1985/67. Report on Government Geologists Conference Workshop on Government Geoscience Programmes in the Coastal and Nearshore Zones.

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Abstract

A Conference Workshop on Governmental Geoscientific Programmes in the Coastal and Nearshore Zones was sponsored by the 1985 Chief Geologists Conference. The intention is to produce a position paper on current and future research activities in the field of coastal and nearshore geology, incorporating summaries of past and present programmes conducted by each organisation.

The Intergovernmental Oceanographic Commission had noted that the economic significance of the coastal and nearshore zone was not adequately reflected in present levels of scientific effort and interest. The Commission recommended that a global programme be developed to address the topic of coastal zone processes and the accumulation of non-renewable resources in this zone.

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INTRODUCTION

The Conference and Workshop was sponsored by a previously held Chief Geologists Conference, which discussed the findings at a meeting of expert advisers to the Intergovernmental Oceanographic Commission who had noted that the economic significance of the coastal and nearshore zone was not adequately reflected in present levels of scientific effort and interest. Geoscientific knowledge of this zone is important to an understanding of both placers and sand and gravel deposits, as well as providing baseline data for environmental coastal management and coastal development. This need is increasing as the population pressure on the coastal zone is increasing. Approximately 90% of Australians inhabit this coastal zone.

Peter Cook, Chief of Continental Resources, B.M.R., addressed the Workshop and outlined the roles and responsibilities of the large number of organisations conducting research in the coastal and nearshore zone. Some of the B.M.R. studies were briefly outlined, including some interesting work at Broad Sound, Queensland where studies of sedimentary and geochemical processes in modern estuarine environments were related to the occurrence of phosphate. Beach ridge and Quaternary sea-level studies in South Australia, beach ridge systems in the Gulf of Carpentaria and studies of offshore morphology were discussed. These studies are related to research into the occurrence of heavy minerals and Quaternary environments. Research by the Baas Becking group was discussed, focussing on geobiological investigations related to modern depositional systems. This work contributes to the understanding of petroleum and mineral forming processes.

Some restructuring of the future role of the B.M.R. is anticipated and a new ship is expected to be used for modern basin analysis studies with respect to petroleum formation.

Peter Cook's summary indicated a trend towards process oriented studies related to modern sedimentary and geochemical environments. The main

emphasis is on carbonate-rich environments, and includes related coastal and continental groundwater environments. He considered there was much more to be learnt about how, where and why heavy mineral sands accumulate and further work was required to refine the sea-level curve for Australia. Investigations into phosphate formation and deposition are to be conducted with particular emphasis on the interaction of the Gulf Stream and sea floor morphology. Areas of interest as regards phosphates included West Australian coasts, the coastline between Brisbane and Newcastle and south-eastern South Australia.

Bob Byrne (B.M.R.) discussed the work of the Baas Becking Geo-biological Laboratory, which was primarily concerned with investigations related to petroleum and mineral genesis. The work deals with microbial processes involved in carbonate and sulphide genesis and includes studies of sedimentary environments, microbial communities and groundwater. Study areas include Hamlin Pool in Western Australia where subtidal stromatolite and algal environments are examined in relation to oil genesis, and Lake Eliza in South Australia, where organic sediments and microbial communities are being investigated with respect to lacustrine oil shale analogues. Other areas in Spencer Gulf are under study and the general theme of all these investigations is in relation to analogues between recent and ancient oil and sulphide generating processes. Other studies relate to the ability of saline groundwater to transport copper, producing deposits in the inter-tidal zone.

This type of work involving modern and ancient analogues is used in the planning of exploration guidelines, both in terms of the understanding of processes and in terms of comparative sedimentology. The comparative sedimentological approach has widespread application in oil exploration, particularly in relation to facies reservoirs.

In summary Bob Byrne's address stressed the role of modern sedi-mentological, microbial and groundwater environments in relation to the ancient analogues. Detailed studies of the Quaternary are being used by, and are of great value in, exploration.

STATE SUMMARIES

South Australia

Most of the work in the coastal and nearshore area is as a result of direct request or community pressure. A Coastal Protection Authority related to the Department of the Environment exists but no specific body related to the State Survey is involved in coastal work.

Current areas of interest are related to extensive beach replenishment programmes. Advice from the survey is concerned with location and assess-ment of suitable sand bodies to be used in the replenishment work. The coastal and nearshore zone is covered by 1:250 000 geological mapping and most of the Pleistocene has been mapped and subdivided. Survey investiga-tions are also related to the calcium carbonate content of dune sands, gypsum and minor salt deposits. Engineering geological studies of the Port Adelaide area are continuing and the collection and collation of geotechnical information is included in these studies. Current mapping of the South Australian coastal Holocene and Pleistocene deposits at intervals of 100 km is continuing. This mapping is primarily related to the investigation of gypsum deposits and recent tectonics. The Adelaide area is currently sinking at a rate estimated at 0.5 m in the past 6000 years and work on recent tectonics is aimed at providing an explanation for this phenomenon.

Northern Territory

Virtually no research work was being done by the State Survey in the coastal zone. The Environmental Geology Section is involved in small scale investigations and most of the coastal information was in relation to hydrogeological studies and geological mapping at a scale of 1:100 000. The coastal and nearshore work has been piecemeal with no systematic approach.

There is apparently a large potential for research as many dynamic and diverse ecosystems are present. Likely areas of future activity are associated with mapping, geomorphic processes, beach ridge systems and chenier plains.

Victoria

The representatives from the Victoria Survey also indicated that little work was done on the coastal and nearshore zone and responsibility and research was fragmented. Their main research was in conjunction with the Ports and Harbours Authority who are responsible for coastal control. The majority of the work was related to beach nourishment programmes and some of the examples were very impressive. The general trend is away from 'hard' coast control structures such as groynes and training walls towards beach nourishment programmes. The geological input is related to determining suitable offshore sand sources.

The second main area of research was in preparing a Coastal Inventory involving the classification and monitoring of beaches with respect to erosion rates, directions of sand movement and grain size distribution.

Queensland

A representative was not present but a summary of their work was provided. They are the most active of all the State Surveys with a Marine and Coastal Investigation Section involving a geophysicist, senior geologist, geologist and technician. An Urban and Environmental Section also has a major role of detailed mapping of onshore and offshore coastal Quaternary deposits.

The work of the Queensland Survey involves both direct request and research activities, as well as collaborative research with other organisations. The work is generally topic oriented in relation to management, environmental and economic issues. Investigations are well integrated providing detailed regional syntheses of most aspects of coastal mapping and research.

New South Wales

The Marine Geology Section of the Survey has been very active in coastal and nearshore investigations in the past. Their role has been downgraded due to a 'hard rock mineral resource' emphasis in the Survey. A great deal of work has been conducted in estuarine areas with respect to heavy mineral sands, aggregate deposits and an estuarine classification system. Barriers, beaches and inner shelf areas have also been prime study areas and a strong role was stressed in the collation of disseminated information concerning the coastal and nearshore zone.

Major investigations have concentrated on the classification of beach barrier systems and their relationship with inner continental shelf sand veneers. These sand bodies associated with transgressive periods of

deposition are considered to be prime targets for heavy mineral deposits. Investigations involved with the location of offshore aggregate deposits have been conducted and two leases are currently worked.

The N.S.W. Survey considered that detailed coastal mapping, involving offshore regions, has provided a general framework for investigations into resource potential.

Western Australia

The W.A. Survey apparently has little interest in the coastal and nearshore areas due to a hard rock mineral resource bias. Mapping of Quaternary geology is apparently outdated and barely adequate. It is unsuitable as baseline data for environmental mapping and land capability surveys. Erosion of coastal areas ia a continual problem, especially as most of the population lives in these areas.

The Western Australian coastline map has been privately produced recently. This map, 'The Coastal Environment of Western Australia', is basically an inventory of coastal information and a superb production which has been widely used. Apparently there is a large scope for further coastal and nearshore research in Western Australia.

KEYNOTE ADDRESS

The keynote address was presented by Bruce Thom from the University of New South Wales. He summarised the past, present and future role of coastal geomorphology in Australia and accentuated the importance of coastal studies in relation to our environment. He stated that we are 'Citizens of the Quaternary' and, as such, Quaternary research and investigations are very relevant to us.

There is an apparent lack of interest by State Surveys in coastal and nearshore research, apart from perhaps Queensland. Most Surveys tend to react to direct request or specific issues related to community pressure. The academic interest by Universities has been very strong in the last ten years and co-ordinated studies have been conducted in some States. Funds are available for research, particularly in relation to soil conservation issues for project oriented studies, and there is scope for co-operation between State Surveys and Universities.

The importance of determining and understanding the Holocene sea level curve was discussed and the refinement of these curves in individual areas was emphasised, due to the difficulties in generalising from one part of the world to another. The problems associated with the interpretation of past sea level evidence in terms of different coastal features was also emphasised.

Some examples of recent coastal erosion problems were presented, including some graphic examples of the effects of the 1967 storms at Surfers Paradise where training walls at the Tweed River contributed greatly to the problem. The examples were used in order to indicate the need for monitoring coastal change. The observation of coastal sediment movement in New South Wales, by monitoring beach form and sediment distribution in relation to storm frequency and magnitude, is considered important as baseline data in understanding the dynamics of coastal processes. An important consideration in relation to the examples discussed was to 'think beyond the data set'. An overall consideration of conditions is important in the understanding of the dynamics of the coastal environment. Examples were given where meterological events and climatic patterns

were of over-riding importance.

A basic geomorphological summary was presented. For example, New South Wales was presented as a basic setting of drowned river valleys, coastal lagoons and barriers. Investigations are considered important in determining the rate of accretion of these barriers and their current state, as well as determining the age structure of beach ridge systems with respect to their rate of progradation. Embayment filling is likely to have occurred during the Holocene transgression with the growth of barriers during the early stillstand. Barrier decay or equilibrium occurred during the late stillstand as some of the large foredunes date to 2000 years B.P.

The role of Quaternary research was discussed again with reference to such things as sediment movement data for coastal engineering purposes. The value of studying the Pleistocene was also highlighted, not only in its relationship to more recent deposits but also its role in the understanding of neotectonics. The role of Quaternary research with respect to oil exploration was highlighted with an example given of the use of Gippsland Holocene analogues by Esso.

The keynote address was extremely interesting, summarising the value of Quaternary mapping and research. Bruce sees the need for sustained mapping and the monitoring of coastal change by geomorphologists or geologsts, as engineers tend to take a short term view with respect to particular problems. He considers that these two roles are the strongest arguments for sustained research projects. The dynamics of the coastal geological environment are important and can bring together a wide range of disciplines including engineering, statistics, sedimentology and geomorphology. As Bruce stresses, research into the coastal and nearshore zone is important as we are 'Citizens of the Quaternary' and are therefore directly affected by this environment.

[19 December 1985]

APPENDIX A

Draft recommendations for a position paper on future coastal and nearshore geoscience programmes in Australia.

Draft recommendations were discussed and are presented below, including some of the basic alterations agreed upon at the meeting. A position paper is to be released after circulation to all participants.

(1) *Status*

Recognition of the relevance of coastal and nearshore geoscience, stressing economic significance. Relevance not only for geological and mineral resource purposes but also for other groups in the community, *e.g.* coastal protection agencies, coastal managers, engineers and developers, Government authorities, *etc.*

(2) *Definition*

The geological zone designated 'coastal and nearshore' includes unconsolidated or partly consolidated marine, aeolian and estuarine sediments of Quaternary age that occur along the coast and on the innter continental shelf.

(3) *Areas of responsibility or principal activity*

(a) State Governments should have as one of their long-term aims, the production of regional maps and reports concerning coastal and nearshore Quaternary deposits. Map scale no smaller than 1:100 000 or as appropriate. A recognition of special needs with respect to mapping techniques is required.

Regional studies should include subsurface data (coring, seismic, radiometric, *etc.*) and stratigraphic cross-sections. Co-operation and collaboration with other agencies is suggested where specialised equipment (*e.g.* vibrocorers) was required.

Mapping and resource assessment programmes to be undertaken opportunistically or systematically at a suggested scale no smaller than 1:100 000.

(b) State and Federal Government geologists should collaborate in research on the occurrence of economic minerals in coastal and nearshore sediments. In particular, those areas of interest in nearshore and inner continental shelf regions may require specialised equipment not normally available to State Governments.

(c) The B.M.R. should have as one of its long-term research functions, comparative sedimentological studies of representative coastal and nearshore sedimentary nearshore environments to provide analogies for the interpretation of ancient hydrocarbon and mineral-bearing sequences.

(d) To establish a recent tectonic history of the Australian Continental margin from stratigraphic and absolute age dating of coastal deposits.

APPENDIX B

GOVERNMENT GEOLOGISTS' CONFERENCE WORKSHOP ON

GOVERNMENT GEOSCIENTIFIC PROGRAMMES IN THE

COASTAL AND NEARSHORE ZONES

SYDNEY, 13 - 14 JUNE 1985

TASMANIAN GEOSCIENTIFIC PROGRAMMES IN THE COASTAL AND NEARSHORE ZONES. AN OVERVIEW.

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9/16

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INTRODUCTION

Tasmania, the island State, has a large coastline compared with its area and in relation to its population. The significance of the coastal and nearshore zone is only partly understood and undoubtedly underestimated. Responsibility for, and investigation of, this zone is fragmented. Little legislation exists and no single body has overall authority in the coastal and nearshore zone. Investigations are generally dispersed and often small scale. No regional investigations or collation of information has been attempted in terms of geoscientific work.

In summary the geoscientific work done by the Department of Mines is related to exploration administration and assistance, involving minor heavy mineral investigations, sand and gravel deposit assessment, fairly extensive groundwater surveys, and engineering geological and geophysical studies associated with coastal landslide areas, engineering structures and sedimentation problems.

The Lands Department is the chief coastal land management authority. It is involved with investigations related to erosion control and minor sedimentation problems.

Other geoscientific information is available from mining exploration companies and local shire council studies of particular erosion or engineering problems, usually involving private consultants from elsewhere in Australia.

Most of the detailed geomorphic studies of the coastal zone are related to research initiated by the University of Tasmania.

The geoscientific information is therefore fairly disseminated due to the size of the State, the nature and extent of particular problems and economic factors. This paper therefore includes information from non-government sources in an attempt to provide a State-wide summary of relevant work in the coastal and nearshore zone.

METALLIC MINERAL RESOURCES

Very few mineral resource investigations have been conducted by the Department of Mines in the coastal and nearshore zone. Those that have been done are generally small scale and isolated. The investigations are almost entirely related to heavy mineral and sand and gravel deposits. It is therefore probably more pertinent to present an overview of past and present economic activity around the coastline concluding with some comments on potential directions. An indication of past interest and probable potential can be gained from mining activities and tenure, most of the information from investigations in the coastal zone being contained in company reports.

Devonian granite is the major mineralised rock type source for detrital minerals in Tasmania. The main economic mineral sought is cassiterite. The granites are well exposed on the west and east coasts and on the Bass Strait islands. On the exposed west coast features are largely erosional with the only large dune and beach deposits occurring at Marrawah and Strahan. In contrast, the east coast has an indented shoreline and many sheltered areas. Numerous sedimentary features have developed. Most of the investigations and coastal mining activity has therefore occurred on the east coast and the eastern coasts of the Bass Strait islands.

Cassiterite is the most sought after heavy mineral and fossil Holocene pebble and sand marine deposits form alluvial sources on the east coast at Coles Bay, Eddystone Point, Noland Bay and Cape Portland. At Musselroe Bay in the north east, investigations have defined a subeconomic deposit in marine sands exposed in the intertidal zone. Investigations and mining activity have been somewhat sporadic and none of the deposits are currently operative. Small deposits have been pegged offshore from creek mouths, particularly adjacent to Bass Strait islands where the lack of suitable placer deposits has been attributed to slow deposition in active tidal waters. Current tin mining at Melaleuca, Cox Bight is centred around old terraces which are thought to be related to an old, uplifted tidal channel connecting Bathurst Harbour to the south coast.

There is some current interest in a potentially viable placer deposit in the north east, located in Ringarooma Bay. Drilling has also defined an estuarine stanniferous gravel related to an 'ancient' Ringarooma River, at the mouth of the present Ringarooma and Boobyalla Rivers. This may relate to the Bay deposit and could be a viable dredging prospect in the future. Some testing has been done but apparently the data is insufficient for a proper assessment. These sediments may also contain fine gold and perhaps marketable aggregate, consequently the area has a high priority for further investigations.

An upsurge in interest and investigations into beach sand heavy minerals occurred in the period 1975 to 1980. Rutile, zircon, ilmenite and cassiterite are the main heavy minerals present. Ilmenite is the most common, but is downgraded against the Western Australian deposits due to chromium contamination. Accurate assessment of the economic heavy mineral content of unconsolidated sands around the coast of Tasmania is affected by two factors. One factor is peculiar to Tasmania in that the hinterland is largely Jurassic dolerite. The other factor, the variable colour of rutile, is common to all beach sand operations in Australia. The Department has worked on sample preparation and processing to facilitate optical counting of potentially economic samples. This has been necessary owing to the fact that around the eastern and southern coasts, the prevalence of dolerite in the hinterland results in a relatively high concentration of pyroxene and a lesser amount of ilmenite.

The only major beach sand mining operation to have been worked in the State was located at Naracoopa on the east coast of King Island. Ilmenite was the main product during the 1930s and 40s, succeeded by rutile and zircon from 1969-77. All operations ceased in 1983 after rehabilitation. Rutile and zircon reserves remain, but grades are now uneconomic. An offshore reserve is expected to occur but has not been assessed.

Heavy mineral beach sand leases and exploration have been located at several places on the East Coast, Bass Strait islands and at Strahan. Most of the Tasmanian deposits are not considered to be economic at present due to small reserves, shallow bedrock, frequent pebble bands, and high variability.

Interestingly, two major investigations are currently centred on two man-caused deposits. These deposits are alluvial fans developed by stream transport of tailings from ore processing plants. One is located near the mouth of the Tamar River where a large fan of tailings from the historic Beaconsfield Gold Mine has been deposited. An operation to recover gold has now commenced. The delta at the mouth of the King River on the West Coast consists of tailings from the Mt Lyell Copper Mine which contain copper pyrites, pyrites and other sulphides. The area is currently under licence and investigations are proceeding for the treatment of the deltaic sands, to produce a range of base metals.

Some scattered dredge samples from around the Tasmanian coast have revealed some phosphate nodules in ocean sediments. No systematic research has yet been carried out to ascertain the presence of economic deposits. The sampling was carried out by an exploration company and is beyond the present resources of the Tasmanian Government.

NON METALLIC MINERAL RESOURCES

Extensive deposits of beach shingle occur on the west coast of King Island and the north coast of Tasmania between Ulverstone and Port Sorell, involving about 30 km of coast in each case. At present only the King Island deposit is worked, the Port Sorell deposit having been closed to mining for several years, though both deposits have been worked extensively in the past. The King Island shingle is of Holocene age and local provenance, the material having been distributed along the coast by northward-flowing currents. The Ulverstone-Port Sorell shingle was brought down principally by the north-flowing Mersey and Forth rivers, and distributed by eastward-flowing currents. These deposits may originally have been glacially derived, as there is evidence of glaciation in both river valleys.

Dune systems occur around the State but are only actively exploited in the south where naturally occurring sands are scarce. Environmental safeguards are applied but are difficult to monitor and instances of frontal dune mining and breaching of dunes have occurred.

Several favourable localities around the coast have been considered as potential offshore aggregate resource areas. These include the Inglis River, which drains an area containing the largest known sand and gravel deposit in the State, and the Ringarooma, Mersey, Forth and Huon rivers. The offshore areas relating to these rivers are considered to be prime targets for aggregate resource investigations, the Huon River offshore area being the only one investigated so far. Results were encouraging but follow-up drilling has yet to confirm the findings of the seismic refraction methods used. It is hoped that this method will be used in investigation of other offshore areas.

The Rubicon and Tamar rivers lie respectively west and east of the Badger Head Precambrian block and have probably derived much of their contents of sand and gravel from this source. Aggregate deposits are numerous in the area and it is assumed that the rivers themselves would also be potential aggregate resources. The matter needs both investigation and a formulation of environment safeguards.

GROUNDWATER RESOURCES

The majority of the Department of Mines detailed investigations in the coastal zone are related to groundwater surveys. Large quantities of fresh water are present in sand deposits along the Tasmanian coast-line. Often untapped and unsuspected by land owners, this valuable resource is suitable for both domestic and irrigation purposes. Lying at a shallow depth it is readily accessible and can be economically

extracted by simple methods. Due to its potential importance, especially in the drier areas on the East Coast, the Department of Mines has for some years been investigating the occurrence, distribution and quality of water in coastal sands. Testing of samples from numerous localities has demonstrated that the groundwater is invariably of good to excellent quality and, except in the immediate vicinity of septic tanks, the water is free of biological impurities.

The larger coastal sand bodies, usually Holocene barrier beach ridge systems, have been investigated in detail. These studies are often in relation to the provision of water supplies to small coastal settlements. Most of the work in the South of the State has centred around Seven Mile Beach. Two adjacent golf clubs are currently extracting groundwater in this area, irrigation supplies being provided from large spear bore arrays. Current investigations involve salinity problems with one of the groundwater systems, considered to be related to over-extraction and lack of attention to monitored information. Both of the systems are monitored in detail and the assessment of results is continuing . Further work is planned in relation to salinity layering and boundary conditions of the groundwater body. Groundwater modelling is planned to enable a more accurate assessment of recharge from rainfall. Recharge is considered to have been overestimated in the past and is vital when calculating safe extraction rates from these multibore arrays. This work will have a direct bearing on investigations in other coastal areas of the State.

Other areas of detailed investigation have centred around Holocene beach ridge complexes at Greens Beach at the mouth of the Tamar River and Nine Mile Beach, near Swansea on the East Coast. In each case spear bore arrays have been installed, although the Nine Mile Beach system, which was to be used as a summer supplementary water supply for Swansea, has not been connected due to various legal problems in land acquisition.

Many small-scale groundwater investigations have been conducted for other Government bodies, local councils and private individuals. Current investigations are centred around the St Helens area on the East Coast, with the groundwater assessment related to a supplementary town supply. This area is very promising, with a large coastal sand body occurring in the form of a frontal dune system backed by coastal lagoons. There is an advantage in this area with respect to recharge as several ephemeral streams flow into the region. Elsewhere the coastal sand bodies rely on recharge from direct rainfall.

Some of the coastal towns of Flinders and King islands rely on groundwater supplies from coastal sand bodies. The coarse coastal sands near Lady Barron on Flinders Island have huge reserves of groundwater of excellent quality and good information is available from detailed investigations in these areas.

In each investigation the primary concern is to obtain groundwater, but auger drilling, surface morphological mapping, and sand sampling are all conducted in detail in order to provide information concerning the age, structure, and depositional environment of the sand body. Samples are also sometimes processed for heavy mineral analysis and investigation, in conjunction with the groundwater survey.

QUATERNARY GEOLOGY

There is no detailed mapping by the Department of Mines of Quaternary deposits in the geomorphological sense. The deposits are mapped by the Geological Survey Section in conjunction with regional geological mapping, and in the past little attempt has been made to subdivide the sediments. Recent maps show a far more stratigraphic and morphological approach; on the recently produced geological map - sheets some regional assessment of the unconsolidated coastal deposits is available as useful baseline information.

Most of the detailed mapping of the coastal sediments and morphological features has been conducted by geomorphologists associated with the Geography Department of the University of Tasmania. Information is available from theses and published papers and includes summaries of sea-level variations and related deposits and landforms.

The Department of Mines has assisted in sampling programmes and investigating the Holocene age structure of some of our large barrier beach ridge systems. We have also provided assistance in an AWRC sponsored study into a geomorphic perspective on the groundwater potential of coastal sands in North Eastern Tasmania. Some of this work has provided potential evidence of Quaternary marine deposits at heights up to 32 metres above present sea level. There is widespread evidence of marine deposits which indicate that sea level attained a height of at least 20 m to 22 m throughout Tasmania. These emergent shorelines have been interpreted in terms of middle and late Quaternary uplift. While only limited geomorphological evidence of the higher shorelines exist, there is a suggestion that uplift rates of 0.21 m/ka may have existed for the period 0-125 ka BP and perhaps to as far back as 325 ka BP.

In general then, the detailed Quaternary research is the domain of the University geomorphologists. Some geologists belonging to the Geological Survey Section have an interest in this area and are usually aware of significant evidence they may find while conducting other investigations. Often, drilling associated with other surveys provides useful information in regard to the Quaternary history.

EROSION, SEDIMENTATION AND MISCELLANEOUS INVESTIGATIONS

Two major studies have been conducted at St Helens on the East Coast. Marine geophysical surveys have been used by the Department of Main Roads in an assessment of sand movement problems on the St Helens Sandbar at the mouth of Georges Bay. This work has defined sand quantities involved in a closed sedimentary system where a circulatory movement of sand sometimes closes the St Helens port or results in a dangerous entrance for the local fishing fleet. Rock training walls have been considered to control the tidal channels. One wall has been constructed and mainland consultants are studying wave tank models.

Our other major study at St Helens has involved a coastal landslide area. Some three kilometres of coast is unstable, partially due to marine erosion and man induced environmental alteration. A steep coastal slope is involved, underlain by Tertiary sands, clay and gravel. Consequently, other coastal slopes where this unstable geology is present are currently under investigation.

Landslip problems are also prevalent along the North West Coast where relict coastal cliffs expose Tertiary basalts and sediments. The Department has a major function in these landslide investigations. Fairly unique landslide zoning systems have developed and are implemented by both Local Shire Councils and the State Government.

Apart from the landslide areas the Department is not involved to any great extent in other coastal erosion or sedimentation problems. Our main input in these matters is often restricted to geophysical surveys. The Lands Department has a major role in this area as 52% of the Tasmanian Coastline is under its control. Over the past 30 years the Lands Department has developed considerable expertise in dune reclamation, erosion control and various other aspects of coastal protection including river mouth control. This Department is more concerned with the action of processes in the coastal zone and some mention of the problems and investigations should be briefly presented.

Tasmania has a much smaller population than the mainland States and to date the coast has suffered less as a consequence. The main type of problems can be divided into four groups. These are:

(i) Large coastal dunes and sand blows.

(ii) Erosion and recession of beaches, foredunes and lesser dune systems.

(iii) Estuaries and river mouths affected by sand bars, siltation or migrating outlets.

(iv) Erosion, recession and landslips affecting foreshores on soil or rock types other than beach sand.

Such work requires understanding of coastal processes as well as the definition of the nature and extent of sediment bodies involved. Investigations, trials and remedial measures have been involved in their work. Dune stabilisation is a major feature and from training wall and groyne studies they consider that these methods should be used with caution since they may simply shift an erosion problem further along the shore.

Beach nourishment is considered probably the most economic and aesthetically pleasing protection in most cases and investigations and trials using sand pumps are planned, which require the location and estimation of nearshore sand reserves.

Investigations of offshore sand deposits in relation to the depleted beaches of the Northern Coast have been strongly recommended. Also suggested in relation to this topic is the need for regular monitoring of shoreline changes and the shifting of sand and other sediments between shore and offshore locations. This important data base will greatly facilitate forward programming and budgeting of coastal protection works.

In relation to the work of the Lands Department concerning minor estuary and river mouth training projects a 'trial and error' approach is used, based on experience and judgement. This is due to the lack of facilities and to economic constraints when considering wave tank testing or computer modelling in relation to the works.

Coastal erosion and engineering problems associated with residential areas are investigated by local shire councils, often with consultants from elsewhere in Australia. The use of such consultants is due to the lack of in-State expertise in coastal processes. Some very detailed reports have been prepared by local council engineers dealing particularly with sediment movement and erosion problems in coastal suburbs of Hobart.

SUMMARY

In summary our current interests in terms of economic minerals are located in the coastal zone at Ringarooma Bay, the delta of the King River and that near the mouth of the Tamar River. The occurrence of phosphate nodules in ocean sediments is also of interest, however, marine surveys are beyond our resources.

Another area of importance concerns the assessment of aggregate deposits in near-shore regions. Such areas as the south, the northern coast and around the Bass Strait islands deserve particular consideration.

The Regional Mapping Programme should continue its trend towards more detailed mapping of coastal deposits in order to provide baseline information. Detailed groundwater surveys and related investigations, possibly in conjunction with heavy mineral assessments, should continue, together with our investigations of landslide-prone areas.

Tasmania is a small State. In view of its extensive coastline and the fact that so little is known of its near-shore areas it may be reasonable to suggest that the State should be provided with the means to investigate them.

Considering economies of scale, perhaps a simpler approach would be the funding of a coastal survey to be carried out by better-equipped organisations such as the BMR or CSIRO.

One of our problems in the Government Services is a lack of expertise in the field of coastal geomorphology and coastal processes. Unless there is a major shift of emphasis in these directions little change will occur. The situation as it is now, where interstate consultants are engaged, is likely to continue, particularly with respect to coastal erosion and sedimentation problems.

Recent requests to the State Government to initiate coastal protection legislation may eventually lead to the formation of some kind of Coastal Authority. The departmentally dispersed expertise and information on the coastal and near-shore zone could then possibly be unified, depending on the scope of such an Authority.

However, an awareness of the significance of this zone is required. Such significance is based on knowledge, and unless there is a shift of emphasis such knowledge may not be obtained.