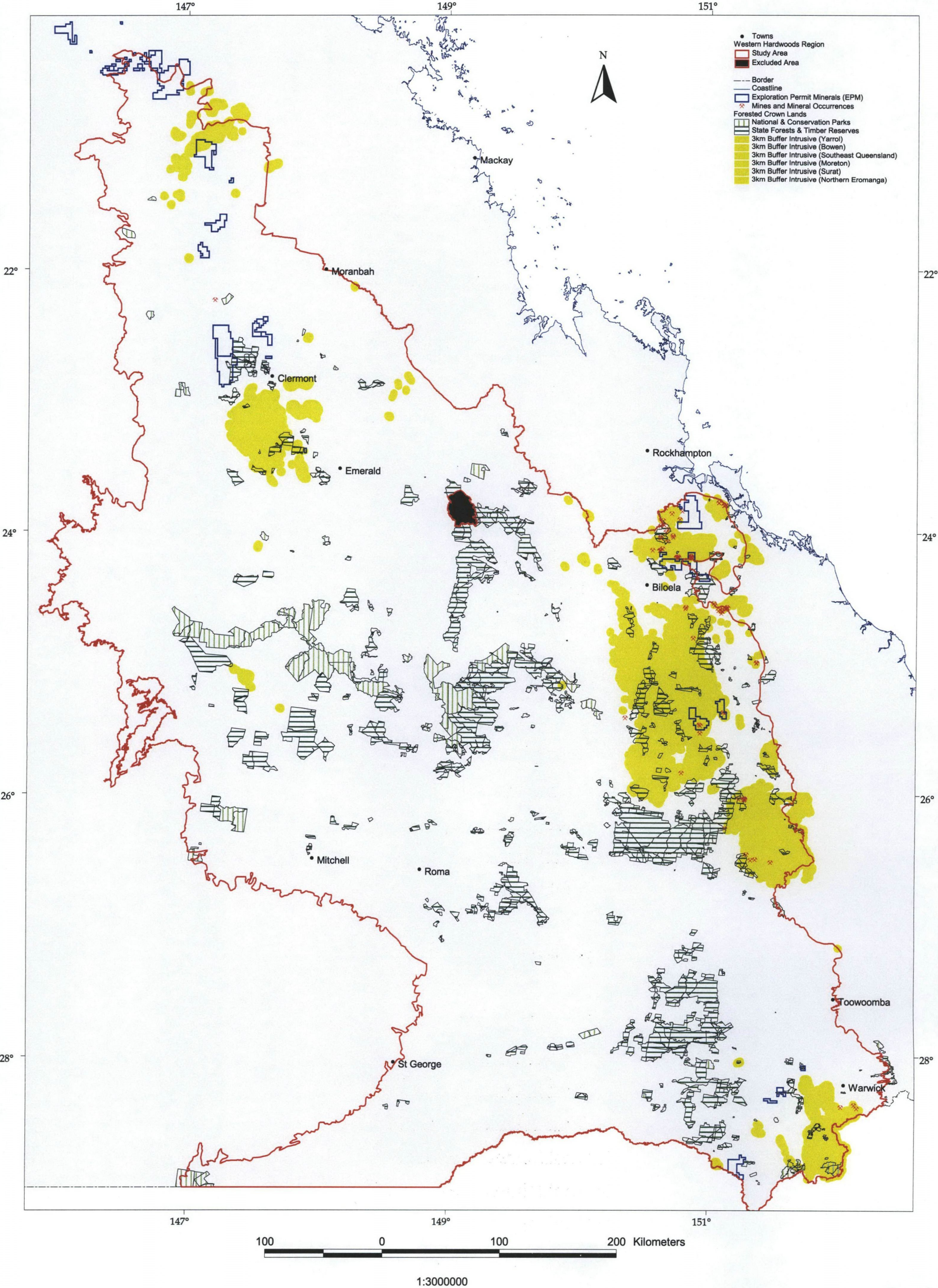


Figure 13B: Areas with Potential for Mesothermal/Hydrothermal Gold/Polymetallic Vein Deposits

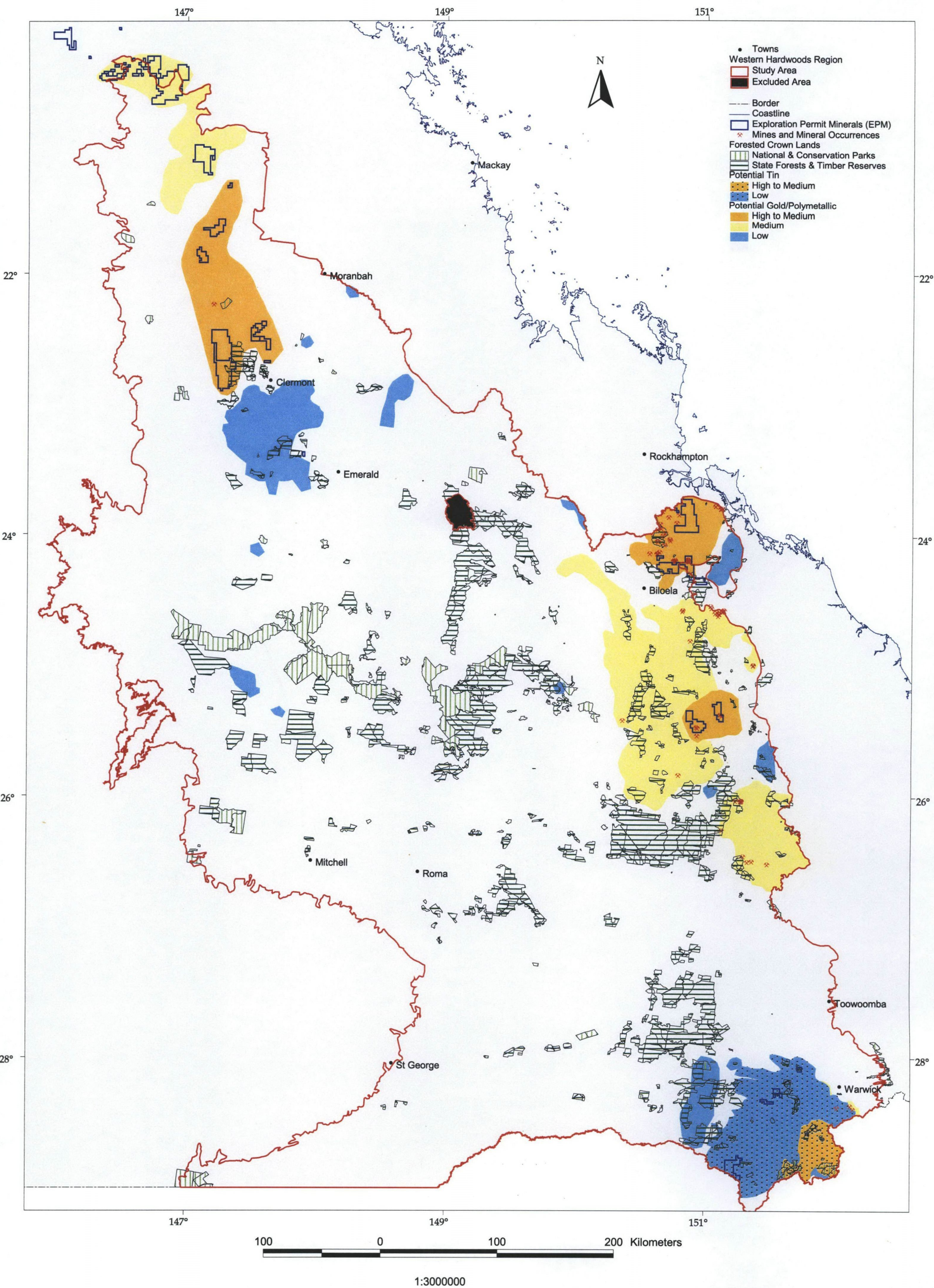


Figure 14A: Geological Units with Potential for Porphyry Type Copper-Molybdenum-Gold Deposits

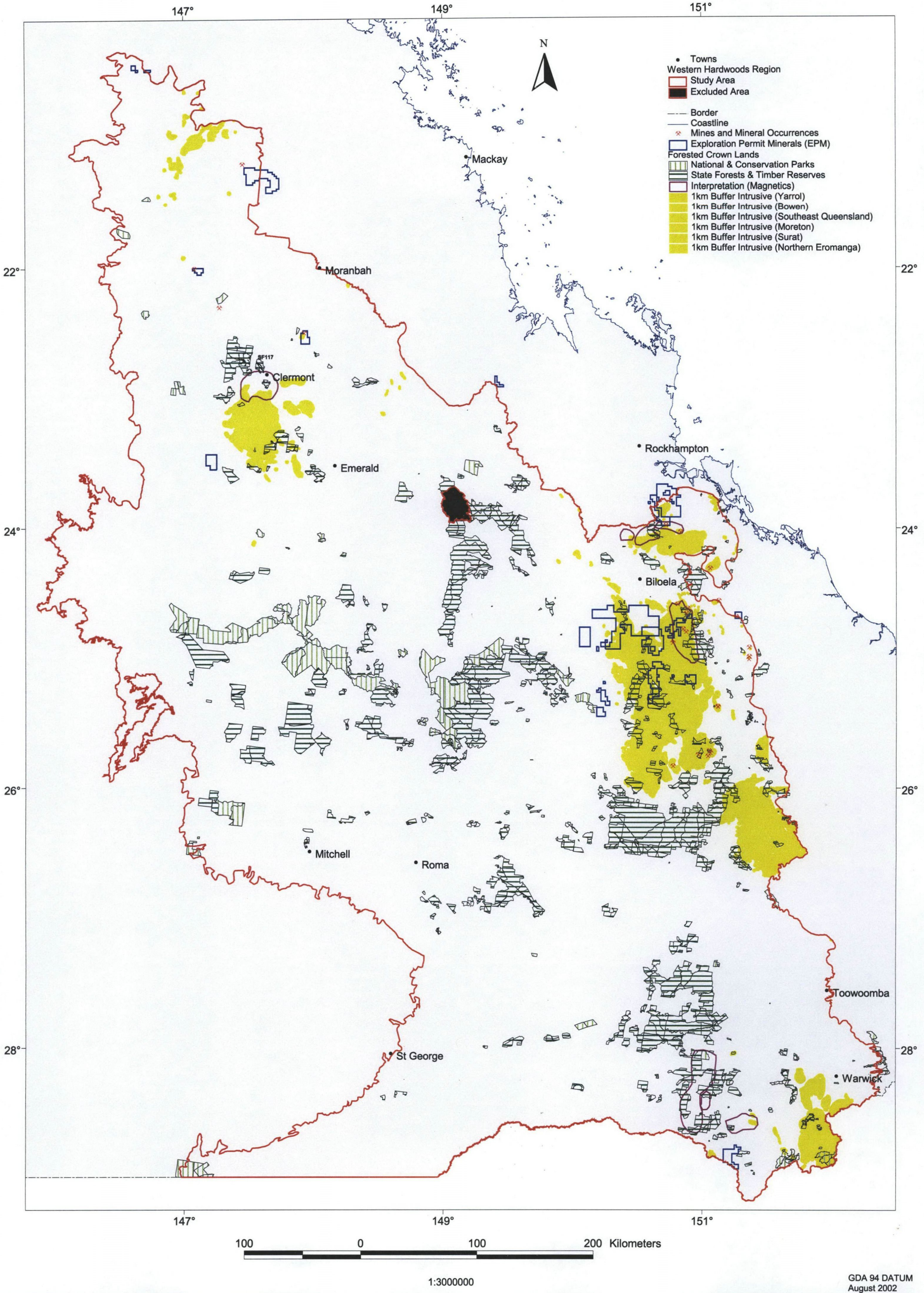
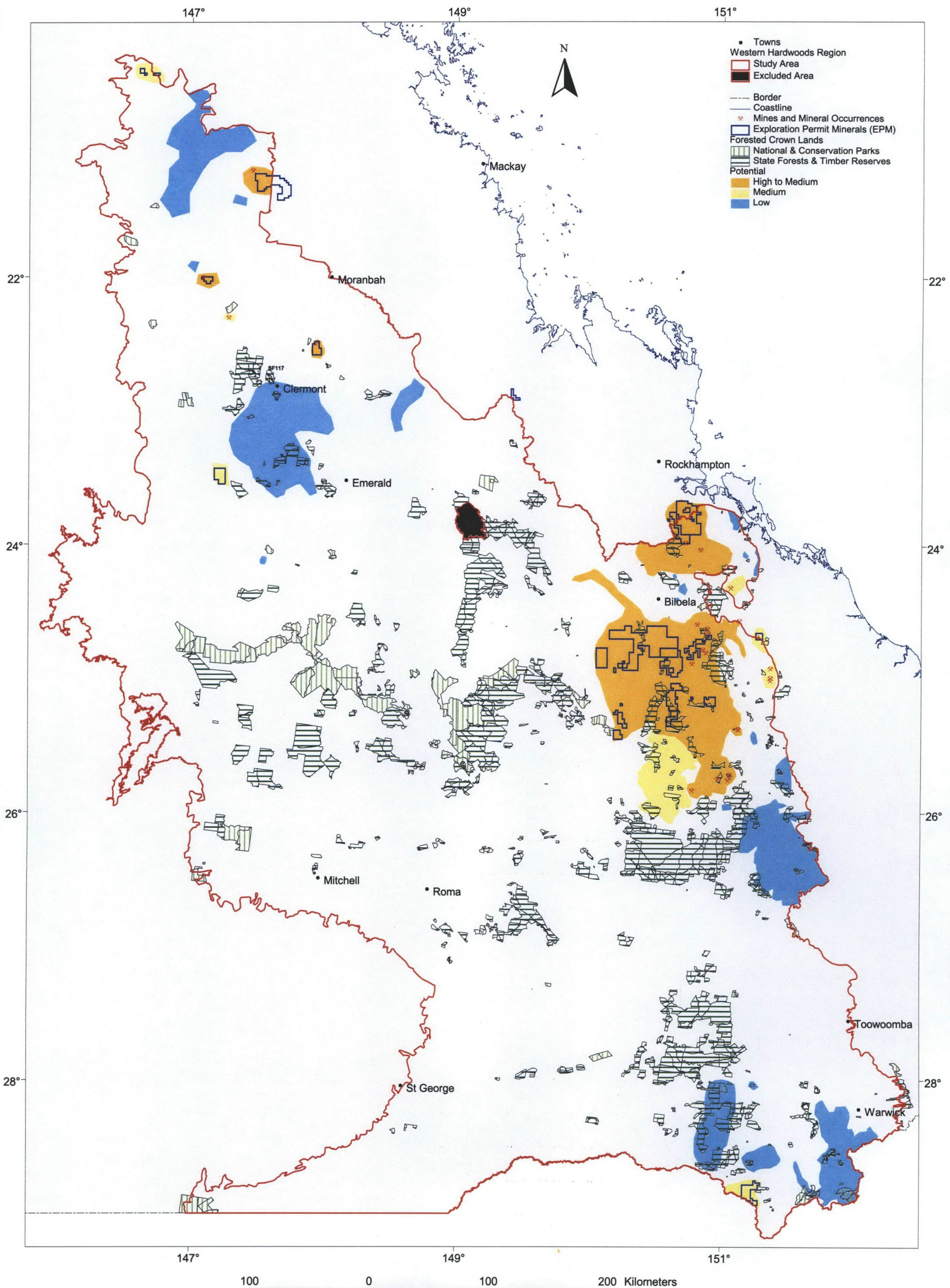


Figure 14B: Areas with Potential for Porphyry Type Copper-Molybdenum-Gold Deposits



Areas of known *base metal* mineralisation in the WHR include the Yarrol Province (eg Raspberry Creek beds, Mount Warner Volcanics, Capella Creek beds, Erebus beds), the Thalanga Province (Mount Windsor Volcanics), Anakie Inlier (Hurley Metamorphics), and the Texas area (Silver Spur beds, Texas beds). Volcanogenic silver deposits near Texas include the Silver Spur and Mount Gunyan deposits and the \$4.5 million Twin Hills silver project. Texas Resources Pty Ltd was granted Mining Lease 50161 over the proposed Twin Hills Mine area in April 2001 for a 15 year term. An opencut mine is proposed with some 9Moz of silver in probable reserves of 3.6Mt at 80g/t silver and is expected to have an operating life of 7 years. Significant volcanogenic deposits, including Mount Morgan, Mount Chalmers, Thalanga and the Develin Creek deposit, are also known to occur in the Yarrol Province and Thalanga Province but are outside the WHR. Rock units that host these volcanogenic deposits, or in some cases similar units, extend into the WHR.

There is potential for a number of base metal deposit types to occur that are as yet undiscovered in the WHR. For example, disseminated copper mineralisation in the basal volcanic sequence along the eastern edge of the Bowen Basin has led to suggestions that the basin may contain sediment-hosted base metal deposits (Murray, 1990). Company exploration applications also indicate an interest in sediment hosted base metal deposits in the Drummond Basin and Anakie Inlier in units such as the Silver Hills Volcanics and Anakie Metamorphic Group.

The most extensive identified resources of *nickel and cobalt* in Queensland are outside the WHR in the Marlborough district, where deposits occur in a western zone extending discontinuously from about 7km south-west of Marlborough for about 40km in a south-easterly direction and are derived from Neoproterozoic serpentinised peridotites that have undergone lateritic enrichment. There is, however, some exploration for lateritic nickel-cobalt and nickel-platinum within the WHR in the Rubyvale district (EPM 11224 - over lateritised serpentinites) and north of Mitchell (EPM 11905 over Tabor Gabbro and equivalents). An associated deposit type, where the principal target is *platinum group elements*, has focused interest on the Hawkwood-Delubra Gabbro of the Rawbelle Batholith. A platinum, palladium, magnetite and gold (PGM) resource has been identified by Pan Australia Resources NL (EPM 12299) in the Hawkwood Gabbro intrusive complex.

Table 5 summarises deposit models, associated rock units and source of the model.

Table 5:

DEPOSIT MODELS AND PROSPECTIVE ROCK UNITS FOR BASE METAL MINERALISATION IN WHR

<i>Deposit Model</i>	<i>Rock Unit/type</i>	<i>Model Source</i>
<i>Skarn</i>	<i>Intrusives and calcareous/limestone surroundings (eg Rosenthal Creek Formation, Balaclava Formation)</i>	<i>eg. Grieves Quarry; Mt Cannindah; Diglum Prospect; Mount Grim; Mount Harry Marsh (copper skarn); Tatong Magnetite (iron skarn)</i>
<i>Potential skarn</i>	<i>Permo-Triassic intrusives and calcareous surrounds eg Erebus beds surrounding Bajool Quart Diorite/Cecilwood Quartz Diorite,</i>	<i>Company Exploration model</i>

<i>Alluvial/Placer - Tin</i>	<i>Alluvium</i>	<i>eg Kingar Creek, Dalcouth Creek, Sugarloaf Creek, Black Swamp Creek</i>
<i>Tin veins (Cornish type)</i>	<i>Texas beds, Ruby Creek Granite, Stanthorpe Granite, Coonambula Granodiorite,</i>	<i>eg State Arsenic Mine, Bluff, Carpenters Gully, Copper King,</i>
<i>Potential Volcanic Massive Sulphide-Besshi</i>	<i>Rookwood Volcanics, Mt Dick beds, Three Moon Conglomerate, Owl Gully Volcanics, Calliope beds, Raspberry Creek Formation, Marble Waterhole beds, Lochenbar Formation, Bathampton Metamorphic, Silver Spur beds, Terrica beds, Drake andesite, Rhyolite Range beds, undifferentiated Permian beds in the Texas area</i>	<i>Eg Silver Spur – abandoned; Peak Downs, Karita Prospect, Mount Fane, Old Kroombit – occurrence; Company Exploration models</i>
<i>Potential Volcanogenic Massive Sulphide - Cyprus</i>	<i>Ophiolite sequences</i>	<i>Yarrol data</i>
<i>Potential Volcanogenic Massive Sulphide - Kuroko</i>	<i>Capella Creek Group, Berserker Group, Marble Waterhole beds, Pond Formation, Capella Creek Group, Mt Warner Volcanics, Ginger Creek Volcanic Member, Raspberry Creek Formation</i>	<i>eg Mount Morgan Mine – abandoned; Tea Tree - occurrence</i>
<i>Potential Volcanogenic Massive Sulphide - undefined type</i>	<i>Greybank Volcanics, Silver Hills Volcanics, Silverwood Group, Mount Windsor Volcanics, volcanics underlying Eromanga Basin sediment</i>	<i>Company Exploration model</i>
<i>Potential Blackbird Cobalt-Copper</i>	<i>Rookwood Volcanics, Mt Dick beds, Three Moon Conglomerate, Owl Gully Volcanics, Calliope beds, Raspberry Creek beds; Marble Waterhole beds, Lochenbar Formation, Bathampton Metamorphics</i>	<i>Yarrol data</i>
<i>Potential Copper-Nickel-Zinc-Lead</i>	<i>Marble Waterhole Formation, Bulgonunna Volcanics, Silver Hills Volcanics, Anakie Metamorphic Group</i>	<i>Company exploration models</i>
<i>Potential Sediment Hosted Copper</i>	<i>Anakie Metamorphic Group, Bathampton Metamorphics, Rosenthal Creek Formation</i>	<i>Company exploration models; M14, Oaklands - occurrence</i>
<i>Potential Basaltic Copper</i>	<i>Mount Hoopbound Formation, Calliope beds, Alton Downs basalt, Camboon Volcanics</i>	<i>Yarrol data</i>

<i>Volcanogenic Manganese</i>	<i>Wandilla Formation, Doonside Formation</i>	<i>Gardiners – occurrence; Yarrol data</i>
<i>Sedimentary Iron Formation</i>	<i>Evergreen Formation– oolitic ironstone</i>	<i>Dawsonvale, Rd 50, Mount Walturn, Moonford - occurrences</i>
<i>Potential Volcanic hosted Magnetite</i>	<i>Areas within Texas beds</i>	<i>USGS 1693</i>
<i>Hydrothermal/Polymetallic veins</i>	<i>Surrounds and within intrusive bodies eg Targinie Quartz Monzonite</i>	<i>eg Archer, Argoon, Austerity – occurrences</i>
<i>Porphyry (Copper-Molybdenum-Gold; Copper; Copper-Gold)</i>	<i>Surrounds and within intrusive bodies; eg Unnamed Granodiorites/Diorites; Cadarga Creek Granodiorite, Diglum Granodiorite, Wingfield Granite, Eidsvold Complex, Mannersley Granodiorite, Mount Saul Adamellite, Monal Granodiorite</i>	<i>eg Briggs Riverhead, Mount Cannindah, Whitewash – occurrences</i>
<i>Potential Porphyry (Copper-Molybdenum-Gold; Copper; Copper-Gold)</i>	<i>Texas beds, Silver Spur beds, Camboon Volcanics, Glandore Granodiorite, Wingfield Granite, intrusive bodies</i>	<i>Company Exploration model</i>
<i>Potential PGE Layered Ultramafics</i>	<i>eg Hawkwood – Delubra Gabbro</i>	<i>Company Exploration model</i>
<i>Podiform Chromite</i>	<i>Serpentinite and serpentinitised ultramafics and overlying weathering profile</i>	<i>Yarrol data</i>

Figures 15A-19A show the spatial relationship between prospective rock units, current EPMs (including applications), known mineral occurrences, and State Forest, Timber Reserve and Forest Reserve. Figures 15B-19B identify regions in terms of their prospectivity. Two deposit model groups have significant gold and base metal commodities, these are the porphyry copper-molybdenum-gold group and the mesothermal/hydrothermal/polymetallic vein group. Reference figures for these models are in the earlier gold section (Figures 13A&B, 14A&B).

Prospective regions are described as either:

1. High: areas of known resources that are considered to have the greatest exploration potential and highest potential for future developments or expansions (ie having identified resources or covered by granted mining tenures or applications).
2. High-Medium: areas outside known deposits or mines but containing currently held EPs (including applications). These areas either contain or are near known mineral occurrences.
3. Medium: areas that are outside known deposits but contain prospective rock units, and either have coverage by EPs or are closely associated with known mines or mineral occurrences; or where isolated EPMs occur at considerable distance from what are identified as prospective rock units in this report.
4. Low: areas that contain prospective rock units but have no other indicators of mineralisation.

Conclusions:

- Intersections between areas of high-medium potential for replacement type gold and base metal skarn deposits and State Forest/Timber Reserves are as follows: Ulam Range, Don River, Dan Dan and Calliope. The Apsley State Forest,

Mount Larcoom, Mount Stowe, Gurulmundi, Binkey and Calliope Forest Reserve contains geological units considered to have medium potential for the occurrence of replacement deposits.

- Areas of high potential for epithermal gold intersect the Arcot, Gunyan and Claremont State Forests. High to medium potential areas intersect the Blair Athol, Apsley, Copperfield, Redrock, Carbine, Gogango, Overdeen, Belmont, Montour, Camboon, Trevethan, Borania, Dyngie, and Rockybar State Forests.
- Hydrothermal vein style deposits (gold, basemetal) have a high-medium potential to occur in geological units that occur within the following State Forests/Forest and Timber Reserve: Blair Athol, Redrock, Mount Larcoom, Targinie, Ulam Range, Calliope, Mount Stowe, Don River, Dan Dan, Kroombit Tops, Yule, Dalgangal. There are over 35 State Forests/Reserves that include areas of medium potential. Tin vein potential is restricted to the Warwick-Texas area with areas of high-medium potential within Passchendaele, Pozieres, Broadwater State Forests and Sundown Resources Reserve.
- Areas of high-medium potential for copper-molybdenum-gold porphyry type deposits cover or intersect the following State Forests: Ulan Range, Don River, Dan Dan, Calliope Range, Belmont, Grevillea, Coomingleah, Montour, Camboon, Trevethan, Yule, Borania, Calrossie, Yerilla, Auburn, Dykehead, Delembra, and Koko.
- Areas of high-medium potential for volcanogenic massive sulphide intersect: Copperfield, Redrock, Ulam Range, Don River, Calliope Range, Dan Dan, Degalgil, Grevillea, Kalpowar, Cannindah, Blair Athol, Apsley State Forests and Kroombit Tops, Wietalaba, Bania, and Delgalgil Forest Reserves and Callide Timber Reserve.
- There are no intersections with forested areas for sediment hosted copper/basaltic copper or volcanic hosted magnetite/manganese deposit types.
- Although PGE areas of high-medium potential intersect six State Forest/Reserves EPMs or prospective rock units most intersections are not extensive in the forested areas.

Figure 15A- Geological Units with Potential for Base Metal Skarn and Polymetallic Replacement Deposits

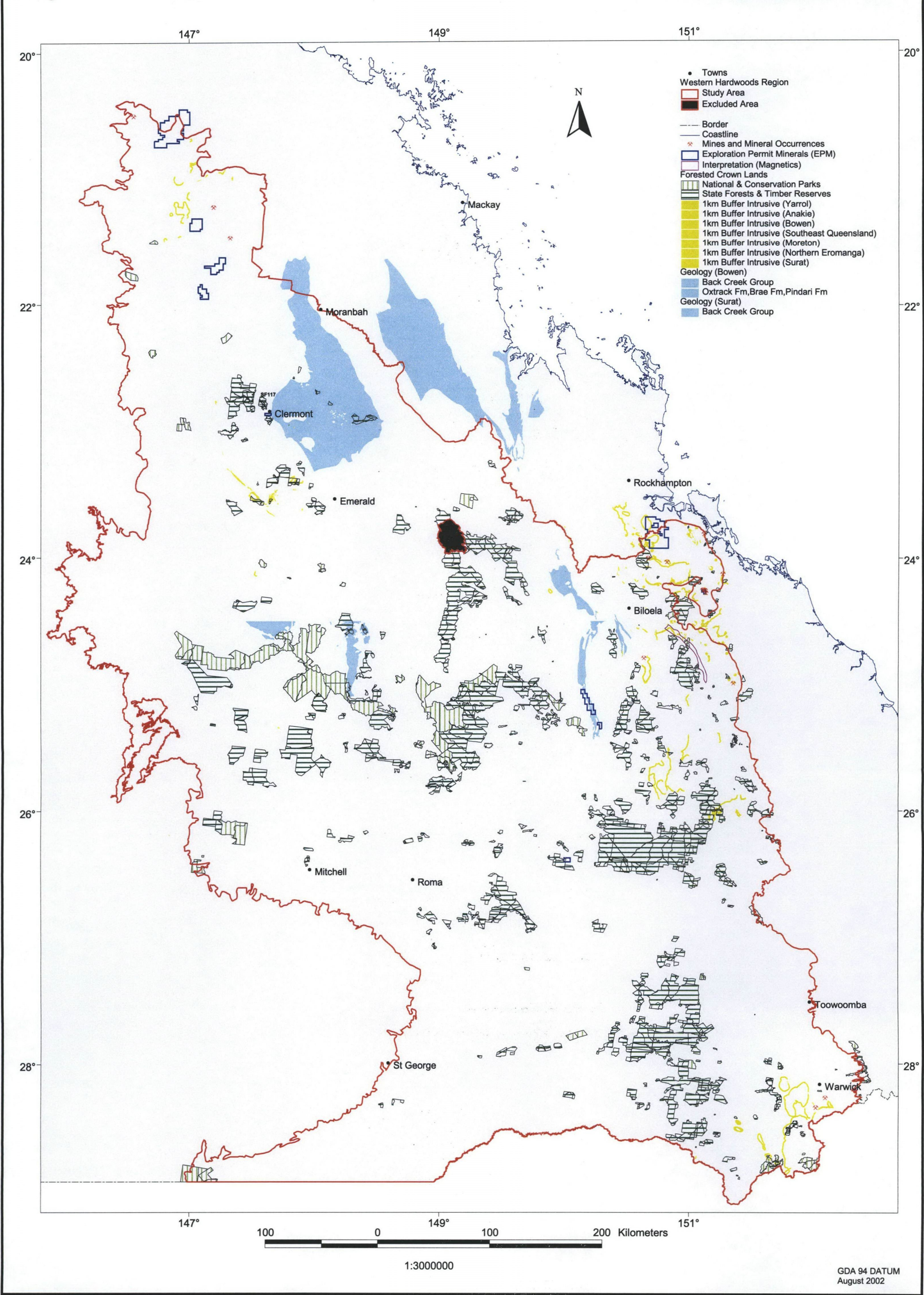


Figure 15B- Areas with Potential for Base Metal Skarn and Polymetallic Replacement Deposits

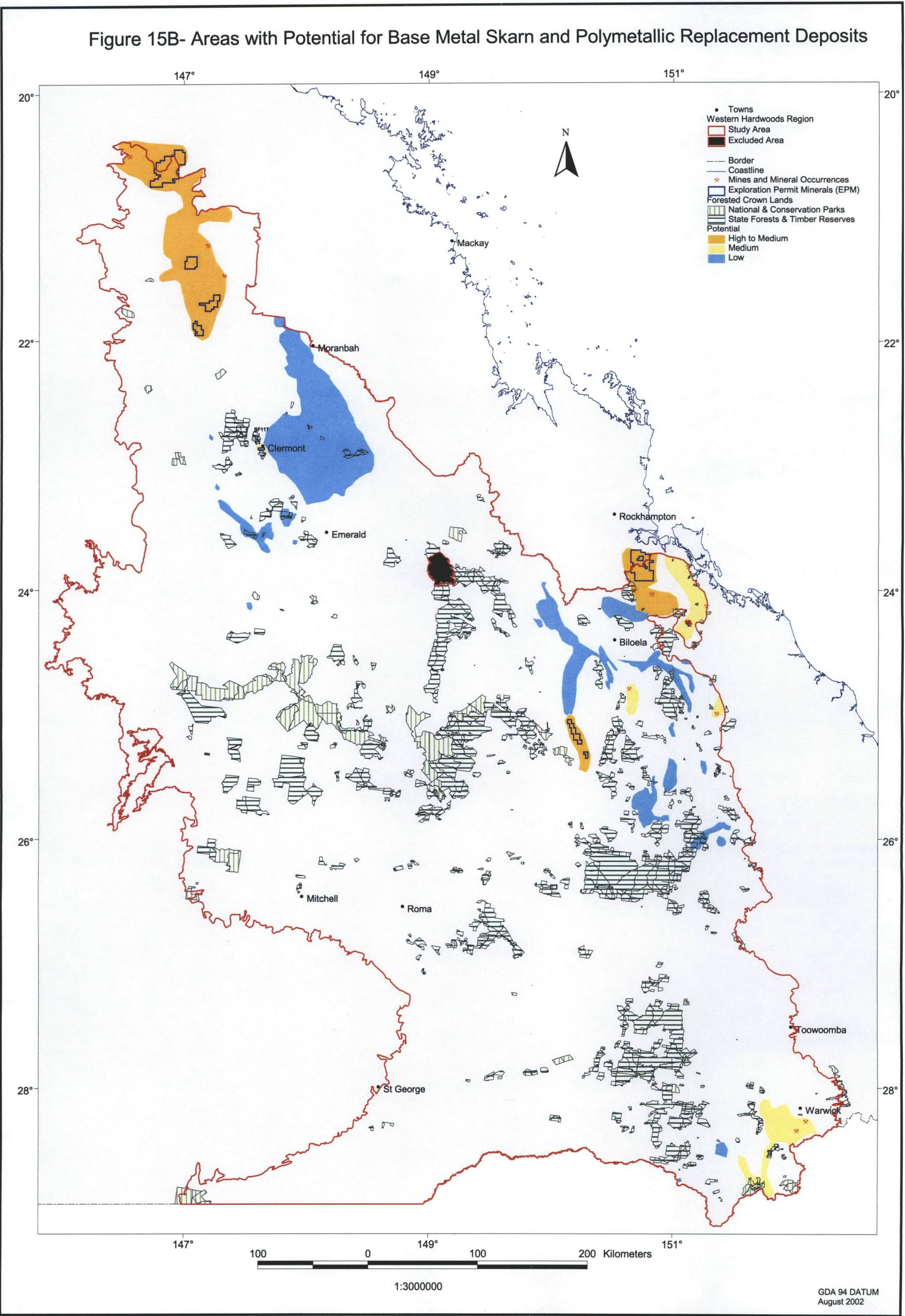


Figure 16A: Geological Units with Potential for Volcanogenic Massive Sulphide and Blackbird Cobalt-Copper Deposits

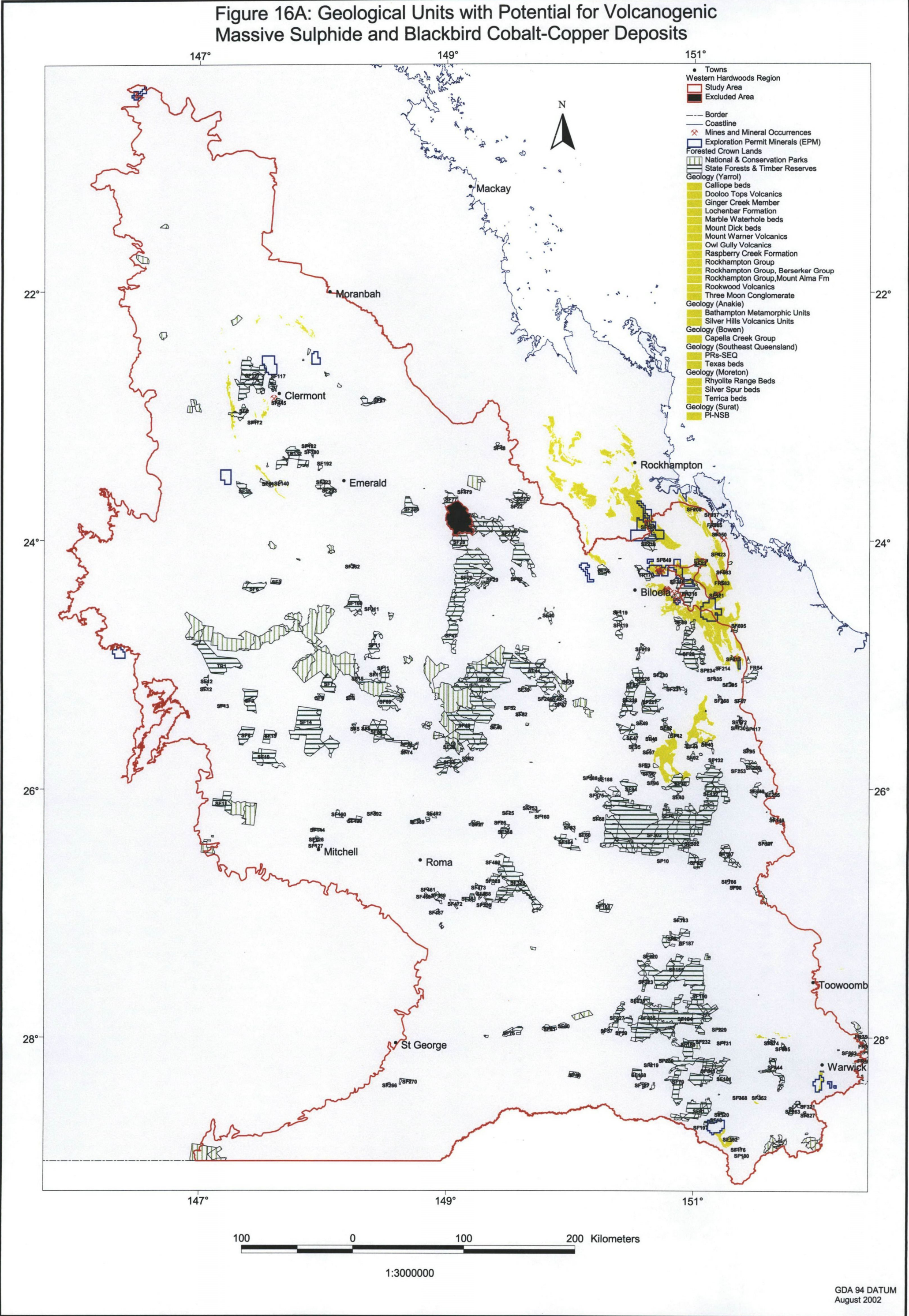


Figure 16B: Areas with Potential for Volcanogenic Massive Sulphide and Blackbird Cobalt-Copper Deposits

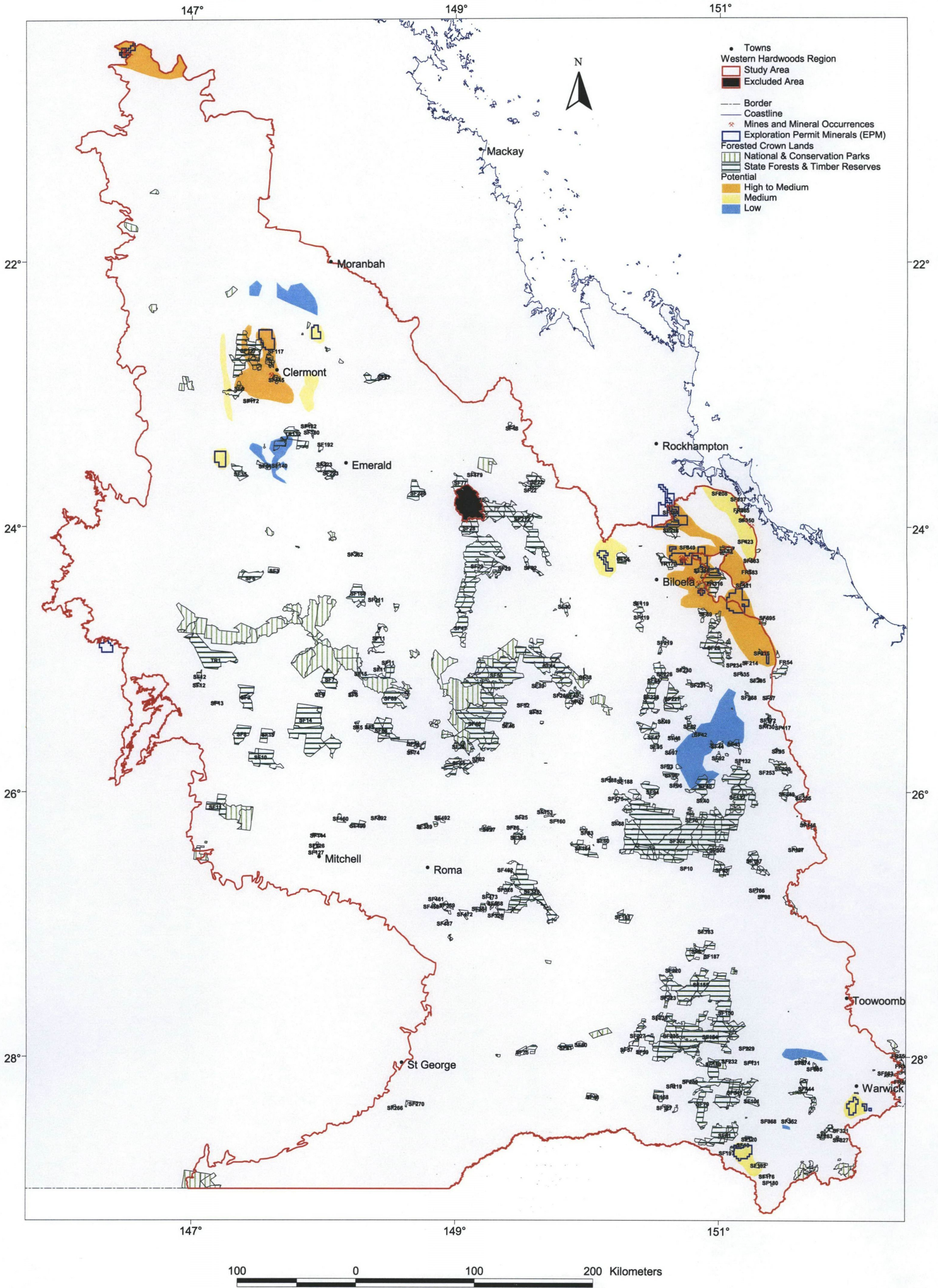


Figure 17A: Geological Units with Potential for Sediment-Hosted Copper/Basaltic Copper Deposits

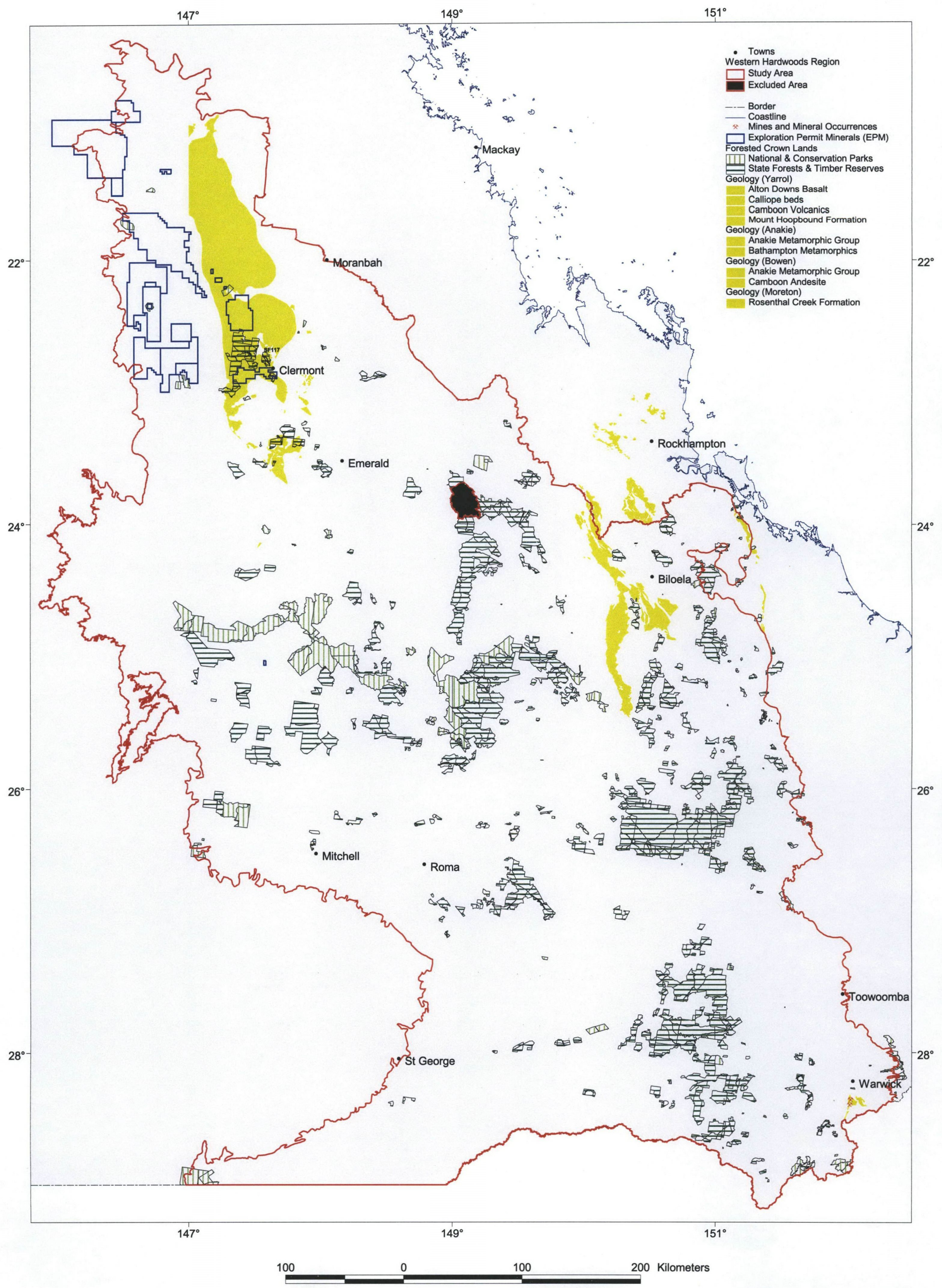


Figure 17B: Areas with Potential for Sediment-hosted Copper/Basaltic Copper Deposits

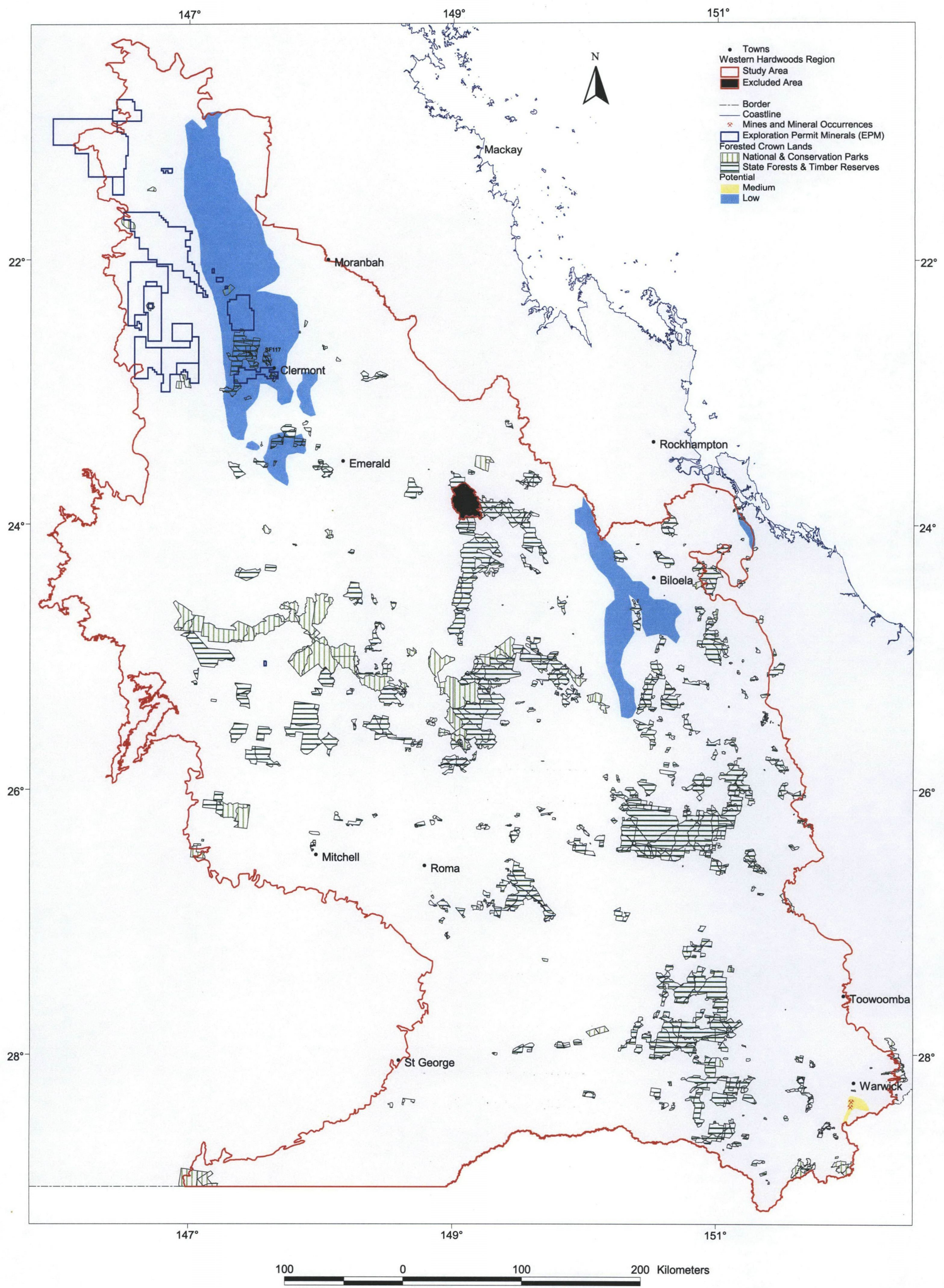


Figure 18A - Geological Units with Potential for Volcanic-hosted Magnetite and Volcanogenic Manganese Deposits

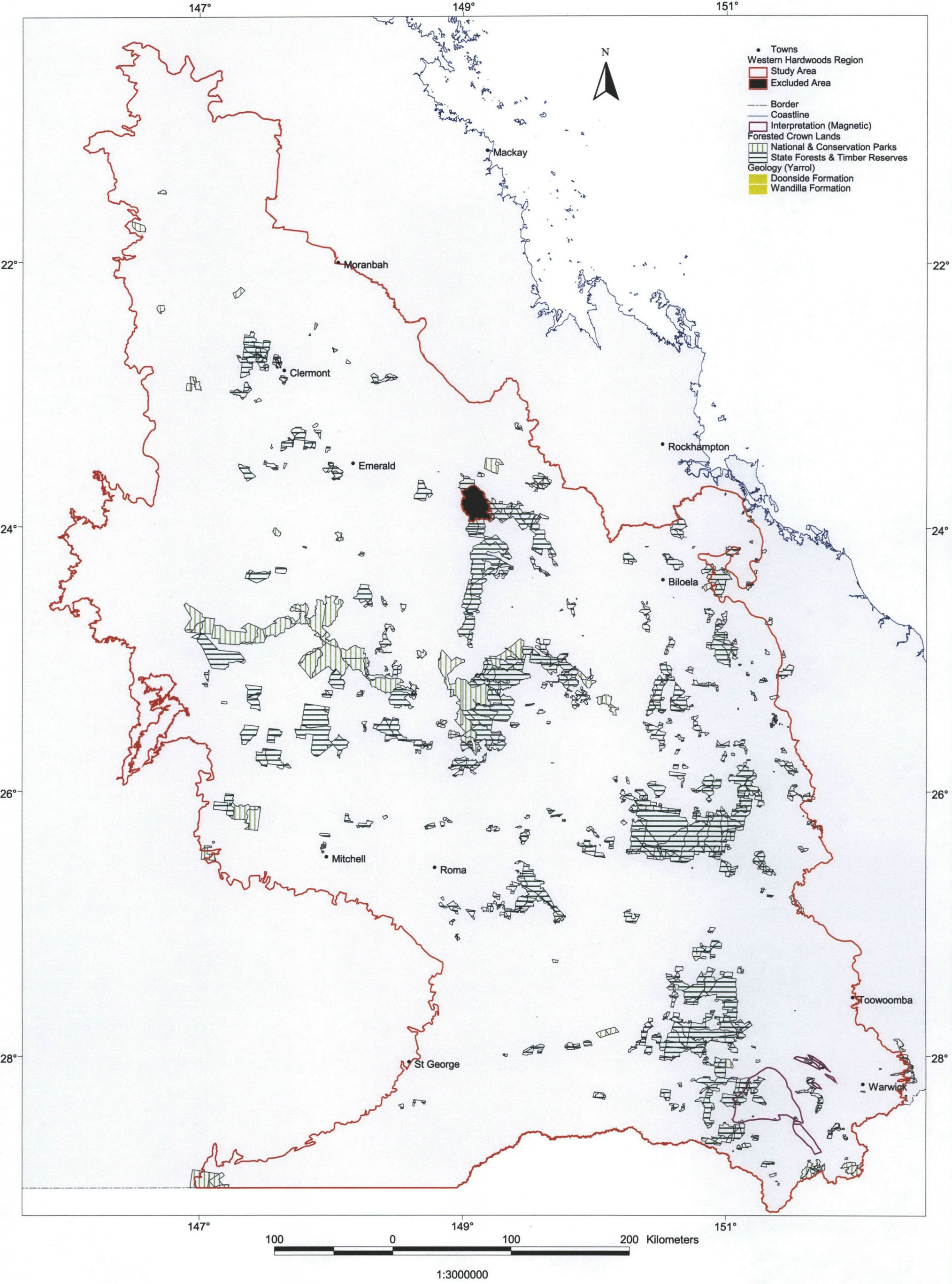


Figure 18B - Areas with Potential for Volcanic-hosted Magnetite and Volcanogenic Manganese Deposits

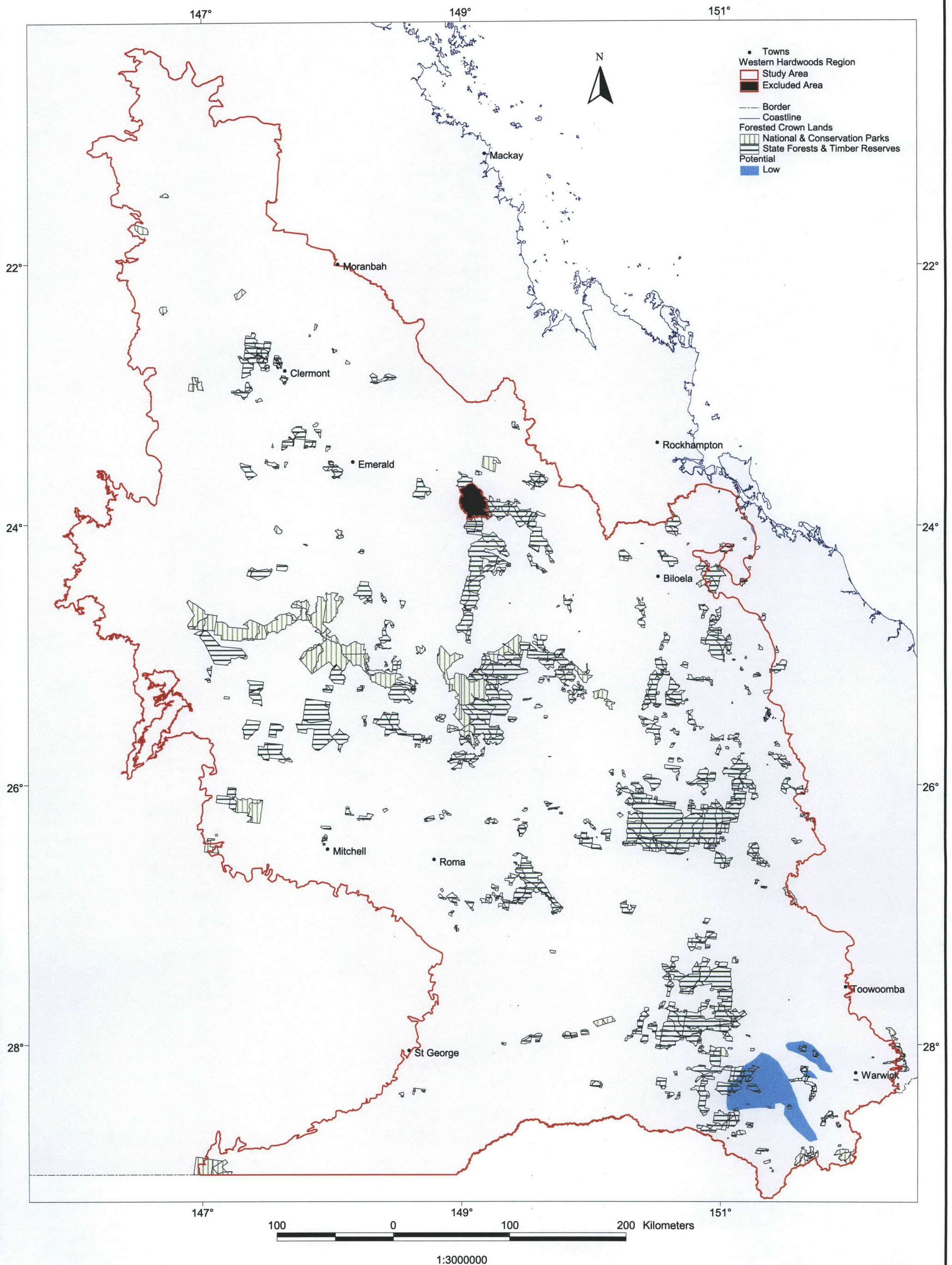


Figure 19A - Geological Units with Potential for Layered Ultramafic PGE Deposits

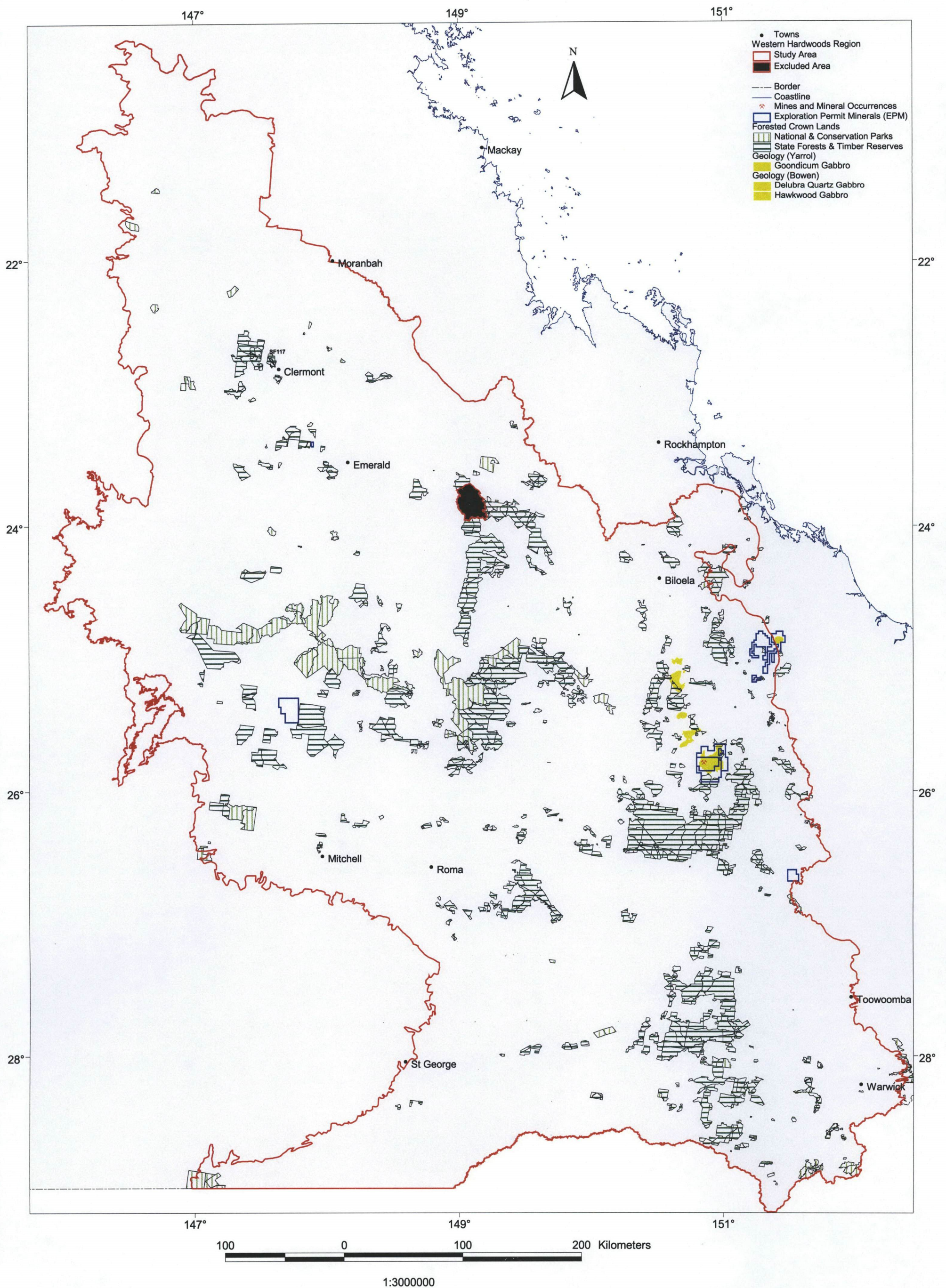
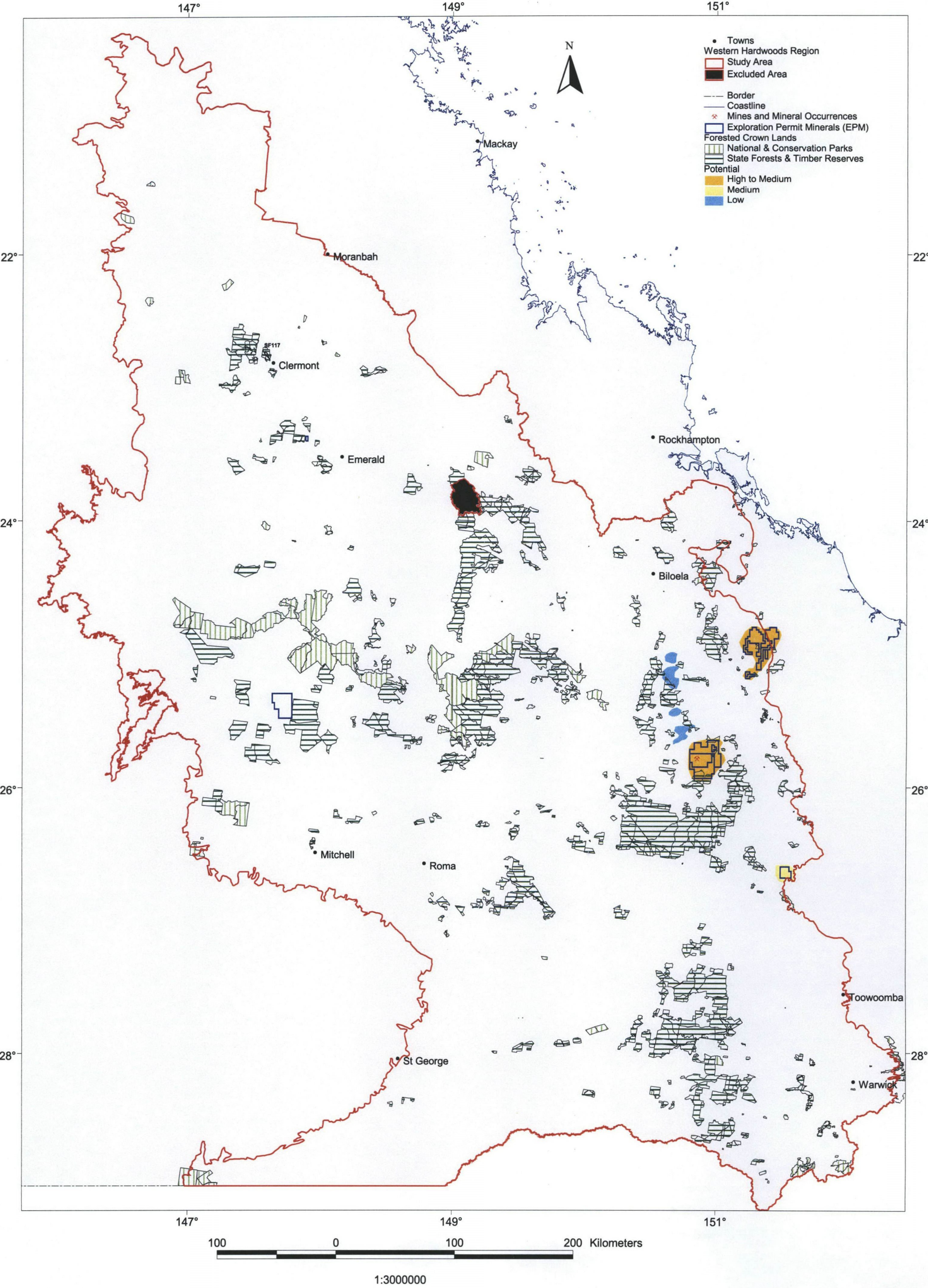


Figure 19B - Areas with Potential for Layered Ultramafic PGE Deposits



OTHERS

Overview

Lateritic bauxite, the ore of aluminium, is mostly used for the production of aluminium metal. Australia is the world's largest producer of primary aluminium and has an integrated aluminium industry that was founded when world-class bauxite deposits were discovered on Cape York Peninsula. The Weipa district hosts the largest bauxite resource in Queensland, with mining leases extending from the Skardon River, 120km north of the town of Weipa, south to Aurukun and along a coastal belt that extends about 50km inland. Bauxite mined at Weipa is shipped to Gladstone where it is processed to alumina and aluminium metal. The industry is set to expand with Comalco Aluminium Limited's announcement that it will proceed with its alumina refinery and Aldoga Aluminium Smelter Pty Ltd's aluminium smelter proposal.

Global consumption of primary aluminium during 2000 grew by 6 percent to 24.8Mt. This compares with an average growth during the 1990s of 2.2 percent. Over two-thirds of aluminium consumption in 2000 was from OECD countries but the greatest consumption growth was in Asia. Forecasters believe that growth in world demand up to 2006 will average 3.3 percent.

The **gemstones**, sapphires and opal, are mined commercially in Queensland and these deposits continue to be an important source of supply to world markets. Production was valued at \$5.8 million and \$1 million in 2000/01 respectively for sapphire and opal. The gemfields are important to regional centres providing support to local communities through tourism as well as direct income from the sale of gems.

Queensland's future gemstone production is likely to increase as the search for new resources continues, with exploration focused on the State's known gemfields as well as unexplored areas with potential to contain new deposits. The demand for Australian sapphires remains strong, particularly for the smaller stones suitable for the mass jewellery market. Whilst there are other low-cost sources of sapphire, such as Laos and Sri Lanka, exploration and mining interest continues and further opportunities exist for sapphire production in Queensland. In contrast, Queensland is the sole supplier of boulder opal and well placed to expand production of this rare commodity with large areas of prospective opal-bearing rock. Diamonds, whilst not identified as a commercial resource, retain interest as a potential commodity, particularly with recent discoveries in the Northern Territory and the development of new exploration models.

Western Hardwoods Region

Lateritic Bauxite has been identified at four localities in the WHR. All are described as very small occurrences. Because of the limited extent of known bauxite occurrences and the absence of prospective rock types elsewhere in the WHR, lateritic bauxite is not considered as a prospective commodity with the WHR.

Gem quality sapphire has been mined for more than 100 years on the Anakie field west of Emerald. The sapphires are of volcanic origin and occur in alluvial deposits in either present day or fossil drainage systems that drain volcanic terrains composed of alkalic-volcanic rocks, mainly basaltic lavas and pyroclastics of Tertiary age. The sapphire is believed to have been derived from interpreted breccia pipes under cover. In the WHR the focus for sapphire is on alluvium sourced from the Hoy Basalt Province and palaeochannels sourced from the area of the Retreat Batholith in the Anakie Inlier.

Zircon and diamonds (rare) have been recovered with sapphires. Diamonds have also been found in the WHR during mining for alluvial gold or for alluvial tin at Stanthorpe. EPM13068 and EPM 12904 also highlight interest in the Stanthorpe Granite, and also possible diamond hosting pipes under cover in the Anakie region.

Queensland supplies boulder and matrix opal found in weathered sedimentary rocks of Cretaceous age in western Queensland. Potential new deposits for precious opal are suggested with EPMs (9303, 12151, 12289, 13365, 13381, 13411) targeting the Griman Creek Formation.

Because alluvial gemfield mining has a very significant component of small scale mining (eg simple hand mining and sieving/washing methods) and prospective alluvium is often at a scale not captured in regional geological data sets, 'prospective alluvium' as such has not been identified. Instead, a number of broad domains have been identified based on current EPs (granted and applications) and the general extent of alluvium sourced from the Hoy Basalt and extending over the Retreat Batholith and, in the Stanthorpe area, based on historical production and current geological interpretation. Similarly in defining areas that have potential for new opal deposits, because the Griman Creek Formation extends under shallow cover, a broad domain has been shown that includes outcropping Griman Creek Formation and recent cover as well as the extent of current EPMs.

Figure 20A shows the spatial relationship between prospective regions, current EPMs (including applications), known mineral occurrences, and State Forest, Timber Reserve and Forest Reserve. Figure 20B identifies regions in terms of their prospectivity for sapphire, diamond and opal.

Conclusions:

- High-medium potential for sapphire has been identified in the Anakie area including the Kettle Timber Reserve, Withersfield, Keilambete, and Zamia State Forests.
- In the Warwick region an area which intersects the Passchendale State Forest has been identified as having high-medium potential for alluvial diamonds.
- No intersections occur between forested lands and areas identified as high potential for opals.

Figure 20A: Geological Units with Potential for Gemstones (Sapphires, Opals, Diamonds)

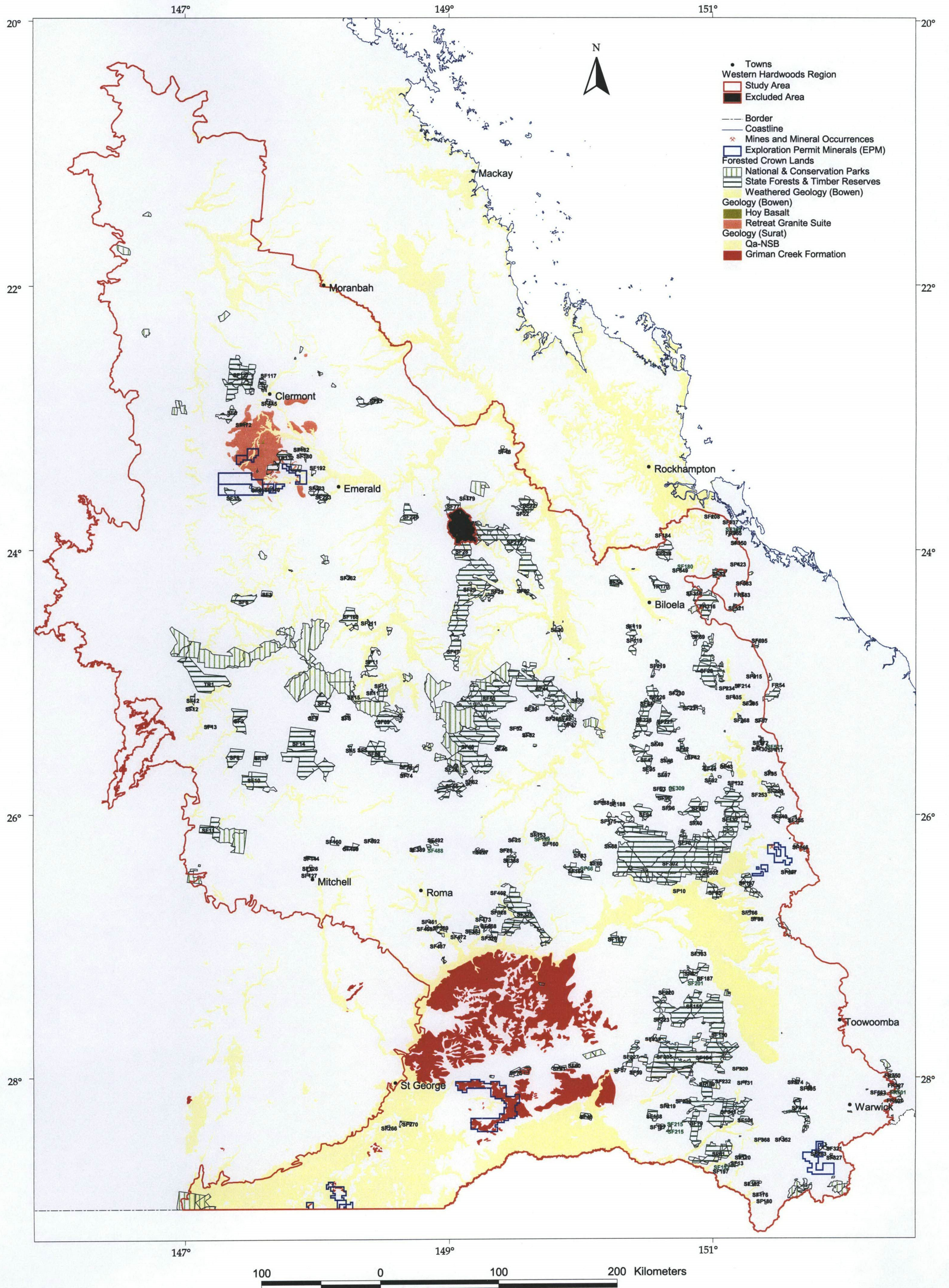
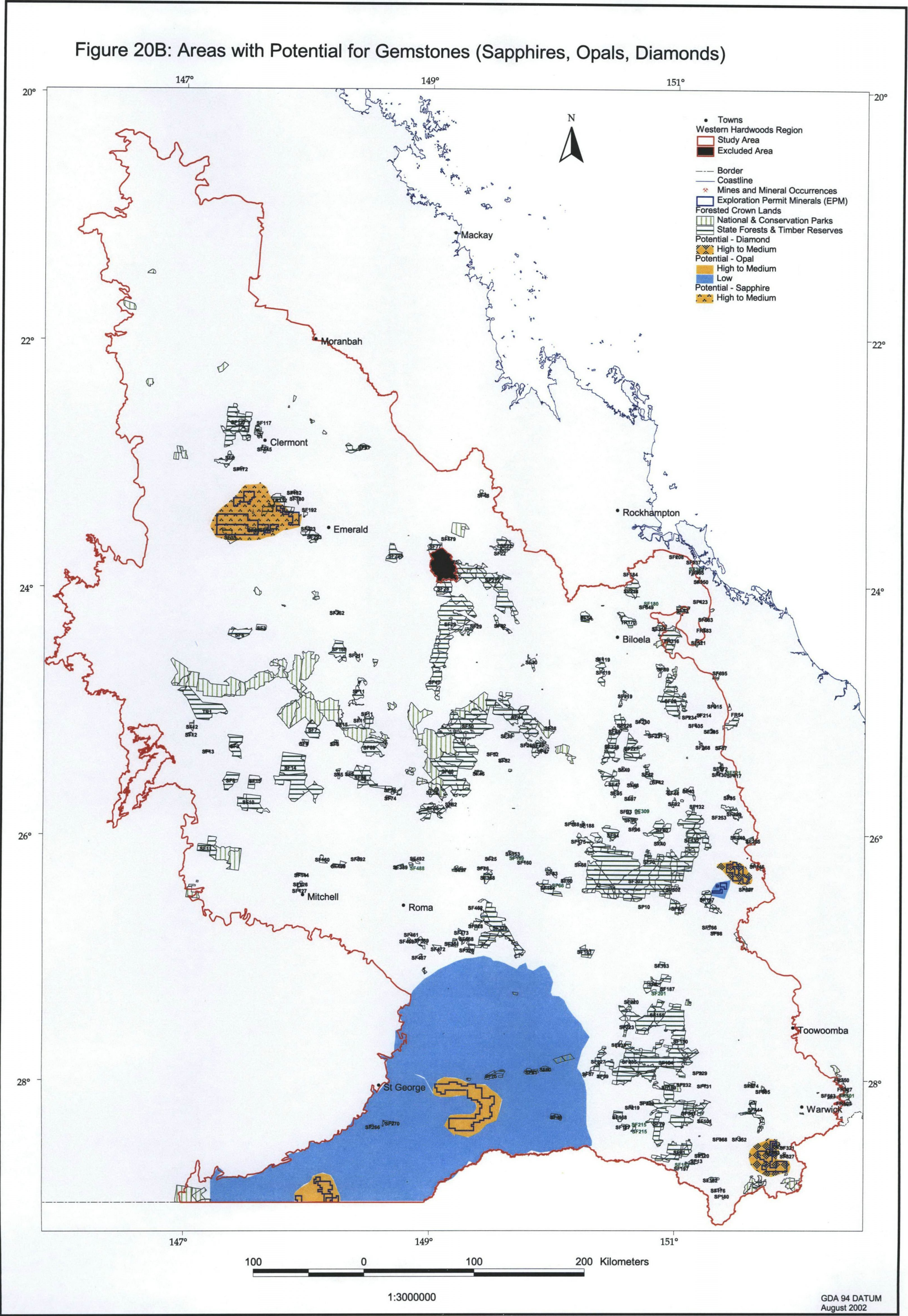


Figure 20B: Areas with Potential for Gemstones (Sapphires, Opals, Diamonds)



GLOSSARY OF TERMS

alluvium

Rocks consisting of unconsolidated or poorly consolidated gravels, sands, clays, and formed from stream and river activity.

basalt

A general term for dark-coloured mafic igneous rocks, commonly extrusive but locally intrusive (eg dykes), composed chiefly of calcic plagioclase and clinopyroxene; the fine-grained equivalent of gabbro.

basic

An igneous rock having a relatively low silica content, sometimes delimited arbitrarily as 44 to 51% to 45 to 52% SiO₂; e.g. gabbro, basalt. Basic rocks are relatively rich in iron, magnesium, and/or calcium, and thus include most mafic rocks as well as other rocks. "Basic" is one of four subdivisions of a widely used system for classifying igneous rocks based on their silica content: acidic, intermediate, basic, and ultrabasic.

basin

Bent down or settled part of the earth's crust in the form of a basin.

Cambrian

The earliest period of the Palaeozoic era, thought to have covered the span of time between 570 and 500 million years ago.

Carboniferous

Period of late Palaeozoic time, ranging from about 360 to about 295 million years ago; also, the corresponding system of rocks.

Cretaceous

The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), thought to have covered the span of time between 135 and 65 million years ago; also, the corresponding system of rocks.

Devonian

A period of the Paleozoic era (after the Silurian and before the Carboniferous), thought to have covered the span of time between 410 and 360 million years ago; also, the corresponding system of rocks.

epithermal

A hydrothermal mineral deposit formed within about 1 kilometre of the earth's surface and in the temperature range of 50°-200°C, occurring mainly as veins.

EPC

Exploration permit for coal.

EPM

Exploration permit for minerals.

EPP

Exploration permit for petroleum

fault

A fracture or a zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture.

formation

A body of rock identified by lithic characteristics and stratigraphic position; it is prevailingly but not necessarily tabular, and is mappable at the earth's surface or traceable in the subsurface.

gabbro

A group of dark-colored, basic intrusive igneous rocks composed principally of basic plagioclase (commonly labradorite or bytownite) and clinopyroxene (augite), with or without olivine and orthopyroxene; also, any member of that group. It is the approximate intrusive equivalent of basalt. Apatite and magnetite or ilmenite are common accessory minerals.

granite

A plutonic rock in which quartz constitutes 10 to 50 percent of the felsic components and in which the alkali feldspar/total feldspar ratio more than 35 percent..

hydrothermal

Of or pertaining to hot water, to the action of hot water, or to the products of this action, such as a mineral deposit precipitated from a hot aqueous solution, with or without demonstrable association with igneous processes.

intrusive

A rock formed at considerable depth by crystallization of magma and/or by chemical alteration. It is characteristically medium- to coarse-grained, of granitoid texture.

Jurassic

The second period of the Mesozoic era (after the Triassic and before the Cretaceous), thought to have covered the span of time between 200 and 135 million years ago; also, the corresponding system of rocks.

laterite

An intrazonal, hydromorphic group of soils having an A2 horizon containing concretions that is underlain by a hardpan composed of iron and aluminum compounds. These soils are formed in warm-temperate to tropical climates in response to a fluctuating water table.

mafic

Said of an igneous rock composed chiefly of one or more ferromagnesian, dark-colored minerals in its mode; also, said of those minerals.

MC

Mining claim.

MDL

Mineral Development Licences.

mesothermal

A hydrothermal mineral deposit formed at considerable depth and in the temperature range of 200°-300°C.

metamorphic rock

Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in the solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the earth's crust.

mineral deposit model

Systematically arranged information describing the essential attributes of a class of mineral deposit. The model may be empirical (descriptive), in which case the various attributes are recognised as essential even though their relationships are unknown; or it may be theoretical (genetic), in which case the attributes are interrelated through some fundamental concept.

mineral occurrence

Any ore or economic mineral in any concentration found in bedrock or as float; a valuable mineral in sufficient concentration to suggest further exploration.

ML

Mining lease

Neoproterozoic

The upper geochronometric subdivision of the Proterozoic, including the rocks between 1000 and 570Ma.

Permian

The last period of the Palaeozoic era (after the Carboniferous), thought to have covered the span of time between 295 and 250 million years ago; also, the corresponding system of rocks.

Permo-Triassic

The last period of the Palaeozoic era extending into the first period of the Mesozoic era.

PL

Petroleum lease.

placer

A surficial mineral deposit formed by mechanical concentration of mineral particles from weathered debris. The common types are beach placers and alluvial placers. The mineral concentrated is usually a heavy mineral such as gold, cassiterite, or rutile.

porphyry

An igneous rock of any composition that contains conspicuous phenocrysts in a fine-grained groundmass; a porphyritic igneous rock. The rock name descriptive of the groundmass composition usually precedes the term, e.g. diorite porphyry.

prospective

Potential or likely occurrence of an economic deposit.

pyroclastic

Clastic rock material formed by volcanic explosion or aerial expulsion from a volcanic vent.

sedimentary rock

A rock resulting from the consolidation of loose sediment that has accumulated in layers; e.g. a clastic rock (such as conglomerate) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

serpentinite

A rock consisting almost wholly of serpentine-group minerals, (antigorite, chrysotile, lizardite) derived from the alteration of ferromagnesian silicate minerals such as olivine and pyroxene. Accessory chlorite, talc, and magnetite may be present.

skarn

Old Swedish mining term for silicate gangue (amphibole, pyroxene, garnet, etc.) of certain iron-ore and sulphide deposits, particularly those that have replaced limestone and dolomite. Its meaning has been generally expanded to include lime-bearing silicates, derived from nearly pure limestone and dolomite with the introduction of large amounts of Si, Al, Fe and Mg.

source rock

Sedimentary rock in which organic material under pressure, heat, and time was transformed to liquid or gaseous hydrocarbons. Source rock is usually shale or limestone.

tectonic setting

Described by geological features such as depositional environment, structural controls, rock type, and magmatic history. The mutual relationships and historical evolution of these features determining the type of mineral deposits formed.

Tertiary

The first period of the Cenozoic era (after the Cretaceous of the Mesozoic era and before the Quaternary), thought to have covered the span of time between 65 and three to two million years ago.

Triassic

The first period of the Mesozoic era (after the Permian of the Palaeozoic era, and before the Jurassic), thought to have covered the span of time between 250 and 200 million years ago; also, the corresponding system of rocks.

torbanite

Essentially synonymous with boghead coal, but often considered as a highly carbonaceous oil shale.

ultramafic

Said of an igneous rock composed chiefly of mafic minerals, e.g. monomineralic rocks composed of hypersthene, augite, or olivine.

updip

A direction that is upwards and parallel to the dip of a structure or surface.

volcanic rock

A generally finely crystalline or glassy igneous rock resulting from volcanic action at or near the earth's surface, either ejected explosively or extruded as lava; e.g. basalt. The term includes near-surface intrusions that form a part of the volcanic structure.

REFERENCES

- Cox, D.P., and Singer, D.A., (Editors), 1986: Mineral deposit models. *US Geological Survey Bulletin*, 1693, 112-113.
- Coxhead, B. A., Smith, R. J., & Coffey, D., (Eds) 2002: Queensland Coal Industry Review 50th Edition, 2000 – 2002. Queensland Government, Department of Natural Resources and Mines.
- Coxhead, B. A., 2001: Queensland Coals – Physical and Chemical Properties, Colliery and Company Information, 13th Edition. Queensland Government, Department of Natural resources and Mines.
- Biggs, M. S., Burgess, A. W., and Patrick, R. B., 1995; Callide Basin *in* Geology of Australian Coal Basins – Geological Society of Australia Incorporated – Coal Geology Group, Special Publication No1.
- Balfe, P.E. *et al* 1986 ‘Geological Setting of Deposits’ in Australian Coal Mining Practice - AusIMM Monograph No12.
- Denaro, T.J., 1989: Mineral occurrences Inglewood, Texas and Ashford 1:100000 sheet areas, Queensland. *Queensland Geological Record* **1989/32**.
- Department of Minerals and Energy 1993: Initial Advice Document – Central Queensland Coal Exploration Land Release.
- Galligan, A.G., & Mengel, D.C., 1986: Code for Reporting of Identified Coal Resources and Reserves. *Queensland Government Mining Journal*, **87**, 201-203.
- Murray, C.G., 1990: Tectonic Evolution and Metallogenesis of the Bowen Basin, *in* the Bowen Basin Symposium, 201-211.
- PESA (QUEENSLAND) 2001 Symposium: Queensland 2001 Exploration and Development.
- Queenslands Mineral Industry Overview (excluding coal and petroleum), *Queensland Government Mining Journal*, **102**, 11-36.
- Queensland Minerals and Petroleum Review 2001. Queensland Government, Department of Natural Resources and Mines.
- Smith, R. J. 1999: Utilisation of Walloon Coals of Southern Queensland for Power Generation. QTHERM, Queensland Government, Department of Mines and Energy.
- Svenson, D., and Hayes, S., 1975: Callide Coal Measures, *in* Economic Geology of Australia and Papua New Guinea AusIMM Monograph No 6 - Volume 2.
- Wildin, T., (Ed) 2001; Queensland Minerals and Petroleum Review. Queensland Government, Department of Natural Resources and Mines.

APPENDIX 1

Geological Data

**DESCRIPTION OF DATA SETS USED IN THE WESTERN HARDWOODS REGION
MINERAL RESOURCE ASSESSMENT (POTENTIAL)**

DATA SET NAME	DESCRIPTION	CURRENCY	COMMENTS SOURCE
Exploration Permit Minerals (EPM)	Defines the extent (by one minute square subblocks) on the ground for exploration title	June 2002	Natural Resources and Mines (NRM) Mining Tenures Database
Exploration Permit Coal (EPC)	Defines the extent (by one minute square subblocks) on the ground for exploration title	July 2002	Natural Resources and Mines (NRM) Mining Tenures Database
Exploration Permit Petroleum (EPP)	Defines the extent (by five minute square blocks) on the ground for exploration title	July 2002	Natural Resources and Mines (NRM) Mining Tenures Database
Mineral Development Licence (MDL)	Defines the extent (by one minute square subblocks) on the ground for the licence	July 2002	Natural Resources and Mines (NRM) Mining Tenures Database
Mining Lease (ML)	Defines the extent on the ground for the mining lease	July 2002	Natural Resources and Mines (NRM) Mining Tenures Database
Petroleum Licence (PL)	Defines the extent on the ground for the petroleum licence	July 2002	Natural Resources and Mines (NRM) Mining Tenures Database
Western Hardwoods Region	Geographic extent of the Western Hardwoods Region (WHR)	May 2002	Natural Resources and Mines (NRM)
Estates/Forested Crown Lands	State Forests and Timber Reserves, and Conservation and National Parks	July 2002	Environmental Protection Agency (EPA)
Northern Eromanga Basin Geology	Digital geology of the Northern Eromanga Basin at a resolution/scale of 1: 1 000 000	1977	Natural Resources and Mines (NRM) Compiled from original maps from 250 000 scale field mapping (1957-1967) GSQ and BMR
Central Eromanga Basin Geology	Digital geology of the Central Eromanga Basin at a resolution/scale of 1: 1 000 000	1974	Natural Resources and Mines (NRM) Compiled from original maps from 250 000 scale field mapping (1957-1967) GSQ and BMR
Surat Basin Geology	Digital geology of the Surat Basin at a resolution/scale of 1: 1 000 000	1976	Natural Resources and Mines (NRM) Compiled from original maps from 250 000 scale field mapping (1970's) GSQ and BMR
Bowen Basin Geology	Digital solid geology of the Bowen Basin at a resolution/scale of 1: 500 000	1986	Natural Resources and Mines (NRM) Compiled from original maps from 250 000 scale field mapping (1960/1970) GSQ and BMR
Clarence Moreton Basin Geology	Digital geology of Clarence Moreton Basin at a resolution/scale of 1: 500 000	1978	Natural Resources and Mines (NRM) Compiled from 250 000 scale field mapping (1970's) GSQ and BMR
Yarrol Geology	Digital geology of the Yarrol Region (Central coastal Queensland) at a mapping scale range of 1: 25 000 to 1: 50 000	August 2001	Natural Resources and Mines (NRM) Compiled from field mapping/air photos (1990's) by GSQ
Anakie Geology	Digital geology of the Anakie Inlier (Central Queensland) at a mapping scale of 1: 25 000 to 1: 30 000	1992	Natural Resources and Mines (NRM) Compiled from field mapping/air photos (1990's) by GSQ
Southeast Queensland Region Geology	Digital geology of the Southeast Queensland Region at a resolution/scale range of 1: 25 000 to 1: 100 000	December 2001	Natural Resources and Mines (NRM) Compiled from field mapping/air photos (1990's) by GSQ
Towns	Geographic location of some towns in the WHR		Natural Resources and Mines (NRM)
Mineral Occurrences and Mines	Geographic location of and descriptive mineral details for mineral occurrences and mines in Queensland	July 2002	Natural Resources and Mines (NRM) Localities compiled from field mapping and company reports. Data extracted from the Geoscience Resource Database
Potential	Interpreted extent of the potential for mineral, coal seam gas and petroleum resources	August 2002	Natural Resources and Mines (NRM) These extents were created from the results of the interpretation of all the relevant available data sets.

APPENDIX 2

EPM summaries

Data current to 10/6/2000.

Exploration Permits for minerals within the Western Hardwood area:								Exploration Permits outside of state forest & forested areas (In white in the Key field)			Exploration Permits intersecting state forest & forested areas (In pale green in the Key field)		
KEY	PRNHOLDER	GRANTED	NONCURRENT	STATUS	DM1	DM2	DM3	Deposit Models	Geology units	Terrain	Comments/ Reports?	Company report numbers (open File) prefix CR	Company report numbers (Confidential File) prefix CR
EPM03215	SOUTHERN PACIFIC PETROLEUM NL	01-JAN-1982	31-DEC-2001	GR	STRAT	STRAT	STRAT	Oil shale deposit	The Narrows Graben; Lowmead Basin, Hillsborough Basin, Duaringa Basin, Nagoorin Graben	The Narrows Graben (Tertiary), Coastal Block, Calliope Subprovince	Y; Glad	26430;	10932; 11677; 12241; 12796;13347; 13698; 14398; 15085; 15086; 15447; 15898; 16573; 17294; 17858; 19363; 19680; 20646; 22075; 22271; 23770;25017; 25368; 26076; 27857; 28496; 31836; 32218; 32219; 32220; 32471; 33220;
EPM03458	SOUTHERN PACIFIC PETROLEUM NL	29-APR-1983	28-APR-2004	GR	CLAY	STRAT	STRAT	Oil shale deposit, kaolin deposit	Duaringa Formation	Duaringa Basin (Tertiary)	Duaringa	nil	12600; 13043; 13645; 14251; 14690; 15086; 15300; 15715; 18877; 20430; 21685; 22655; 25019; 25627; 25760; 27631; 32123; 32221; 32223; 32224; 32225; 32772; 33310;
EPM03460	SOUTHERN PACIFIC PETROLEUM NL	29-APR-1983	28-APR-2004	GR	CLAY	STRAT	STRAT	Oil shale deposit, kaolin deposit	Duaringa Formation	Duaringa Basin (Tertiary)		nil	12600; 13043; 13645; 14251; 14690; 15086; 15300; 15715; 18877; 20430; 21685; 22655; 25019; 25627; 25760; 27631; 32123; 32221; 32223; 32224; 32225; 32772; 33310;
EPM04459	BASE METALS OF AUSTRALIA NL	23-OCT-1986	22-OCT-2002	GR	EPI	PORP	PORP	Epithermal gold, porphyry breccia (gold, copper); (silver, antimony, gold, arsenic); (gold, copper, lead, zinc)	Anakie Metamorphics, Drummond sequence, Silver Hills Volcanics; Saint Anns Formation	Anakie Inlier; Drummond Basin	old workings Lone Sister gold prospect; Johnos Prospect; Johnos South Prospect; Johnos Reward Prospect	19338; 2162	16541; 19121; 19122; 19633; 20433; 21483; 21654; 23158; 25030; 25068; 26255; 29741; 26372; 30515; 32259; 33237;
EPM04612	ESSO AUSTRALIA RESOURCES PTY LTD	11-MAR-1987	10-MAR-1995	GR	STRAT	STRAT	STRAT	Oil shale deposit	Narrows beds, Rundle Formation	The Narrows Graben (Tertiary)	Y;Rock/Glad	nil	18187; 18283; 19588; 20341; 21049; 21528; 22525; 22654; 23221; 25020; 25021;26148; 26149; 28118; 28119;

EPM07259	NEWCREST OPERATIONS LIMITED	18-MAY-1990	17-MAY-2002	GR	EPI	EPI	EPI	Epithermal gold (bonanza style) (copper, arsenic, lead, zinc, silver, gold, bismuth)	Bulgonunna Volcanic Group; Saint Anns Formation; Mount Wyatt Formation; Ukalunda beds	Drummond Basin	Rosetta extended (Prospect); Bimurra (Prospect), Ramillies West (Prospect); Battery Hill, Bluegum, Bobby Dazzler, Conway, Isabella, Mount David; Red Flag Hill;	nil	23163; 23813; 24766; 26777; 27306; 27624; 28601; 29788; 30765; 31655; 32486;
EPM08257	SOLOMON ISLANDS MINING N.L.	02-SEP-1991	01-SEP-2001	GR	EPI	LMST	LMST	Epithermal gold (gold, copper, lead, zinc, arsenic): Later interest in limestone next to gold	Saint Anns Formation, Anakie Metamorphics, Ukalunda beds; Greybank Volcanics; Llanarth Volcanic Member;	Drummond Basin: Anakie Inlier	conceptual lithostructural models and conceptual targets as under cover and mask highly prospective stratigraphy; Illamahta Prospect, Mount Hope, Mount Kroman, The Tor, Murdering Lagoon, Orchid Hill, Rostta, Station Range (prospects); Di Rossi, Firefly, Hercules (prospects)	26037; 2773	24055; 25194; 26328; 27625; 28094; 28598; 29786; 30768; 31641;
EPM08402	DIATREME RESOURCES LIMITED	13-NOV-1991	12-NOV-2002	GR	EPI	VMS	VMS	Epithermal gold, basemetal (VMS?) (gold, copper, lead, zinc, silver)		Yarrol Basin (Block)	Yarrol Prospect, Beehive Prospect, Y; Monto	nil	24226; 25186; 26605; 28195; 28514; 30177; 30694; 31437; 32580;
EPM08693	PLUTONIC OPERATIONS LIMITED	06-MAR-1992	05-MAR-2003	GR	EPI	EPI	EPI	Epithermal gold (gold, silver, arsenic)	Devonian-Carboniferous sediments and volcanics; Saint Anns Formation, Silver Hills Volcanics, Star of Hope Formation	Drummond Basin: Anakie Inlier	Twin Hills Project; Lone Sister Prospect, Anomaly 309 Prospect, Disney Flats Prospect	25538; 2662	24539; 25513; 26624; 27786; 28663; 30238; 30910; 31670; 32407; 33238;
EPM08726	NEWCREST OPERATIONS LIMITED	20-JUL-1992	19-JUL-2002	GR	EPI	EPI	EPI	Cracow style mineralisation (gold, copper, lead, zinc, silver)	Camboon Andesite, Torsdale beds	Bowen Basin; Auburn Subprovince, Gogango Overfolded Zone	near (north of) Cracow to extend life of mine: (Prospects:) Klondyke, Golden Plateau, Gold Top, Royal Standard, Golden West, Orange Creek; Big Gun, Boughyard, Mizzap, Buffel Hill, Walhalla, Mount Elvinta, Fordee, Golden Mile (Deposit:) Roses Pride	26439; 2800	24816; 26242; 27012; 28007; 29252; 30337; 31373; 32030; 32874
EPM08854	TEXAS SILVER MINES PTY LTD	08-JUL-1992	07-JUL-2002	GR	HYD	HYD	VEIN	Gold, Silver, Zinc, Lead, Copper	Silver Spur beds	Texas Block		26073; 2695	250511; 26104; 26806; 27685; 29054; 30217; 32041; 32666;

EPM08887	GUNSON RESOURCES LTD	15-JUL-1992	14-JUL-2002	GR	EPI	SEDC	SEDG	Pedogenic cobalt(enriched cobaltiferous manganese oxide)	Early Jurassic sediments: Hutton sandstone, Evergreen Formation	Eromanga Basin	(Prospects:) Mount Tabor, Babbiloorra, Mount Black, Carnarvon, Mount Gould, Alpha	nil	25268; 25959; 26989; 32112
EPM08908	SOLOMON ISLANDS MINING N.L.	17-JUL-1992	16-JUL-2002	GR	EPI	HYD	HYD	Disseminated ultrafine gold (hydrothermal), (gold, silver)	Anakie Metamorphics Ukalunda beds, Bulgonunna Volcanic Group, Silver Hills Volcanics	Drummond Basin: Anakie Inlier	Basin margin and ns structures; Blueberry Hill prospect	30980	25203; 25880; 28268; 28609; 29789; 30769; 31642; 32749; 33335;
EPM08909	SOLOMON ISLANDS MINING N.L.	17-JUL-1992	16-JUL-2002	GR	EPI	HYD	HYD	Disseminated ultrafine gold (hydrothermal), (gold, silver)	Drummond Group sediments, Anakie Metamorphic Group, Silver Hills Volcanics, Ukalunda beds, Star of Hope Formation,	Drummond Basin: Anakie Inlier	Basin margin and ns structures; Blackadder Project	nil	25087; 25881; 28269; 28602; 29790; 30770; 30981; 31643; 32750; 33336;
EPM09080	SONS OF GWALIA LTD	26-OCT-1992	25-OCT-2002	GR	EPI	EPI	EPI	Epithermal gold (adularia-sericite), (gold, silver, bismuth, copper, lead, arsenic, molybdenum, zinc, antimony, mercury)	Lower Drummond Basin sediments under cover; Bulgonunna Volcanic Group, Ukalunda beds, Silver Hills Volcanics	Drummond Basin	(Prospects:) Black Butt Dam, Black Rock, Boundary North, Handy Andy, Porcupine, Last Stand, Rottenstone, Granite, Revenge,	33065;	25208; 26444; 28588; 28589; 29787; 30771; 31644; 32967; 33337;
EPM09081	SONS OF GWALIA LTD	26-OCT-1992	25-OCT-2002	GR	EPI	EPI	EPI	Epithermal gold (adularia-sericite), (gold, silver, bismuth, copper, lead, arsenic, molybdenum, zinc, antimony, mercury)	Lower Drummond Basin sediments under cover; Bulgonunna Volcanic Group, Ukalunda beds, Silver Hills Volcanics	Drummond Basin	Suggesting what were mapped as Bolgonunna may be in part Lower Drummond Basin; (Prospects:) Black Butt Dam, Black Rock, Boundary North, Handy Andy, Porcupine, Last Stand, Rottenstone, Granite, Revenge, Mount Loudon	26085; 2971	25208; 26444; 28588; 28589; 29787; 30772; 31645; 32745; 33338;
EPM09100	MONTO RESOURCES PTY LTD	12-NOV-1992	11-NOV-2002	GR	ULTR	ULTR	ULTR	Ilmenite, Titanium, Gold	Goondicum Gabbro	Yarrol Province	Y: Monto	30720; 3301	25381; 28665; 29423; 29424; 29864; 30365; 30751; 32275; 32326;
EPM09103	NEWCREST OPERATIONS LIMITED	05-JAN-1993	04-JAN-2002	GR	REPL	REPL	REPL	Replacement (gold); (gold, lead, zinc, copper)	Basal units of Back Creek Group; Camboon Andesite, Torsdale beds	Bowen Basin, Gogango Overfolded Zone, Auburn Subprovince	Close to existing mill; (Prospects:) Cracow South, Botany Ridge, Fernyside, Dawn, Mizzap, Walhalla, Buffel Hill, White Hope, Roses Pride, Klondyke; (Mine:) Golden Plateau	nil	26441; 26442; 28007; 29252; 30337; 31373; 32030; 32874;
EPM09252	SONS OF GWALIA LTD	04-MAR-1993	03-MAR-2002	GR	EPI	EPI	EPI	Epithermal gold (silver, arsenic, bismuth, gold, copper, molybdenum, lead, antimony, zinc)	Under oil shale in Drummond Basin; Bulgonunna Volcanic Group, Ukalunda beds, Anakie Metamorphic Group, Silver Hills Volcanics	Drummond Basin; Anakie Inlier	Under cover	27487; 2971	25931; 26819; 28588; 28589; 29787; 31145; 31146; 31646; 32746; 33339;

EPM09303	CONSOLIDATED BROKEN HILL LTD	23-APR-1993	22-APR-2002	GR	OPAL	OPAL	OPAL	(opal)	Griman Creek Formation	Surat Basin	Extension of Lightening Ridge trend; (Prospects:) Calooma; Eagle Hawke shafts; 61; Ironbank; Grasslands; Booligar, Koomalah, Bloodwood, Box, Ringwood, Ironbark	29333; 3000	25856; 26631; 27172; 28229; 30811; 30931; 32968;
EPM09308	SOLOMON ISLANDS MINING N.L.	14-APR-1993	13-APR-2002	GR	EPI	EPI	EPI	gold (illite, smectite, quartz)	Mount Wyatt Formation, Ukalunda Volcanics, Bulgonunna Volcanics, Anakie Metamorphic Group, Silver Hills Volcanics,	Drummond Basin; Anakie Inlier	Yandan gold operation; Wirralie mine; (prospects:) Durah Creek, Wirralie- Rosetta, North-East Corner, Duckpond, Bimurra, Palace Flophouse, Muffy-Jo, Curio, Bungobine yards, Black Adder, Rosetta Creek, Chainsaw, Cupcake Hill, Green Sinter, Crazy Horse	27488;	25517; 26875; 27626; 28599; 29785; 30766; 31647; 32487; 33340;
EPM09310	SOLOMON ISLANDS MINING N.L.	14-APR-1993	13-APR-2002	GR	EPI	EPI	EPI	Epithermal gold, replacement gold (zinc, lead, antimony, molybdenum, mercury, copper, arsenic, silver, gold); (illite, smectite, quartz)	Mount Coolum Andesite, Silver Hills Volcanics, Bulgonunna Volcanic Group	Drummond Basin; Anakie Inlier; Bowen Basin	(Prospects:) Badlands, Brumby Creek, Verbena Creek, Verbena Sinter, Police Creek, Canadian, Mount Koala, Blackbutt; Golden Bar,	nil	25511; 26876; 28591; 28592; 29784; 30767; 31648; 32792; 33251;
EPM09453	SEDIMENTARY HOLDINGS LTD	19-JUL-1993	18-JUL-2001	GR	VMS	VMS	VMS	Gold, copper, zinc, lead	Hurleys Metamorphics, Mount Windsor Volcanics	Anakie Inlier		nil	26243; 27607; 28700; 29432; 30644; 32265; 32328; 32879;
EPM09528	NEWCREST OPERATIONS LIMITED	22-JUL-1993	21-JUL-2002	GR	EPI	EPI	EPI	Cracow style mineralisation (gold, copper, lead, zinc)	Camboon Andesite volcanics, contact Torsdale beds/Camboon andesites	Bowen Basin, Auburn Subprovince	Proximity to operating mill provides support for smaller finds; (Prospects:) Cracow Creek, Botany Ridge, Fernyside, Dawn, Buffel Hill, Mount Elvinta, Walhalla, Mizzap, SW Hill; (Mine:) Golden Plateau	nil	26443; 27022; 28007; 29252; 30337; 31373; 32030; 32874;

EPM09596	SEDIMENTARY HOLDINGS LTD	13-AUG-1993	12-AUG-2001	GR	HYD	HYD	HYD	Disseminated gold , breccia hosted gold (Mt Leyshon style); (copper, gold, silver, lead, zinc) + (antimony, arsenic, bismuth)	Contact base of Drummond sequence and Anakie Inlier (Silver Hills Volcanics and Anakie metamorphics), gold in volcano-sediments of Drummond sequence and breccia, Hurleys Metamorphics, Mount Windsor Volcanics,	Anakie Inlier; Drummond Basin	refer EPM9680: (Prospects:) Kurrajong, Miclere, Strathfield, Breakaway, Heywood, (Mine:) Black Ridge	32034; 3289	26843; 27119; 28700; 29432; 30644; 32265; 32328; 32879;
EPM09680	SEDIMENTARY HOLDINGS LTD	08-DEC-1993	07-DEC-2001	GR	VMS	VMS	VMS	Volcanic related mineralisation(copper, gold, zinc, lead, silver)+ (antimony, arsenic, bismuth, molybdenum)	Contact base of Drummond sequence and Anakie Inlier (Silver Hills Volcanics and Anakie metamorphics), beneath tertiary basalt, Hurley Metamorphics; Mount Windsor Volcanics,	Anakie Inlier; Drummond Basin	old workings Miclere, Black Ridge, The Springs. (Prospects:) Kurrajong, Miclere, Strathfield, Breakaway, Heywood,	27395; 3176	26843; 27119; 28700; 29432; 30644; 32265; 32328; 32879;
EPM09718	SOLOMON ISLANDS MINING N.L.	01-DEC-1993	30-NOV-2001	GR	EPI	EPI	EPI	(silver, gold)	Mount Wyatt Formation, Silver Hills Volcanics, Bulgonunna Volcanics, Ukalunda beds	Drummond Basin, Ana	(Prospects:) Conway, Bluestone, Mount Roscow, Roadside Copper, Mount Loudon, Y2K Sinter, Cobnob Hill, Humbucker,	27738;	26562; 28267; 28600; 29791; 30773; 31649; 32488; 33341;
EPM09897	EASTERN STONE & MINERALS PTY LTD	05-APR-1994	04-APR-2002	GR	DIM	DIM	DIM	Building stone from gabbro boulders	Hawkwood - Delubra Gabbro; Cadarga Creek granodiorite	Rawbelle Batholith		nil	26561; 28754; 29819; 32408; 32409;
EPM09898	AUSTRALIAN MAGNESIUM CORPORATION LIMITED	04-FEB-1994	03-FEB-2002	GR	VMS	VMS	VMS	Volcanogenic massive sulphide (basemetals), ? (gold, arsenic, bismuth, molybdenum, lead, zinc, copper, cobalt, silver, antimony, tin)	Camboon Andesite, Rookwood Formation	Bowen Basin, Connors Arch, Gogango Overfolded Zone, Marlborough Block	old workings near Cooper Downs:	29601; 3170	26354; 27770; 29108; 29933; 30907; 31540; 32482; 32483; 33201;
EPM09981	SONS OF GWALIA LTD	08-MAR-1994	07-MAR-2002	GR	STRAT	STRAT	STRAT	(nickel, cobalt, silver, arsenic, gold, zinc, lead, copper, molybdenum)	Anakie Metamorphic Group, Bulgonunna Volcanics, Silver Hills Formation	Drummond Basin, Anakie Inlier	(Prospects:) Eastern Siliceous Zone, Hill 273, Stockyards, Gunna,	29519; 3085	27538; 28947; 30813; 30814; 31928; 32469; 32747; 33342;
EPM10097	PERILYA LIMITED	31-MAY-1994	30-MAY-2002	GR	VMS	VMS	VMS	Volcanogenic massive sulphide deposits similar to Mount Morgan (gold, copper, zinc)	Raspberry Creek beds, Mount Warner Volcanics, Capella Creek Group	Yarrol Province	Old workings considered to indicate a less obvious source for same style of mineralisation; Y; Rock	29583; 3194	27018; 27912; 28881; 30861; 31940; 33185; 33186;
EPM10223	YULEBA RESOURCES PTY LTD	12-AUG-1994	11-AUG-2001	GR	CLAY	SILIC	SILIC	Silica sands		Bowen Basin, Surat Basin		nil	32295; 32296;

EPM10262	MONTO RESOURCES PTY LTD	23-SEP-1994	22-SEP-2002	GRA	ULTR	ULTR	ULTR	Heavy metals associated with layered ultramafic/mafic intrusives (ilmenite, magnetite, silver, gold, copper, lead, zinc)	Goondicum Gabbro and associated intrusives	Yarrol Province	missing; Y; Monto	nil	28023; 29501; 29502; 29864; 32886;
EPM10299	PAN AUSTRALIAN EXPLORATION PTY LTD	28-SEP-1994	27-SEP-2002	GRA	ULTR	ULTR	PGE	Platinum group metals, gold copper, magnetite (nickel)	Hawkwood-Delubra Gabbro	Rawbelle Batholith, Gogango Overfolded Zone		29447; 3303	27105; 28694; 30687; 30688; 31197; 32677; 33035;
EPM10413	NEWCREST OPERATIONS LIMITED	18-JAN-1995	17-JAN-2003	GRA	REPL	REPL	REPL	Carlin style disseminated gold (zinc, lead, copper, gold)	carbonate bearing beds base of Back Creek Group (Buffel, Otrack Formations)	Bowen Basin, Gogango Overfolded Zone, Auburn Subprovince	(Mine:) Golden Plateau; (Prospects:) Cracow South, Botany Ridge, Dawn, Buffel Hill, Mizzap, Walhalla, SW Hill, Golden Mile, Mount Elvinta, Klondyke,	28008;	28007; 29252; 30337; 31373; 32030; 32874;
EPM10622	SOUTHERN PACIFIC PETROLEUM NL	26-APR-1995	25-APR-2002	GRA	CLAY	STRAT	STRAT	Duaringa oil shale; Kaolinite	Duaringa Formation	Duaringa Basin (Tertiary)	Service corridors	27784;	32123; 32221; 32223; 32224; 32225; 32772; 33310;
EPM10622	SOUTHERN PACIFIC PETROLEUM NL	26-APR-1995	25-APR-2002	GRA	ROAD	ROAD	ROAD	Access road Duaringa Oil Shale; Also kaolinite	Duaringa Formation,	Bowen Basin	(Deposit:) Duaringa Oil Shale	27784;	32123; 32221;
EPM10677	PERILYA LIMITED	18-JUL-1995	17-JUL-2003	GRA	VMS	VMS	VMS	Mt Morgan style (gold, copper, zinc)	Raspberry Creek beds, Mount Warner volcanics, Capella Creek Group	Yarrol Province	refer 10097 - Southern Dee Range, Lux prospect; Y: Bajool	30254; 3107	27912; 28881; 30861; 31940; 33185; 33186;
EPM10735	GLENGARRY RESOURCES LIMITED	22-AUG-1995	21-AUG-2002	GRA	HYD	REPL	VEIN	Replacement gold (Mt Leyshon style) (antimony, molybdenum, copper, arsenic, gold) + (lead, zinc)	Under cover - Gunjulla breccia Permo-Carb intrusive complex with associated tuffs, sediments possibly equivalent to Silver Hills Volcanics.	Drummond Basin, Anakie Inlier	(Prospects:) Avon Downs Road, Bullock Creek Lineament, Gunjulla Breccia, Hill 253, Diamond Creek, AVR; (Deposit:) Twin Hills	29764;	28196; 29462; 30446; 31115; 32140;
EPM10935	ALAGROW PTY LIMITED	24-MAY-1996	23-MAY-2001	GRA	CLAY	CLAY	CLAY	Zeolite				3 Company reports on EPM file	3 Company reports on EPM file
EPM10937	NEWCREST OPERATIONS LIMITED	31-JAN-1996	30-JAN-2002	GRA	HYD	HYD	HYD	Intrusive related hydrothermal gold (lead, zinc, copper, gold)	Ravenswood-Lolworth Batholith, Cambro-Ordovician basement, Deane Granodiorite	Lolworth-Ravenswood Province, Drummond Basin	(Prospects:) Britannia, Bluff, Warrawee, Laura, Lighthouse, Town Creek, Bletchington Park, Fenian, Currency Lass,	32035;	28578; 30338; 30454; 30979; 32005; 32698;
EPM11047	NEWCREST OPERATIONS LIMITED	23-APR-1996	22-APR-2003	GRA	HYD	HYD	HYD	Intrusive related hydrothermal (gold) + (copper, lead, zinc)	Deane Granodiorite	Lolworth-Ravenswood Province, Drummond Basin	(Prospects:) Crows Nest, Buckles, Galena-Bungalow, Helianman, Igloo, Magpie, Whistling Duck, Laura, Lighthouse, Town Creek	32035;	28793; 30338; 30454; 30979; 32005; 32698;

EPM11088	FLYNN Brian Stanley Robert	03-JUL-1996	02-JUL-2002	GR	EPI	EPI	EPI	Epithermal and replacement gold? (copper, gold) + (silver)	Sunbeam Granodiorite and Ukalanda Beds; Anakie Metamorphic Group	Drummond Basin, Anakie Inlier	(Deposit:) Sunbeam Silver deposit	nil	28942;
EPM11152	NEWMONT AUSTRALIA LIMITED	15-AUG-1996	14-AUG-2001	GR	EPI	EPI	EPI	Epithermal sytems (vera-Nancy style); (copper, silver, gold)	Star of Hope Formation	Lolworth- Ravenswood Province, Drummond Basin	Drilling blind targets to depths in excess of 400m; studying structures and fluid flow; (Prospects:) Chickadee, Eagles Nest, Employment, Iguana Creek, Nancy, Scrubby, Spoongate, Trinette, Vera, Wahines, J73, K7H, Nolans, J9D	30690; 3177	29317; 30355; 31476; 31835; 33056;
EPM11224	VIPER RESOURCES PTY LTD (RECEIVERS AND MANAGERS APPOINTED)	12-JUL-1996	11-JUL-2002	GR	HYD	ULTR	ULTR	(Chalcedony, chrysoprase, nickel- cobalt) + (gold)	lateritised ultramafics; Retreat Granite Suite	Anakie Inlier	Structural control within ultramafics	nil	29325; 32338;
EPM11321	CURRUMBIN SAND AND GRAVEL PTY LTD	10-OCT-1996	09-OCT-2002	GR	CLAY	CLAY	CLAY	Zeolite in tuff - geoautoclave	Ducabrook Formation (zeolitic tuff and sandstone)	Drummond Basin	Zeolithic sandstone seams within EPM	nil	29119; 30820; 32941;
EPM11367	TABLELANDS EXPLORATION PTY LTD	03-OCT-1996	02-OCT-2001	GR	REPL	SKAR	REPL	Replacement (gold) [skarn?] (malachite, azurite, magnetite, garnet)	Limestone and granitic intrusive; Caswell Creek Group, Mount Seaview Igneous Complex, Diglum Granodiorite	Yarrol Province	Focus on old workings (Mines:) Ajax, Good Hope, Lenz's Shafts, Mabel; (Prospects:) Ajzx, Twin Tanks, Crows Creek, Lightning Ridge, Crows Nest, Ajax garnet, Ajax Sulphide; Y; Calliope	31749; 3175	29495; 30433; 31465; 32122;
EPM11386	NEWCREST OPERATIONS LIMITED	02-SEP-1996		APP	HYD	HYD	VEIN	Permo_Carboniferous intrusive activity along NE trending lineaments (gold): Pajingo and Mount Leyshon styles.	intrusive bodies and structures under Tertiary cover	Lolworth- Ravenswood Block	Undercover: Structure focus - Pajingo Corridor	nil	nil
EPM11455	TEXAS SILVER MINES PTY LTD	01-APR-1998	31-MAR-2002	GR	EPI	PORP	PORP	Epithermal (silver, gold), Porphyry (copper), (arsenic, lead, zinc)	Texas Beds	Texas Block	missing	31929;	30860; 31719; 32666;
EPM11471	GLENGARRY RESOURCES LIMITED	14-OCT-1996		APP	EPI	EPI	EPI	Epithermal gold, replacement style gold	Silver Hills Volcanics, Anakie Metamorphics under cover		Y		

EPM11488	SOLOMON ISLANDS MINING N.L.	23-APR-1999	22-APR-2002	GR	EPI	EPI	EPI	Epithermal; gold (Twin Hills style sinter and sediment hosted and Lone Sister flow dome complex) + (silver, gold)	Anakie Metamorphic Group, Saint Anns Formation, Llanarth Volcanic Member,	Anakie Inlier, Drummond Basin	Structure focused; (Prospect:) Pseudo, Blackwater,	nil	31746; 32753; 33296;
EPM11492	SOLOMON ISLANDS MINING N.L.	03-MAY-2000	02-MAY-2002	GR	EPI	EPI	EPI	Epithermal gold	Cycle 1 sediments and volcanics on Mt Coolon; Silver Hills Volcanics	Bowen Basin	Area studied for VMS also; Pretoria prospect	nil	32754;
EPM11513	ALPHADALE PTY LTD	05-NOV-1996		APF	REPL	SKAR	PORP	Structurally controlled gold, copper-gold skarns, porphyry (gold, gold-copper); limestone	Erebus beds, intrusive bodies, limestone beds	Yarrol Basin	Y; Bajool	nil	nil
EPM11575	AUSTRALIAN GOLDFIELDS NL	20-DEC-1996		APF	EPI	EPI	EPI	Epithermal gold			missing - application; No company reports	nil	nil
EPM11581	NEWCREST OPERATIONS LIMITED	24-DEC-1996		APF	HYD	REPL	REPL	Intrusive related hydrothermal copper-gold; comprising breccia, replacement and stockwork types		Drummond Basin and Ravenswood Batholith	Focus on a NS a structure and NE Permo-Carb corridor 'Mt Robin' trend. Interest under cover.	nil	nil
EPM11621	EQUIPMENT & MACHINERY SALES PTY LTD	07-NOV-1997	06-NOV-2001	GR	HYD	HYD	VEIN	Prospecting (gold)		Texas Subprovince			2 company reports on EPM file, no work done.
EPM11628	INTEGRATED MINERAL TECHNOLOGY LIMITED	12-JAN-1998	11-JAN-2003	GR	CLAY	STRAT	STRAT	Bentonite - based on height above sea-level and formations that host elsewhere in the region (volcanic ash).			Fault control of sodic solutions; No company reports	nil	nil
EPM11701	DI LIZIO Luigi	18-MAR-1997		APF	?	?	?				missing - application; No company reports; Y; Scoria	nil	nil
EPM11794	ENERGY MINERALS PTY LTD	08-MAY-1997		APF	PORP	PORP	PORP	Copper deposits potentially with gold and base metal (porphyry?) - beneath alluvium	Intrusives		No company reports	nil	nil
EPM11806	AUSTRALIAN GOLDFIELDS NL	30-MAY-1997		APF	HYD	HYD	HYD	Structural control hydrothermal fluid migration.	Volcanic units such as Silver Hills volcanics and Anakie Metamorphics associated with intrusive bodies or geophysical interpretations of these.	Anakie Inlier and Lolworth-Ravenswood Block	Structural control rather than lithological, interest under cover. No company reports	nil	nil
EPM11814	SOLOMON ISLANDS MINING N.L.	23-AUG-2001	22-AUG-2003	GR	EPI	EPI	EPI	Epithermal style gold	Devonian - Carboniferous sediments and volcanics	Drummond Basin	Mt Coolon Fault considered control, Focus on units under cover.	nil	nil
EPM11837	BHP BILLITON MINERALS PTY LTD	18-MAY-2000	17-MAY-2002	GR	VMS	VMS	VMS	Volcanogenic massive sulphides, intrusive related (gold, copper, lead, zinc)	Capella Creek Group, intrusives (blind in Pond Formation)	Yarrol Province	missing	nil	32736;

EPM11863	CARPENTARIA GOLD PTY LTD	26-OCT-2000	25-OCT-2002	GR/VMS	VMS	VMS	(gold, copper, zinc)	Dacitic volcanics; Lochenbar Formation, Marble Waterhole beds, Winterbourne Volcanics	Yarrol Province	Mt Kroombit (Goldfield); Y;Biloela& top Scoria	nil	33250;
EPM11902	TITAN MINERALS PTY LTD	22-DEC-2000	21-DEC-2005	GR/VMS	LMST	LMST	(gold, limestone, basen	Limestone units in Palaeozoic rocks. All Devonian, Carboniferous, Permian units dominated by intermediate and acid volcanic activity	New England Fold Belt	No company reports	nil	nil
EPM11905	RIO TINTO EXPLORATION PTY LIMITED	25-JUL-1997		APF/ULTR	ULTR	ULTR	Nickel and platinum gr	Gabbroic, ultramafic rocks (Lower Palaeozoic?)	Core Maranoa Anticline	No company reports	nil	nil
EPM11912	DI LIZIO Luigi	29-JUL-1997		APF/PORP	PORP	PORP	Porphyry (copper, gold, base metal)	Glandore Granodiorite, Wingfield Adamellite and surrounds		Major structural controls suggested, No company reports	nil	nil
EPM11935	FLYNN Brian Stanley Robert	06-AUG-1997		APF/STRAT	STRAT	STRAT	no data		Drummond Basin	✓	nil	nil
EPM11971	RESOLUTE LIMITED	01-SEP-1997		APF/EPI	PORP	PORP	Epithermal gold, porphyry (copper, molybdenum)	Bulgonunna Volcanics (base)		Possible caldera margin under shallow cover of Mt Suttor Formation	nil	nil
EPM12008	STRINGER Rowen James	01-OCT-1997		APF/?	?	?				Elevated values of gold in stream sediment sampling in another EPM in the area(prospecting permits 70762, 70862); No company reports	nil	nil
EPM12012	PLUTONIC OPERATIONS LIMITED	03-OCT-1997		APF/EPI	EPI	EPI	Epithermal gold	volcanics and sediments at base of Drummond Basin sequence	Drummond Basin	✓	nil	nil
EPM12015	MARLBOROUGH RESOURCES NL	08-OCT-1997		APF/EPI	EPI	EPI	Epithermal gold	basement under cover	Drummond Basin	Marlborough fault zone -epithermal and porphyry targets	nil	nil
EPM12016	MARLBOROUGH RESOURCES NL	08-OCT-1997		APF/EPI	EPI	EPI	Epithermal gold	basement under cover	Drummond Basin	Marlborough fault zone -epithermal and porphyry targets	nil	nil
EPM12037	RIO TINTO EXPLORATION PTY LIMITED	20-OCT-1997		APF/EPI	SEDC	SEDG	Sediment-hosted gold-silver and/or base metals	Drummond basin sediments	Drummond Basin	Basement structure involved in targeting; No company reports	nil	nil
EPM12040	RIO TINTO EXPLORATION PTY LIMITED	20-OCT-1997		APF/EPI	SEDC	SEDG	Sedimentary hosted (gold, base metals)	Sedimentary units	Drummond Basin	little outcropping expression; Diehard Prospect	nil	nil
EPM12045	AUSQUEST LIMITED	04-SEP-2001	03-SEP-2006	GR/EPI	SEDC	SEDG	Sediment hosted (gold-silver and/or base metals)		Drummond Basin	Lascellas Creek	nil	nil
EPM12046	AUSQUEST LIMITED	25-MAY-1998	25-MAY-2002	GR/EPI	SEDC	SEDG	Sediment hosted (gold-silver and/or base metals)	Silver Hills Volcanics	Drummond Basin	Fiery Creek Prospect	nil	31800; 31951; 32777;
EPM12047	AUSQUEST LIMITED	04-SEP-2001	03-SEP-2006	GR/EPI	SEDC	SEDG	Sediment hosted gold-silver and/or base metals		Drummond Basin	Epping Forest	nil	nil

EPM12049	MOONRAKER PTY LTD	15-SEP-1999	14-SEP-2002	GRA	HYD	STRAT	CLAY	Intrusive (gold); pure white clay (kaolin/kaolinite) - sedimentary; (oil shale)		Drummond Basin; Anakie Inlier	Moonraker	nil	32589; 33043;
EPM12080	GLENGARRY RESOURCES LIMITED	20-NOV-1997		APP	HYD	HYD	VEIN	Pajingo and Charters Towers style mineralisation (gold, basemetals)			Old workings (Curlew, Liontown)	nil	nil
EPM12087	RIO TINTO EXPLORATION PTY LIMITED	27-NOV-1997		APP	EPI	SEDC	SEDG	Sediment hosted (gold- silver and/or base metals)		Drummond Basin	Bingeringo	nil	nil
EPM12088	RIO TINTO EXPLORATION PTY LIMITED	27-NOV-1997		APP	EPI	SEDC	SEDG	Sediment hosted gold- silver and/or base metals		Drummond Basin	Mount Elsie	nil	nil
EPM12112	SOLOMON ISLANDS MINING N.L.	06-JUL-2000	05-JUL-2002	GRA	EPI	EPI	EPI	Epithermal gold	Silver Hills Volcanics, Bulgonnuna Volcanics, intrusive bodies	Drummond Basin	near old workings - Gen Eva Deposit	nil	32915;
EPM12118	GOLDFIELDS EXPLORATION PTY LIMITED	02-JAN-1998		APP	HYD	PORP	PORP	Intrusive related disseminated and structurally controlled(gold)	Permo-Carboniferous rhyolitic intrusive rocks and surrounds (not host specific but structural control)	Lolworth- Ravenswood Block	Kidston and Mt Leyshon type or sheeted veins such as Nolan's/Sarafield	nil	nil
EPM12124	NEWCREST OPERATIONS LIMITED	02-JAN-1998		APP	HYD	PORP	PORP	Intrusive related gold	Mt Windsor Volcanics, Permo- Carb intrusives	Lolworth- Ravenswood Block	Newcrest report Charters Towers region as having potential to produce a world class deposit	nil	nil
EPM12151	THE RIDGE OPAL COMPANY PTY LTD	24-DEC-1999	23-DEC-2002	GRA	OPAL	OPAL	OPAL	(black opal)	Lower Cretaceous deeply weathered sediments(Griman Creek Formation); Wallangulla Sandstone member (in the Rolling Downs Group); Winton Formation	Great Artesian Basin		nil	nil
EPM12164	AUSTRALIAN GOLDFIELDS NL	05-MAR-1998		APP	HYD	HYD	VEIN	Twin Hills style (gold)	Retreat Granite, Anakie metamorphics		Structural control extending from plutonic Twin Hills tenement where a recent high grade discovery announced; No company reports	nil	nil

EPM12197	BASIN GOLD PTY LTD	01-APR-1998		APP	EPI	REPL	REPL	Epithermal gold, gold replacement	Drummond Basin sediments and Anakie Metamorphics, Devonian St Anns Formation (replacement)	Lolworth-Ravenswood Block	vms - Cambrian Ordovician Mt Windsor Volcanics, Anakie Metamorphics (also some vein au); Siluro-Devonian vein au Ravenswood and Lolworth Grdr Complexes and Charters Towers Metamorphics; Late Carboniferous-Early Permian au veins intrusive related and breccia pipes such as Kidston, also Bulgonunna Volcanics in search of epithermal		
EPM12212	NEWCREST OPERATIONS LIMITED	15-APR-1998		APP	EPI	PORP	PORP	Porphyry gold (Cadia, Round Mountain style); epithermal gold(Vera-Nancy, Pajingo style)	Camboon Andesite	Bowen Basin, Gogango Overfolded Zone, Connors Arch	Adjacent Cracow	nil	nil
EPM12218	PERILYA LIMITED	11-JUL-2000	10-JUL-2003	GRA	VMS	SKAR	PORP	Large volcanogenic massive sulphide, skarn and disseminated gold (gold, copper, zinc)	Mount Warner Volcanics, Raspberry Creek Formation	Mt Warner Volcanics and associated intrusives, Yarrol Province	refer 10097-equivalent hosts to Mt Morgan deposit and major metallogenic linears associated with Mt Morgan mine; Y; Rock	nil	33186;
EPM12234	AUSQUEST LIMITED	04-SEP-2001	03-SEP-2003	GRA	EPI	SEDC	SEDC	Sediment hosted (gold-silver and/or base metals)	Silver Hills Volcanics	Drummond Basin		nil	nil
EPM12257	SOLOMON ISLANDS MINING N.L.	17-AUG-2000	16-AUG-2002	GRA	EPI	EPI	EPI	Epithermal gold	Cycle1 lithologies of Drummond Basin - Late Devonian Silver Hills volcanic/clastics	Drummond Basin	Structures spatially related to Mt Coolon and Glen Eva mines. Area is also being explored for replacement style gold (Yandan). Yandan mill supports smaller finds. (Prospect:) Stockyards	nil	32952;
EPM12282	HARVEY Peter Lawrence	13-SEP-2000	12-SEP-2002	GRA	ALLU	ALLU	ALLU	Alluvial (gold,silver)	alluvium		Y	nil	nil
EPM12289	THE RIDGE OPAL COMPANY PTY LTD	24-DEC-1999	23-DEC-2002	GRA	OPAL	OPAL	OPAL	(black opal)	clay facies(Griman Creek Formation?)		seeking equivalents to the Finch clay facies at Lightning Ridge	nil	nil
EPM12293	HARVEY Peter Lawrence	01-JUL-1998		APP	ALLU	ALLU	ALLU	Alluvial gold?	alluvium		Y	nil	nil

EPM12307	MOONRAKER PTY LTD	15-JUL-1998		APP	STRAT	DEEP	ALLU	(clay, gold, oil shale)	Suttor Formation (gold)?	Y		nil	nil	
EPM12341	SOLOMON ISLANDS MINING N.L.	07-AUG-1998		APP	EPI	DEEP	DEEP	Epithermal gold, palaeochannel gold	Anakie Metamorphics(Ukalundas), Carb intrusive - Percy Douglas Granodiorite, deep leads at base of Mt Suttor	Drummond Basin	Y	nil	nil	
EPM12372	THALANGA COPPER MINES PTY LTD	01-SEP-1998		APP	VMS	VMS	VMS	Volcanogenic massive sulphides	Mount Windsor volcanic belt, and under Tertiary Campaspe Formation - contact Trooper Creek and Rollston Formations	Y		nil	nil	
EPM12447	ALCOVE INVESTMENTS PTY LTD	27-OCT-1998		APP	BRIN	BRIN	BRIN	Brines - hydrogeological source	Quaternary sediments	Casuarina Basin		refer Port Alma Brinefield	nil	nil
EPM12526	SOLOMON ISLANDS MINING N.L.	17-AUG-2000	16-AUG-2002	GRA	EPI	EPI	EPI	Epithermal gold	Devonian-Carboniferous sediments and volcanics; Silver Hills Volcanics	Drummond Basin		Southern extension of Mt Coolon fault	nil	32953;
EPM12546	SMARTTRANS HOLDINGS LIMITED	29-JAN-2002	28-JAN-2005	GRA	EPI	PORP	PORP	Epithermal, porphyry/breccia gold- copper		South Connors Arch and Urannah Complex	Y		nil	nil
EPM12557	NICKEL SEEKERS MINING SERVICES PTY LTD	20-SEP-1999	19-SEP-2002	GRA	ALLU	ALLU	ALLU	(gold, sand)				Focus on old workings Sneekers Gully; Y; Glad	nil	nil
EPM12558	NICKEL SEEKERS MINING SERVICES PTY LTD	20-SEP-1999	19-SEP-2002	GRA	LMST	LMST	LMST	(limestone)		Texas Subprovince			nil	nil
EPM12605	NEWCREST OPERATIONS LIMITED	13-SEP-2000	12-SEP-2003	GRA	LMST	LMST	LMST	Dolomite				Y; Theodore/ Mundubbera		
EPM12633	NEWCREST OPERATIONS LIMITED	17-AUG-2000	16-AUG-2003	GRA	EPI	PORP	PORP	Bulk low tonnage porphyry gold (Cadia & Round Mountain style); high grade low tonnage epithermal gold (Vera-Nancy, Pajingo); (gold, copper)	Camboon Andesite volcanics	Gogango Overfolded Zone		Cracow field produced about 1000000 oz gold.; Y; Scoria/Theodore	nil	33062;
EPM12635	CARPENTARIA GOLD PTY LTD	24-MAR-2000	23-MAR-2005	GRA	EPI	EPI	EPI	Cracow style mineralisation (gold)	Camboon Andesite volcanics	Gogango Overfolded Zone, Bowen Basin		Structural control at Cracow extended to this area - NE and NW trending lineaments	nil	32830;
EPM12669	STUART Neil Francis	08-FEB-2000	07-FEB-2002	GRA	LMST	LMST	LMST	Dolomite (chemical grade)	Peak Range Volcanics	Bowen Basin	Y		nil	32875;
EPM12700	TRANCO PTY LTD	11-MAY-2000	10-MAY-2002	GRA	VMS	VMS	VMS	Volcanogenic (copper)	Volcanic sequence underlying Eromanga Basin sediments	Y			nil	nil
EPM12708	KENNETH JOSEPH ARKINSTALL	26-OCT-1999	25-OCT-2001	GRA	DIM	DIM	DIM	Sandstone	Evergreen Formation, Precipice Formation	Philpott Subprovince, Gogango Overfolded Zone			nil	32240;

EPM12714	TASIC Barnislav	16-JUN-1999		APP?	?	?	Prospecting			missing - application: No company reports	nil	nil
EPM12729	ST JOHN CREEK GOLD MINE PTY LIMITED	14-JUN-2000	13-JUN-2003	GRA	HYD	HYD	VEIN	high grade intrusive related veins near old workings(gold)	Coonambula Granodiorite, rock units in area	St Johns goldfield - old Burnett Squatter mine. Structural focus. Testing models developed for Western Victorian Goldfields - Ballarat	nil	nil
EPM12736	RICHARDSON John William	14-JUL-1999		APP	GEM	GEM	GEM	Prospecting -alluvial sapphire	Alluvium	missing - application: No company reports	nil	nil
EPM12741	IPOH PACIFIC PTY LTD	19-JUL-1999		APP	CLAY	CLAY	CLAY	Montmorillonite- bentonite	Black Alley Shale	Surat Basin	Y	nil
EPM12742	CRANNEY Donald Graham	03-NOV-1999	02-NOV-2004	GRA	ROAD	ROAD	ROAD	Extractive rock (silicon) - prospecting; (gravel - sand)	alluvium	Surat Basin	Y	nil
EPM12744	BLOMFIELD David Nivison	11-FEB-2000	10-FEB-2002	GRA	ALLU	ALLU	ALLU	Alluvial (gold)	alluvium	New England Province, Texas Subprovince	Y	nil
EPM12752	JANKE Frances Matilda	17-DEC-1999	16-DEC-2001	GRA	ROAD	ROAD	ROAD	(gravel, sand)		Surat Basin	Y	nil
EPM12755	MOONRAKER PTY LTD	20-AUG-1999		APP	STRAT	DEEP	ALLU	(clay, gold, oil shale)	Suttor Formation (gold)		Y	nil
EPM12766	THALANGA COPPER MINES PTY LTD	01-SEP-1999		APP	VMS	VMS	VMS	Volcanic massive sulphide deposit (Thalanga and Reward style)	Mount Windsor Volcanic belt	Thalanga Province	Y	nil
EPM12778	ENERGY MINERALS PTY LTD	07-SEP-1999		APP	VMS	HYD	VEIN	Mt Morgan style mineralisation (copper, gold), Mt Kroombit style (copper, zinc), Dooloo Creek (copper, gold)	Mid-late Devonian Lochenbar beds may overlie Mt Morgan host rocks	Biloela	No company reports; Y; intersects Maxwelton Goldfield	nil
EPM12809	CENTRAL QUEENSLAND MAGNETITE PTY LTD	15-FEB-2000	14-FEB-2005	GRA	?	?	?	(garnet, magnetite,gold, copper)			missing: No company reports; Y; Biloela/Bajool	nil
EPM12821	NEUENDORF BRETT EVAN	24-AUG-2000	23-AUG-2002	GRA	HYD	HYD	VEIN	Prospecting			No company reports	nil
EPM12831	JUNIOR MINING (OPERATIONS) PROPRIETARY LTD	29-OCT-1999		APP	GEM	GEM	GEM	Alluvial (sapphires)	alluvium		Y	nil
EPM12849	JUNIOR MINING (OPERATIONS) PROPRIETARY LTD	03-AUG-2000	02-AUG-2002	GRA	GEM	GEM	GEM	Alluvial (sapphires)	alluvium		Y	nil
EPM12857	CURRUMBIN SAND & GRAVEL P/L	18-JUL-2000	17-JUL-2003	GRA	CLAY	CLAY	CLAY	Zeolite in tuff - geoauroclave	Ducabrook Formation (zeolitic tuff and sandstone)	Drummond Basin	geoauroclave model proposed by Flood for Carboniferous arcflank felsic volcanics	nil

EPM12858	MACMIN NL	10-AUG-2000	09-AUG-2002	GRA	HYD	PORP	PORP	Hydrothermal mineralisation - epithermal silver-gold and porphyry copper	Silver Spur beds, Texas beds	Texas Block	Targeting concepts include airborne geophysics	nil	32666;
EPM12867	CHALCOPHILE RESOURCES PTY LTD	22-DEC-2000	21-DEC-2005	GRA	EPI	SEDC	SEDG	Stratigraphically controlled gold, stratiform copper (lead, zinc)	Brampton Metamorphics, Anakie Metamorphics	Anakie Inlier		nil	33140;
EPM12870	RIO TINTO EXPLORATION PTY LTD.	05-JUL-2000	04-JUL-2002	GRA	CLAY	CLAY	CLAY	Concentration of titanium minerals (rutile, ilmenite, leucoxene, zircon) in strandline shoreface settings	Upper Jurassic Westbourne Formation and lower Cretaceous Gubberamunda Formation	Surat Basin		32986;	32983;
EPM12871	RIO TINTO EXPLORATION PTY LTD.	05-JUL-2000	04-JUL-2002	GRA	CLAY	CLAY	CLAY	Concentration of titanium minerals (rutile, ilmenite, leucoxene, zircon) in strandline shoreface settings	Upper Jurassic Westbourne Formation and lower Cretaceous Gubberamunda Formation	Surat Basin		32986;	32983;
EPM12887	CHALCOPHILE RESOURCES PTY LTD	15-DEC-1999		APP	STRAT	STRAT	STRAT	(gold,silver)	late Carboniferous Bulgonunna volcanics	Drummond Basin	developing new model	nil	nil
EPM12898	MOONRAKER PTY LTD	04-JAN-2000		APP	STRAT	STRAT	STRAT	(clay, gold, oil shale)	Suttor Formation (gold)			nil	nil
EPM12903	CHALCOPHILE RESOURCES PTY LTD	14-JAN-2000		APP	PORP	SKAR	VEIN	Intrusive related porphyry/skarn/vein gold - Mt Cannindah style mineralisation (copper, gold)	Intrusive bodies and associated palaeozoic volcanics/sediments	Yarrol Province	Mt Cannindah mine 4.4Mt@ 0.93%Cu, 20g/t Ag, 0.4g/tAu; Cannindah East 250000t @ 2.82g/t Au; No company reports; Little Wonder area, Mount Cannindah; Y; Monto	nil	nil
EPM12904	BANNERBLOCK PTY LIMITED	14-JAN-2000		APP	GEM	ALLU	ALLU	Diamond carrying pipes below alluvials, alluvial gold and sapphire as a by-product			No company reports	nil	nil
EPM12905	BANNERBLOCK PTY LIMITED	14-JAN-2000		APP	GEM	ALLU	ALLU	Diamond carrying pipes below alluvials, alluvial gold and sapphire as a by-product			No company reports	nil	nil
EPM12928	DOXFORD Clyde Ian	08-FEB-2000		APP	ALLU	ALLU	ALLU	Prospecting alluvial (gold?)			No company reports	nil	nil
EPM12933	WHITTY Michael Edward	24-AUG-2000	23-AUG-2002	GRA	DIM	DIM	DIM	Sedimentary siltone(construction material)	Evergreen Formation (siltstone, Jlo)		Y	nil	nil
EPM12956	CHALCOPHILE RESOURCES PTY LTD	22-DEC-2000	21-DEC-2005	GRA	ALLU	REPL	REPL	Stratigraphically controlled gold and stratiform copper (Peak Downs style), alluvial gold; (gold, copper, lead,zinc)	alluvial gold/deep leads base of Permian Bowen Basin units, Bathampton Metamorphics (gold, copper): Anakie Metamorphic Group	Anakie Inlier	Y	nil	33140;

EPM12974	CARPENTARIA GOLD PTY LTD	27-MAR-2000		APPEPI	EPI	EPI	Crawcow style mineralisation			Structure associated with Cracow mineralisation extends into the area; No company reports	nil	nil
EPM12980	RIO TINTO EXPLORATION PTY LIMITED	03-APR-2000		APPEPI	CLAY	CLAY	Heavy metals (rutile, ilmenite) in strandline shoreface settings	Gubberamunda Sandstone	Surat Basin	No company reports	nil	nil
EPM12981	RIO TINTO EXPLORATION PTY LIMITED	03-APR-2000		APPEPI	CLAY	CLAY	Heavy metals (rutile, ilmenite) in strandline shoreface settings	Gubberamunda Sandstone	Surat Basin	No company reports	nil	nil
EPM12983	RIO TINTO EXPLORATION PTY LIMITED	03-APR-2000		APPEPI	SEDC	SEDC	Sediment hosted (gold-silver and/or base metals)		Drummond Basin	Y	nil	nil
EPM12984	WHITTY Michael Edward	24-AUG-2000	23-AUG-2005	GRADIM	DIM	DIM	Sedimentary siltstone(construction material)	Evergreen Formation (siltstone, Jlo)		Y	nil	nil
EPM13001	AUSQUEST LIMITED	04-SEP-2001	03-SEP-2006	GRADIM	EPI	SEDC	Sedimentary hosted(gold,base metals)	Sedimentary units	Drummond Basin		nil	nil
EPM13002	AUSQUEST LIMITED	04-SEP-2001	03-SEP-2006	GRADIM	EPI	SEDC	Sedimentary hosted (gold, base metals)		Drummond Basin	basement structures significant	nil	nil
EPM13003	AUSQUEST LIMITED	17-APR-2000		APPEPI	SEDC	SEDC	Sedimentary hosted(gold,base metals)	Sedimentary units	Drummond Basin		nil	nil
EPM13024	HARTH Robin Michael	23-NOV-2000	22-NOV-2002	GRADIM	EPI	EPI	Shear hosted (gold,copper)	volcanic associations		moderate tonnage of medium to high grade; Y;Duaringa	nil	nil
EPM13025	WRF SECURITIES LTD	03-MAY-2000		APPEPI	EPI	EPI	Cracow style mineralisation (gold, copper)			moderate tonnage of medium to high grade; Y;Banana	nil	nil
EPM13030	SUPERSORB MINERALS NL	26-SEP-2000	25-SEP-2003	GRADIM	CLAY	CLAY	Zeolite in tuff	Carboniferous Ducabrook and Star of Hope Formations		Y	nil	nil
EPM13044	AUSQUEST LIMITED	04-SEP-2001	03-SEP-2006	GRADIM	EPI	SEDC	Sediment hosted (gold-silver and/or base metals)		Drummond Basin	Y	nil	nil
EPM13056	INTEGRATED MINERAL TECHNOLOGY LIMITED	29-NOV-2000	28-NOV-2003	GRADIM	EPI	REPL	Epithermal style mineralisation (gold), bonanza vein (Carlin style)	Devonian - Permian limestone, volcanics and sediments		Target - structure control with nw graben in Anakie basement: No company reports	nil	nil
EPM13067	HORTON GEOSCIENCE CONSULTANTS PTY LTD	22-SEP-2000	21-SEP-2005	GRADIM	VMS	VMS	Volcanic massive sulphide deposit (copper, gold) - eg Mt Morgan, Mt Chalmers, Drake, Develin Creek	Volcanics at Dooloo creek - Lochanbar Beds? - time equivalents to Mt Morgan		Intersection of 2 major mineralising features - nnw and nne trending; Devonian volcanic ventr interpreted in the area: No company reports; Y; Monto	nil	nil
EPM13068	DIAMONEX LTD	01-JUN-2000		APPEPI	GEM	PIPE	Diamonds emplaced via structural conduits		New England Province	No company reports	nil	nil

EPM13076	METALLICA MINERALS LIMITED	04-OCT-2000	03-OCT-2002	GR	EPI	VMS	LMST	Limestone,marble(cement lime and dimension stone), volcanogenic massive sulphide (basemetals), (gold); (gold, copper, lime, marble, lead, zinc)	Devonian limestone and volcanic units; Silverwood group - Connolly Volcanics, Risdon Stud Formation, Rosenthal Creek Formation	Silverwood Subprovince (Block), New England Province	(Mines:) Davenneys, Oaklands, Silverwood Copper (Prospects:) Copper Valley, Golden Bush, Grieves Quarry	nil	33003; 33004;	
EPM13113	BELLINO Geraldo	06-JUL-2000		APP	DIM	DIM	DIM	Dimension stone	Stanthorpe Batholith	New England Province	✓	nil	nil	
EPM13114	SOLOMON ISLANDS MINING N.L.	07-JUL-2000		APP	EPI	EPI	EPI	Low sulphide epithermal gold-silver(Vera-Nancy)	cycle1 volcanic and volcanoclastic rocks(Late Devonian to Early Carboniferous)	Drummond Basin	✓	nil	nil	
EPM13121	AUSTRALIAN GEOSCIENTISTS PTY LTD	20-MAR-2001	19-MAR-2003	GR	EPI	HYD	VEIN	Intrusive associated gold veins; diorite dimension stone	Granitoids and surrounding units; Eidsvold Igneous Complex		Y	nil	nil	
EPM13143	NORTHERN SAFECORP CONSULTANTS PTY LTD	08-AUG-2000		APP	DIM	DIM	DIM	Dimension stone	Stanthorpe Batholith	New England Province	✓	nil	nil	
EPM13145	INTEGRATED MINERAL TECHNOLOGY LIMITED	10-AUG-2000		APP	CLAY	STRAT	STRAT	Bentonite - based on height above sea-level and formations that host elsewhere in the region (volcanic ash).			Fault control of sodic solutions: No company reports	nil	nil	
EPM13155	SOLOMON ISLANDS MINING N.L.	18-AUG-2000		APP	EPI	EPI	EPI	Low sulphide epithermal gold-silver(Vera-Nancy)	cycle1 volcanic and volcanoclastic rocks(Late Devonian to Early Carboniferous)	Drummond Basin	✓	nil	nil	
EPM13156	SOLOMON ISLANDS MINING N.L.	18-AUG-2000		APP	EPI	EPI	EPI			Drummond Basin	✓	nil	nil	
EPM13161	IPOH PACIFIC PTY LTD	21-AUG-2000		APP	CLAY	CLAY	CLAY	Calcium bentonite	Black Alley Shale		Y	nil	nil	
EPM13162	IPOH PACIFIC PTY LTD	02-APR-2001	01-APR-2003	GR	CLAY	CLAY	CLAY	Calcium bentonite	Black Alley Shale	Drummond Basin	✓	nil	33278;	
EPM13188	NEWMONT GOLD EXPLORATION PTY LTD	30-APR-2001	29-APR-2006	GR	EPI	EPI	EPI	Low sulphide epithermal gold-silver(Vera-Nancy); (silver-gold)	cycle1 volcanic and volcanoclastic rocks(Late Devonian to Early Carboniferous), Silver Hills Volcanics	Drummond Basin		Drummond has potential to host world-class deposits of this type (Yandan, Wirralie, Mt Coolon). Host may be below Tertiary cover. Structural control significant. (Prospect:) Pretoria Hill	nil	33297;
EPM13194	NEWCREST OPERATIONS LIMITED	14-SEP-2000		APP	EPI	PORP	PORP	Porphyry (Cadia, Round Mountain) and epithermal gold (Vera-Nancy, Pajingo)	Camboon Andesite volcanics			Cracow having produced about 1000000 oz gold. Targeting NE and NW structures	nil	nil

EPM13204	CARPENTARIA GOLD PTY LTD	20-MAR-2001	19-MAR-2004	GRA	HYD	MESO	MESO	Mesothermal sheeted vein gold of Ravenswood style			geochem used to define targets; mineralisation associated with Pajingo-Ravenswood trend	nil	nil
EPM13226	RANDALL Kevin Stanley	20-APR-2001	19-APR-2004	GRA	ALLU	ALLU	ALLU	Prospecting (gold)	alluvial gold	Rawbelle Batholith	Focus on old workings (structural control?)	nil	nil
EPM13231	DONERVAN ROBERT CHONG	14-AUG-2001	13-AUG-2006	GRA	HYD	HYD	VEIN	Prospecting		New England Province, Texas Subprovince	No company reports	nil	nil
EPM13239	RHEA John Desmond	06-MAR-2001	05-MAR-2006	GRA	DIM	DIM	DIM	Dimension stone	Precipice Sandstone (Jurassic)	Mulgildie Basin	sandstone units	nil	nil
EPM13302	KOKSTAD MINING PTY LTD	20-MAR-2001	19-MAR-2004	GRA	STRAT	STRAT	STRAT	Sodium bicarbonate groundwater (soda ash)		Surat Basin	Grafton Range Sodium Bicarbonate Project	nil	33223;
EPM13317	WEBSTER Peter Francis	24-MAY-2001	23-MAY-2003	GRA	EPI	DIM	VEIN	Netvein and stockwork (gold)	Eidsvold Igneous Complex	Rawbelle Batholith	major Eidsvold - 'Jackass'	nil	nil
EPM13328	BROTHERS MINING PTY LTD	21-AUG-2001	20-AUG-2003	GRA	LMST	LMST	LMST	(limestone, dolomite)			Nogoa Lime NE Emerald	nil	nil
EPM13365	BENNETT William Arthur	30-JUL-2001	29-JUL-2002	GRA	OPAL	OPAL	OPAL	(opal?)			Y	nil	nil
EPM13370	TURANY PTY LTD	25-JUN-2001	24-JUN-2004	GRA	LIME	STRAT	STRAT	Surface gravel analysed and found to consist of dolomite			Gravel pits; No company reports	nil	nil
EPM13372	PAN AUSTRALIAN EXPLORATION PTY LTD	14-AUG-2001	13-AUG-2006	GRA	ULTR	ULTR	PGE	Platinum Group metals in layered gabbros	Hawkwood Gabbro	Rawbelle Batholith, Gogango Overfolded Zone	No company reports	nil	nil
EPM13373	PAN AUSTRALIAN EXPLORATION PTY LTD	14-AUG-2001	13-AUG-2006	GRA	ULTR	ULTR	PGE	Platinum Group metals in layered gabbros	Hawkwood Gabbro	Rawbelle Batholith, Gogango Overfolded Zone	No company reports	nil	nil
EPM13381	OPAL HORIZON LIMITED	18-MAY-2001		APP	OPAL	OPAL	OPAL	(opal)	chemically weathered sediments of Griman Creek Formation	Surat Basin	Structural targets in Cretaceous host; Nariel prospect	nil: Check Opal Horizon Prospectus!	nil
EPM13410	RIO TINTO EXPLORATION PTY LIMITED	17-SEP-2001	16-SEP-2006	GRA	ULTR	ULTR	ULTR	Hardrock rutile	Chahpingah meta igneous complex	Yarraman Subprovince	Albitite rich zones of sodium metasomatism in gneissic complexes	nil	nil
EPM13411	CONSOLIDATED BROKEN HILL LTD	05-DEC-2001	04-DEC-2006	GRA	OPAL	OPAL	OPAL	Formation/structural control (Black opal)			Y	nil	nil
EPM13441	GRAHAM Neil	04-JAN-2002	03-JAN-2004	GRA	GEM	GEM	GEM	Alluvial sapphires	alluvium	Yarrol Subprovince	Y; Baralaba	nil	nil
EPM13443	NEWCREST OPERATIONS LIMITED	31-JAN-2002	30-JAN-2004	GRA	EPI	PORP	PORP	Bulk low tonnage porphyry gold (Cadia, Round Mountain style); high grade low tonnage epithermal gold (Vera-Nancy, Pajingo)	Camboon Andesite volcanics	Bowen Basin, Gogango Overfolded Zone	No company reports; Y; Scoria	nil	nil
EPM13457	SCHWERIN Neil Charles	09-JAN-2002	08-JAN-2003	GRA	ALLU	ALLU	ALLU	sand?			Y	nil	nil

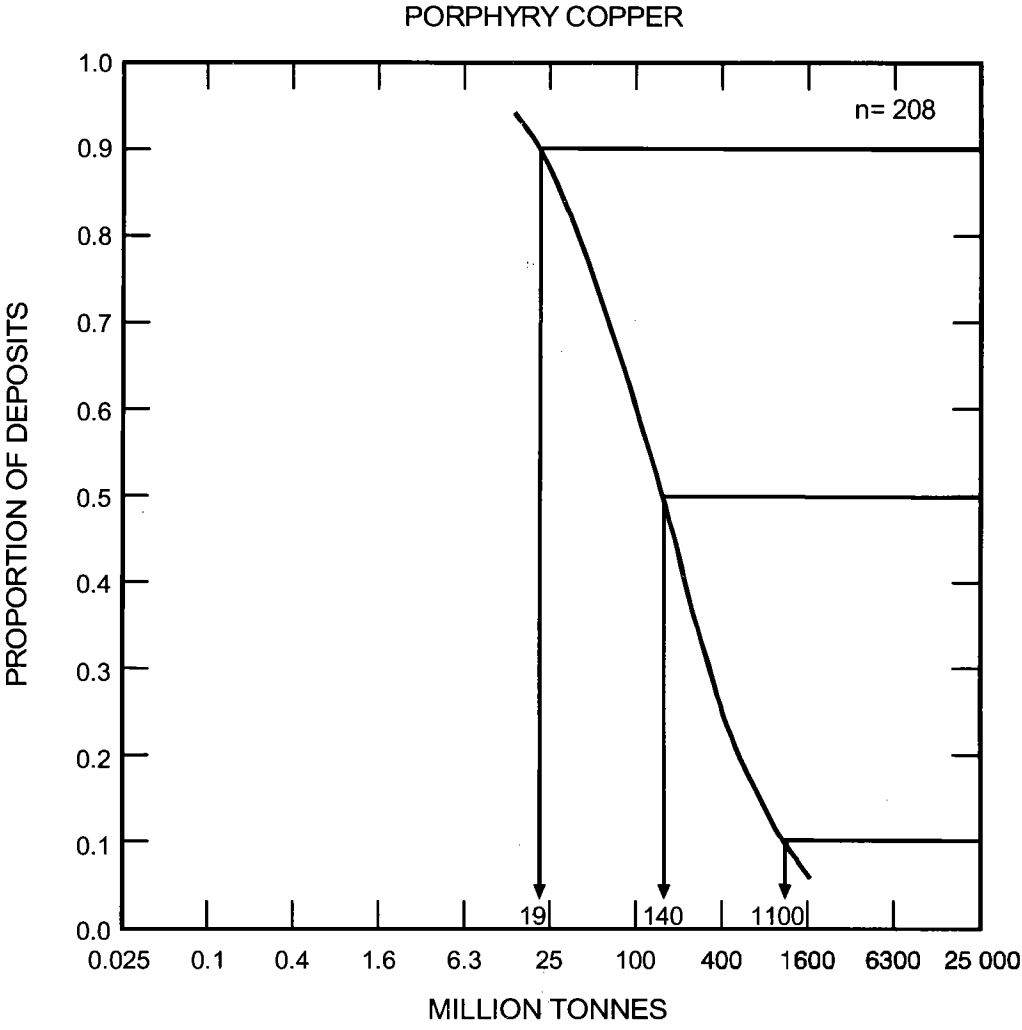
EPM13483	GOLDEN BREED PTY LTD	02-JAN-2002	01-JAN-2004	GR	DIM	DIM	DIM	Dimension stone, Industrial Nepheline Syenite (Mt Ramsay)			Y	nil	nil
EPM13484	RIO TINTO EXPLORATION PTY LIMITED	15-JAN-2002	14-JAN-2007	GR	CLAY	CLAY	CLAY	Heavy metals (rutile, ilmenite) in strandline shoreface settings	Upper Jurassic, Lower Cretaceous Kumbarilla Beds	Yarrol Province	No company reports	nil	nil
EPM13486	RIO TINTO EXPLORATION PTY LIMITED	15-JAN-2002	14-JAN-2007	GR	CLAY	CLAY	CLAY	Heavy metals (rutile, ilmenite) in strandline shoreface settings	Upper Jurassic, Lower Cretaceous Kumbarilla Beds	Yarrol Province	No company reports	nil	nil
EPM13488	RIO TINTO EXPLORATION PTY LIMITED	14-MAR-2002	13-MAR-2007	GR	CLAY	CLAY	CLAY	Heavy metals (rutile, ilmenite) in strandline shoreface settings	Upper Jurassic, Lower Cretaceous Kumbarilla Beds	Yarrol Province	No company reports	nil	nil
EPM13492	RIO TINTO EXPLORATION PTY LIMITED	15-JAN-2002	14-JAN-2007	GR	CLAY	CLAY	CLAY	Heavy metals (rutile, ilmenite) in strandline shoreface settings	Upper Jurassic, Lower Cretaceous Kumbarilla Beds	Yarrol Province	No company reports	nil	nil
EPM13497	ILUKA RESOURCES LIMITED	09-JAN-2002	08-JAN-2004	GR	STRAT	STRAT	STRAT	Stratigraphic units with potential to host beach placer heavy metal concentrations (rutile, ilmenite)		Yarrol Province	No company reports	nil	nil
EPM13499	PETER HARVEY HELL HOLE MINING PTY LTD	01-OCT-2001		APP	ALLU	ALLU	ALLU	Alluvial deposits (gold?)	alluvium		Focus on alluvial and old workings	nil	nil
EPM13500	HELL HOLE MINING PTY LTD	02-JAN-2002	01-JAN-2005	GR	CLAY	CLAY	CLAY	Diatomite	main range tertiary basalts	Texas Block	Y	nil	nil
EPM13504	GRAHAM Neil	09-JAN-2002	08-JAN-2004	GR	GEM	GEM	GEM	Exploration for sapphires	Alluvial wash from Tertiary Basalts		No company reports	nil	nil
EPM13506	ROYLE David	25-FEB-2002	24-FEB-2004	GR	GEM	GEM	GEM	Diamond - breccia pipes	interpreted beneath cover breccia pipes		Y	nil	nil
EPM13507	RIO TINTO EXPLORATION PTY LIMITED	11-MAR-2002	10-MAR-2007	GR	STRAT	STRAT	STRAT	Exploring for heavy minerals			No company reports	nil	nil
EPM13575	DARRA EXPLORATION PTY LTD	02-JAN-2002	01-JAN-2006	GR	LMST	CLAY	CLAY	Mining in adjacent leases(limestone,clay)		Yarrol Province	Y; Bajool	nil	nil
EPM13576	ARKINSTALL Kenneth Joseph	16-OCT-2001		APP	DIM	DIM	DIM	Dimension stone?	sandstone		Y	nil	nil
EPM13587	SKINNER Warren Richmond	30-OCT-2001		APP	ALLU	ALLU	ALLU	Prospecting (gold?)	Stanthorpe Batholith	Neo England Province	Y	nil	nil
EPM13592	MARLBOROUGH RESOURCES NL	01-NOV-2001		APP	?	?	?	(gold, copper)		S of Gladstone	No company reports; Y; Calliope, Bajool; EPM intersects forest area outside WH project area	nil	nil
EPM13609	STEVENSON Gregory John	13-MAR-2002	12-MAR-2004	GR	HYD	HYD	VEIN	(gold)		35 km W of Warwick; New England Province, Texas Subprovince	No company reports	nil	nil
EPM13624	BROWN Michael John	13-DEC-2001		APP	DIM	DIM	DIM	Dimension stone	sandstone, Evergreen Formation (siltstone, Jlo)		Y	nil	nil
EPM13637	LODESTONE EXPLORATION PTY LTD	18-JAN-2002		APP	VMS	VMS	VMS	Volcanogenic massive sulphide deposits	Ginger Creek Member - highly evolved rhyolites		missing - application: No company reports; Y; Bajool	nil	nil
EPM13639	YARDARINO LIMITED	23-MAY-2002	22-MAY-2005	GR	EPI	EPI	EPI	Epigenetic oxide/sulphide copper and gold mineralisation.	basement under cover		Aeromagnetics established prospectivity	nil	nil

EPM13640	YARDARINO LIMITED	23-MAY-2002	22-MAY-2005	GR	EPI	EPI	EPI	(gold, copper)			Y	nil	nil
EPM13647	AUSTRALIAN GEOSCIENTISTS PTY LTD	08-FEB-2002		APP	?	?	?	(gold)		30km E of Biloela; Specimen Hill area.	No company reports; Y; Biloela	nil	nil
EPM13649	A.C.N. 099 477 737 PTY LTD	08-MAY-2002	07-MAY-2007	GR	VMS	VMS	PORP	Volcanic massive sulphide deposits and porphyry	early Paleozoic rocks underlying younger cover		Favourable structural location indicated	nil	nil
EPM13657	SAVANNAH RESOURCES	08-FEB-2002		APP	?	?	?						
EPM13662	AUSTRAL DUTCH KAOLIN PTY LTD	15-FEB-2002		APP	STRAT	STRAT	STRAT	(clay, oil shale, gold)			Y	nil	nil
EPM13666	SCHWERIN Neil Charles	19-FEB-2002		APP	CLAY	SILIC	SILIC	Silica sand			missing - application: No company reports	nil	nil
EPM13667	LACH DRUMMOND RESOURCES PTY LTD	20-FEB-2002		APP	EPI	EPI	EPI	Epithermal (gold, silver, copper)		Drummond Basin	Y	nil	nil
EPM13672	FREESPORT PTY LIMITED	01-MAR-2002		APP	DIM	DIM	DIM	Dimension stone	sandstone		Y	nil	nil
EPM13673	VAN DEN ELSEN Martin John	01-MAR-2002		APP	DIM	DIM	DIM	Dimension stone	sandstone		Y	nil	nil
EPM13674	MCDONALD Darcy Robert	01-MAR-2002		APP	ROAD	ROAD	ROAD	Industrial minerals (basalt)	local known hill for development/roadwork base		Y; Calliope	nil	nil
EPM13678	TABLELANDS EXPLORATION PTY LIMITED	07-MAR-2002		APP	?	?	?				Y; Calliope	nil	nil
EPM13683	FRESHTRACKS PRS PTY LTD	15-MAR-2002		APP	HYD	HYD	HYD	Hydrothermal vein systems			old workings Little Horrigan/Duke of York; Y; Bajool	nil	nil
EPM13723	ELLIOT Maurice James	19-APR-2002		APP	GEM	GEM	GEM	Palaeo channel (sapphire)	Gravel ridges (TQw/Czg)		Y	nil	nil
EPM13724	GOLDEN BREED PTY LTD	19-APR-2002		APP	VMS	VMS	PORP	porphyry or volcanogenic massive sulphide(gold,silver, copper, tantalum, bismuth)	Greybank Volcanics		Y	nil	nil
EPM13742	FROST ENTERPRISES PTY LTD	02-MAY-2002		APP	LMST	LMST	LMST	Limestone		Rockhampton Province, Calliope Subprovince	Y	nil	nil
EPM13754	NEWCREST OPERATIONS LTD	14-MAY-2002		APP	EPI	EPI	EPI	Cracow style mineralisation - hydrothermal (gold)	Camboon Andesite volcanics	Gogango Overfolded Zone, Bowen Basin	missing - application: No company reports; Y; Banana	nil	nil
EPM13756	SILLER Roderick William	23-MAY-2002		APP	LMST	LMST	LMST	Limestone (cement, burnt lime), intrusive related (gold)	Calliope Beds, gold associated intrusives		Y	nil	nil
EPM13757	NEW RUSH NL	24-MAY-2002		APP	LMST	LMST	LMST	Dolomite - sedimentary, travertine deposit, basalt weathering? - known occurrence			refers to railway cutting near Langton siding (Dunstan, 1900)	nil	nil

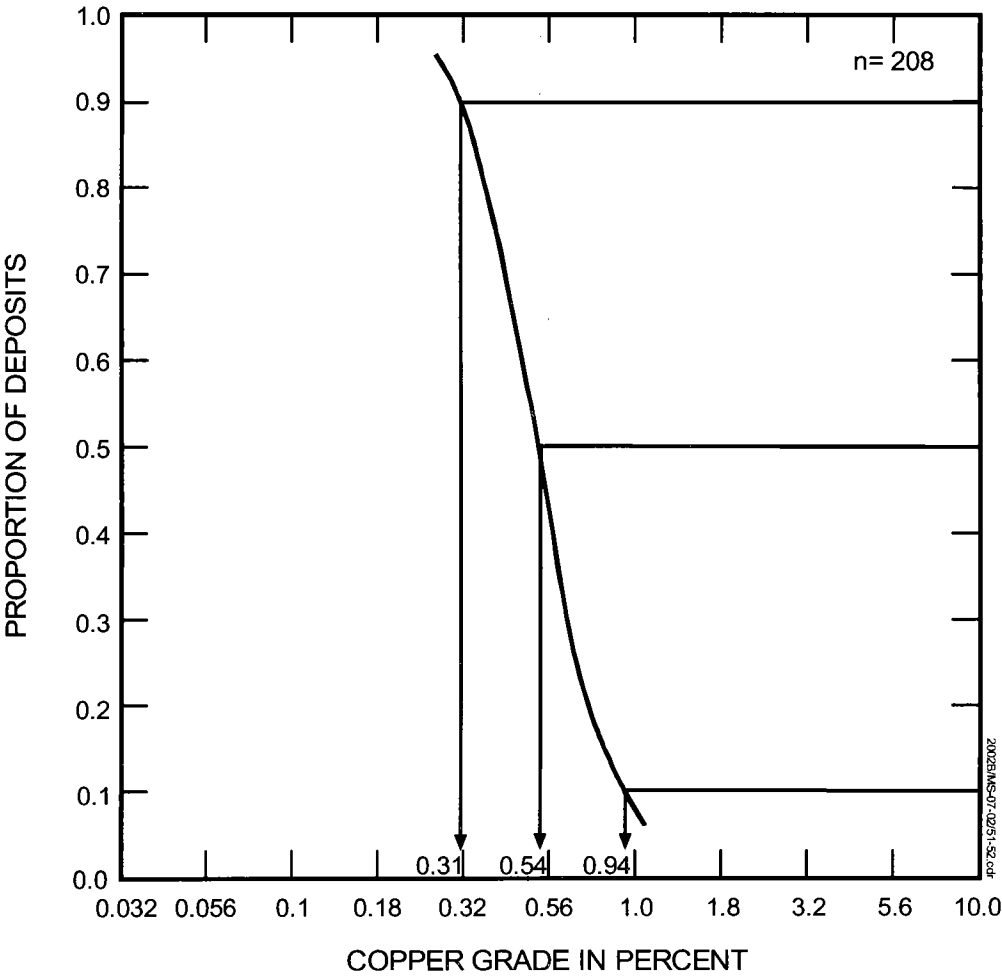
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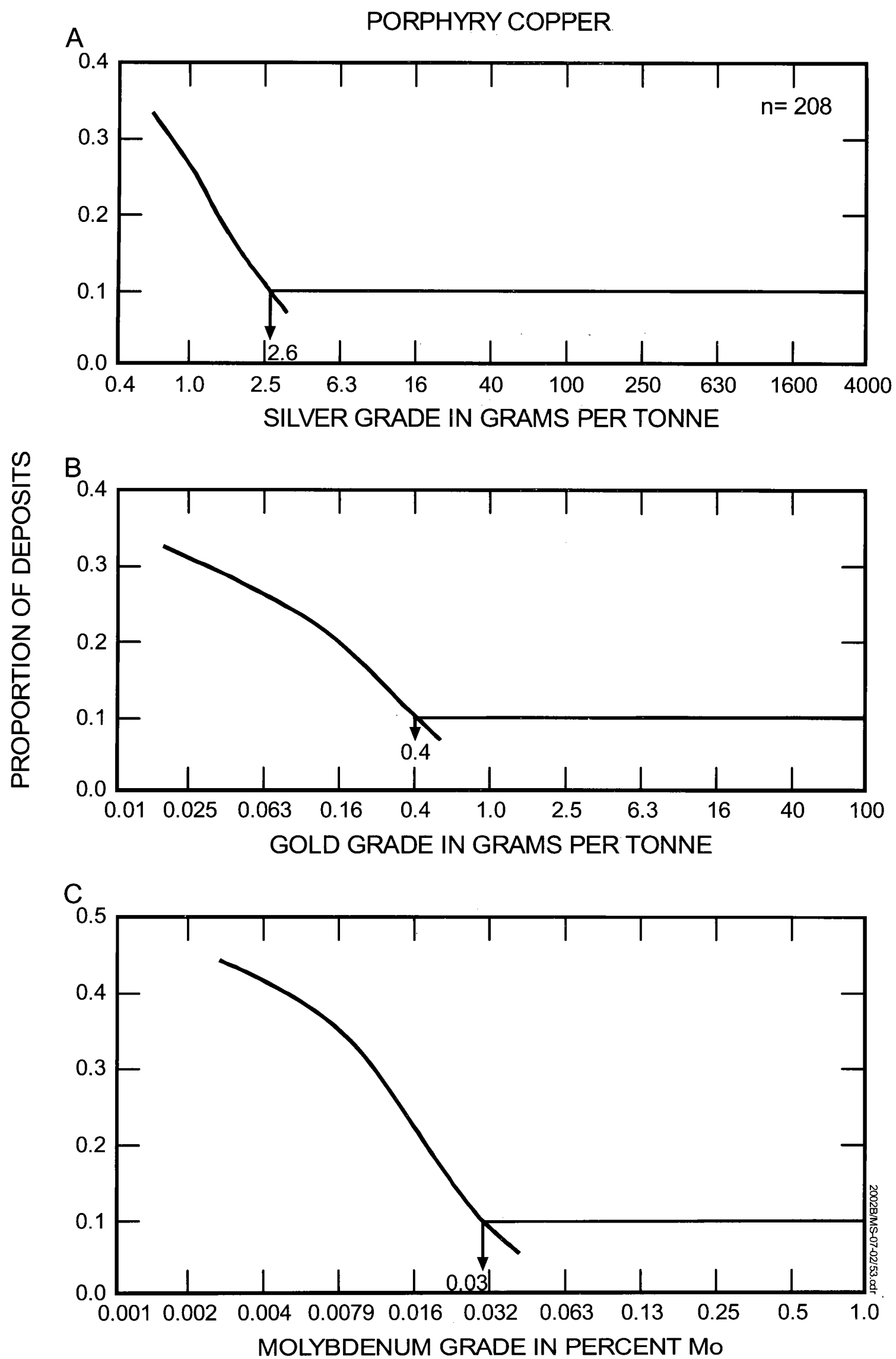
APPENDIX 3
GRADE AND TONNAGE MODELS
(Source USGS BULLETIN 1693)

Tonnages of porphyry Cu deposits

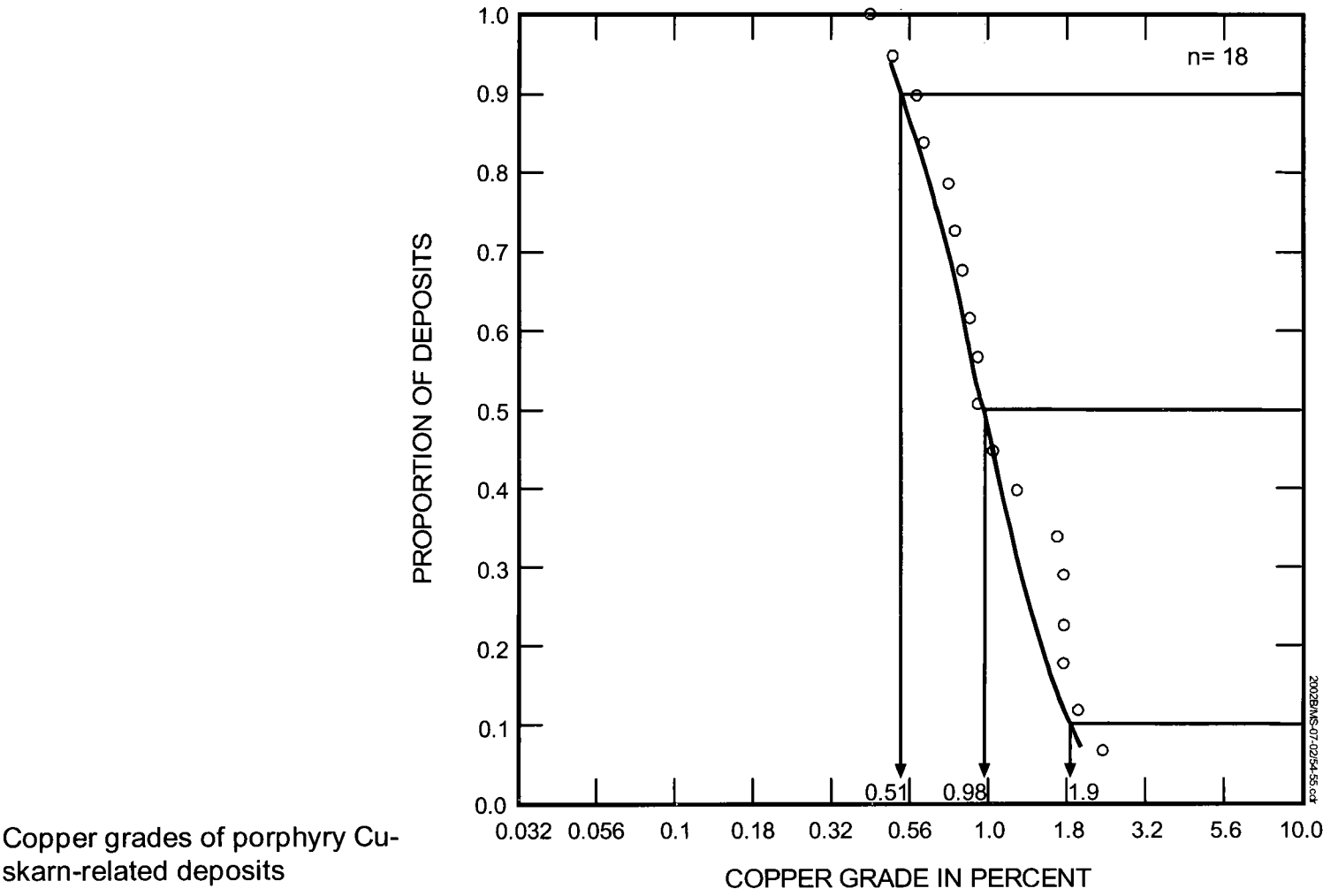
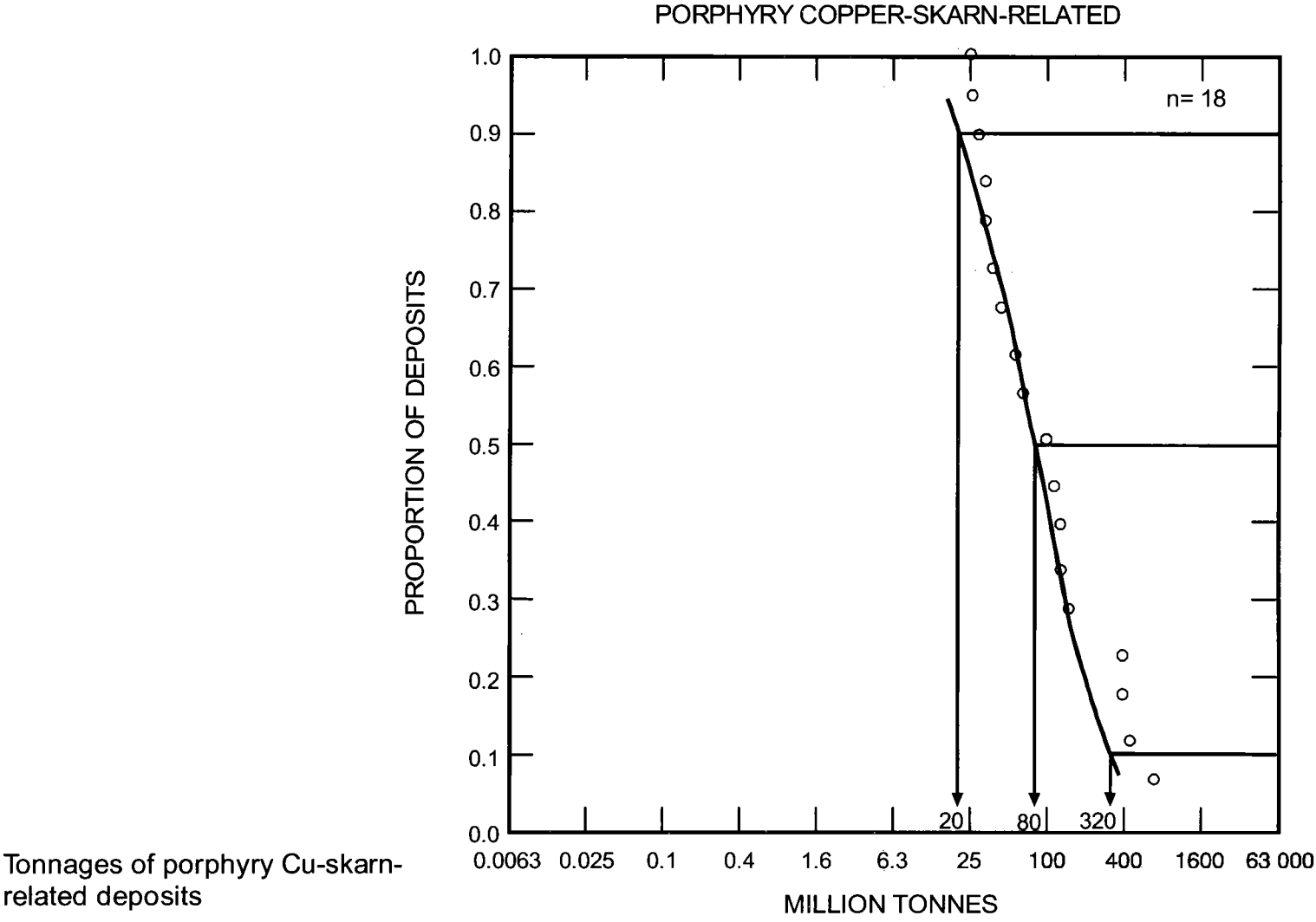


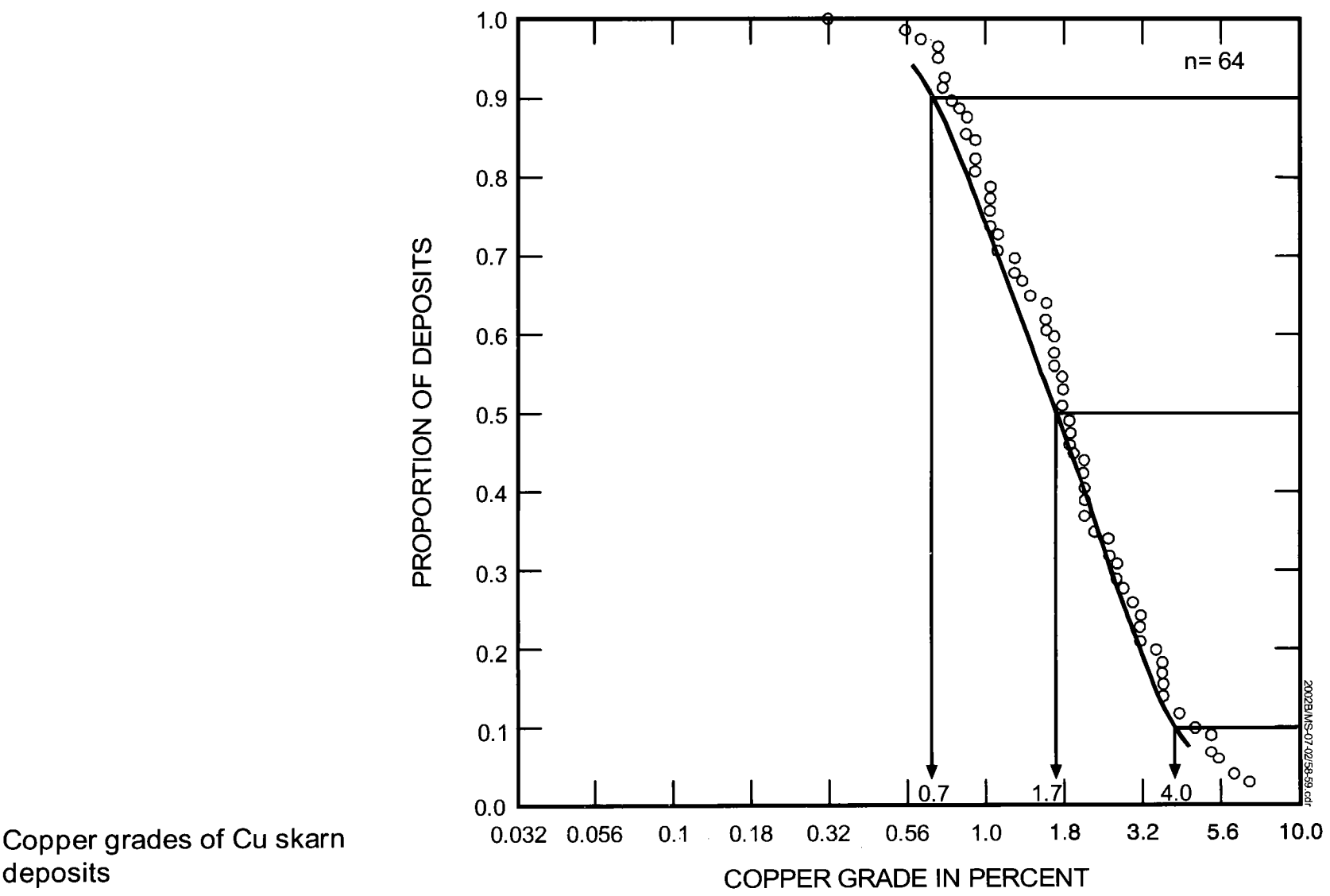
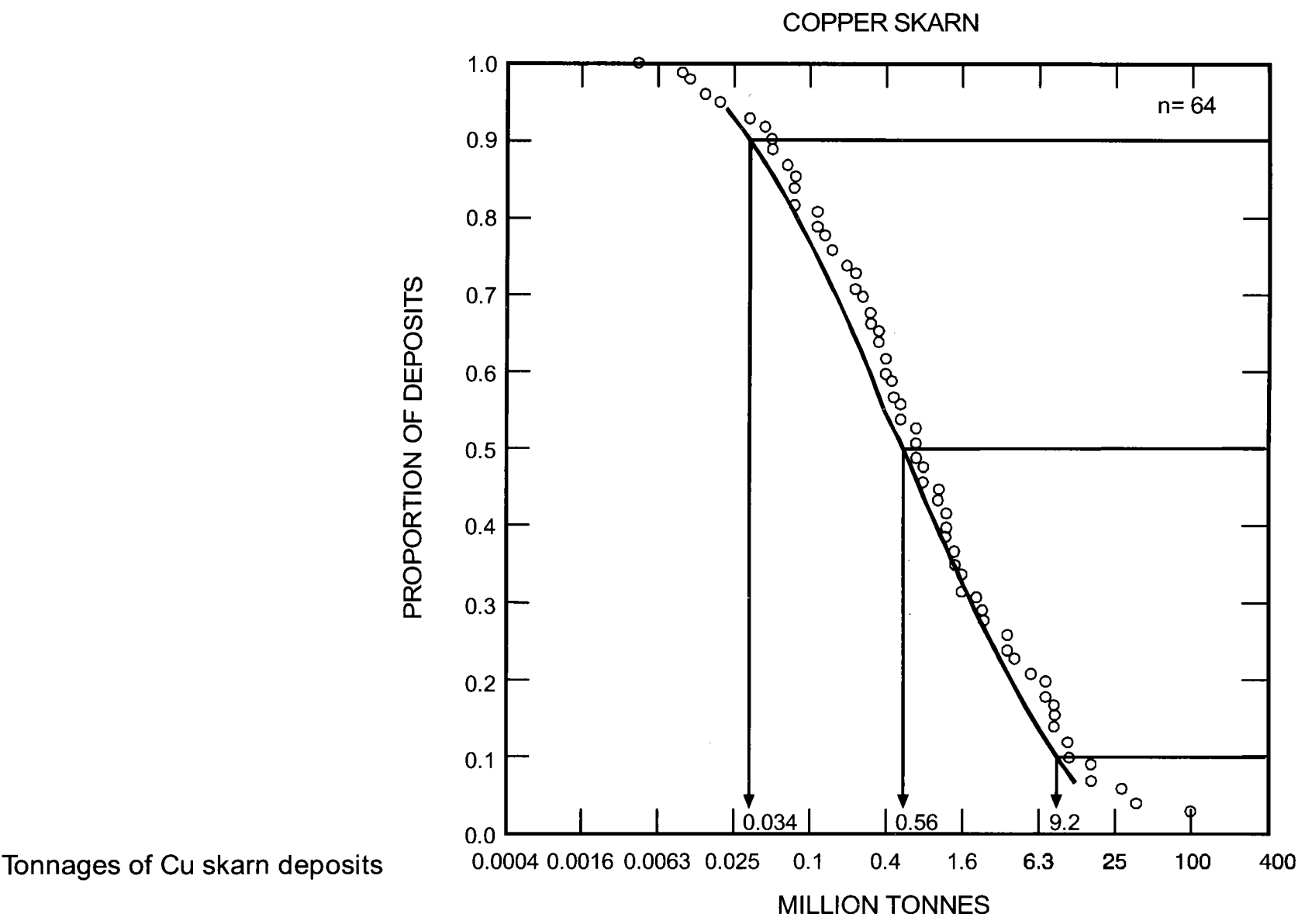
Copper grades of porphyry Cu deposits

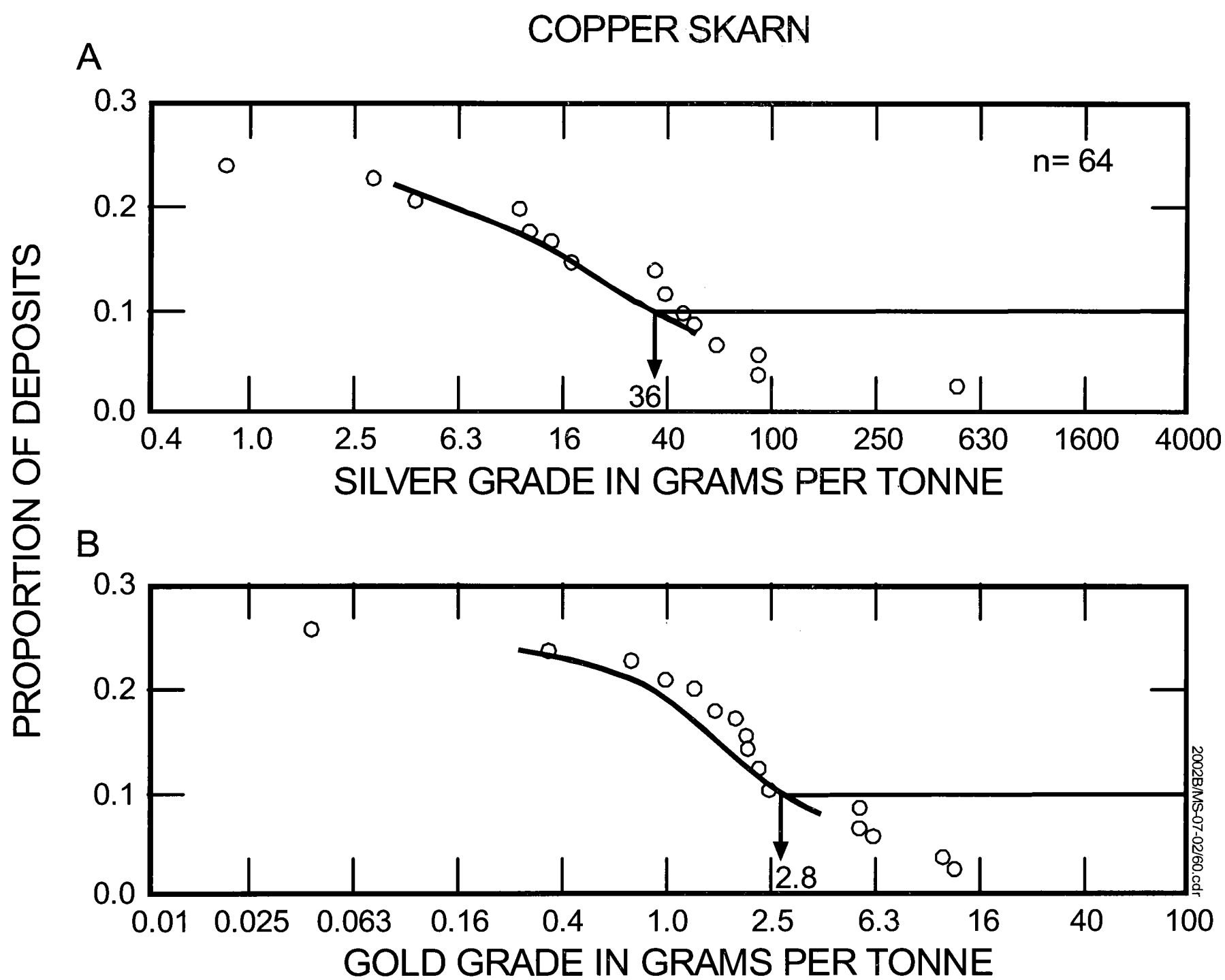




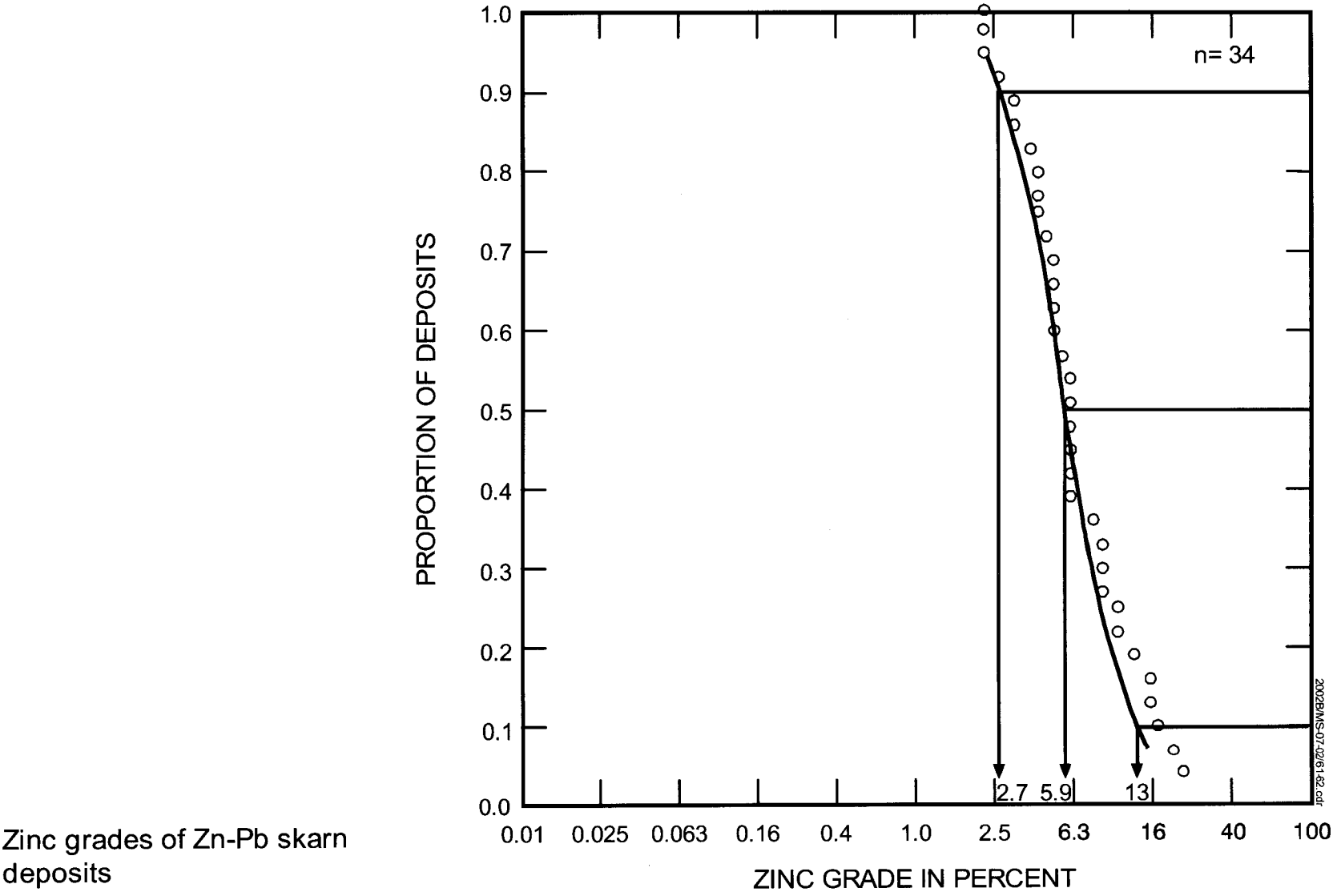
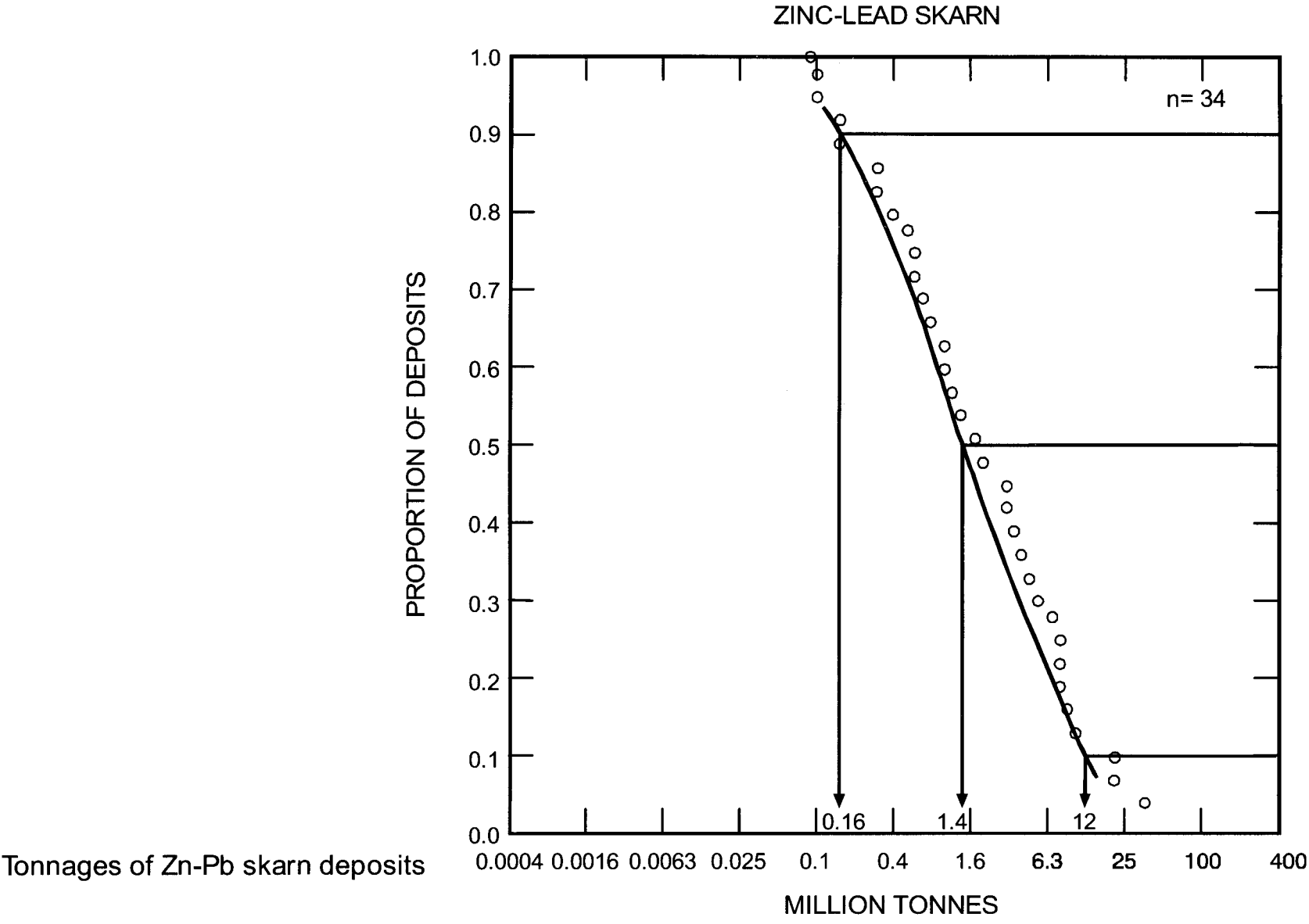
By-product grades of porphyry Cu deposits
A, Silver; B, Gold; C, Molybdenum



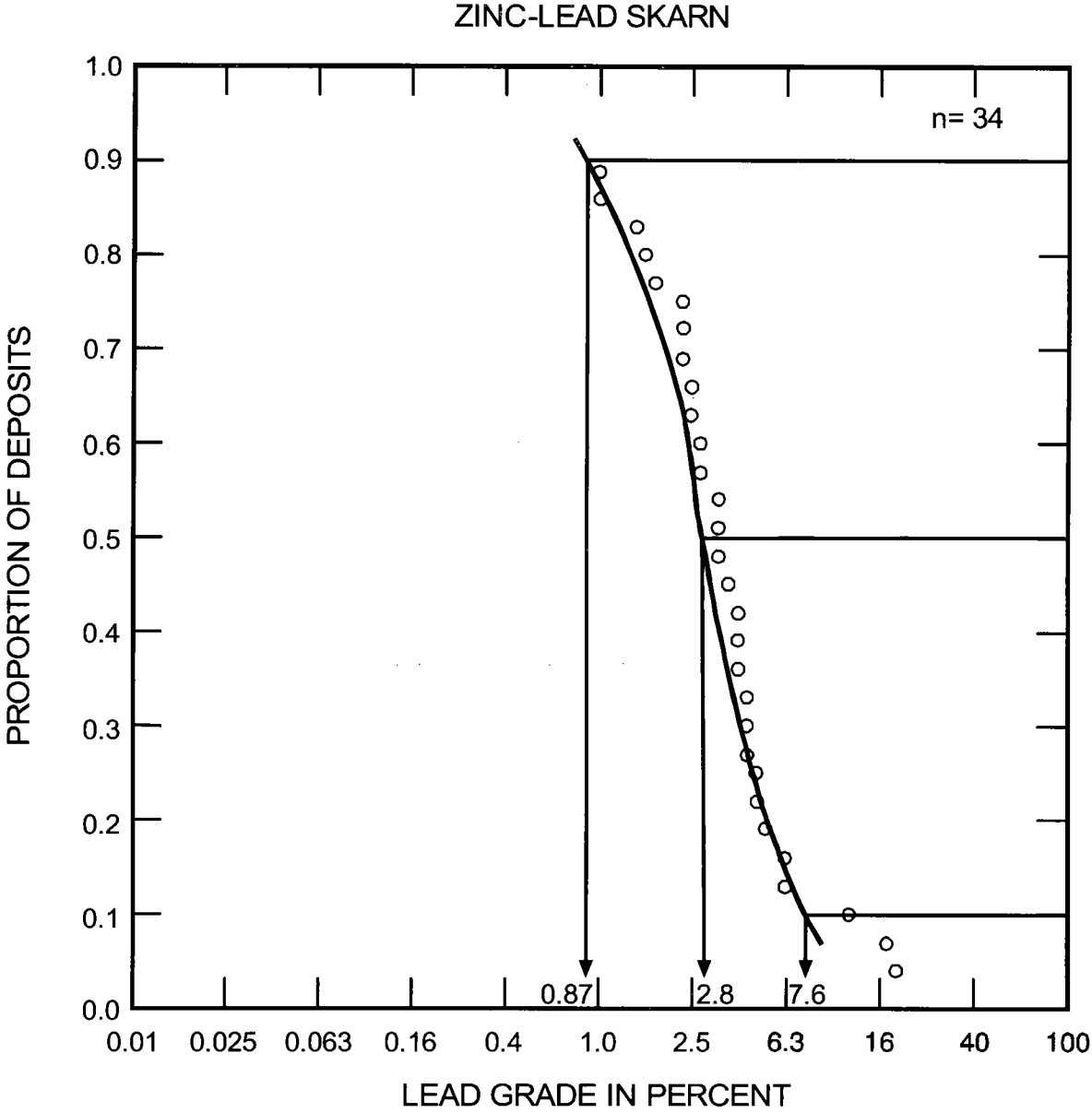




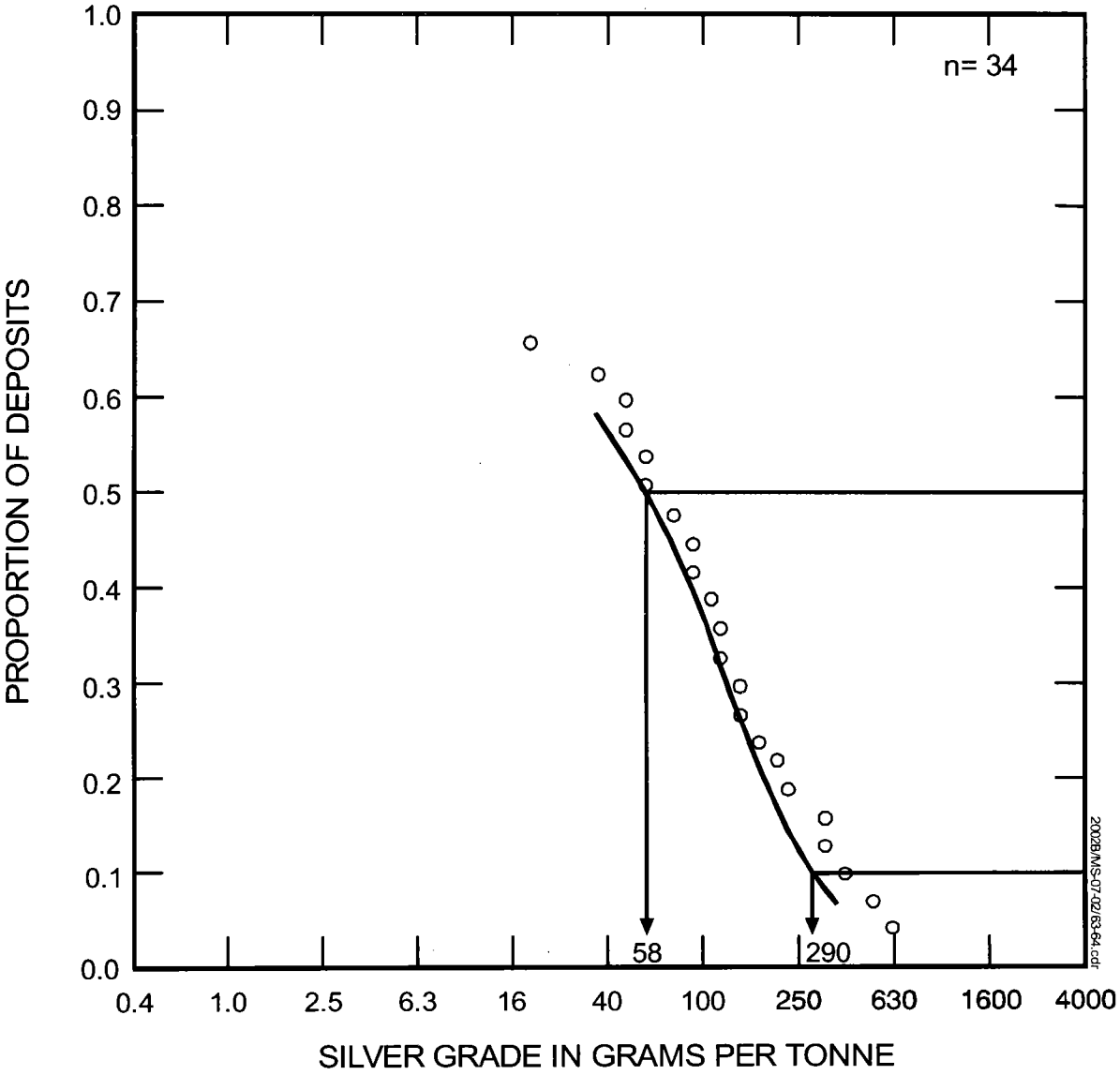
Precious-metal grades of Cu skarn deposits
A, Silver; B, Gold

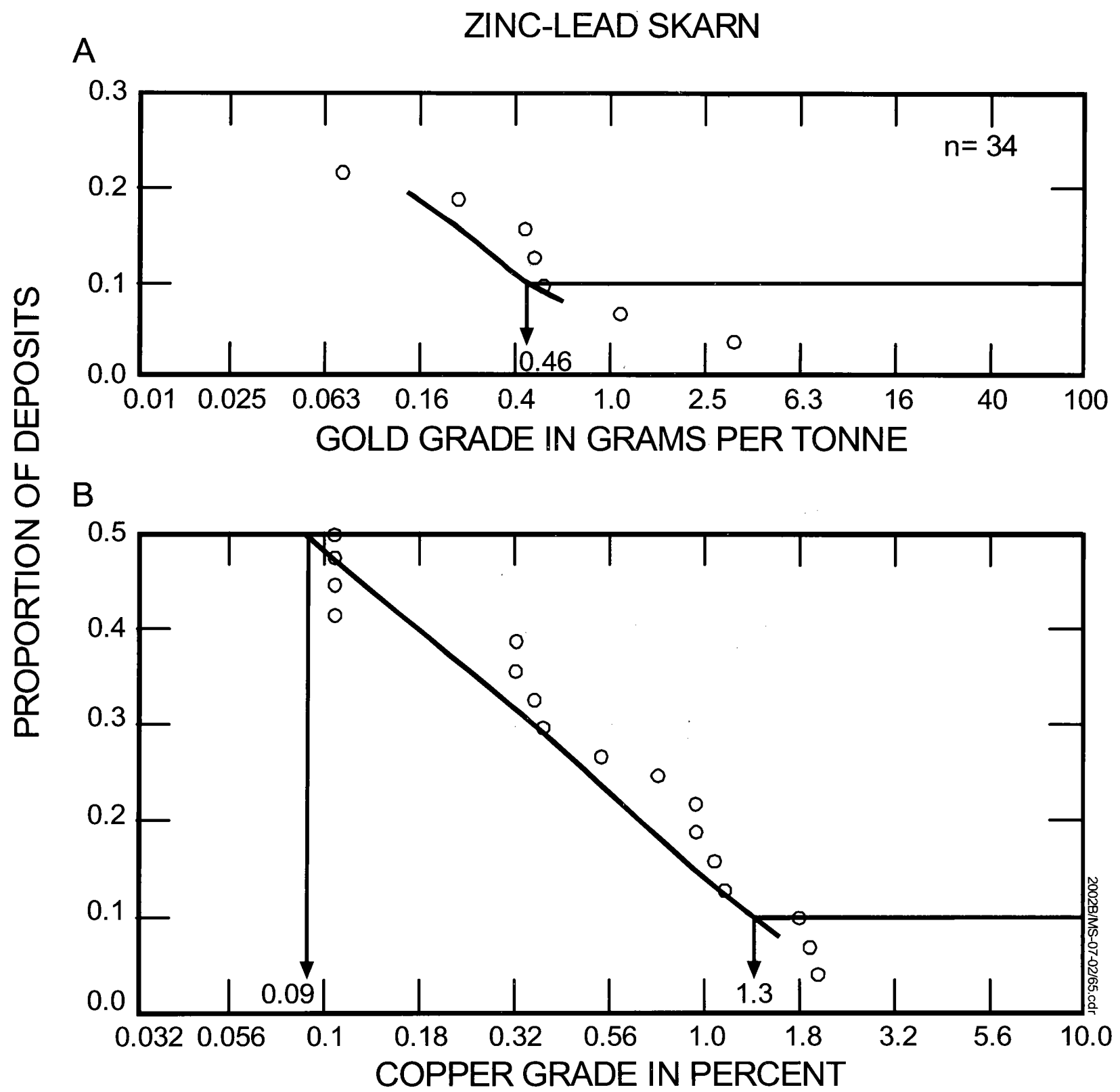


Lead grades of Zn-Pb skarn deposits



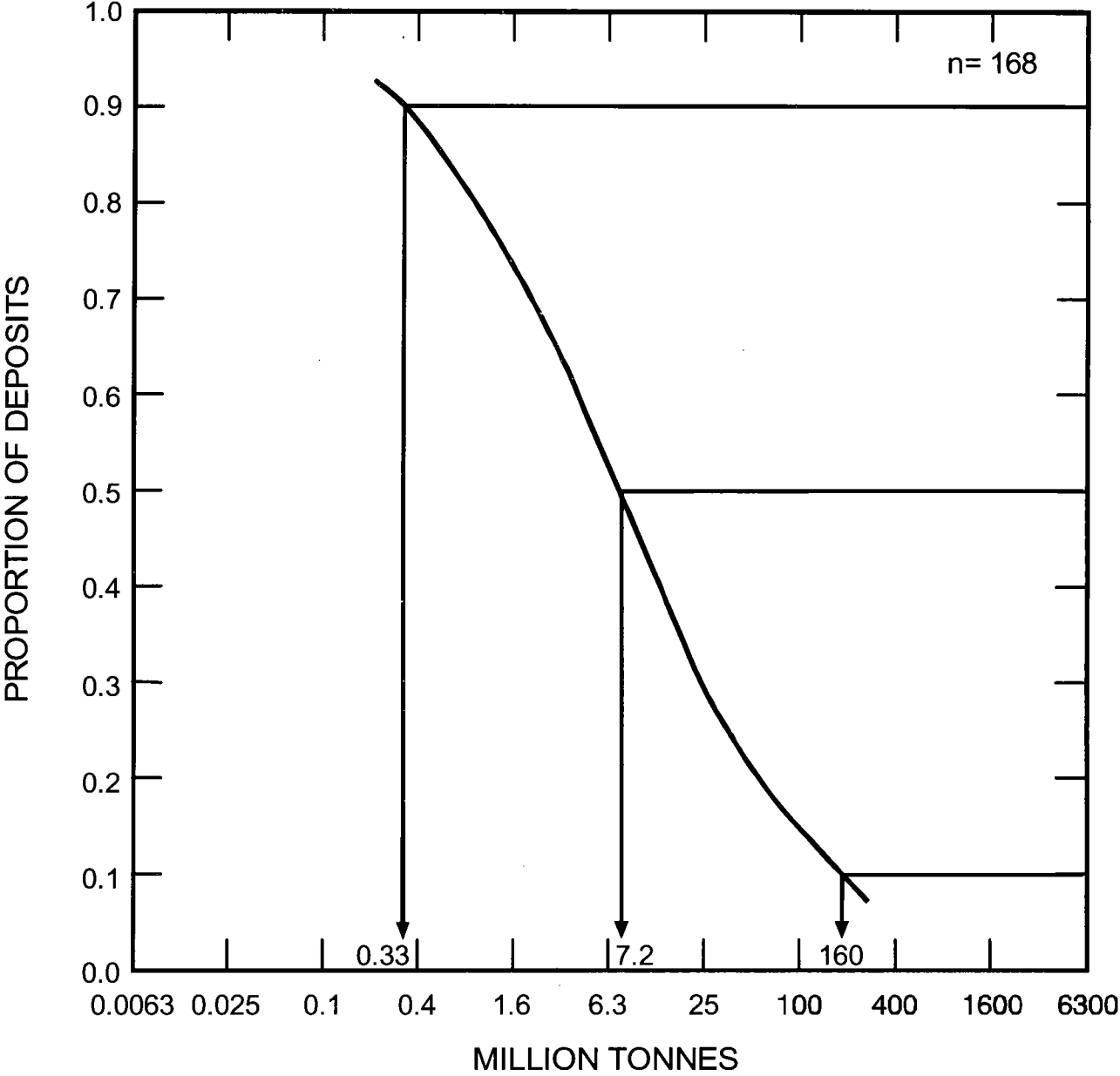
Silver grades of Zn-Pb skarn deposits



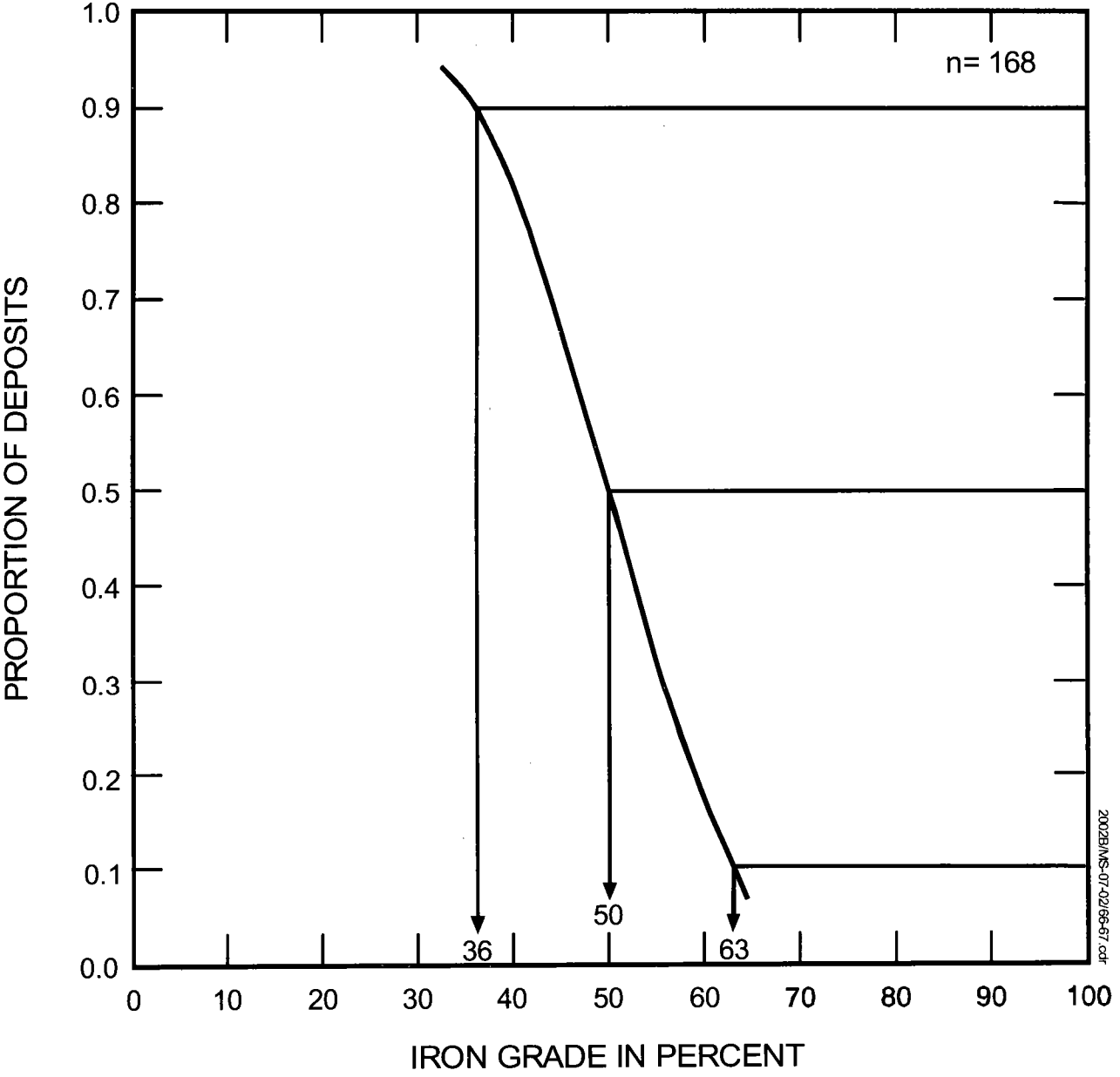


Metal grades of Zn-Pb skarn deposits
A, Gold; B, Copper

IRON SKARN

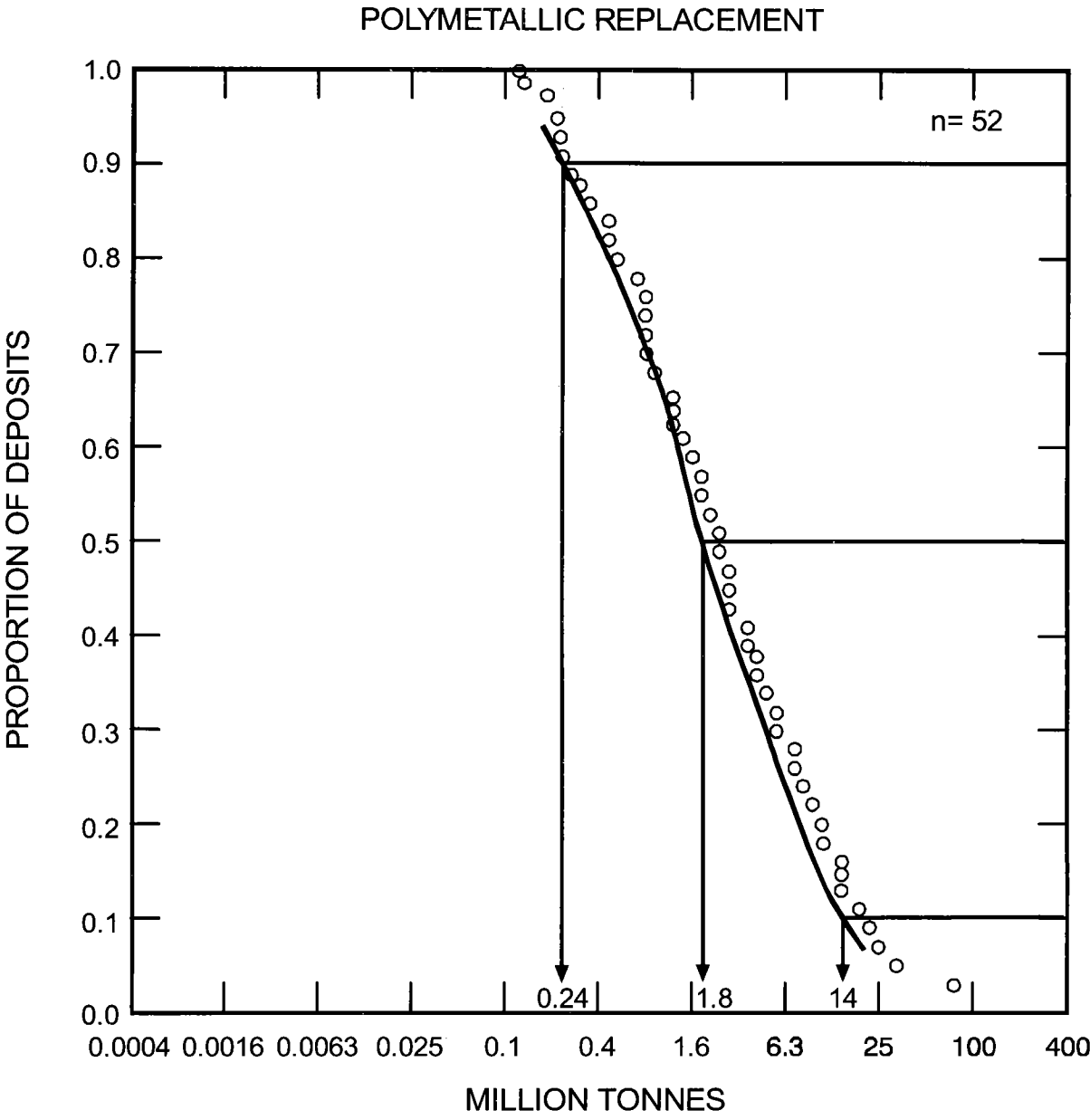


Tonnages of Fe skarn deposits

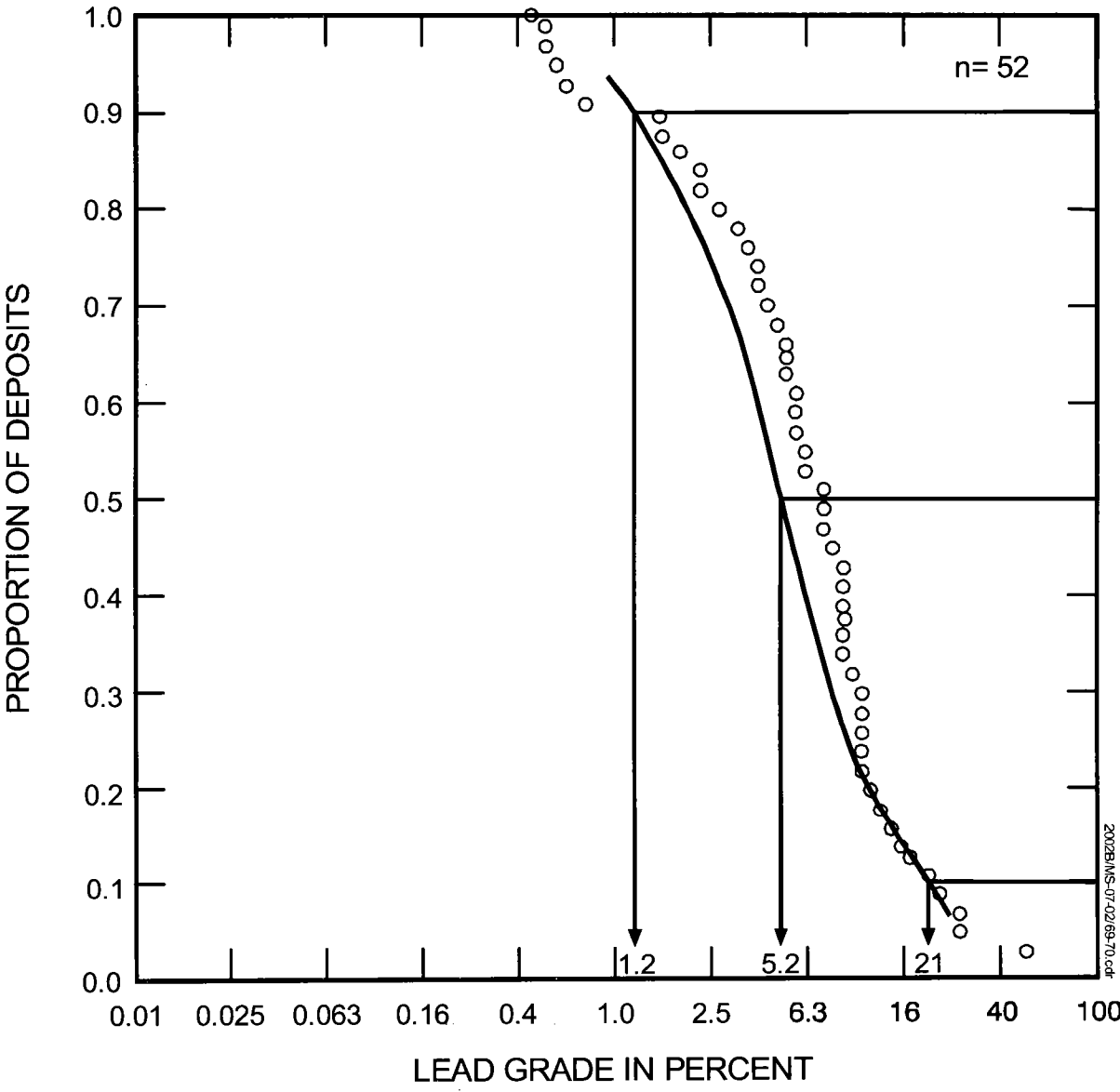


Iron grades of Fe skarn deposits

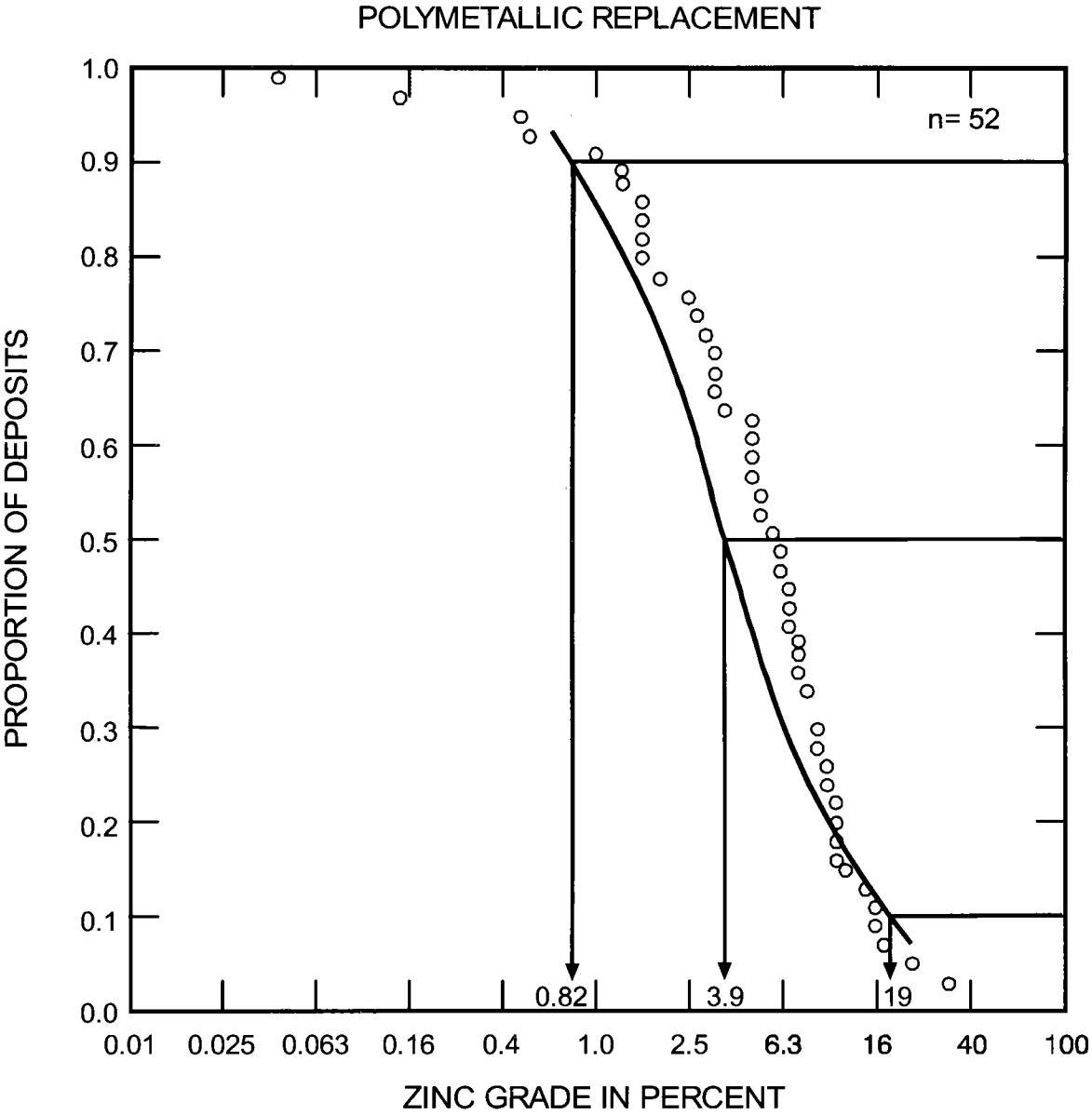
Tonnages of polymetallic replacement deposits



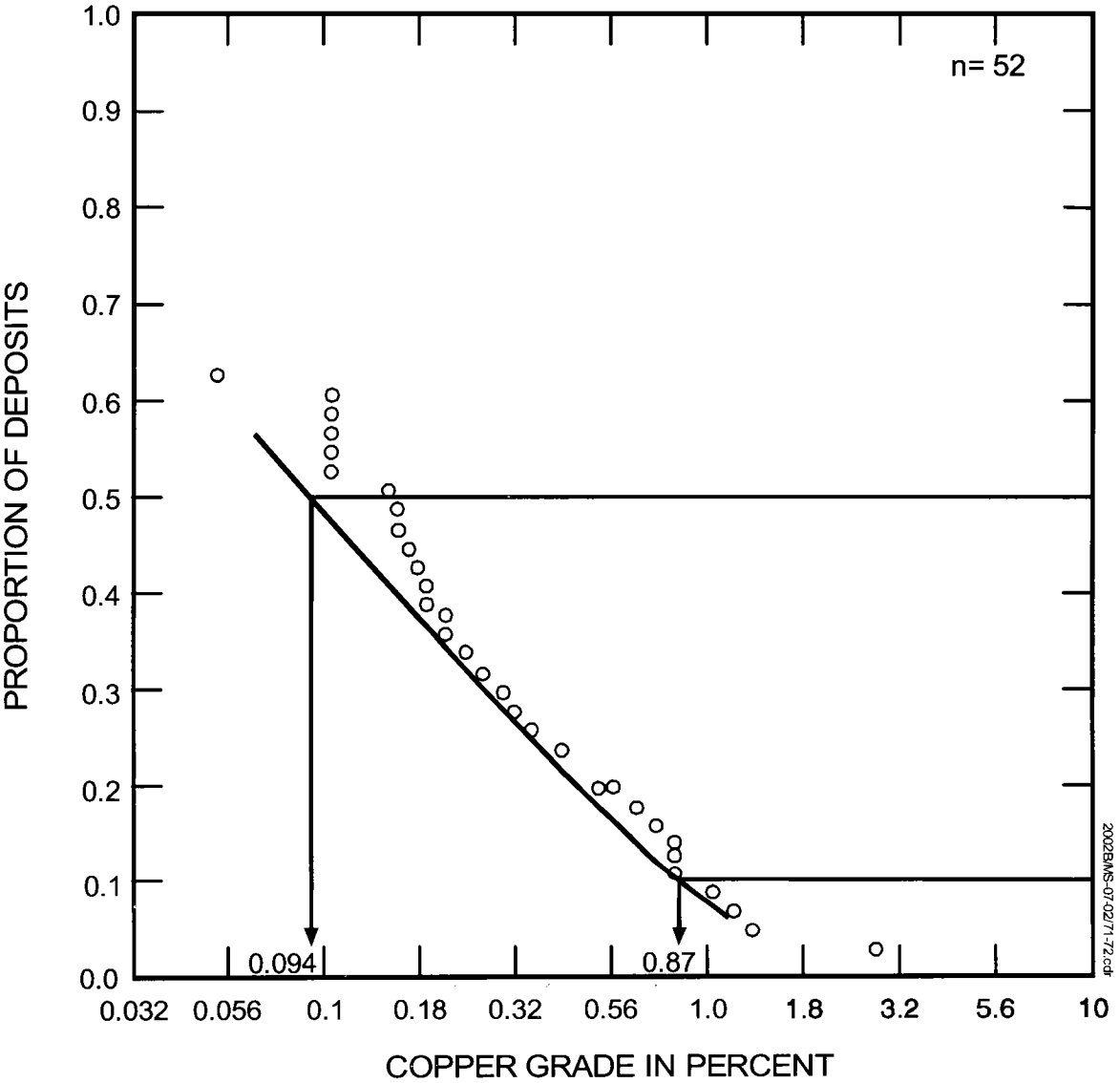
Lead grades of polymetallic replacement deposits



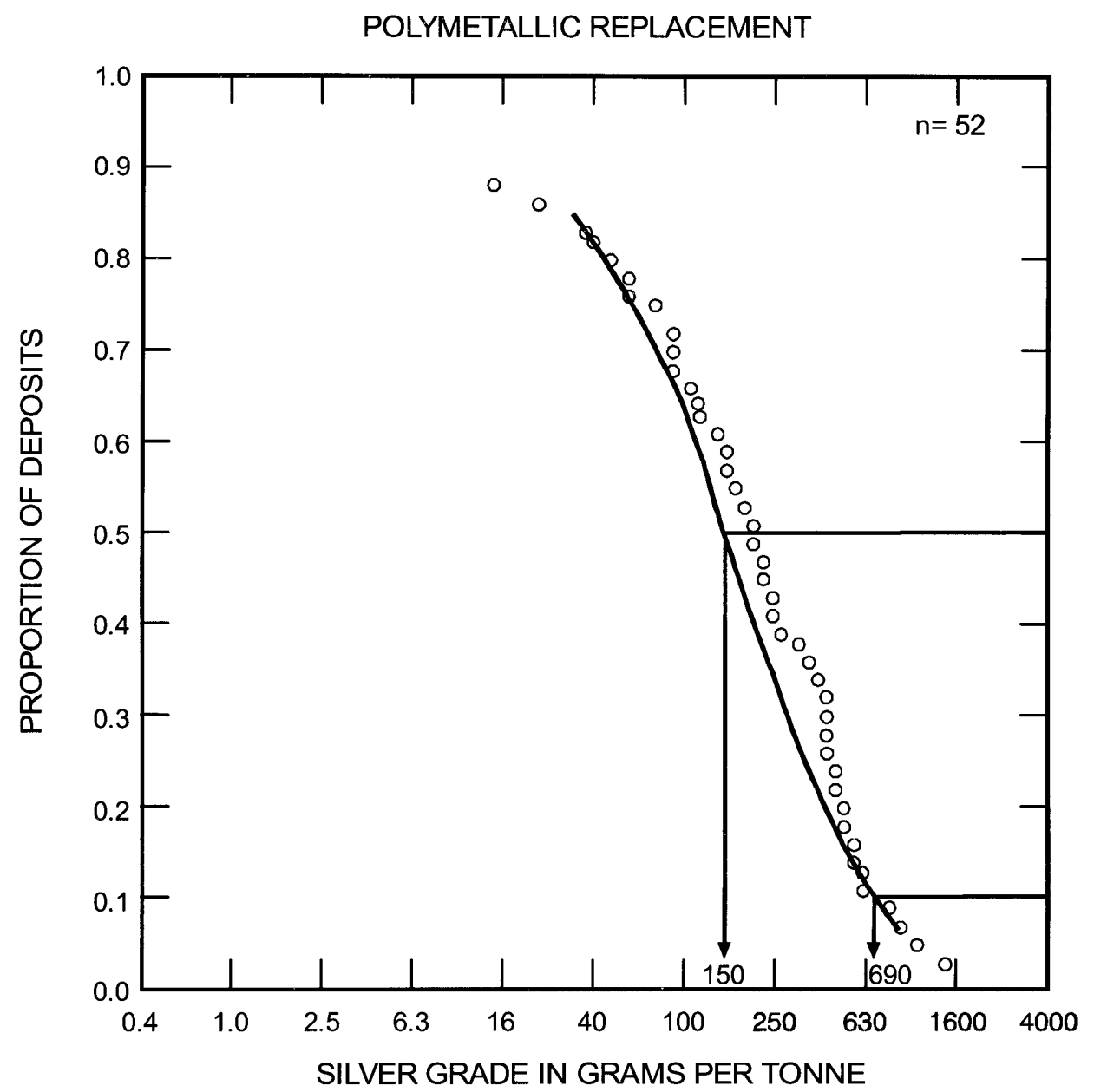
Zinc grades of polymetallic replacement deposits



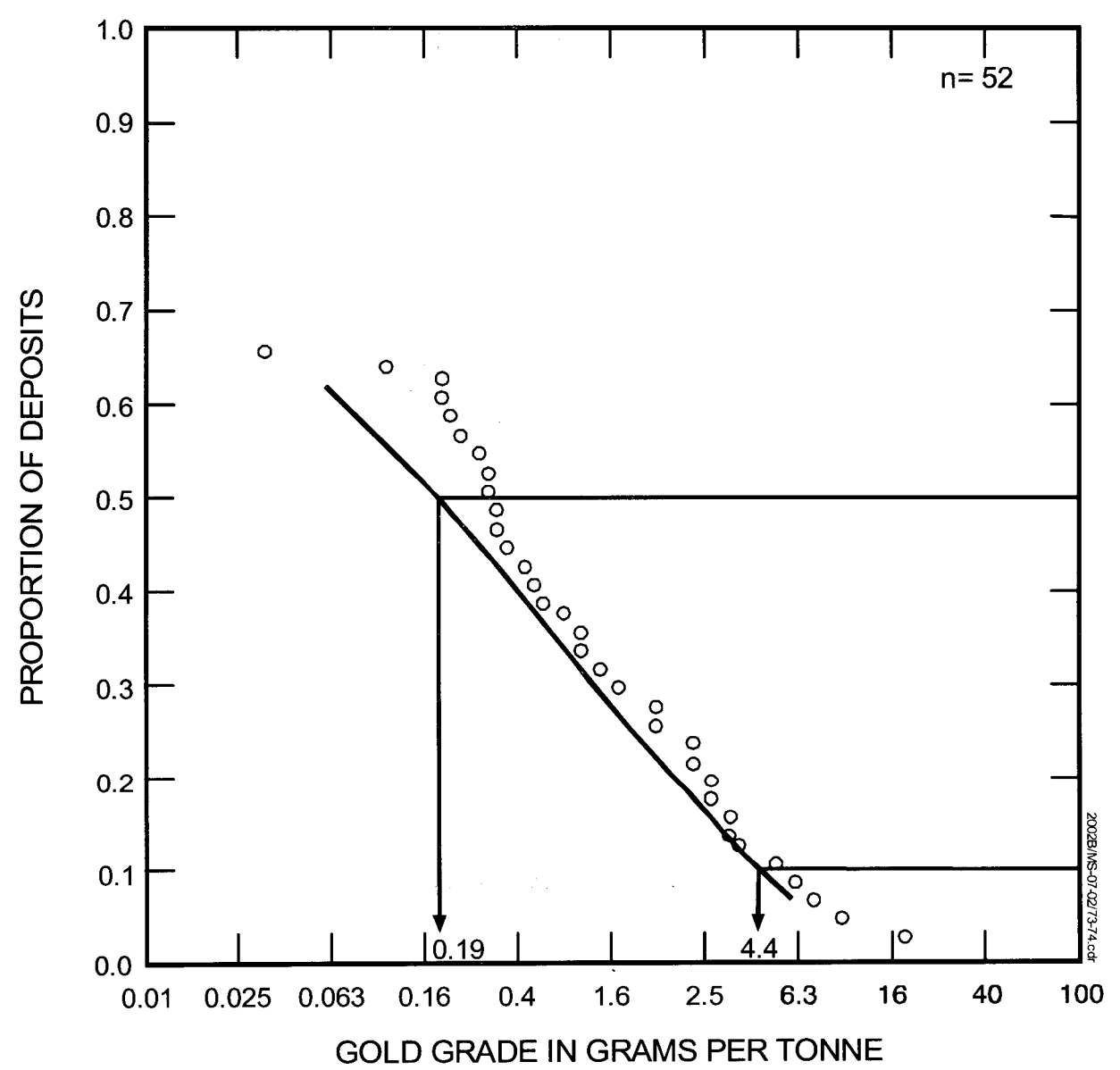
Copper grades of polymetallic replacement deposits



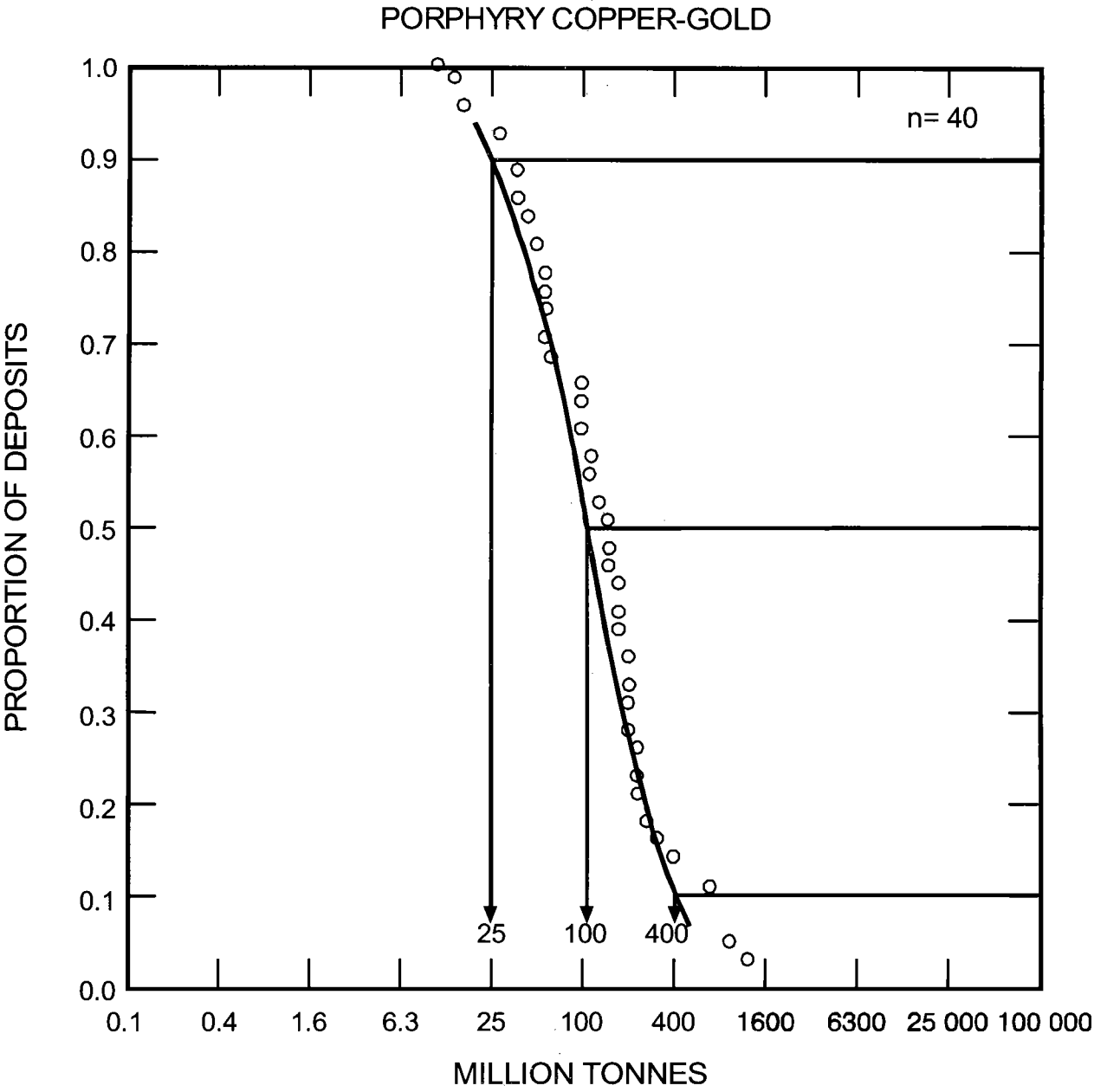
Silver grades of polymetallic replacement deposits



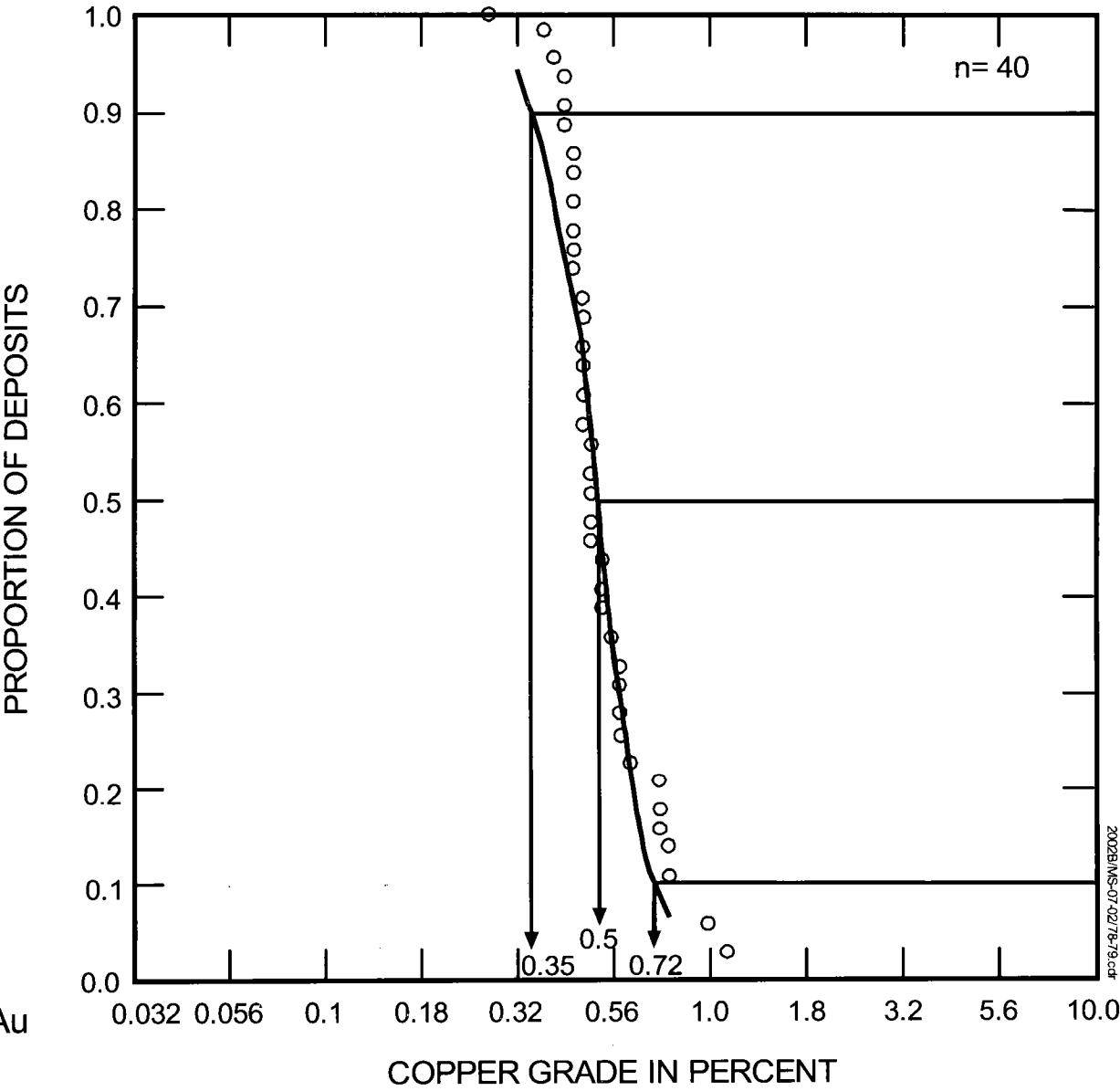
Gold grades of polymetallic replacement deposits



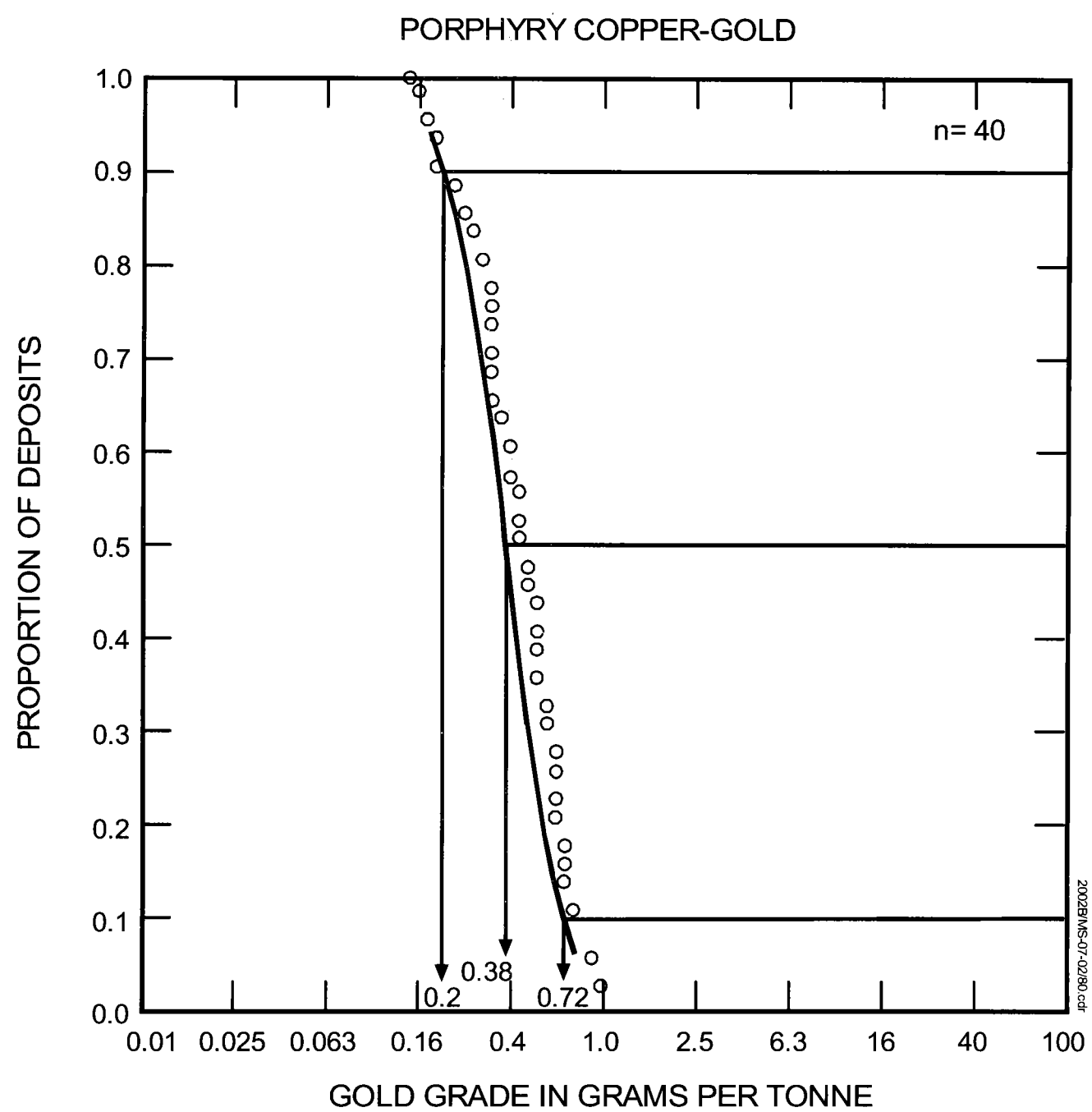
Tonnages of porphyry Cu-Au deposits

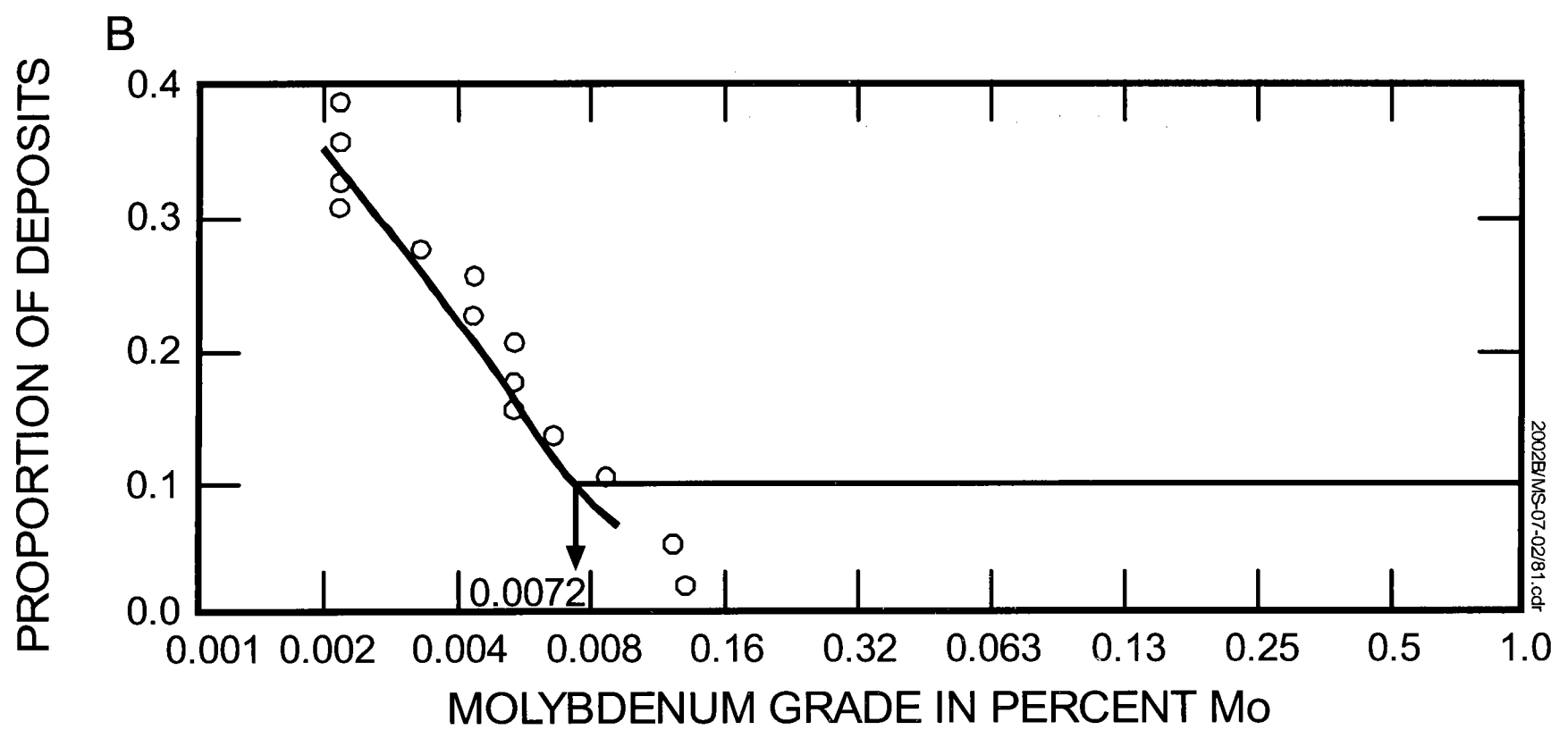
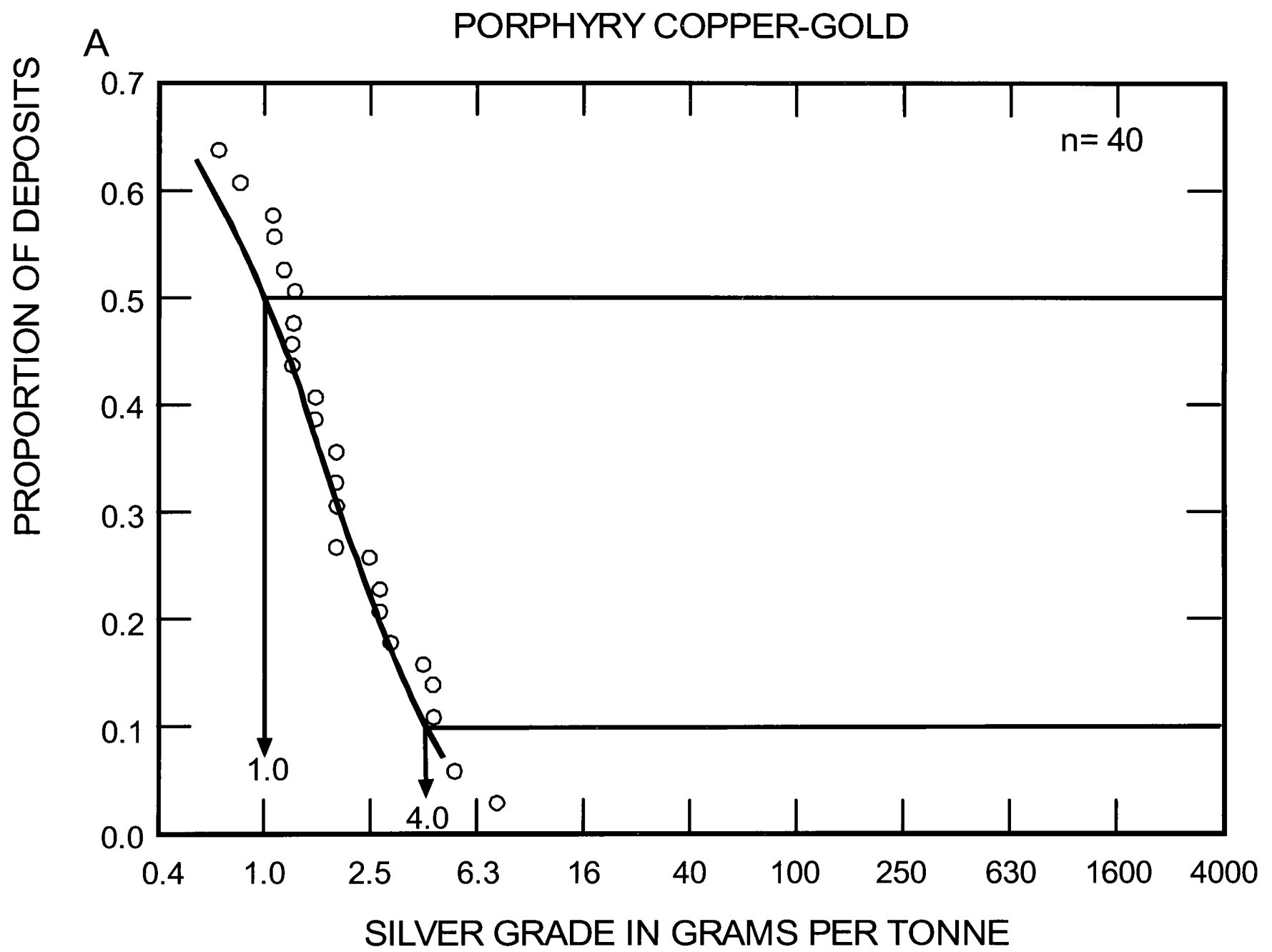


Copper grades of porphyry Cu-Au deposits



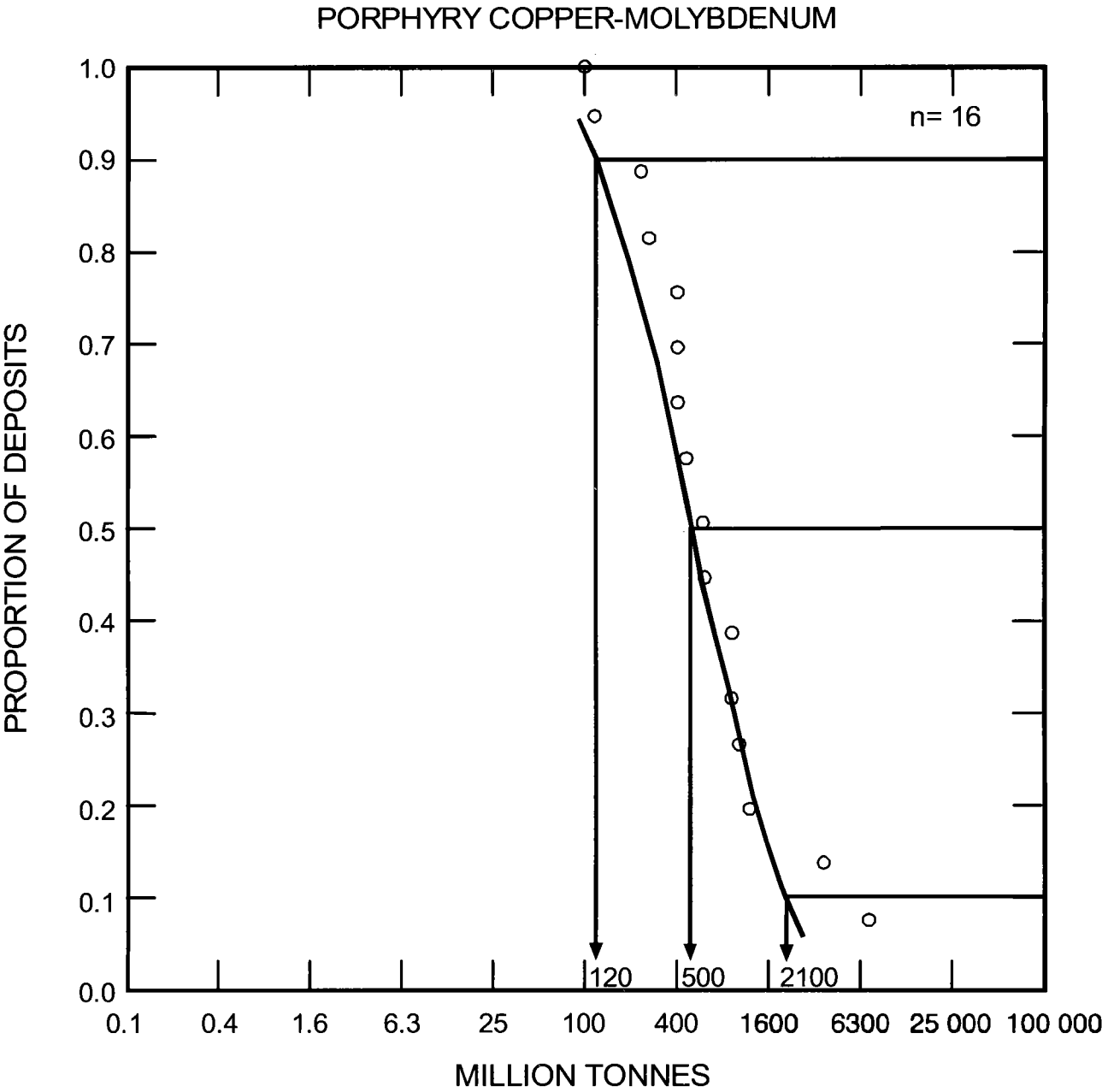
Gold grades of porphyry Cu-Au deposits



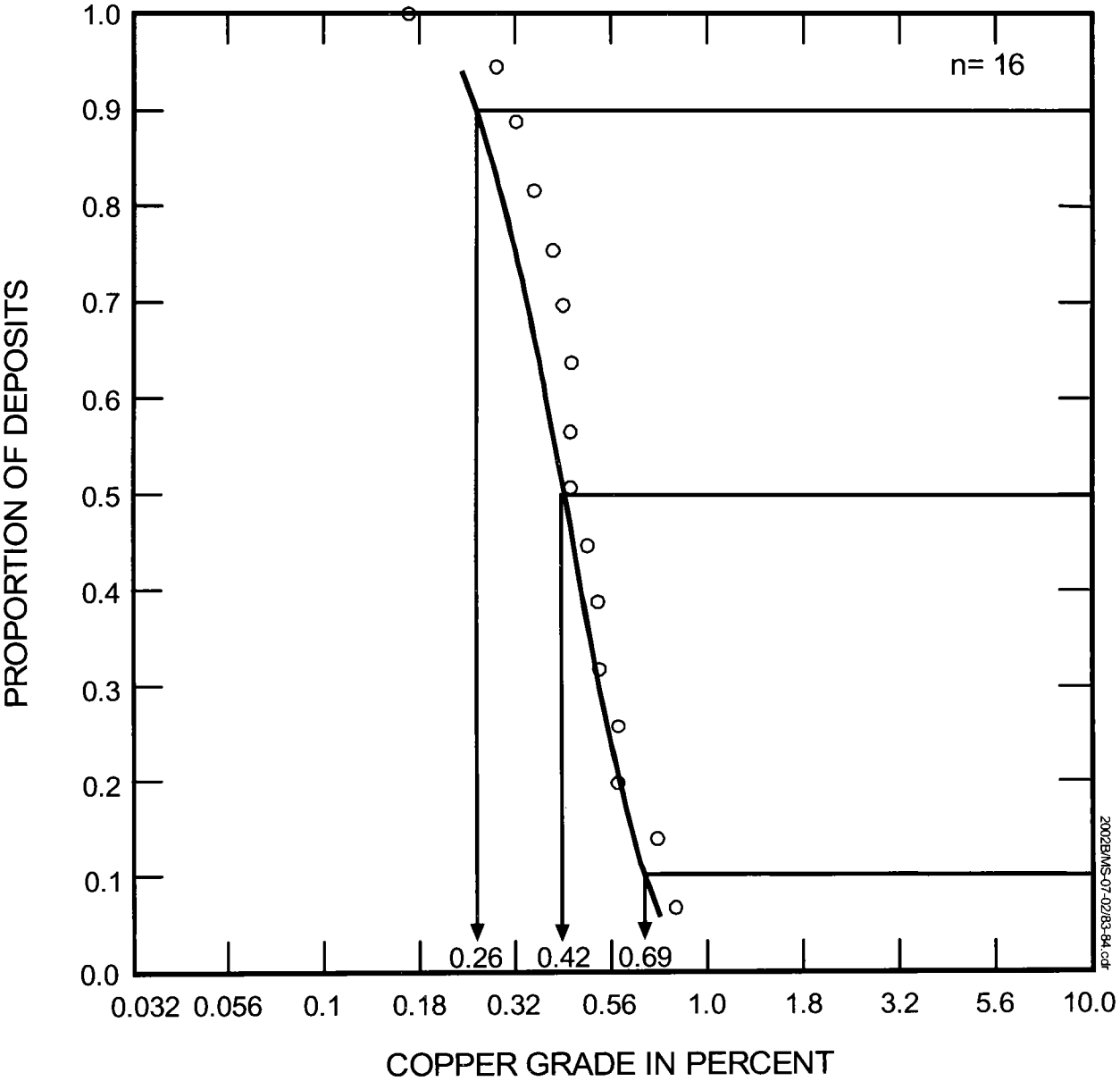


By-product grades of porphyry Cu-Au deposits
 A, Silver; B, Molybdenum

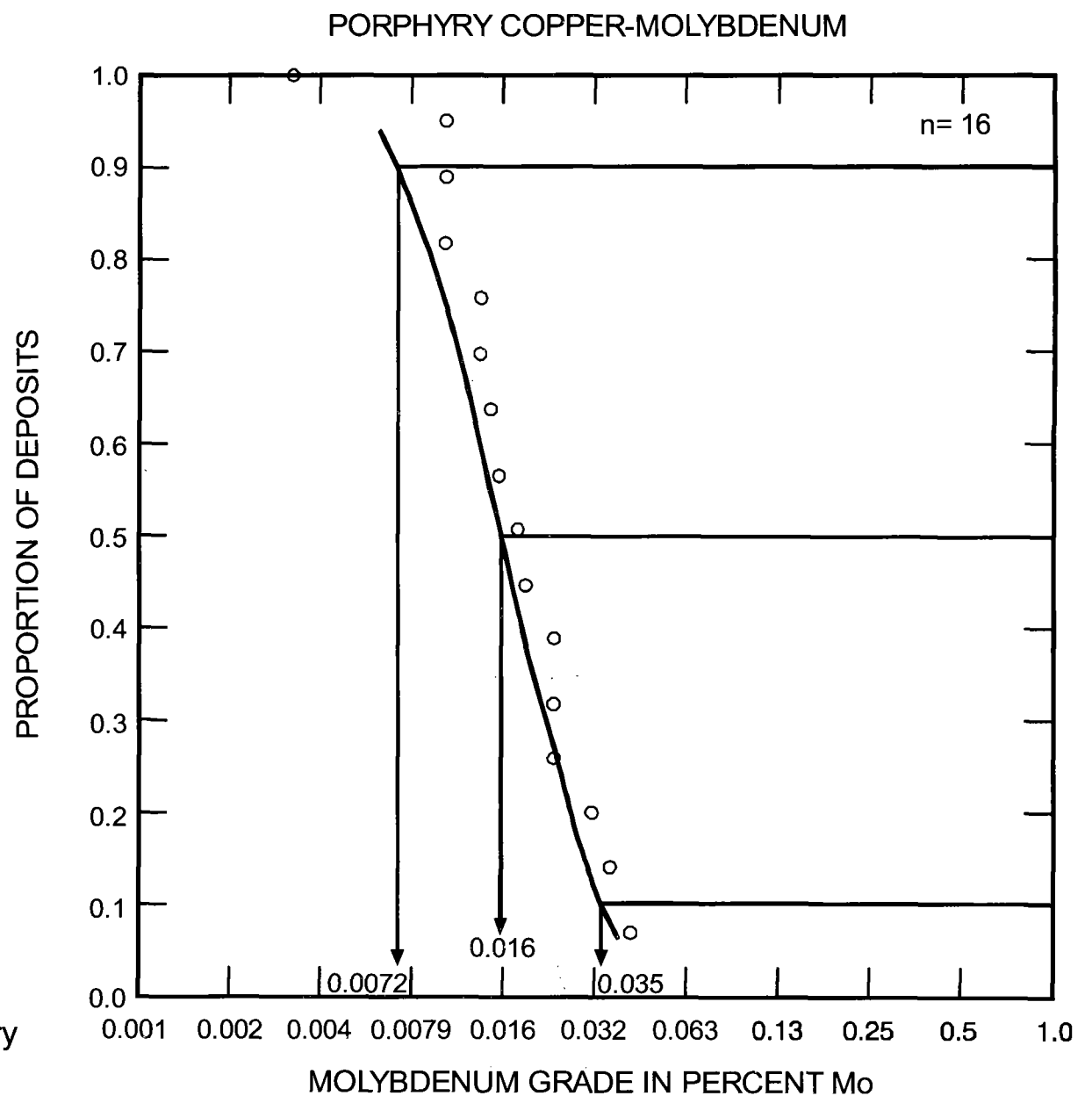
Tonnages of porphyry Cu-Mo deposits



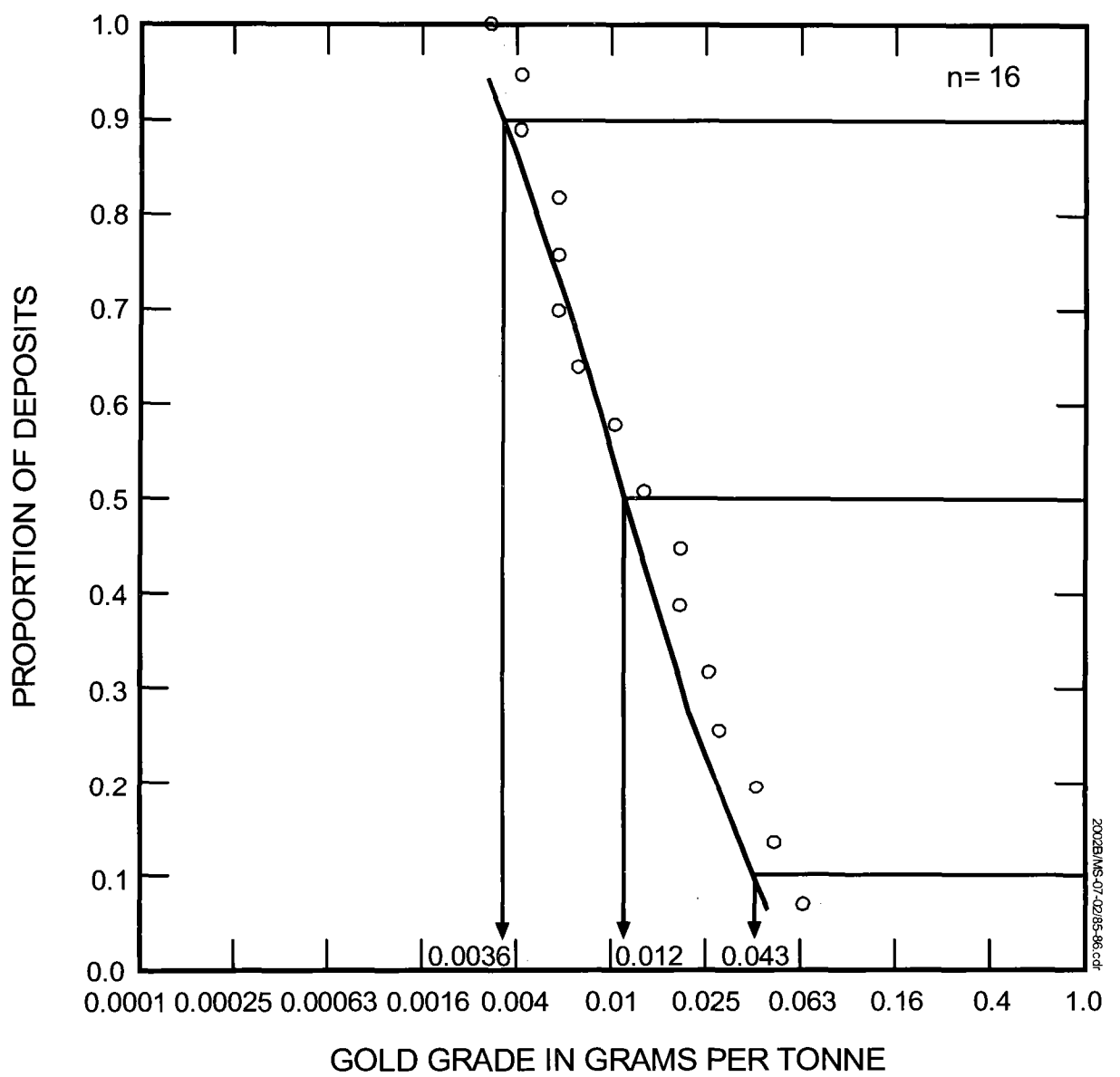
Copper grades of porphyry Cu-Mo deposits



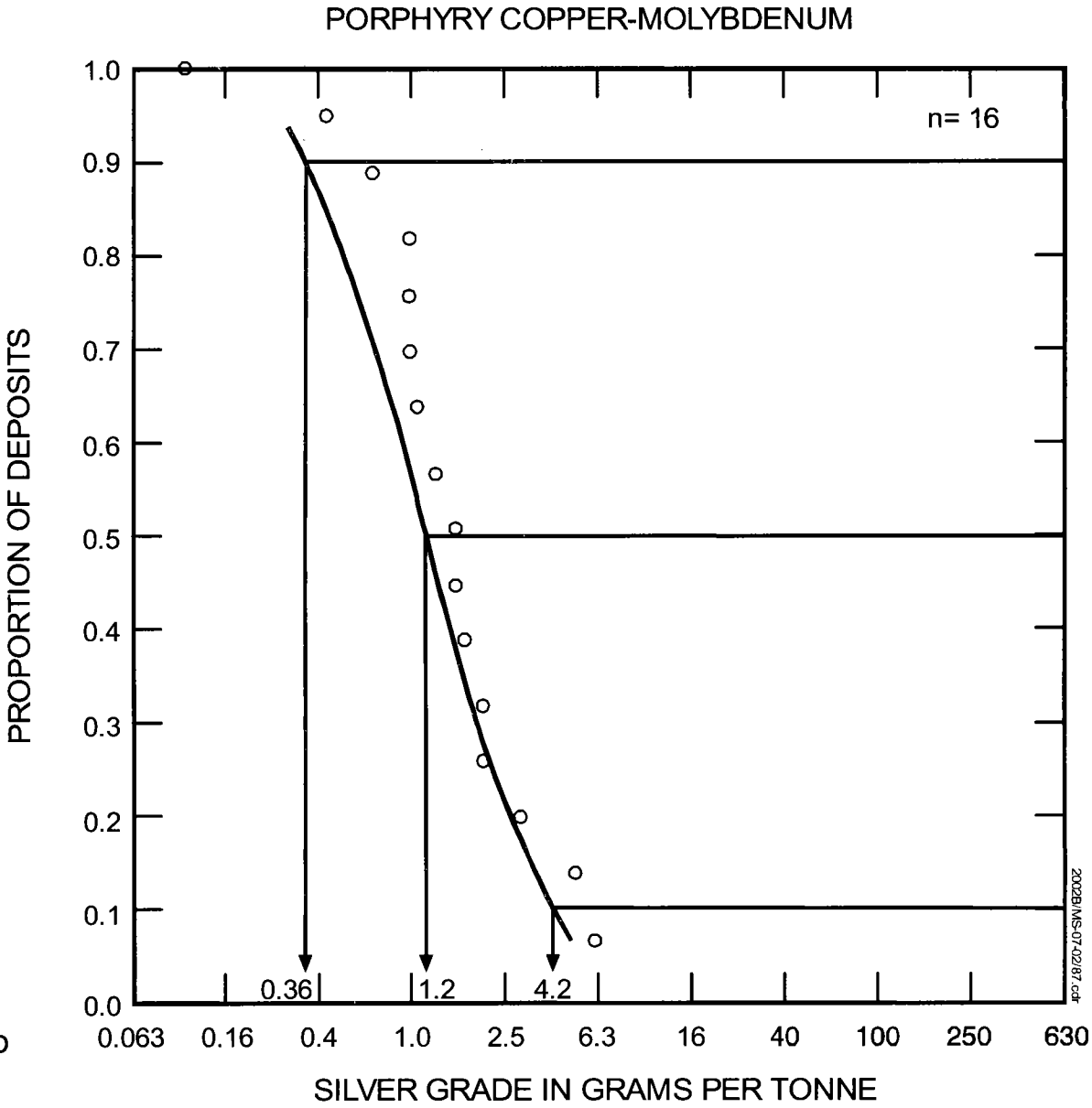
Molybdenum grades of porphyry
Cu-Mo deposits



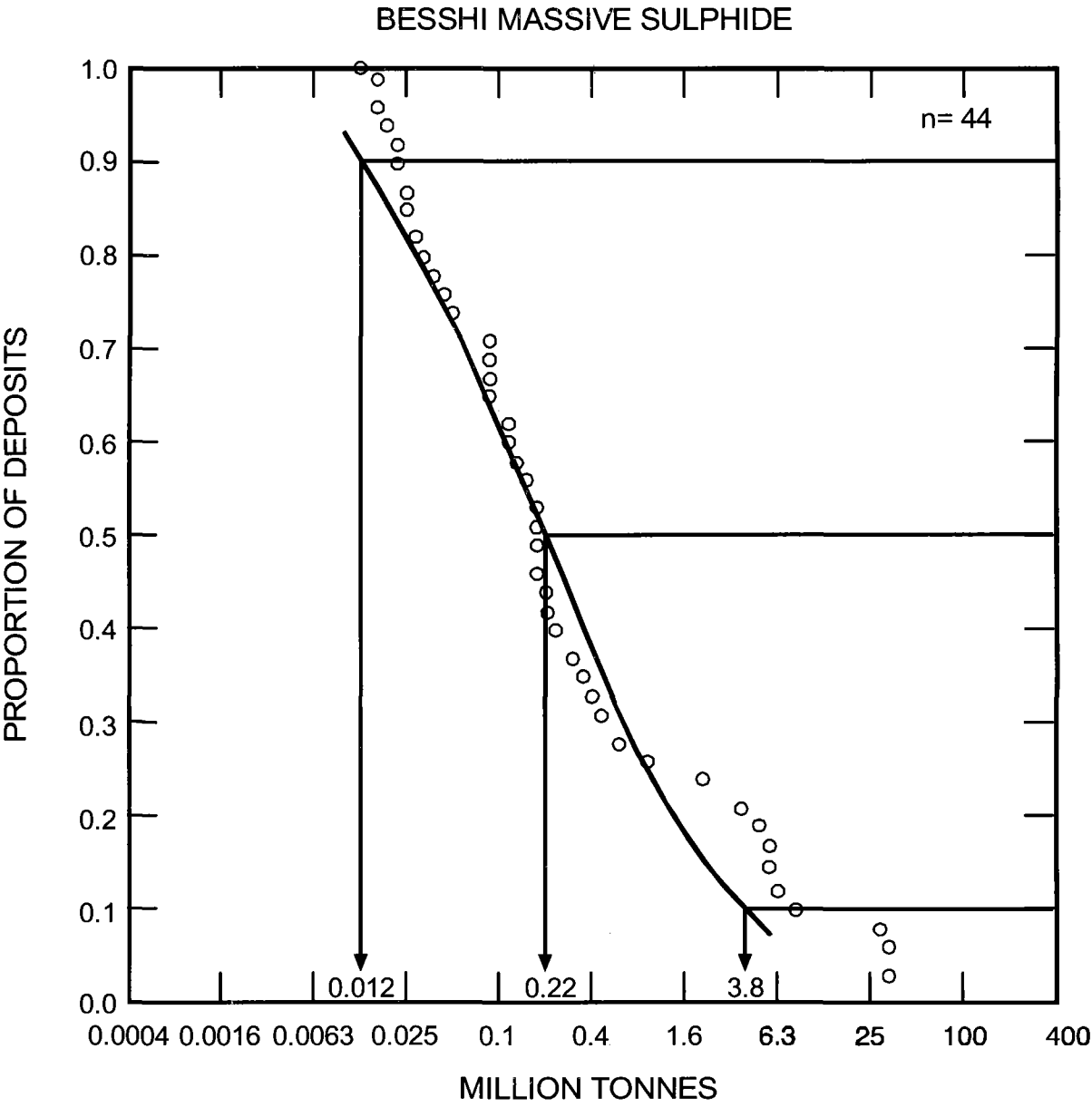
Gold grades of porphyry
Cu-Mo deposits



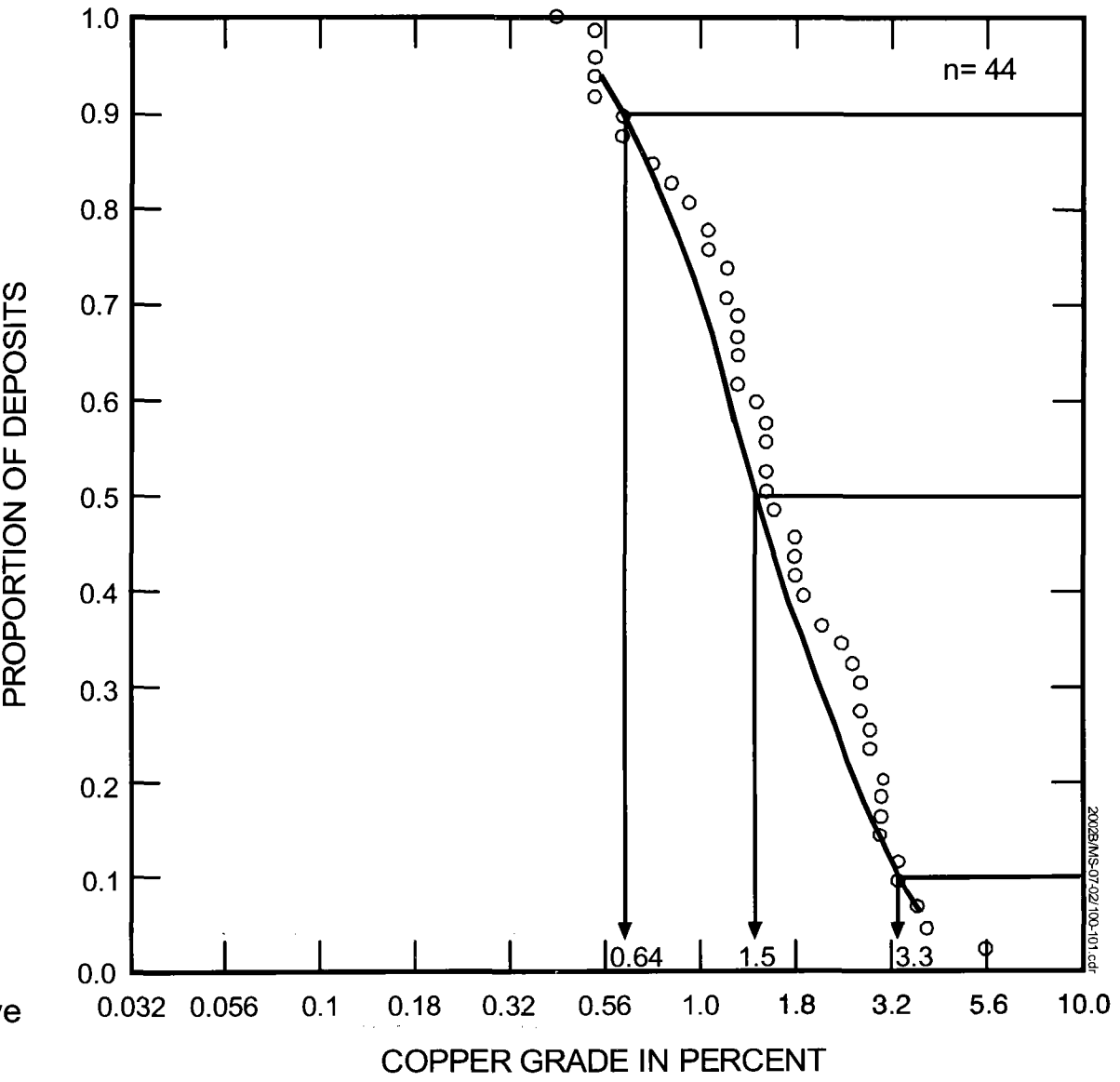
Silver grades of porphyry Cu-Mo deposits

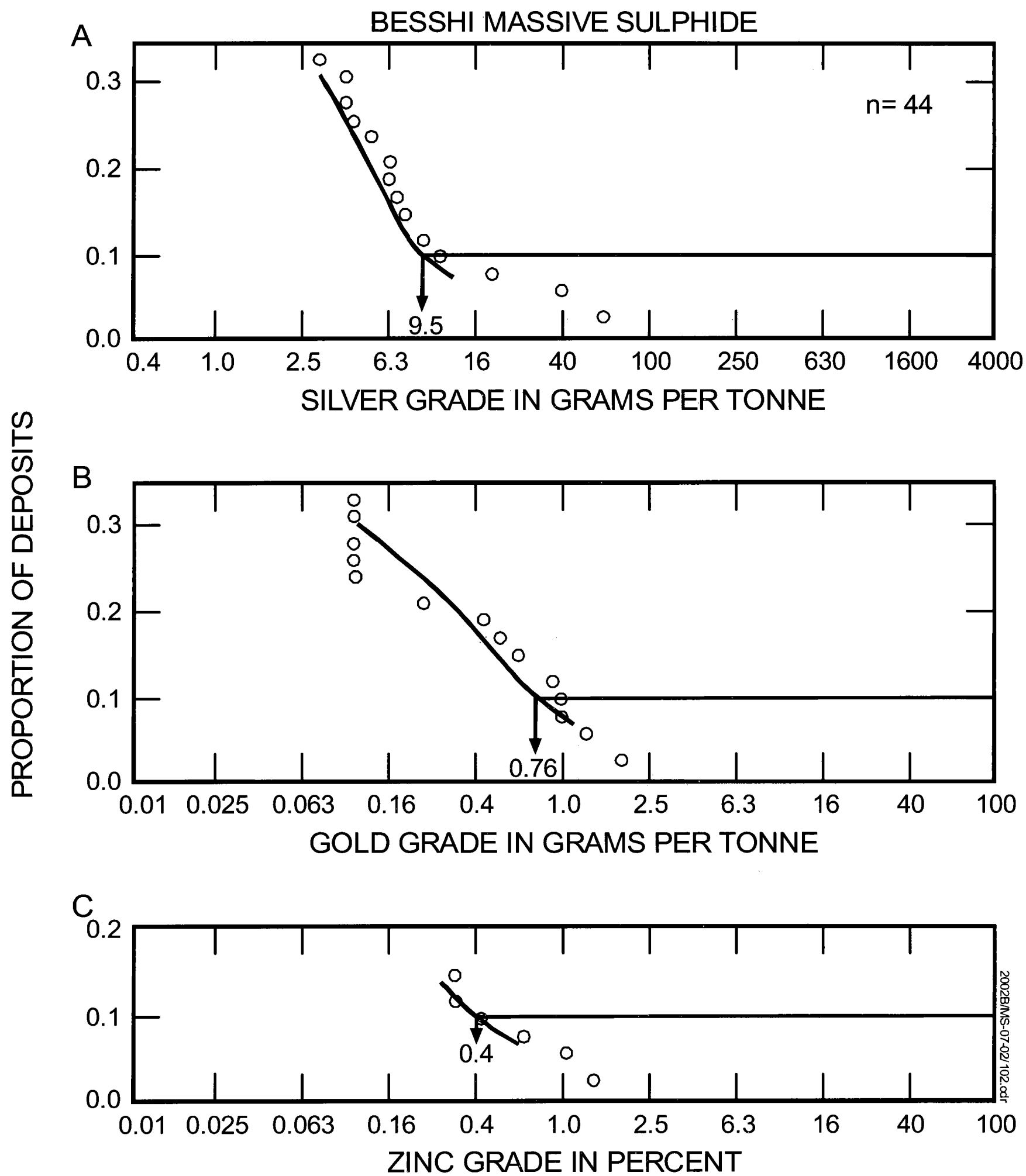


Tonnages of Besshi massive sulphide deposits



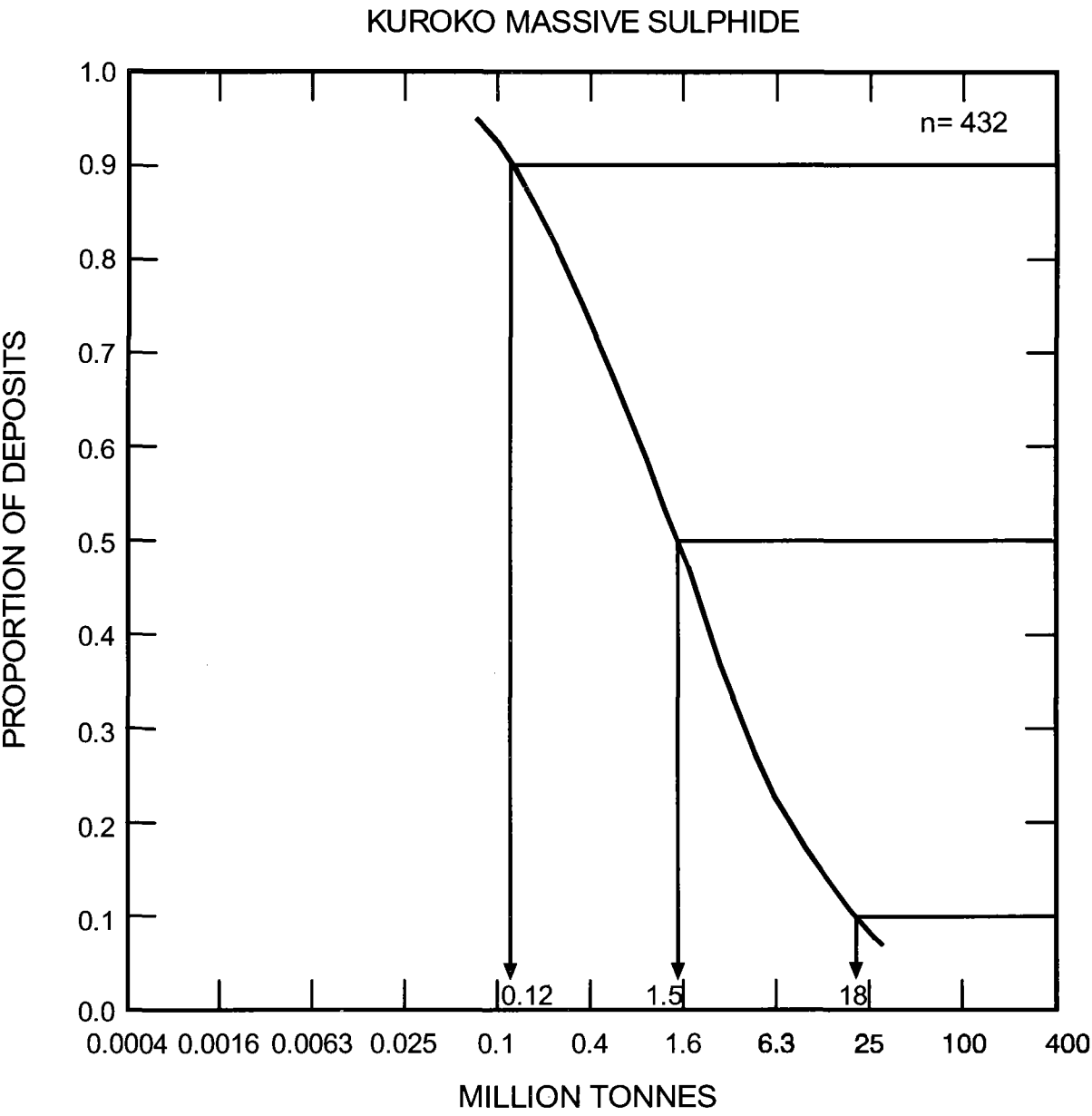
Copper grades of Besshi massive sulphide deposits



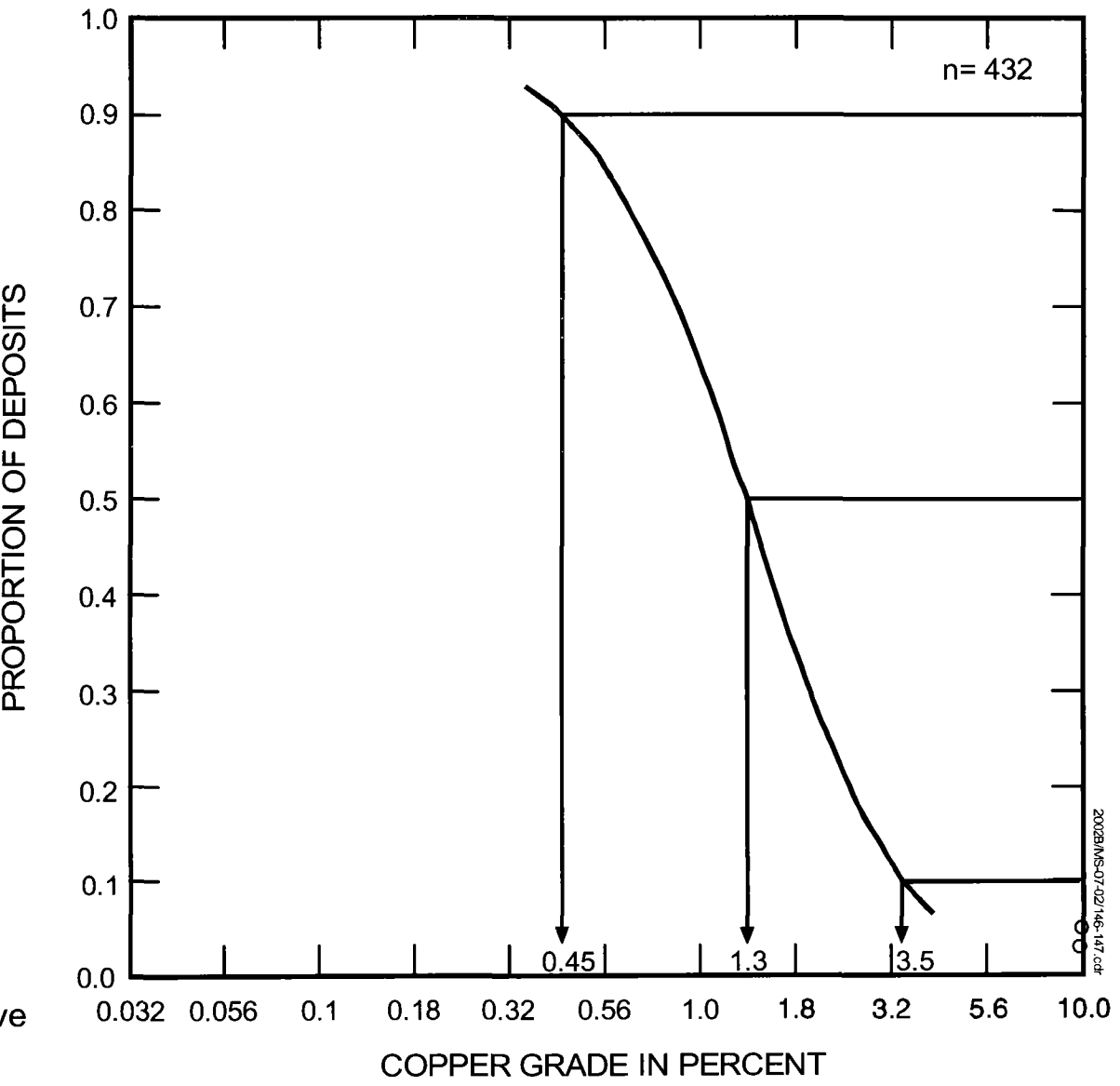


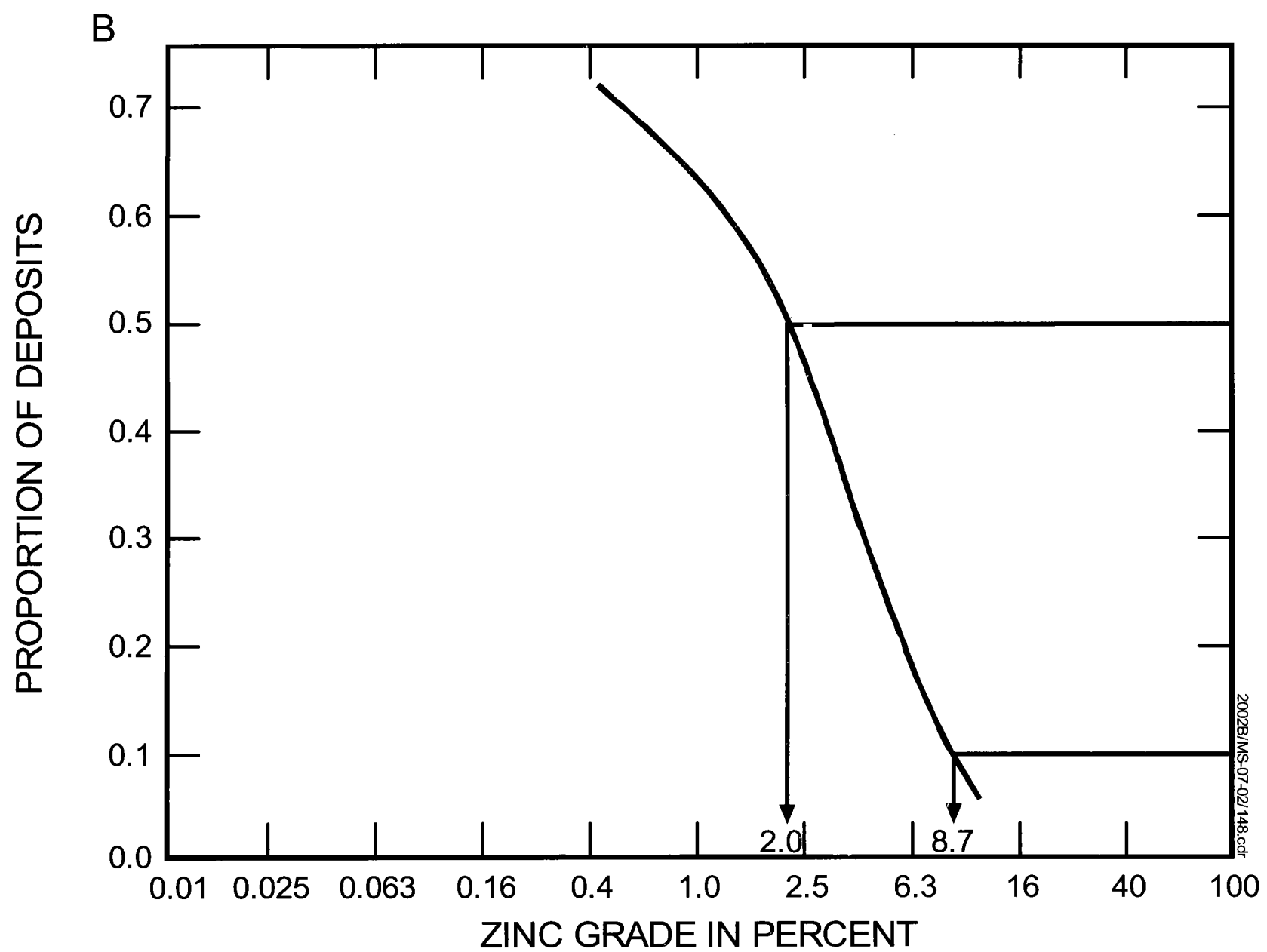
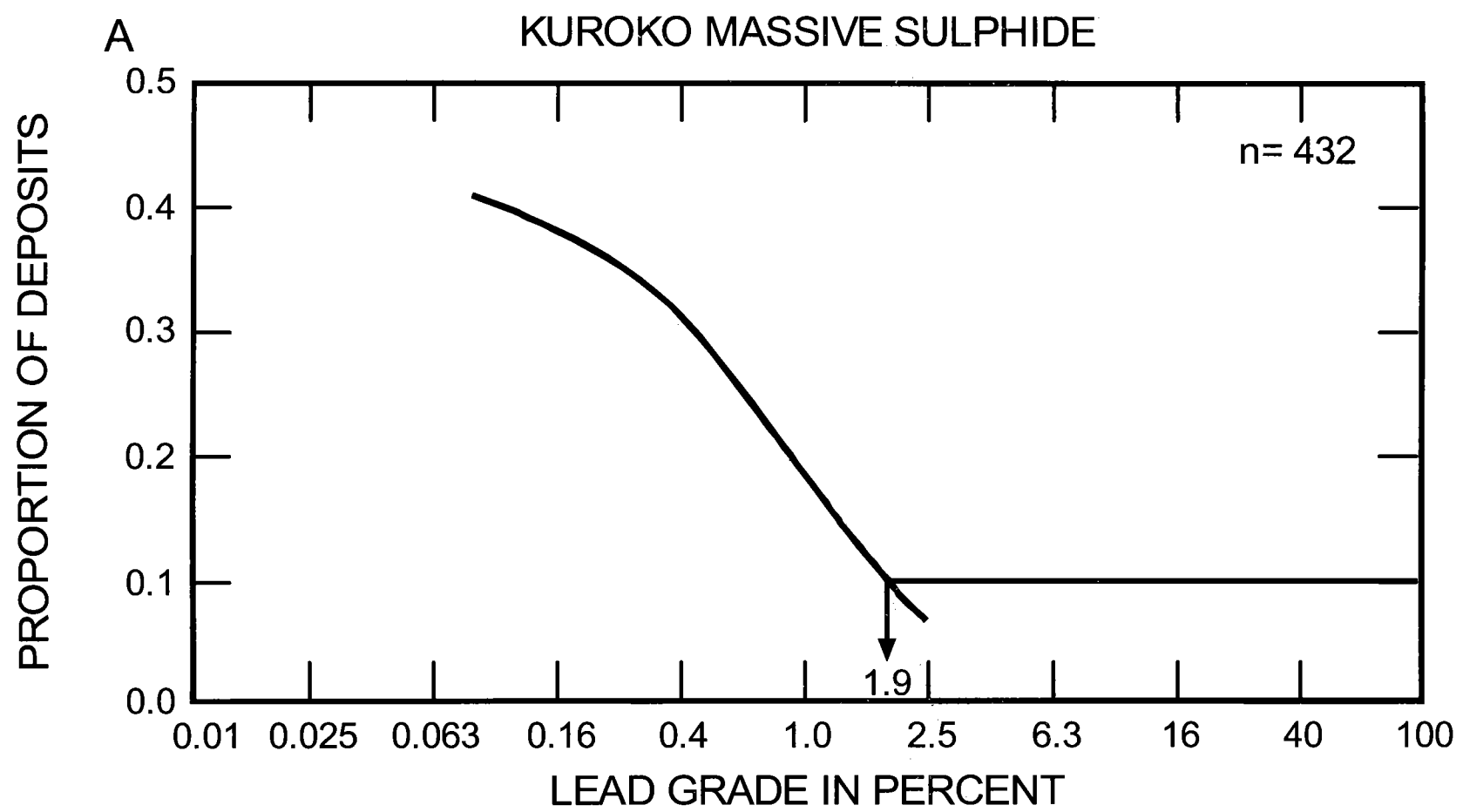
By-product grades of Besshi massive sulphide deposits
A, Silver; B, Gold; C, Zinc

Tonnages of Kuroko massive sulphide deposits

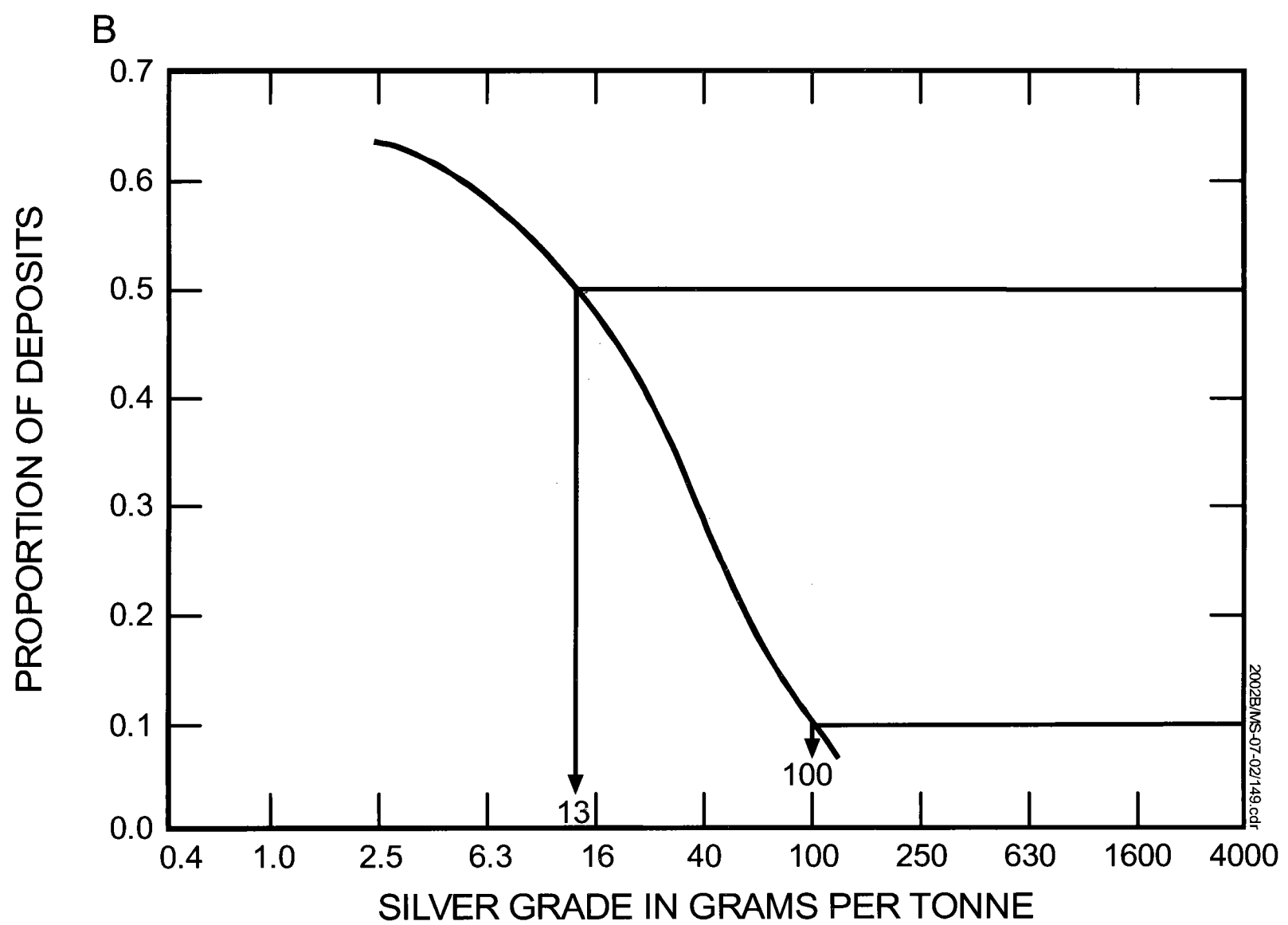
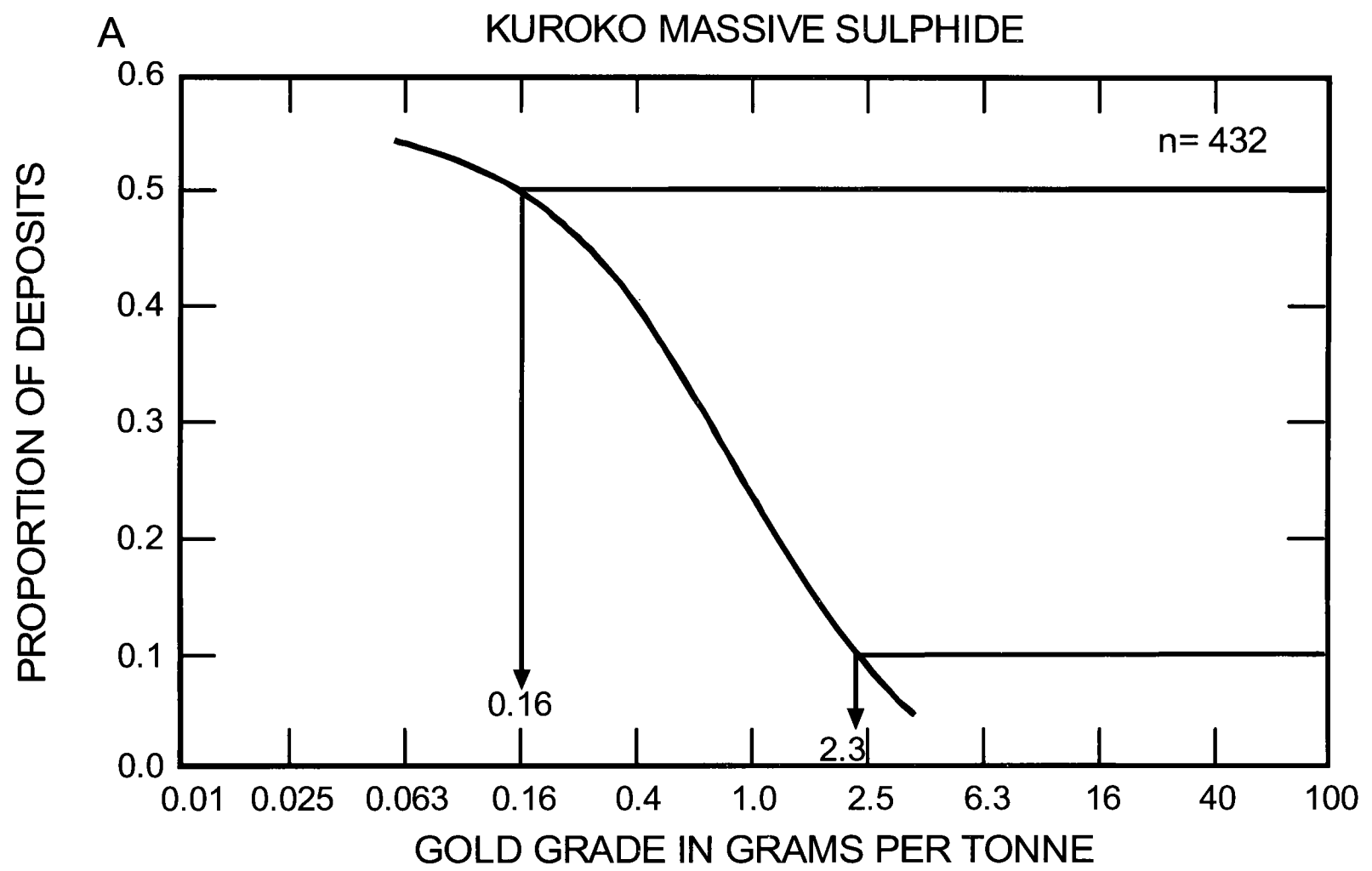


Copper grades of Kuroko massive sulphide deposits



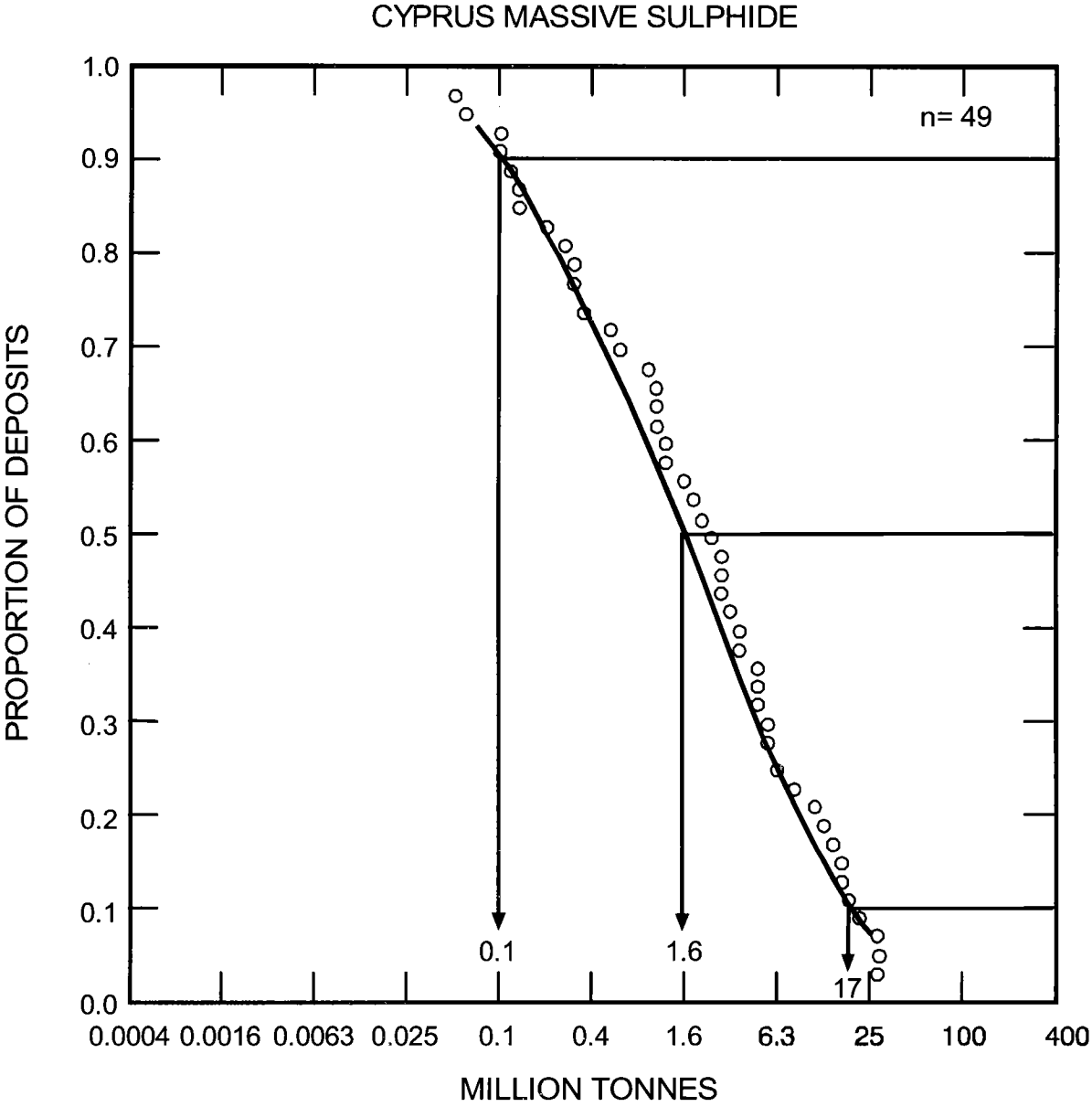


Lead-zinc grades of Kuroko massive sulphide deposits
A, Lead; B, Zinc

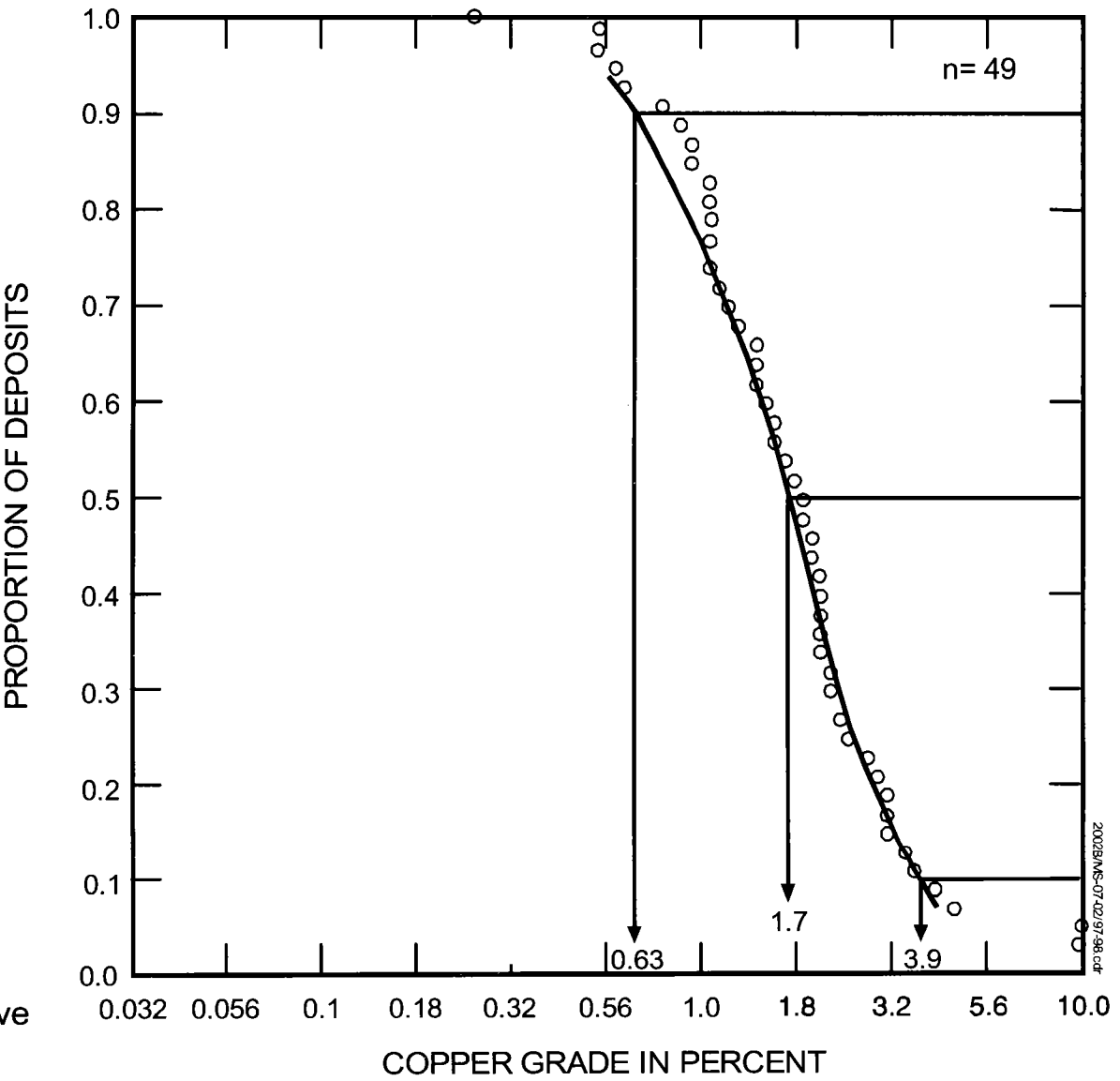


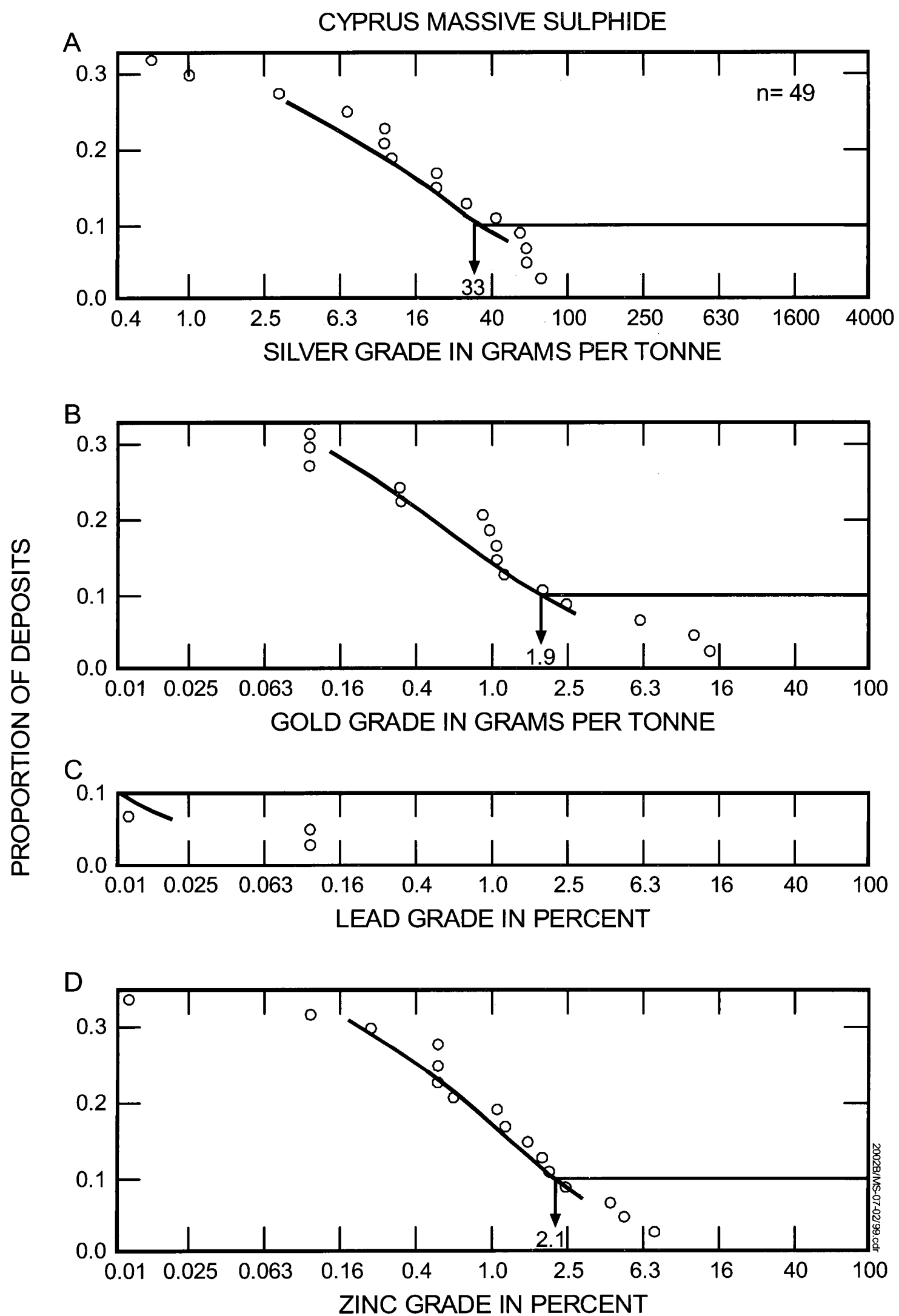
Precious metal grades of Kuroko massive sulphide deposits
A, Gold; B, Silver

Tonnages of Cyprus massive sulphide deposits



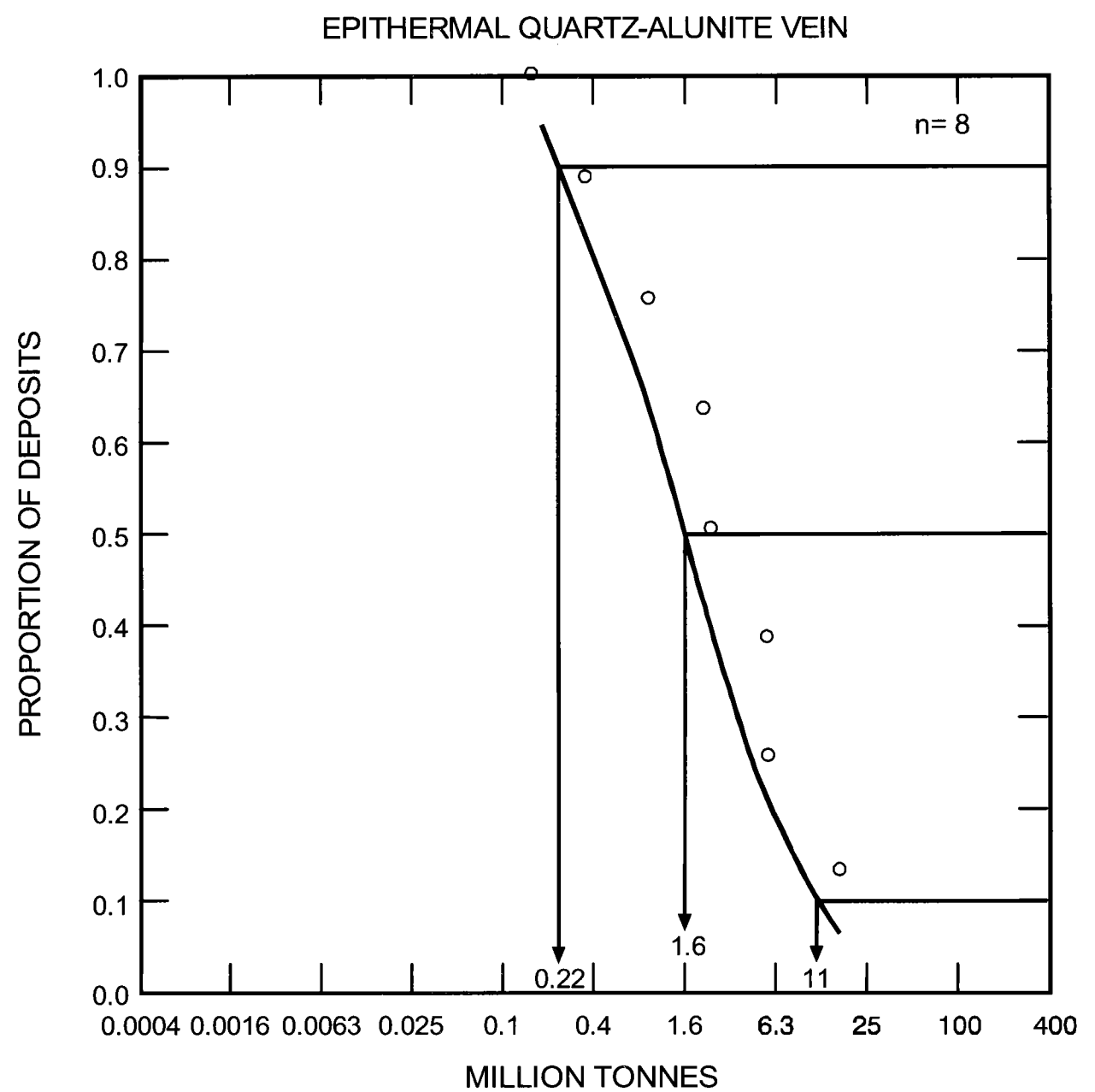
Copper grades of Cyprus massive sulphide deposits



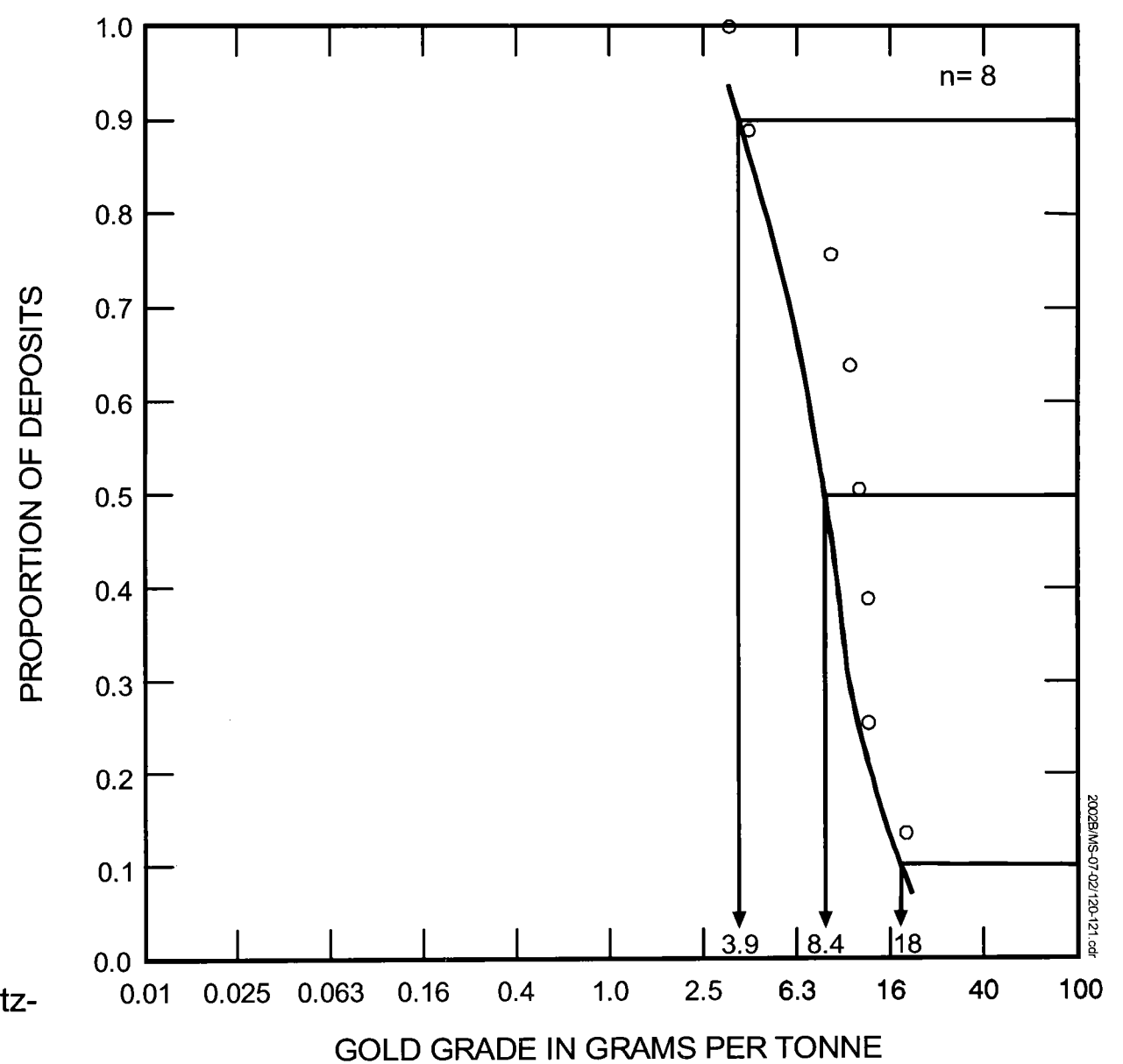


By-product grades of Cyprus massive sulphide deposits
A, Silver; B, Gold; C, Lead; D, Zinc

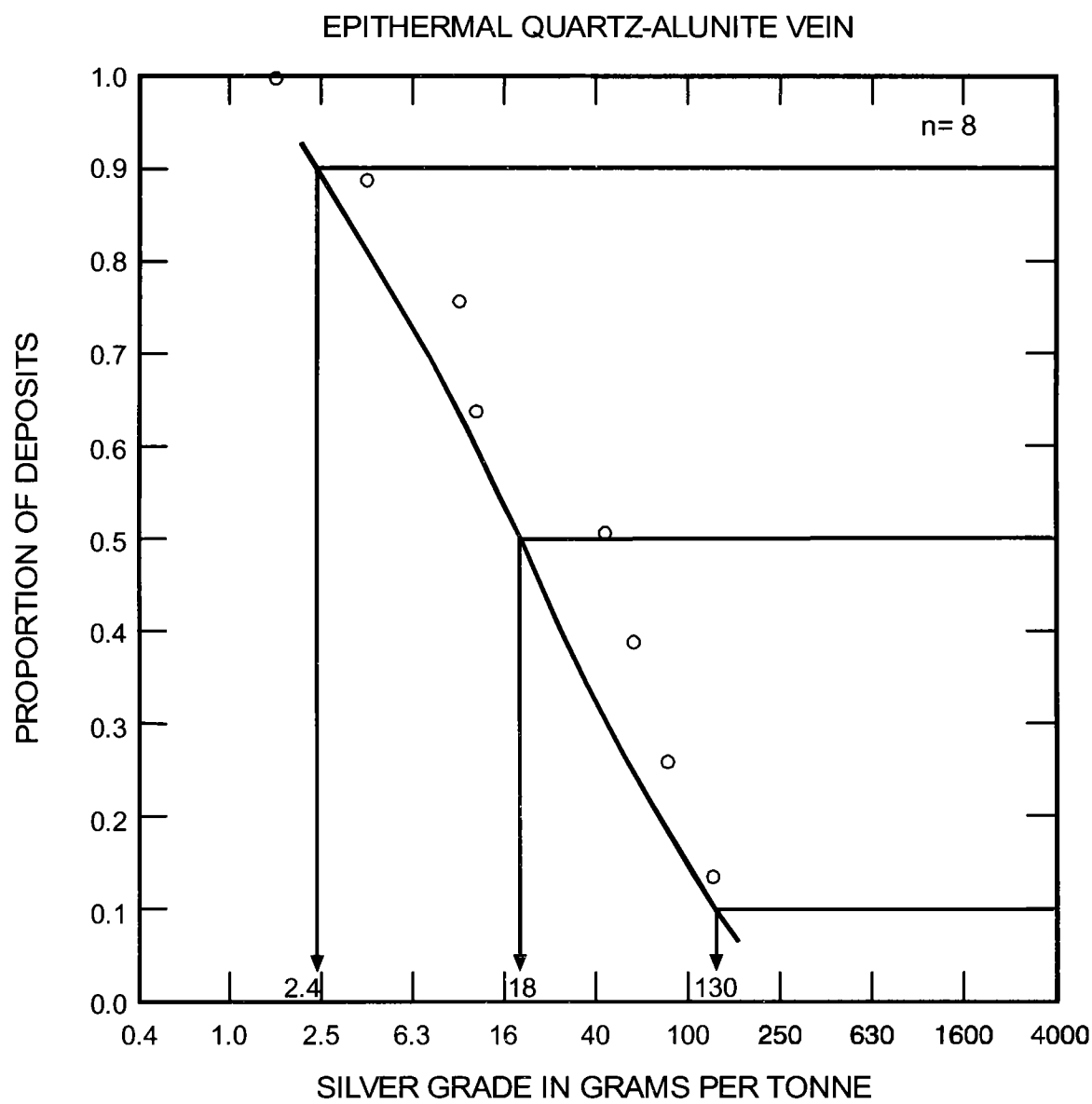
Tonnages of epithermal quartz-alunite vein deposits



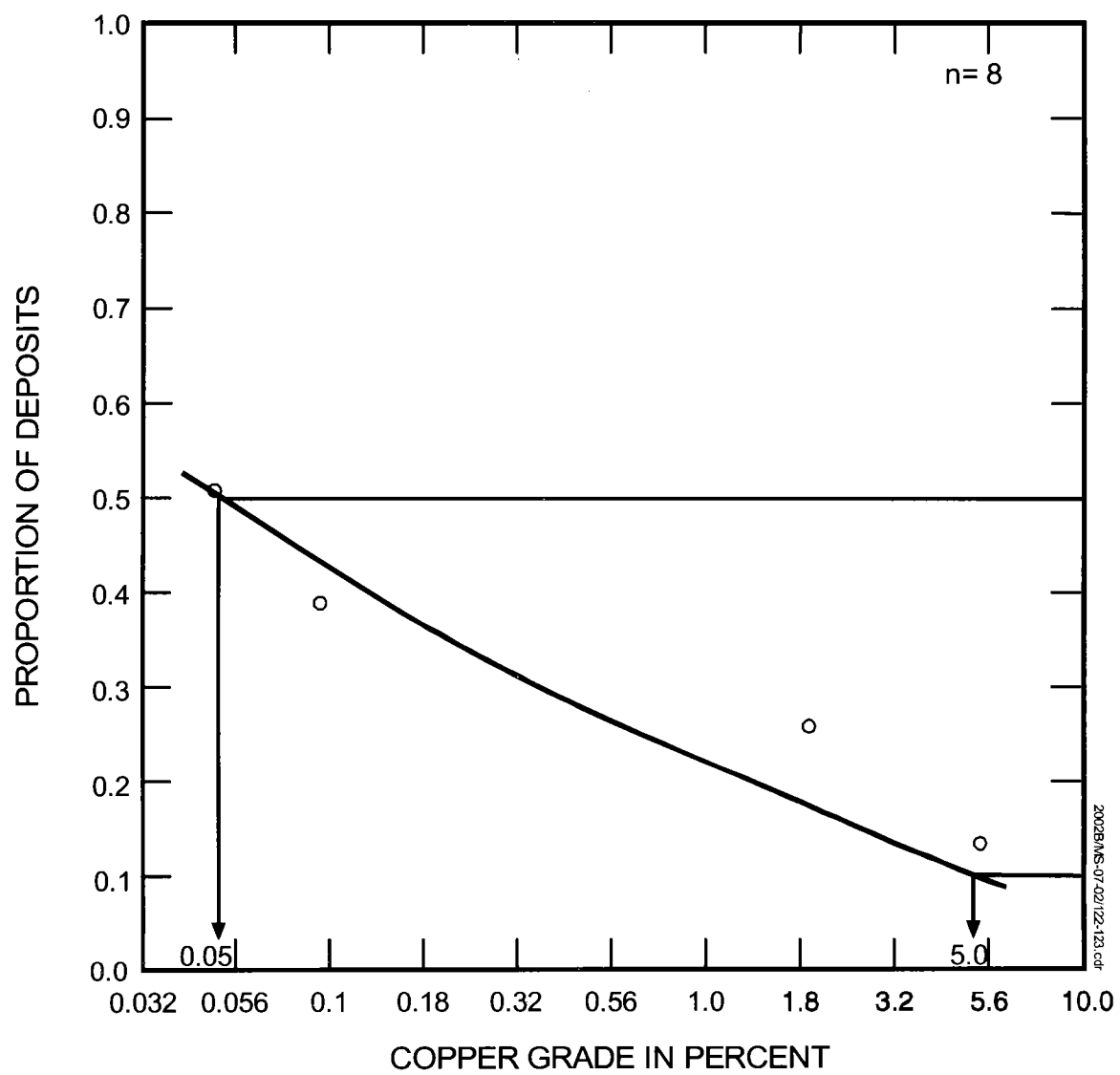
Gold grades of epithermal quartz-alunite vein deposits



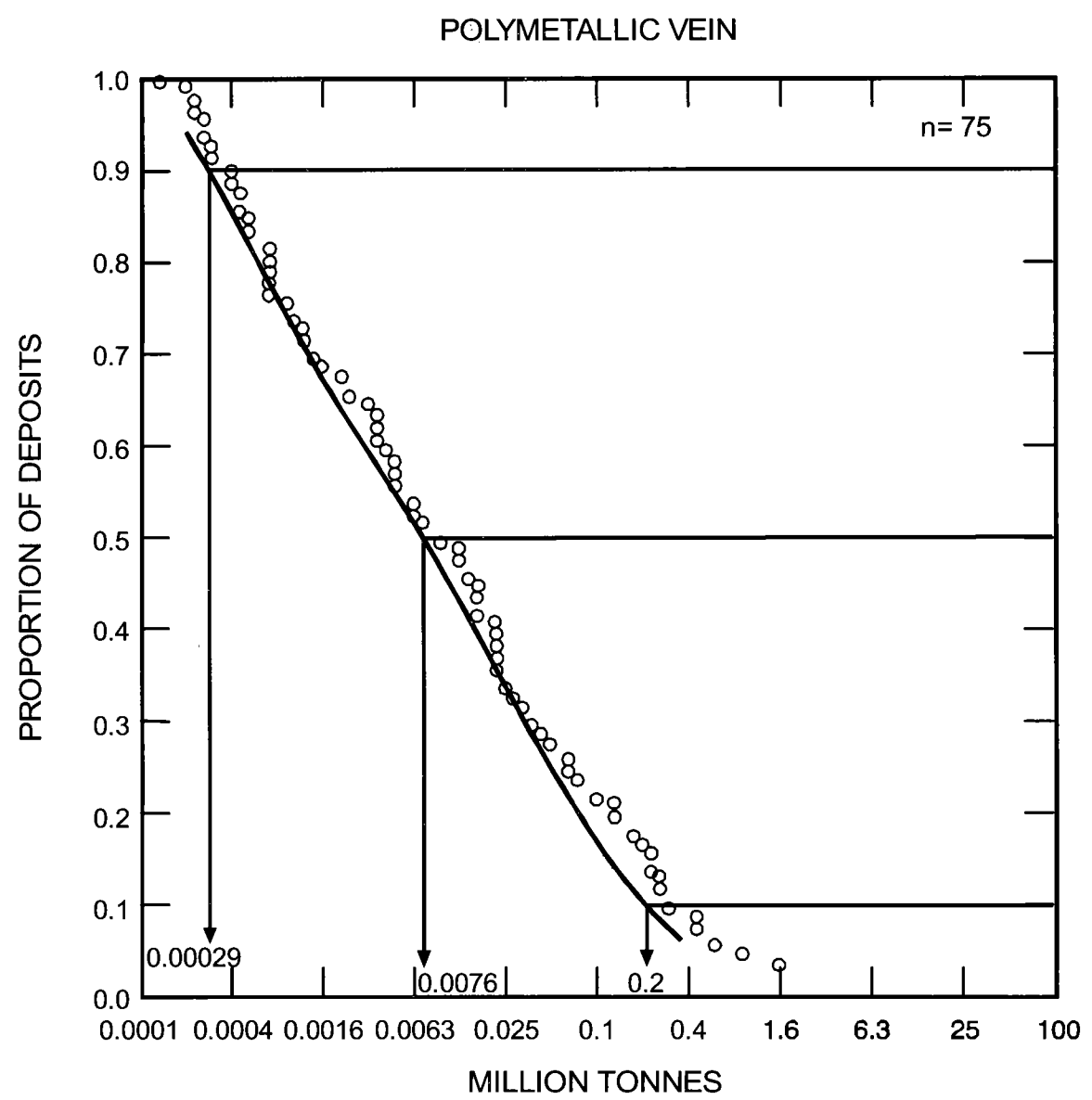
Silver grades of epithermal quartz-alunite vein deposits



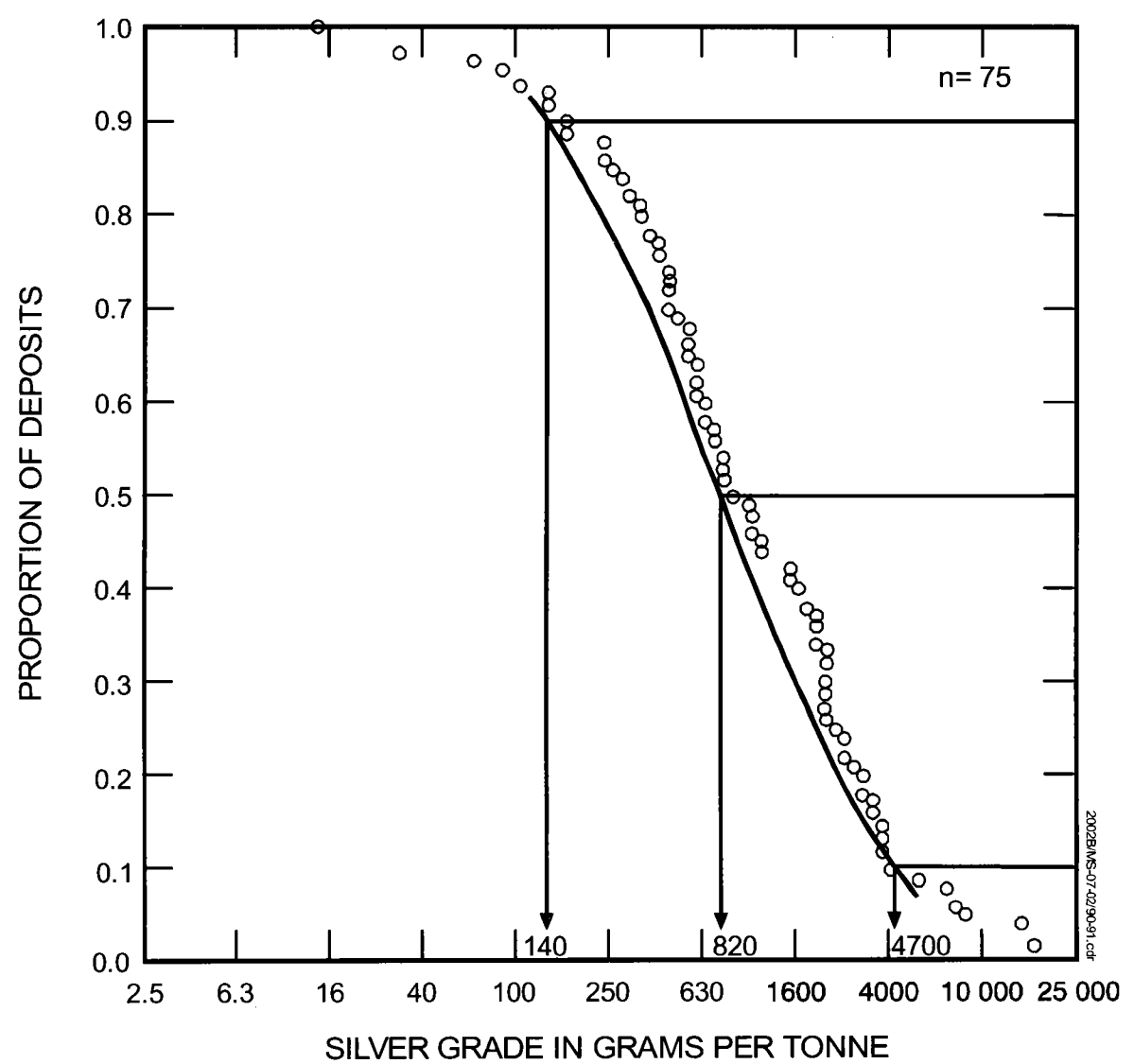
Copper grades of epithermal quartz-alunite vein deposits



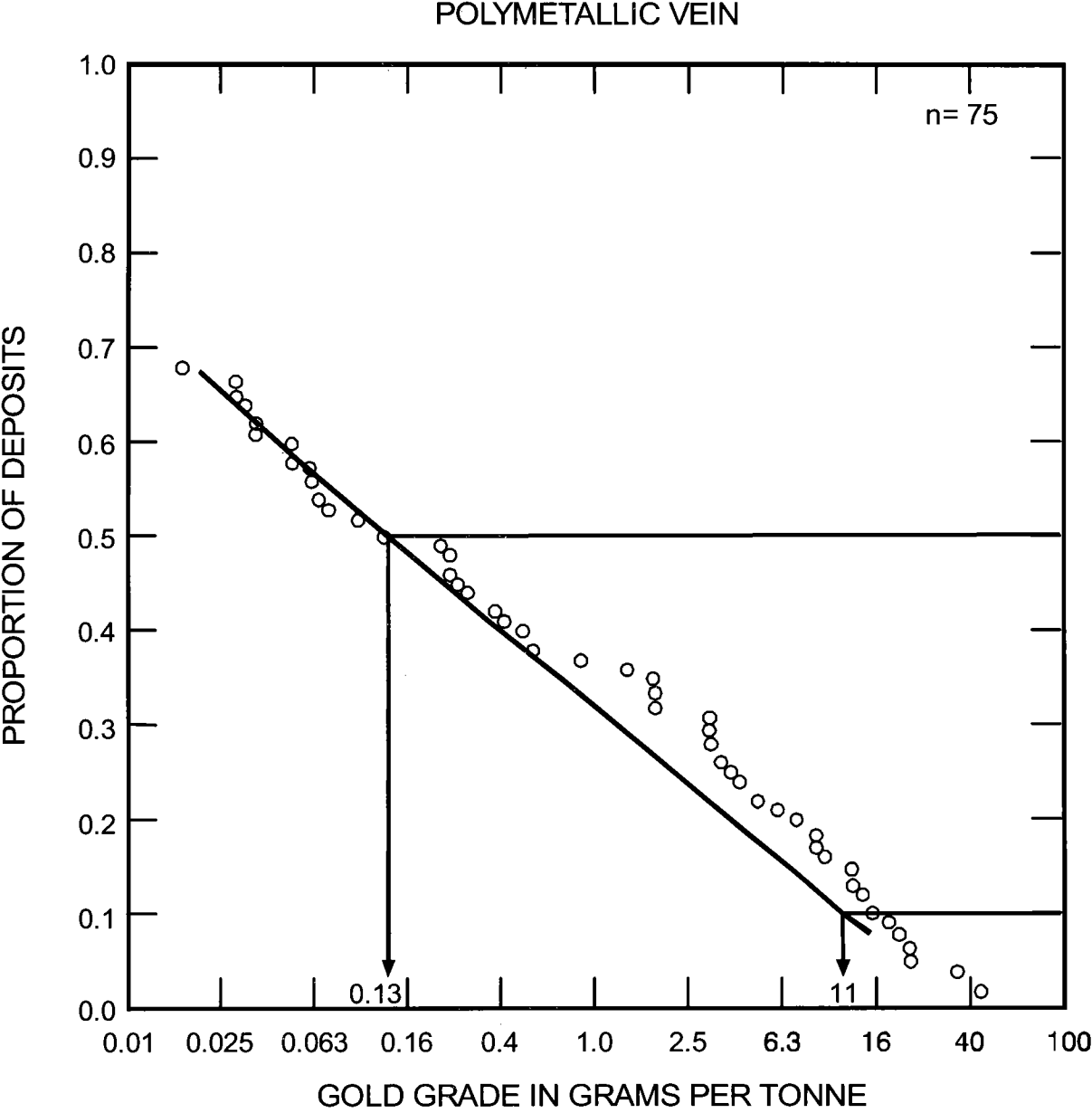
Tonnages of polymetallic vein deposits



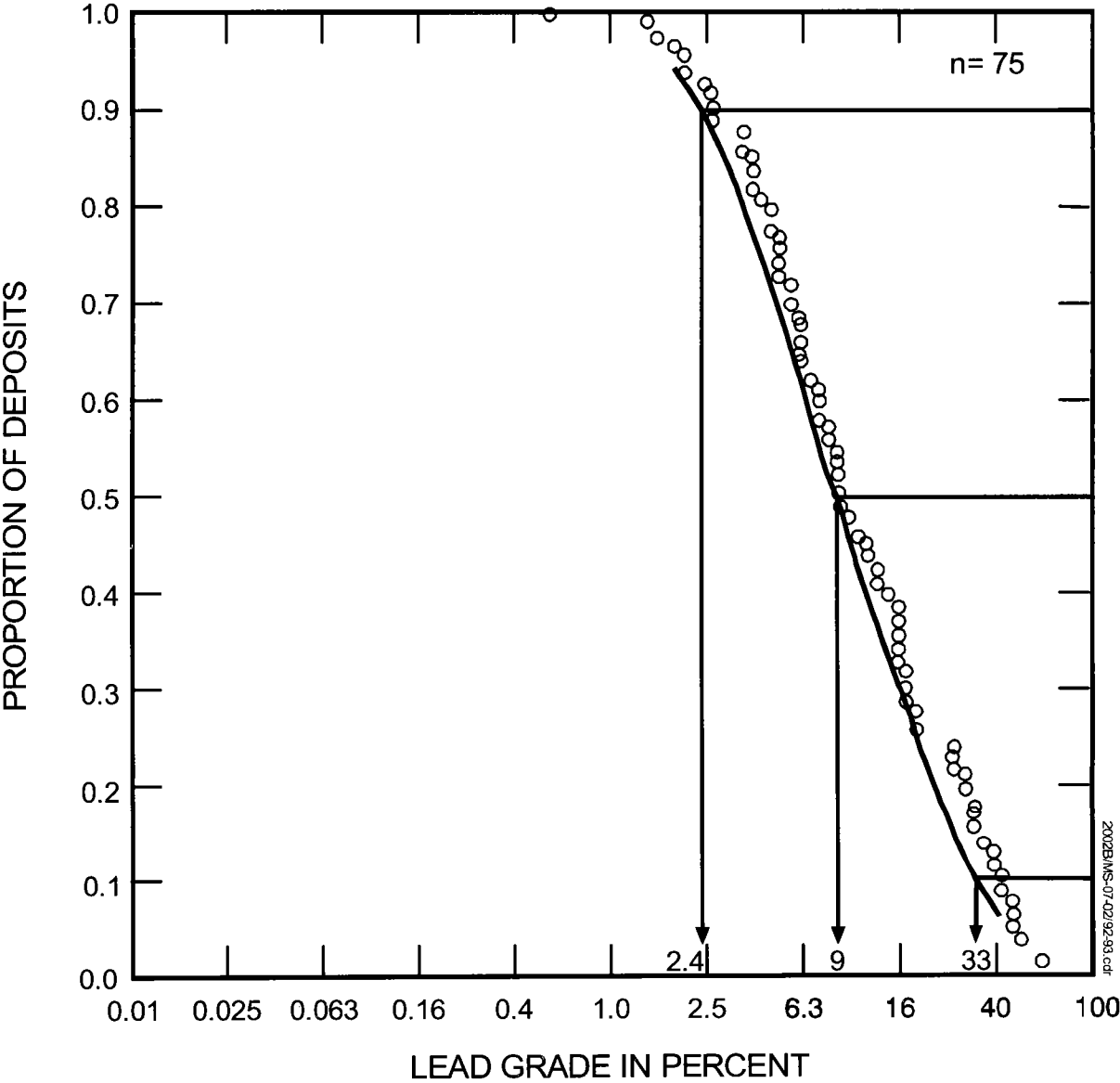
Silver grades of polymetallic vein deposits

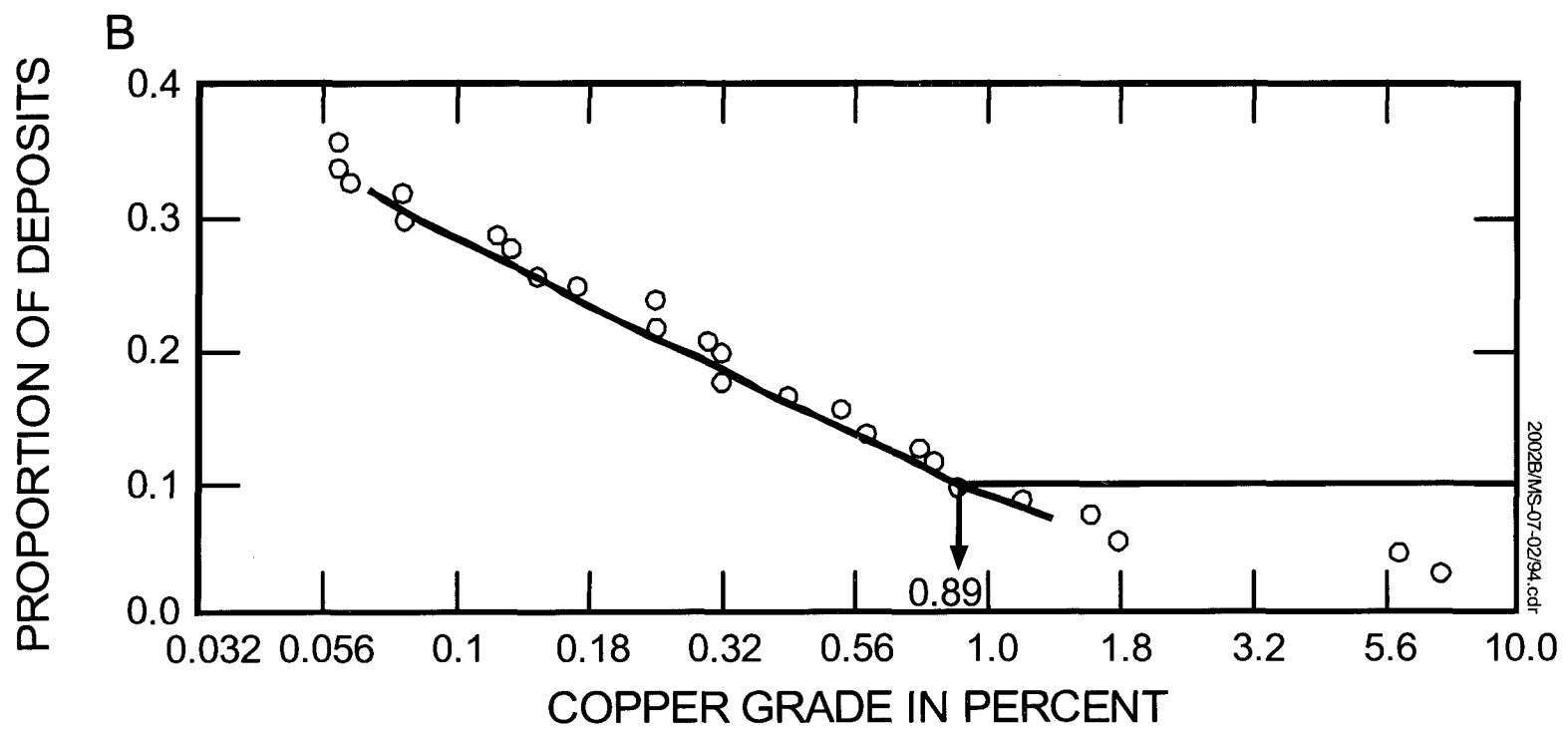
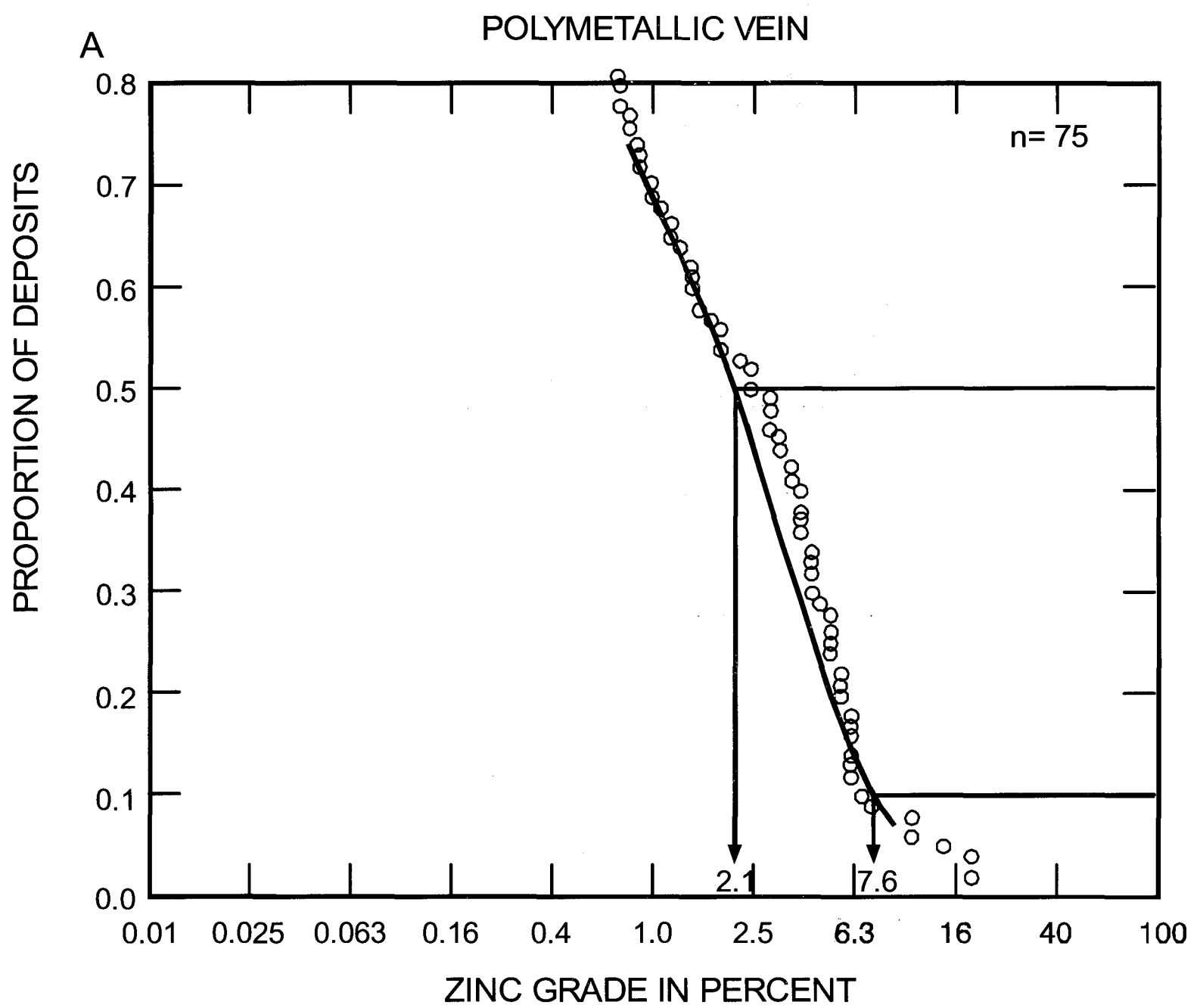


Gold grades of polymetallic vein deposits



Lead grades of polymetallic vein deposits





Zinc and copper grades of polymetallic vein deposits
A, Zinc; B, Copper

APPENDIX 4 COAL

BOWEN BASIN – PROSPECTIVE COAL MEASURES AND OPERATING MINES

Coal Group	Age	Description	Coal Bearing Sequence	Operating Mines
IV	Late Permian	This is the most diverse group in terms of quality, and also the most widely distributed within the basin. Although the quality and rank of Group IV coals vary greatly, they are characterised by comparatively low reactivities content and low levels of sulphur. They are of major economic importance as a source of both coking and non-coking coal, and have been extensively mined for many years.	Rangal Coal Measures	*Moura O/C *Blackwater O/C *Curragh O/C *Yarrabee O/C *Jellinbah East O/C *Cook U/G *Enshan O/C *Foxleigh O/C Coppabella O/C Burton O/C Newlands O/C Newlands U/G South Walker Creek O/C
III	Late Permian	Group III coal include major deposits of high grade coking coal which are mined, mainly by open cut methods, in a number of operations extending from Kestrel mine near Emerald, to Riverside north of Moranbah. These mines produce high quality coking coal. All production of Group III coal is currently exported.	German Creek Formation Moranbah Coal Measures	*Kestrel U/G *Crinum U/G *Gregory O/C *Oak Creek O/C, *Oak North & No1 U/G *German Creek East O/C *Southern U/G *Central U/G *Norwich Park O/C *Saraji O/C *Peak Downs O/C *Moranbah North U/G Goonyella O/C & Riverside O/C North Goonyella U/G
II	Early Permian	Group II coal measure include several unconnected deposits around the northern and western margins of the basin: the Collinsville Coal Measures; the coal measures at Rugby; and a group of deposits in the Clermont area, including the Blair Athol and Wolfgang Basins.	Collinsville Coal Measures Blair Athol Coal Measures	Collinsville O/C *Blair Athol O/C
I	Early Permian	Group I is represented by the Reids Dome beds, a unit of highly variable thickness and lithology. Distribution is restricted to the south-western part of the basin. In the southern Denison Trough, seams in the Reids Dome beds attain thicknesses in excess of 30m, but at considerable depth. Further north the seams are thinner but nearer the surface; shallow resources of good quality, non-coking coal have been delineated in the Capella area. No mining of Group I coal has yet occurred. Warrants further exploration.	Reids Dome beds	Nil

*Within Western Hardwood Project Area