JABATAN MINERAL DAN GEOSAINS MALAYSIA
MINERALS AND GEOSCIENCE DEPARTMENT MALAYSIA

LAPORAN TAHUNAN 2015 ANNUAL REPORT

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KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR MALAYSIA
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT MALAYSIA

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Dari kiri / From left: Mohd Aznawi Haji Mat Awan, Alvyn Clancey Mickey, Wan Salmi Haji Wan Harun, Suhaimizi Yusoff, Kamaruddan Abdullah, Mohd Fauzi Rajimin, Haniza Zakri, Abdul Rahman Yusoff, Dr. Sia Say Gee, Dr. Nazwin Ahmad, Amir Mizwan Mohd. Akhir, Jaithish John, Mohd. Zulkiflee Che Soh, Che Ibrahim Mat Saman, Mat Niza Abd Rahman, Suzannah Akmal, Brendawati Ismail, Habibah Tahir

Perutusan Ketua Pengarah
Message From The Director General

Tahun 2015 merupakan tahun yang mencabar bagi Jabatan Mineral dan Geosains Malaysia (JMG). Isu perlombongan bauksit Kuantan, gempa bumi Sabah, serta kebakaran tanah gambut dan kekurangan air akibat kemarau yang berkaitan dengan El Niño hanyalah sebahagian daripada isu-isu yang termasuk dalam bidang kuasa JMG. Sungguhpun berdepan dengan cabaran-cabaran ini, JMG bukan sahaja telah mencapai kemajuan yang baik sebagaimana yang dirancang untuk 2015, malah melebihi sasaran.

2015 has been a challenging year for the Minerals and Geoscience Department of Malaysia (JMG). The Kuantan bauxite mining woes, the Sabah earthquake, as well as the peatland fires and shortage of water as a result of El Niño-related droughts were some of the issues falling within the purview of JMG. Despite numerous challenges, JMG not only made good progress in achieving all the targets planned for 2015, but actually exceeded them.

Hasil daripada prestasi yang cemerlang ini, JMG telah memenangi beberapa anugerah antarabangsa dan tempatan, ini termasuk satu pingat perak dan satu pingat gangsa sempena *International Invention and Innovation Exhibition* ke-26 (ITEX'15), serta telah mendapat tempat kedua dalam Pertandingan Inovasi 1NRE 2015 yang dianjurkan oleh Kementerian Sumber Asli dan Alam Sekitar (NRE). JMG juga telah memperolehi tempat kedua dalam *The Inclusive Innovation Challenge* yang telah dianjurkan bersama oleh Kementerian Sains, Teknologi dan Inovasi (MOSTI) dan Yayasan Inovasi Malaysia (YIM).

Mineral merupakan bahan yang penting untuk kehidupan moden. Oleh itu, permintaan mineral yang semakin meningkat memerlukan bukan sahaja eksplorasi yang berterusan ke atas sumber mineral baru, tetapi juga pengekstrakan secara mampan ke atas sumber-sumber mineral yang telah dikenal pasti untuk memastikan bekalan yang stabil. Sebagai sebuah agensi yang bertanggungjawab ke atas sumber mineral dan perlombongan di negara ini, kerja eksplorasi yang dijalankan oleh JMG pada tahun 2015 telah membawa kepada penemuan sumber baharu bauksit, agregat batuan, andalusit, batu kapur, batuan silika, lempung, pasir dan kelikir, dan batu arang. JMG menyedari kepentingan untuk sumber mineral diekstrak secara teratur dan bersistematik mengikut amalan kejuruteraan terbaik bagi mengelak kesan negatif alam sekitar dan sosial ke atas masyarakat tempatan. JMG terus menjalankan pemeriksaan teknikal untuk memastikan pengusaha lombong dan kuari mematuhi peruntukan undang-undang dan peraturan-peraturan yang dikuatkuasakan oleh JMG. Dalam tahun 2015, JMG telah melakukan sebanyak 1111 pemeriksaan ke atas operasi perlombongan, 2192 pemeriksaan ke atas operasi kuari, 502 pemeriksaan ke atas kilang amang dan loji pemprosesan mineral, serta 381 pemeriksaan ke atas urusniaga kedai bijih mineral dan emas mentah. Di samping itu, JMG bersama Bahagian Mineral dan Geosains di bawah NRE sedang membuat semakan semula peruntukan-peruntukan yang bertelingkah dan bertindih di bawah Akta Pembangunan Mineral 1994 dan Enakmen Mineral Negeri dengan Kanun Tanah Negara 1965, Akta Perhutanan Negara 1984, Akta Kualiti Alam Sekeliling 1974 dan perundangan lain yang relevan.

As a result of this excellent performance, JMG had won several international and local awards in the year, including a silver medal and a bronze medal at the 26th International Invention and Innovation Exhibition (ITEX'15), as well as being accorded second place in the 1NRE Innovation Competition 2015 organized by the Ministry of Natural Resources and Environment (NRE). JMG similarly secured a second placing in the Inclusive Innovation Challenge jointly organized by the Ministry of Science, Technology and Innovation (MOSTI) and the Malaysian Innovation Foundation (YIM).

Minerals are essential for modern living. Hence, the growing demand for minerals requires not only continued exploration for new mineral deposits, but also sustainable extraction of identified mineral resources to ensure stable supply. As an agency responsible for mineral resources and mining in the country, explorations conducted by JMG in 2015 led to the discovery of new deposits of bauxite, rock aggregate, andalusite, limestone, silica rock, clay, sand and gravel, and coal. JMG recognizes the importance of mineral resources being extracted in an orderly and systematic manner, in accordance with the best engineering practices so as to avert negative environmental and social impacts on local communities. JMG continued technical inspections to ensure that miners and quarry operators complied with the relevant laws and regulations enforced by JMG. In 2015, JMG carried out a total of 1111 inspections on mining operations, 2192 on quarries operations, 502 on amang and mineral processing plant operations, and 381 on mineral ore and gold dealers. Apart from that, JMG together with the Minerals and Geoscience Division of NRE is in the process of reviewing conflicting or overlapping provisions of the Mineral Development Act 1994 and the State Mineral Enactments with the National Land Code 1965, National Forestry Act 1984, Environmental Quality Act 1974, and other relevant legislations.

Walaupun mempunyai iklim tropika dan sumber air yang kaya, fenomena El Niño yang berlaku pada selang masa antara dua hingga tujuh tahun sering menyebabkan kekurangan air yang teruk di negara ini. Cuaca kering yang dibawa oleh El Niño berkait rapat dengan kebakaran tanah gambut yang menyebabkan asap jerebu yang tebal di Malaysia. Keadaan ini adalah terutamanya serius pada tahun 1997/1998 di mana kebakaran tanah gambut secara berleluasa telah menyumbang kepada keadaan jerebu yang teruk di rantau ini. Pada tahun 2015, sekali lagi negara ini telah diselimuti oleh asap jerebu tebal yang disebabkan oleh kebakaran tanah gambut akibat musim kering yang berpanjangan dan ini telah menyebabkan banyak sekolah di beberapa negeri ditutup buat sementara waktu. JMG terus mempergiatkan usaha mengeksploitasi sumber air tanah untuk mengawal kebakaran tanah gambut dan sebagai sumber air alternatif untuk penduduk di kawasan kekangan air, terutamanya semasa musim kemarau. Pada tahun 2015, sebanyak 33 telaga eksplorasi telah digerudi, 29 telaga pengeluaran dan 9 telaga pemantauan telah berjaya dibangunkan untuk sumber air. Kerja pemantauan air tanah juga telah dijalankan ke atas 396 telaga untuk memantau kualiti air dan memastikan penggunaan air tanah secara mampan. Selain itu, sebanyak 19 buah telaga telah dibina sebagai projek khas di bawah Projek Bantuan Bencana untuk membekal air pembersihan berikutan kejadian banjir besar yang melanda pantai timur Semenanjung Malaysia pada penghujung tahun 2014 sehingga awal tahun 2015.

Umumnya, sebahagian besar Malaysia adalah stabil dari segi seismos, namun Sabah berisiko untuk gempa antara plat dan intra plat kerana kedudukan yang berdekatan dengan Lingkaran Api. Pada 5 Jun 2015, gempa bumi dengan kekuatan 6.0 pada skala Richter melanda Ranau, Sabah. Gempa bumi tersebut disebabkan oleh pergerakan Sesar Lobou-Lobou yang berarah baratdaya-timurlaut. Oleh kerana pusat gempa bumi berhampiran dengan Gunung Kinabalu, gegaran telah menyebabkan jatuhan batuan secara besar-besaran di sekitar gunung berkenaan. Jatuhan batuan tersebut telah mengakibatkan kerosakan yang serius kepada asrama dan rumah rehat berhampiran puncak Gunung Kinabalu. Insiden ini telah menyebabkan kehilangan nyawa seramai 18 orang pendaki daripada 5 buah negara. JMG telah turut serta dalam operasi mencari

Despite having a tropical climate and rich water resources, the El Niño phenomenon that occurs at irregular intervals of two to seven years often causes severe water shortage in the country. The dry weather brought by El Niño is closely related to the peatland fires which cause massive clouds of smoke haze in Malaysia. This was especially serious in 1997/1998 when widespread peatland fires contributed to severe haze conditions in this region. In 2015, the country was once again blanketed by massive clouds of smoke haze caused by peatland fires due to a prolonged dry season and had forced schools in many states to close temporarily. JMG continues to intensify its effort to exploit groundwater, the largest source of usable fresh water, to control peatland fires and as an alternative water resource for the populace in areas of water constraint, especially during droughts. A total of 33 exploration wells were drilled, 29 production wells and 9 monitoring wells were successfully developed in 2015. Groundwater monitoring was carried out at 396 wells to monitor the quality of water resources, and to ascertain that the water resources were being sustainably utilised. Besides this, a total of 19 wells were constructed as special projects under the Disaster Relief Project to provide water for clean-up purposes following the floods that hit the east coast of Peninsular Malaysia in late 2014 till early 2015.

In general, Malaysia is largely seismically stable. Nevertheless, the state of Sabah is at risk of interplate and intraplate earthquakes due to its close proximity to the Ring of Fire. On 5 June 2015, an earthquake with a magnitude of 6.0 on the Richter scale struck Ranau, Sabah. The earthquake was caused by movement on the SW-NE trending Lobou-Lobou Fault. As the epicentre of the earthquake was near to Mount Kinabalu, the tremors caused massive rock falls around the mountain, causing serious damage to the hostels and resthouse near the summit of Mount Kinabalu, where 18 climbers from 5 different nationalities were confirmed dead. JMG participated in the search and rescue operations, humanitarian aid, as well as the post Sabah earthquake impact assessment. JMG also initiated a mapping project on the active faults in Sabah, Sarawak, and a few states in Peninsular Malaysia to assess earthquake risk.

dan menyelamat, bantuan kemanusiaan, serta penilaian kesan pasca gempa Sabah. JMG juga telah memulakan projek kajian sesar aktif dan risiko gempa bumi di Sabah, Sarawak, dan beberapa negeri di Semenanjung.

Perlombongan dan industri mineral sering dipandang sebagai industri yang mempunyai inovasi dan perubahan teknologi yang perlahan. Menyedari kepentingan teknologi yang boleh mengubah pandangan terhadap sumber mineral, JMG menerusi Pusat Penyelidikan Mineral menjalankan R&D dalam pengekstrakan mineral, kesan alam sekitar dan pemulihan. Kajian yang dijalankan pada tahun 2015 memberi tumpuan kepada pembangunan teknik rawatan acid mine drainage (AMD), serta teknologi pemulihan lombong dan kuari. Kajian juga telah dijalankan ke atas mineral tempatan supaya dapat menghasilkan bahan mentah dan bahan tambah nilai untuk digunakan oleh industri, dan untuk membangunkan teknologi pemprosesan mineral dan kitar semula yang bersesuaian. Pada tahun 2015, satu paten telah didaftarkan ke atas satu hasil penemuan penyelidikan, iaitu *Method for Recovery of Sulphide Minerals from Sulphide-containing Material,* sementara satu perisian, iaitu *Quarry Particulate Pollution Index and Noise Software Volume* 1.0.0 (Qpins V1.0.0) telah didaftarkan di bawah kategori hakcipta.

Saya mengambil peluang ini untuk merakamkan terima kasih kepada Kementerian Sumber Asli dan Alam Sekitar atas sokongan dan kepercayaan yang diberikan kepada JMG. Saya juga menyampaikan setinggi-tinggi penghargaan kepada semua pegawai dan kakitangan JMG di atas komitmen dan sumbangan mereka, serta agensi kerajaan yang lain, institusi pengajian tinggi awam dan sektor swasta atas sokongan dan kerjasama rapat dalam menjayakan pelbagai aktiviti JMG.

MIOR SALLEHHUDDIN MIOR JADID
Ketua Pengarah / Director General
Jabatan Mineral dan Geosains Malaysia

The mining and minerals industry has often been perceived as an industry where innovation and technological changes are implemented very slowly. Realizing the importance of technology which can change the way that we look at mineral deposits, JMG through Mineral Research Centre undertook R&D in mineral extraction, environmental impact, and rehabilitation. The research conducted in 2015 focused on acid mine drainage treatment techniques, as well as mine and quarry rehabilitation technology. Research was also conducted on local minerals in order to produce raw and value added materials for industrial use, and to develop suitable mineral processing and recycling technologies. In 2015, a patent was filed for one research finding, namely a Method for Recovery of Sulphide Minerals from Sulphide-containing Material, while one software, namely Quarry Particulate Pollution Index and Noise Software Volume 1.0.0 (Qpins V1.0.0), was filed under the category of copyright.

I would like to take this opportunity to express my gratitude to the Ministry of Natural Resources and Environment for the support and trust accorded to JMG. I would also like to express my deep appreciation to the staff of JMG for their commitment and contributions, as well as to other government agencies, public higher educational institutions, and the private sector for their support and close co-operation in JMG's activities.

Profil Korporat
Corporate Profile

Profil Korporat
Corporate Profile

Visi

Peneraju pembangunan mineral dan geosains menjelang 2020

Misi

Menyumbang kepada peningkatan daya saing ekonomi negara dan kualiti hidup melalui penggunaan maklumat, perkhidmatan berkepakaran tinggi serta penyelidikan berkaitan mineral dan geosains yang efektif

Objektif Strategik

1. Memperkasa pengurusan modal insan dan kapasiti organisasi ke arah meningkatkan kecekapan penyampaian perkhidmatan

2. Memperkukuh keupayaan aktiviti mineral dalam eksplorasi, pembangunan dan promosi untuk memacu ekonomi negara

3. Memantap pelaksanaan perkhidmatan geosains berkepakaran tinggi ke arah pembangunan mampan yang menyumbang kepada kesejahteraan hidup dan pemeliharaan alam sekitar

4. Memperkukuh penyelidikan dan pembangunan (R&D) mineral untuk memajukan industri mineral negara

Vision

Leader in mineral and geoscience development by 2020

Mission

To contribute towards enhancement of the nation's economic competitiveness and quality of life through effective usage of mineral and geoscience information, specialised expert services and related research

Strategic Objectives

1. To strengthen the management of human capital and organisational capacity towards improving the efficiency of service delivery

2. To intensify the capability of mineral exploration, development and promotion activities to spearhead the national economy

3. To strengthen the implementation of specialised geoscience services towards sustainable development that contributes to the well-being of mankind and conservation of environment

4. To intensify research and development (R&D) on minerals for increased growth and advancement in the nation's mineral industry

Objektif

- Menyediakan maklumat komoditi mineral bagi meningkatkan pertumbuhan industri berasaskan mineral
- Menggalakkan penggunaan optimum maklumat dan perkhidmatan geosains bagi pembangunan negara yang mapan
- Memastikan perusahaan sumber mineral berkembang secara teratur, selamat, cekap dan mesra alam serta mendatangkan pulangan yang maksimum kepada negara
- Menggalak dan mempelbagai penggunaan sumber mineral tempatan bagi menyumbang kepada pembangunan sektor perindustrian negara melalui aktiviti-aktiviti penyelidikan dan pembangunan (R&D)
- Menyediakan perkhidmatan kepakaran dalam bidang mineral, geosains dan perlombongan di peringkat nasional dan antarabangsa bagi menggalakkan pelaburan dalam sektor mineral dan perancangan pembangunan negara

Objectives

- To provide mineral commodity information to enhance the growth of mineral-based industries
- To encourage the optimal use of geoscience information and services for the sustainable development of the country
- To ensure that mineral resources are exploited in a systematic, safe, efficient and environmentally friendly manner as well as to secure their maximum returns to the country
- To encourage and diversify the use of local mineral resources so as to contribute towards the development of the country's industrialisation through research and development (R&D) activities
- To provide expert services in the fields of mineral, geoscience and mining at national and international levels so as to promote investments in the mineral sector and for national development planning

Fungsi

- Mengendali eksplorasi mineral secara sistematik
- Mengendali penyiasatan pelbagai bidang geosains seperti pemetaan geologi, sumber air tanah, geologi kejuruteraan, bencana geologi, geologi alam sekitar, geologi marin, geofizik, dan bidang-bidang geosains lain secara sistematik
- Menyedia perkhidmatan analisis geokimia dan ujian fizikal bahan batuan dan mineral
- Bertindak sebagai bank data nasional bagi semua maklumat berkaitan dengan geosains dan sumber mineral negara
- Mengumpul, menganalisis dan menyebarkan data dan maklumat berkaitan eksplorasi mineral, perlombongan dan aktiviti yang berkaitan
- Menyedia perkhidmatan nasihat teknikal dan kepakaran dalam bidang mineral, geosains, perlombongan dan pengkuarian
- Membantu dan bekerjasama dengan pihak swasta dan industri dalam usaha pembangunan sektor mineral
- Menentukan supaya aktiviti perlombongan mineral serta aktiviti lain yang berkaitan dengannya dijalankan dengan cara yang selamat, cekap dan sistematik
- Melaksana dasar dan arahan Kerajaan berhubung dengan industri mineral dan geosains, disamping mentadbir dan menguatkuasakan undang-undang yang berkaitan
- Menjalankan penyelidikan dan pembangunan (R&D), pemindahan teknologi, pembangunan sumber mineral serta mempromosi hasil penyelidikan supaya digunapakai oleh pihak industri

Functions

- To undertake systematic mineral exploration
- To undertake systematic investigations in various geoscience disciplines such as geological mapping, groundwater resources, engineering geology, geological hazards, environmental geology, marine geology, geophysics, and others
- To provide geochemical analyses and physical tests on rock materials and minerals
- To act as the national depository for all information related to geoscience and mineral resources of the country
- To collect, analyse and disseminate data and information pertaining to mineral exploration, mining and related activities
- To provide technical advisory and expertise services in the fields of mineral, geoscience, mining and quarrying
- To assist and co-operate with the private sector and industry to develop further the mineral sector
- To ensure that mining of minerals and related activities are carried out safely, efficiently and systematically
- To implement government policies and directives with regards to the mineral industry and geoscience, besides administration and enforcement of regulations
- To carry out research and development (R&D), technology transfer, mineral resources development and promotion of research products so that they are acceptable to the industry

Piagam Pelanggan

Maklumat Mineral dan Geosains

- Membekalkan laporan geologi (termasuk peta), mineral dan bidang-bidang geosains lain yang telah diterbitkan dan sedia ada, dalam masa 1 hari selepas permohonan diterima
- Membekalkan laporan dan peta geologi, mineral dan bidang-bidang geosains lain yang belum diterbitkan dan sedia ada, dalam masa 1 minggu selepas permohonan diterima
- Membekalkan maklumat berdigit sedia ada dalam masa 3 hari selepas permohonan diterima

Perkhidmatan Kepakaran

- Menyediakan perkhidmatan kepakaran apabila diminta dalam rangka masa yang ditetapkan atau dipersetujui bersama dengan pelanggan, terutamanya bagi bidang-bidang:
  - Pemetaan geologi
  - Siasatan mineral
  - Siasatan air tanah
  - Siasatan geofizik
  - Geologi marin
  - Siasatan geologi kejuruteraan
  - Siasatan geologi alam sekitar

Perkhidmatan Makmal

- Menyediakan perkhidmatan makmal apabila diminta bagi bidang berikut:
  - Analisis mineralogi dan petrologi
  - Analisis geokimia sampel bijih, mineral, aloi, batuan, kelodak, konsentrat, tanih dan air
  - Ujian mineral perindustrian
  - Ujian sedimentologi
  - Ujian geologi kejuruteraan

  dalam tempoh yang dipersetujui, sekiranya mandatori, atau jika rutin, dalam tempoh 2 minggu selepas sampel diterima

Clients Charter

Mineral and Geoscience Information

- To supply available and published geological (including maps), mineral and other geoscience reports within 1 day upon receipt of request
- To supply available but unpublished geological maps, mineral and other geoscience reports within 1 week upon receipt of request
- To supply available digital information within 3 days upon receipt of request

Expert Services

- To provide expert services upon request, within the time frame stipulated or mutually agreed upon with the client, especially in the fields of:
  - Geological mapping
  - Mineral investigation
  - Groundwater investigation
  - Geophysical investigation
  - Marine geology
  - Engineering geology investigation
  - Environmental geology investigation

Laboratory Services

- To provide laboratory services upon request for:
  - Mineralogical and petrological analyses
  - Geochemical analyses of ores, minerals, alloys, rocks, silts, concentrates, rocks and water samples
  - Industrial mineral tests
  - Sedimentological tests
  - Engineering geology tests

  within the time frame stipulated or mutually agreed upon with the client if it is mandatory, or within 2 weeks if it is routine, upon receipt of samples

Perkhidmatan Perlombongan dan Pengkuarian

- Mengeluarkan Lesen Melombong atau Lesen Kuari dalam tempoh 30 hari dari tarikh penerimaan permohonan yang lengkap
- Menyediakan laporan-laporan teknikal yang tepat dan lengkap berkaitan dengan kepentingan perlombongan, dalam tempoh 30 hari dari tarikh penerimaan permohonan yang disertakan dengan dokumen-dokumen yang lengkap

Perkhidmatan Dagangan Mineral

- Memberi ulasan ke atas permohonan untuk mengeksport mineral dalam tempoh 5 hari dari tarikh penerimaan permohonan yang disertakan dengan dokumen-dokumen yang lengkap
- Mengeluarkan Lesen Bijih Mineral dalam tempoh 30 hari dari tarikh penerimaan permohonan yang lengkap
- Mengeluarkan dan membaharukan permit pengangkutan konsentrat timah dalam tempoh 1 jam

Mining and Quarrying Services

- To issue Mining Licences or Quarrying Licences within 30 days upon receipt of duly completed application forms
- To prepare comprehensive technical reports relating to mining interest within 30 days upon receipt of application supported by duly completed documents

Mineral Commerce Services

- To provide comments on mineral export applications within 5 days upon receipt of applications accompanied by duly completed documents
- To issue Mineral Ore Licences within 30 days upon receipt of duly completed application forms
- To issue and renew permits for transportation of tin concentrates within 1 hour

Dasar Kualiti

Jabatan Mineral dan Geosains Malaysia komited untuk memastikan produk dan perkhidmatannya sentiasa memenuhi keperluan pelanggan. Untuk mencapai matlamat ini, pengurusan jabatan serta seluruh warga JMG adalah komited untuk:

- Melaksanakan sistem kualiti berdasarkan kepada keperluan MS ISO 9002;
- Memastikan bahawa produk dan perkhidmatan tepat pada masanya;
- Memastikan bahawa peningkatan kualiti dilaksanakan secara berterusan;
- Membina pasukan kerja yang kuat, responsif dan mempunyai etika kerja yang positif, dan
- Meningkatkan pengetahuan dan kemahiran melalui latihan.

Quality Policy

The Minerals and Geoscience Department Malaysia is committed to ensuring customer satisfaction in its products and services. To achieve this goal, the JMG management as well as the constituents are committed to:

- Implementing a quality system based on MS ISO 9002 qualifications;
- Ensuring that datelines are met in both products and services;
- Continuance of quality improvement is implemented;
- Building of a strong and responsive work force with positive work ethics, and
- Development of knowledge and skills through training.

Pengurusan Tertinggi
Top Management

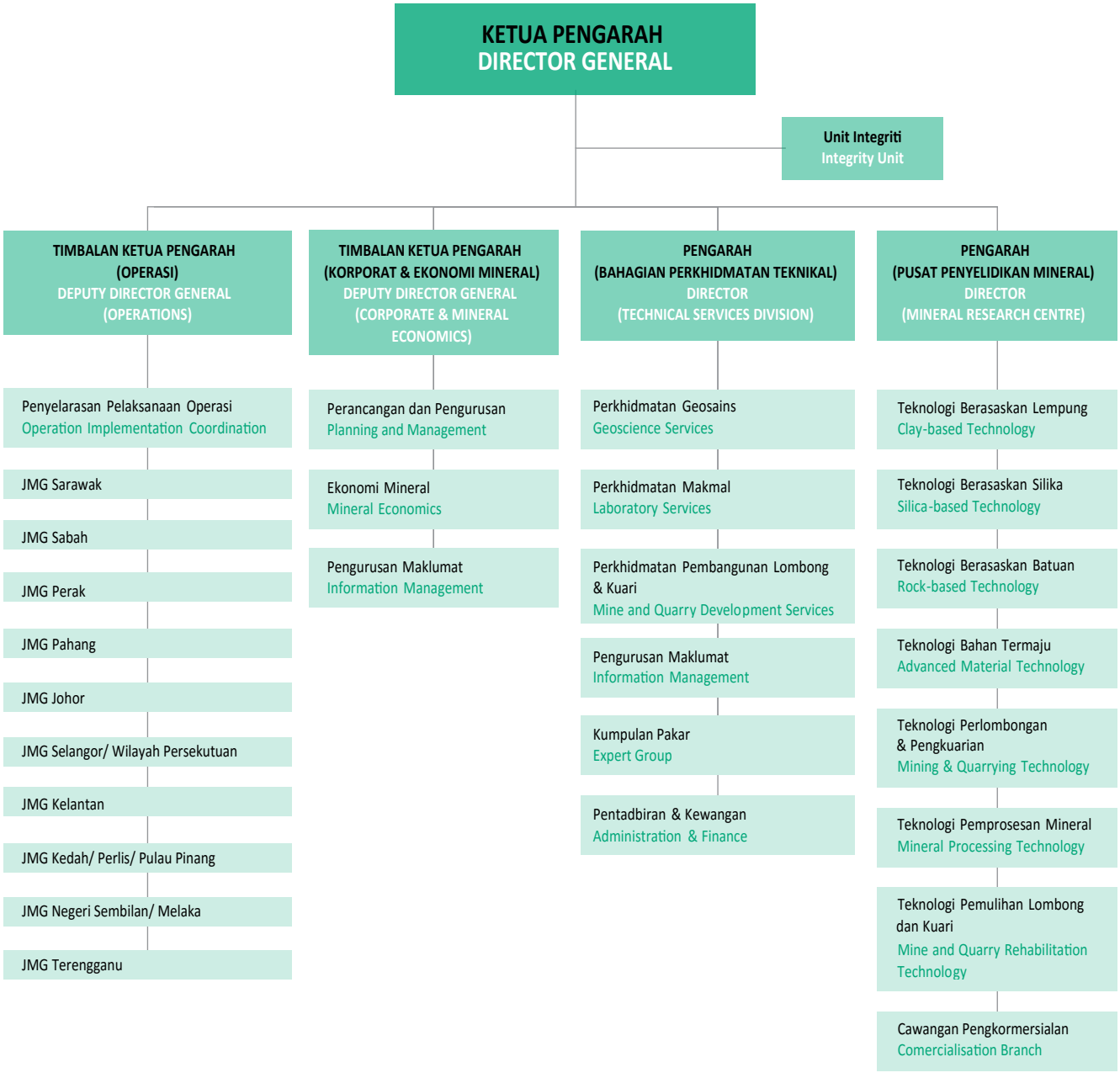
1. **Mior Sallehhuddin Mior Jadid**
   (Ketua Pengarah; dari 28 September 2015)
   (Director General; from 28 September 2015)

2. **Dr. Vijayan A/L V.V. Rajan**
   (Timbalan Ketua Pengarah – Operasi; dari 28 September 2015)
   (Deputy Director General – Operations; from 28 September 2015)

3. **Shahar Effendi Abdullah Azizi**
   (Timbalan Ketua Pengarah – Korporat dan Ekonomi Mineral; dari 28 September 2015)
   (Deputy Director General – Corporate and Mineral Economics; from 28 September 2015)

4. **Dr. Kamaludin Hassan**
   (Pengarah – Bahagian Perkhidmatan Teknikal)
   (Director – Technical Services Division)

Carta Organisasi
Organisation Chart



Hal Ehwal Korporat
Corporate Affairs

Hal Ehwal Korporat
Corporate Affairs

Kewangan

Financial

Perbandingan peruntukan dan perbelanjaan mengurus 2011-2015
Comparison of recurrent allocation and expenditure 2011-2015

Tahun Year	Peruntukan Allocation (RM)	Perbelanjaan Expenditure (RM)	%
2011	58,743,900.00	58,570,135.00	99.70
2012	62,093,912.00	62,093,911.00	99.99
2013	63,390,568.00	63,387,855.00	99.99
2014	68,555,484.40	68,529,659.17	99.96
2015	66,931,910.00	64,911,225.24	96.98

Perbandingan peruntukan dan perbelanjaan pembangunan 2011-2015
Comparison of development allocation and expenditure for 2011-2015

Tahun Year	Peruntukan Allocation (RM)	Perbelanjaan Expenditure (RM)	%
2011	5,544,010.00	5,251,252.00	94.72
2012	10,234,000.00	10,195,509.00	99.62
2013	8,765,700.00	8,761,881.00	99.95
2014	32,774,728.00	30,499,351.23	93.06
2015	31,519,300.00	31,513,496.01	99.98

Sumber Manusia

Human Resource

Status perjawatan tahun 2015
Staffing status 2015

Kumpulan perkhidmatan Group of service	Bil. jawatan diisi No. of filled posts	Bil. jawatan belum diisi No. of vacant posts	Jumlah Total
Pengurusan Tertinggi Top Management	4	1	5
Pengurusan & Profesional (Gred 41-54) Management & Professional (Grade 41-54)	282	41	323
Kumpulan Pelaksana I (Gred 17- 40) Implementers I (Grade 17 - 40)	501	72	573
Kumpulan Pelaksana II (Gred 1-16) Implementers II (Grade1-16)	167	24	191
Jumlah Keseluruhan / Grand Total	**954**	**138**	**1092**

Pembangunan Sumber Manusia

Program Latihan Dalam Jabatan

Sebanyak 323 program latihan dalam Jabatan melibatkan kursus, bengkel, taklimat, seminar, persidangan dan ceramah telah dilaksanakan oleh semua pejabat sepanjang 2015. Seramai 9774 peserta telah menghadirinya. Sebahagian besar daripadanya merupakan program yang terdapat dalam takwim latihan yang dirancang.

Human Resource Development

In-HouseTraining Programme

A total of 323 in-house training programmes involving courses, workshops, briefings and seminars were conducted during 2015. A total of 9774 participants were involved in these programmes. Most of these programmes were scheduled in the planned training calendar.

Program latihan dalam tahun 2015
Training programmes in 2015

Program latihan Training programme	Dalam jabatan In-house	Luar jabatan External	Luar negara Overseas	Jumlah Total
Sumber Mineral / Mineral Resources	11	4	6	21
Geosains / Geoscience	67	73	38	178
Lombong & Kuari / Mine & Quarry	17	14	8	39
Kimiabumi / Geochemistry	15	5	-	20
Penyelidikan / Research	19	10	2	31
Pengurusan Maklumat Information Management	14	41	4	59
Pengurusan Sumber Manusia Human Resource Management	90	109	1	200
Pengurusan Kewangan Financial Management	9	56	-	65
Pembangunan Kendiri / Self Development	26	106	1	133
Kualiti & Produktiviti Quality & Productivity	8	19	-	27
Kursus Wajib / Compulsory Course	-	2	-	2
Bahasa & Komunikasi Language & Communication	2	11	-	13
Lain - lain / Others	45	140	-	185
Jumlah / Total:	**323**	**590**	**60**	**973**

Pengajian ijazah lanjutan sesi 2015/ 2016
Post-graduate for session 2015/ 2016

Bil. No.	Nama pegawai Name of officer	Universiti University	Bidang pengajian Field of study
1	Suzannah Akmal	Dalam Negara	Penderiaan Jauh
2	Mohd. Shahrizal Mohamed Sharifodin	Dalam Negara	Geofizik
3	Muhammad Mustadza Mazni	Dalam Negara	Geologi Kejuruteraan
4	Muhammad Umar Sarimal	Dalam Negara	Pemetaan Geologi

18-21.05.2015
Capacity Building on Geohazard: Light Detection and Ranging (LiDAR) Technology in Landslide Hazards and Risk Assessment at Cameron Highlands, Pahang

Program Latihan Luar Jabatan (Tempatan)

Sebanyak 590 kursus, bengkel dan seminar telah dihadiri oleh 2410 kakitangan Jabatan. Program ini melibatkan agensi penganjur seperti NRE, INSTUN, INTAN, INTIM, JPM, AKAUNTAN NEGARA, INSPIN, AKADEMI SAINS, MIMA, USM, UM, FRIM, JAKIM, JANM, JPA, SUK, NAHRIM, LPPKN, SIRIM, UNIMAS, LHDN, USM, UTP, IGM, IKM, MQA, RTM dan lain-lain.

External Training Programme (Local)

A total of 590 courses, workshops and seminars were attended by a total of 2410 participants. These programmes involved organising agencies such as NRE, INSTUN, INTAN, INTIM, JPM, AKAUNTAN NEGARA, INSPIN, AKADEMI SAINS, MIMA, USM, UM, FRIM, JAKIM, JANM, JPA, SUK, NAHRIM, LPPKN, SIRIM, UNIMAS, LHDN, USM, UTP, IGM, IKM, MQA, RTM and others.

Program Latihan Luar Negara

Sebanyak 60 program latihan, mesyuarat dan lawatan di luar negara iaitu ke Singapura, Vietnam, Indonesia, Thailand, Laos, Cambodia, China, Jepun, India, Korea Selatan, USA dan Afrika Selatan telah dianjurkan oleh APEC, ASOMM, Perak MB Inc, KIGAM, AMMIN, GAI, CCOP, JPA, Geological Survey of China dan pelbagai agensi luar negara. Seramai 111 anggota jabatan telah mengikuti program ini.

Overseas Training Programme

A total of 60 training programmes, meetings and overseas visits to Singapore, Vietnam, Indonesia, Thailand, Laos, Cambodia, China, Japan, India, South Korea, USA and South Africa were organised by the APEC, ASOMM, Perak MB Inc, KIGAM, AMMIN, GAI, CCOP, JPA, Geological Survey of China and other overseas agencies. A total of 111 staff of the department attended these programmes.

12.01.2015–06.03.2015

Centre for Science and Technology of the Non-Aligned and Other Developing Countries – Department of Science & Technology (NAM S&T-DST) Fellowship Training on Minerals Processing and Beneficiation, MINTEK, South Africa

20-25.09.2015

Workshop on Multipurpose Utilization Technology of Low Grade Bauxite for ASEAN Countries, Nanning, China

05-09.10.2015

Developing Effective Performance Management, Reward and Retention Strategies in Royal Institute of Public Administration (RIPA), London, England

Peserta kursus dari pelbagai negara
Participants from various countries

Sesi perbincangan dan latihan dalam kumpulan
Discussions and group exercises

16-27.11.2015

Leadership Development Programme (LDP) 2015 organized by National Institute of Public Administration (INTAN) Malaysia, Civil Service Institute Brunei and Civil Service College (CSC) Singapore

16-27.11.2015
Program latihan pegawai penyelidik 'International Networking for Coal Industry Activation', Korea
Training program for research officer on International Networking for Coal Industry Activation, Korea

Pengurniaan dan Kepujian Awards and Accolades

Penerima pingat darjah kebesaran
Recipients of honorary titles and awards

Bil. No.	Nama Pegawai Name of Officer	Jawatan Position	Pejabat Office	Pingat Darjah Kebesaran Medal Decoration
1	Azhari Ahmad	Pegawai Geosains Gred C54	BPT, Ipoh	Darjah Ahli Mahkota Perak (A.M.P)
2	Mohamad Zainudin Abdullah	Penolong Jurutera Gred JA29	PPM, Ipoh	Pingat Pekerti Terpilih (P.P.T.)

Penerima anugerah perkhidmatan cemerlang tahun 2015 (Tahun Penilaian: 2014)
Recipients of excellent service award 2015 (Year of Assessment: 2014)

	Ibu Pejabat / Headquarters	
1.	Mohd Badzran bin Mat Taib	Pegawai Geosains Gred C52
2.	Tan Teong Ming	Pegawai Teknologi Maklumat Gred F48
3.	Nightingale Lian Marto	Pegawai Geosains Gred C41
4.	Hajiah binti Moslini	Setiausaha Pejabat Gred N27
5.	Farah Lisa binti Ghazali	Setiausaha Pejabat Gred N27
6.	Ab Razak bin Ismail	Pembantu Geosains Gred C26
7.	Hamidah binti Abd. Hamid	Pembantu Tadbir (P/O) Gred N22
8.	Shahrida binti Ahmad Basri	Pembantu Tadbir (P/O) Gred N17
9.	Vijaya Rani Naidu A/P Perumal Naidu	Pembantu Tadbir (Kew) Gred W17

Bahagian Perkhidmatan Teknikal / Technical Services Division		
10.	Mohd Zaidi bin Mohd Hasan	Pegawai Geosains Gred C52
11.	Abdullah bin Sulaiman	Pegawai Geosains Gred C48
12.	Mohd Zahar bin Ibrahim	Pegawai Geosains Gred C41
13.	Mayzura binti Odin	Penolong Pegawai Teknologi Maklumat Gred F29
14.	Mohd Rizal bin Jasmin	Penolong Pegawai Geosains Gred C27
15.	Zamrizum bin Jaafar	Penolong Jurutera Gred Ja29
16.	Ahmad Ismail bin Nazri	Pembantu Tadbir (P/O) Gred N22
17.	Ragimi bin Othman	Pembantu Geosains Gred C22
18.	Zuliana binti Tukiar	Pembantu Tadbir (P/O) Gred N17
19.	Ahmad Jefry bin Othman	Pembantu Geosains Gred C17
20.	Mohd Sariman bin Md Darus	Pembantu Geosains Gred C17
21.	Saiful Baharil bin Abu Bakar	Pembantu Operasi Gred N11
22.	Zainun Aziz bin Ab. Rahman	Pembantu Awam Gred H11
23.	Mohamad Bistare bin Kamaruddin	Pemandu Kenderaan Gred H11
Pusat Penyelidikan Mineral / Mineral Research Centre		
24.	MD. Muzayin bin Alimon	Pegawai Penyelidik Gred Q54
25.	Siti Mazatul Azwa binti Saiyed Mohd Nuruddin	Pegawai Penyelidik Gred Q44
26.	Faridah binti Yahya	Pembantu Penyelidik Gred Q26
27.	Hasnita binti Mat Isa	Penolong Pegawai Tadbir Gred N32
28.	Renuka A/P Arjunan	Pembantu Tadbir (Kew) Gred W17
29.	Suaid bin Abdullah	Pembantu Penyelidik Gred Q22
30.	Addawiyah binti Md Salleh	Pembantu Awam Gred H11
31.	Shaifol Bahari bin Mat Misir	Pembantu Operasi Gred N11
32.	Ramlee bin Bador @ Rasiman	Pemandu Kenderaan Gred H11
JMG Kedah/ Perlis/ Pulau Pinang		
33.	Badrol bin Mohamad	Pegawai Geosains Gred C44
34.	Azihan bin Mat Arshad	Pegawai Geosains Gred C41
35.	Iskandar Shah Win bin Abdullah	Pembantu Tadbir (P/O) Gred N17
36.	Mohamad Hasmuni bin Hj Md Sukor	Pegawai Khidmat Pelanggan Gred N17

	JMG Perak	
37.	Suzannah binti Akmal	Pegawai Geosains Gred C44
38.	Othman Kangsar	Pegawai Geosains Gred C44
39.	Khairudin Mohamed Tahir	Pembantu Geosains Gred C17
40.	Mohd Rodzi bin Mat Saman	Pembantu Geosains Gred C17
41.	Sharmizah binti Aniza	Pembantu Tadbir (Kew) Gred W17
	JMG Selangor/ Wilayah Persekutuan	
42.	Mazatul Akmar binti Aros	Pegawai Geosains Gred C44
43.	Azira bin Ramley	Pembantu Tadbir (P/O) Gred N17
44.	Mohd Fadzli bin Tajudin Noor	Pembantu Geosains Gred C17
	JMG Negeri Sembilan/ Melaka	
45.	Muhammad Fawwaz bin Zainal Abedin	Pegawai Geosains Gred C41
46.	Siti Haslinda binti Abdul Wahid	Penolong Pegawai Tadbir Gred N27
47.	Muhd Khaddi bin Abdullah	Pembantu Geosains Gred C17
48.	Sunardi bin Baharuddin	Pembantu Awam Gred H11
	JMG Johor	
49.	Muhammad Hazli bin Mohamed Hanapi	Pegawai Geosains Gred C44
50.	Rosmazura binti Yunus	Pembantu Tadbir (Kewangan) Gred W17
51.	Nik Mohd Fikri bin Mhd Nor	Pembantu Geosains Gred C17
52.	Mohamad Hafiza'al bin Mohamad Ali	Pembantu Awam Gred H11
	JMG Pahang	
53.	Afandi bin Muda	Pegawai Geosains Gred C48
54.	Nazelan bin Md Yusof	Pembantu Geosains Gred C22
55.	Azizul bin Ali	Pembantu Operasi Gred H11
56.	Mohd Nazri bin Rosli	Pembantu Awam Gred H11
	JMG Terengganu	
57.	Razaidi Shah bin A Kadir	Pegawai Geosains Gred C41
58.	Faridah binti Mat Amin	Pembantu Geosains Gred C17
59.	Siti Fatimah binti Mat Ali	Pembantu Tadbir (Kew) Gred W17
60.	Ramli bin Awang	Pemandu Kenderaan Gred H11

	JMG Kelantan	
61.	John anak Joseph Jinap	Pegawai Geosains Gred C44
62.	Azliyah binti Che Long	Penolong Pegawai Tadbir Gred N27
63.	Muhammad Nur Hafiz bin Ali	Pembantu Geosains Gred C17
	JMG Sarawak	
64.	Jaithish John	Pegawai Geosains Gred C48
65.	Rengga anak Gendang	Pegawai Geosains Gred C44
66.	Salehuddin bin Mohamad	Pegawai Geosains Gred C44
67.	Balachandar a/l Subramaniyan	Pegawai Geosains Gred C44
68.	Mohd Shafri bin Mahzan	Penolong Pegawai Geosains Gred C27
69.	Micheal Lim	Pembantu Geosains Gred C17
70.	Abang Nor Zandaria bin Abang Drahman	Pembantu Geosains Gred C22
71.	Azlina binti Madihi	Penolong Juruukur Gred JA29
72.	Charlie anak Muding	Pembantu Tadbir (Kew) W22
73.	Shuib bin Luwi	Pembantu Operasi H11
74.	Mohd Sabri bin Ismail	Pemandu Kenderaan H11
	JMG Sabah	
75.	Hillary Muyan Nicholas Thomas	Pegawai Geosains Gred C48
76.	Frederick Francis Tating	Pegawai Geosains Gred C48
77.	Mison bin Ajum	Pegawai Geosains Gred C41
78.	Mulia binti Pog	Pembantu Geosains Gred C22
79.	Ali Akbar bin Amil Hassan	Pembantu Geosains Gred C17
80.	Suriani binti Ramlee	Pembantu Perpustakaan Gred S22
81.	Winnie Juakim	Pembantu Tadbir (P/O) Gred N17
82.	Richard Untuhan	Pemandu Kenderaan Gred H11

Pelawat Luar Negara

17.03.2015
Lawatan Dr. Ashok Nandi, wakil dari International Bauxite, Alumina & Aluminum Society (IBAAS), India
Visit of Dr. Ashok Nandi, representative from IBAAS, India

05.06.15
Lawatan wakil dari Aakash Business Consultants India berkaitan perlombongan pasir pantai di Malaysia
Visit of representatives from Aakash Business Consultants of India regarding beach sand mining in Malaysia

Overseas Visitors

26.03.2015
Lawatan wakil dari Russian Aluminium (RUSAL), Rusia berkaitan bauksit
Visit of representatives from RUSAL, Russia regarding bauxite

15.09.2015
Lawatan delegasi European Union berhubung "Conflict Minerals"
Visit of delegation from European Union regarding "Conflict Minerals"

Kerjasama Antarabangsa

Penyiasatan Geologi Bersama Sempadan Malaysia-Thailand (MT-JGS)

International Cooperation

Malaysia-Thailand Border Joint Geological Survey (MT-JGS)

23-27.02.2015

Bengkel Kajian dan Pengurusan Dinosaur, Khon Kaen, Kalasin dan Nakhon Ratchasima, Thailand

Workshop on Dinosaur Investigation and Management, Khon Kaen, Kalasin and Nakhon Ratchasima, Thailand

Photo: Mat Niza Abdul Rahman

Lawatan ke makmal dinosaur di Muzium Dinosaur Sirindhon, Kalasin, Thailand

Visit to dinosaur laboratory of the Dinosaur Museum, Kalasin, Thailand

Photo: Mat Niza Abdul Rahman

Latihan persampelan fosil tulang dinosaur di Nakhon Ratchasima, Thailand

Training on sampling of dinosaur bone fossil in Nakhon Ratchasima, Thailand

23-28.03.2015

Mesyuarat Kumpulan Kerja Penyiasatan Geologi Bersama Sempadan Malaysia-Thailand Bil. 1/2015, Surat Thani, Thailand

The Malaysia-Thailand Border Joint Geological Survey Working Group Meeting No. 1/2015, Surat Thani, Thailand

Photo: Mat Niza Abdul Rahman

Photo: Mat Niza Abdul Rahman

26-31.05.2015

Mesyuarat Penyuntingan Kumpulan Kerja Penyiasatan Geologi Sempadan Malaysia-Thailand, Satun, Thailand

Malaysia-Thailand Border Joint Geological Survey Working Group Joint Editorial Meeting, Satun, Thailand

Photo: Mat Niza Abdul Rahman

Photo: Mat Niza Abdul Rahman

01-04.06.2015

Kerja Lapangan Bersama Kumpulan Kerja Penyiasatan Geologi Sempadan Malaysia-Thailand, dari Kuala Perlis, Perlis hingga Jeli, Kelantan

Malaysia-Thailand Border Joint Geological Survey Working Group Joint Field Check, from Kuala Perlis, Perlis to Jeli, Kelantan

Photo: Mat Niza Abdul Rahman

Kerja lapangan di Kampung Bersia, Gerik, Perak

Field check at kampung Bersia, Gerik, Perak

Photo: Mat Niza Abdul Rahman

Kerja lapangan di Sungai Golok, Kelantan

Field check at Sungai Golok, Kelantan

02.08. 2015

Kerja lapangan pasca Persidangan Geosains Kebangsaan 2015 di Bukit Panau, Tanah Merah, Kelantan

Post-National Geoscience Conference 2015 field excursion at Bukit Panau, Tanah Merah, Kelantan

Photo: Mat Niza Abdul Rahman

Photo: Mat Niza Abdul Rahman

Perbincangan di lapangan dengan pakar stratigrafi Thailand, Dr. Assanee Meesook

Field discussion with Thailand stratigraphy expert Dr. Assanee Meesook

25.08.2016

Mesyuarat Kumpulan Kerja Penyiasatan Geologi Bersama Sempadan Malaysia-Thailand Bil. 2/2015, Taiping, Perak

Malaysia-Thailand Border Joint Geological Survey Working Group Meeting No. 2/2015, Taiping, Perak

Photo: Mohd Hafiz Mohd Alwi

Photo: Mohd Hafiz Mohd Alwi

Ahli Mesyuarat Kumpulan Kerja Malaysia-Thailand

Members of the Malaysia-Thailand Working Group Meeting

26.08.2015

Mesyuarat Ke-12 Jawatankuasa Penyiasatan Geologi Bersama Sempadan Malaysia-Thailand (MT-JGSC), Taiping, Perak

12th Malaysia-Thailand Border Joint Geological Survey Committee (MT-JGSC) Meeting, Taiping, Perak

Photo: Mohd Hafiz Mohd Alwi

Ketua Pengarah JMG, Dato' Yunus Abd Razak, menyampaikan ucapan

JMG's Director General, Dato' Yunus Abd Razak, delivering his speech

Photo: Mohd Hafiz Mohd Alwi

Pertukaran dokumen mesyuarat antara Dato' Yunus Abd Razak dan En. Supot Jemsawatdipong

Exchange of meeting documents between Dato' Yunus Abd Razak and Mr. Supot Jemsawatdipong

Photo: Mohd Hafiz Mohd Alwi

Ahli mesyuarat

Members of the meeting

Photo: Mohd Hafiz Mohd Alwi

Dato' Yunus Abd Razak dan En. Supot Jemsawatdipong mempengerusikan mesyuarat

Dato' Yunus Abd Razak and Mr. Supot Jemsawatdipong co-chaired the meeting

Kerjasama Teknikal dan Saintifik Malaysia – Indonesia dalam bidang geologi dan sumber mineral

Malaysia – Indonesia Scientific and Technical Co-operation in the field of geology and mineral resources

10-15.08.2015
Mesyuarat Kumpulan Kerja Teknikal 2 (TWG2) Sumber Mineral dan Tenaga di Kundasang, Sabah
Meeting of the Mineral and Energy Resources Technical Working Group 2 (TWG2) at Kundasang, Sabah

27-30.10.2015

Mesyuarat Kumpulan Kerja Teknikal Tahunan dan Mesyuarat Jawatankuasa Pemandu Ke-6 di Bali, Indonesia
Annual Technical Working Group Meeting and the 6th Steering Committee Meeting, Bali, Indonesia

Kumpulan Kerja Teknikal 1 (TWG1) Korelasi Geologi
Geological Correlation Technical Working Group 1 (TWG1)

Mesyuarat Tahunan Kumpulan Kerja Teknikal 3 (TWG3) Geohazard
Annual Meeting of the Technical Working Group 3 (TWG3) on Geohazard

11-15.11.2015
Bengkel pemetaan bencana dan risiko cerun menggunakan teknologi LiDAR di Cameron Highlands, Pahang
Workshop on slope hazard and risk mapping using LiDAR technology at Cameron Highlands, Pahang

Photo: Mat Niza Abdul Rahman

Photo: Mat Niza Abdul Rahman

Latih amal penggunaan alat *Terrestrial LiDAR System* (TLS)
Training on the use of Terrestrial LiDAR System (TLS) equipment

Photo: Mat Niza Abdul Rahman

Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP)

08–15.03.2015
CCOP-JMG Advanced Training in Geochemical Analysis - Base Metal by Inductive OES Couple Plasma Optical Emission Spectrometer (ICP-OES) and Gold by Fire Assay/ Cupellation Techniques, Kuantan, Pahang

22-25.06.2015
CCOP-Best Practices on Mine Rehabilitation and Decommissioning, Manila, Philippines

03.10.2015-13.11.2015

Course on Enhancement of Management Capacity for ASEAN Web-based Mineral Resources Database at Tsukuba, Japan and Phnom Penh, Cambodia

Peserta kursus di Japan Space Systems, Tokyo
Course participants at Japan Space Systems, Tokyo

Lawatan lapangan mengenai Korelasi Geologi di Kemboja
Field trip on Geology Correlation in Cambodia

ASEAN Senior Officials Meeting on Minerals (ASOMM), ASOMM + 3 Consultations, and ASEAN Ministerial Meeting on Minerals (AMMin)

4-6.8.2015

Mesyuarat Kumpulan Kerja ASOMM Ke-12 dan Mesyuarat Ke-2 Kumpulan Kerja Bersama Penyediaan AMCAP 2016 - 2025, Vientiane, Lao PDR

The 12th ASOMM Working Group Meeting and the 2nd ASOMM Joint Working Group Meeting on the preparation of AMCAP 2016 - 2025, Vientiane, Lao PDR

8-11.9.2015
Mesyuarat ASOMM Ke-15, ASOMM + 3 (China, Jepun, Korea) Ke-8, dan AMMin Ke-5, Vientiane, Lao PDR
The 15th ASOMM, the 8th ASOMM + 3 Consultations (China, Japan, Republic of Korea), and the 5th AMMin meetings, Vientiane, Lao PDR

Wakil Malaysia ke mesyuarat AMMin Ke-5
Malaysia representatives to the 5th AMMin meeting

Wakil menteri-menteri negara ASEAN ke mesyuarat AMMin Ke-5
Representative of ministers from ASEAN countries to the 5th AMMin meeting

Kerjasama Dalam Negara

National Cooperation

03.06.2015
Projek Flagship Torium bersama Agensi Nuklear Malaysia
Thorium Flagship Project together with the Malaysian Nuclear Agency

JMG Dalam Berita

28.03.2015: New Straits Times
Perlis bercadang mewartakan tapak fosil kayu
Perlis may gazette fossilised stem site

Mineral and Geoscience Department for Kedah, Perlis and Penang director ***Zainol Husin showing the 280 million-year-old fossilised stem*** *in Bukit Chondong yesterday.* **Pic by Eizairi Shamsudin**

Perlis may gazette fossilised stem site

BETTER PROTECTION: State govt seeks geoheritage status for Bukit Chondong

RJ SHAZWANI
PADANG BESAR
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ALTHOUGH it is the smallest state in the country, Perlis is expected to be the next popular destination among geoheritage enthusiasts following the discovery of the 280 million-year-old plant stem in Bukit Chondong here.

The fossilised stem, which was unearthed by paleontology researchers from the Mineral and Geoscience Department two years ago, dates back to the Permian period in the Palaeozoic era.

Mineral and Geoscience Department for Kedah, Perlis and Penang director Zainol Husin said the plant stem, which was as wide as an identity card and about 1m long was found inside the rock at the hill when the team was carrying out archeological research in the area.

"We are planning to propose to the state government to gazette the area as a geoheritage site to protect and conserve the site.

"Besides giving the opportunity to the public to have a closer look at the fossil for education and research purposes, the site also has huge potential for being the country's new tourism destination," he said during a tour of the site yesterday.

Apart from Bukit Chondong, Zainol said, the department was working on a proposal to have two other sites in the state — Utan Aji in Kangar and Gua Bukit Kubu in Kuala Perlis — gazetted as well.

A resident in Kampung Semadong said she was surprised to learn about the plant stem.

Suriani Ismail, 46, said the site used to be a huge hill before it was flattened about 20 years ago to make way for the development of a school, leaving some parts unattended, including the area where the plant stem is said to have been found.

"A million-year-old fossil found in our small village? You must be pulling my leg," she responded in disbelief when told about the discovery.

Suriani, who was born and raised in the village said it never crossed her mind that the hill which was her childhood playground in the 1980s would contain such precious and ancient remains.

Another villager, Nurzarina Darus, 41, said she was excited to learn about the discovery as she believed it would benefit everyone, especially the villagers.

JMG in the News

28.03.2015: Utusan Malaysia
Mineral bermutu ditemukan di Perlis
High grade mineral found in Perlis

Mineral bermutu ditemukan di Perlis

Oleh SHOLINA OSMAN
pengarang@utusan.com.my

■ KANGAR 27 MAC

JABATAN Mineral dan GeoSains Malaysia Kedah/Perlis/Pulau Pinang berjaya menemukan batu dolomit di utara negeri ini yang dikenalpasti paling bermutu sekali gus membolehkan Perlis kini mempunyai aset mineral bernilai tinggi bagaikan 'emas' jika dikomersialkan.

Pengarahnya, Zainol Husin berkata, dalam penemuan itu pihaknya mendapati jika dolomit itu diproses ia boleh menghasilkan sejenis bahan kimia 'Magnesium Oxide' (MgO) yang dijual di pasaran semasa dengan harga RM147 bagi setiap 100 gram berbanding sekarang dolomit mentah dijual dengan harga RM80 hingga RM120 setan.

"MgO mempunyai pasaran lebih besar termasuk pembuatan kaca, elektrik, farmaseutikal, perabot, makanan tambahan untuk ternakan dan sebagainya," katanya dalam sidang akhbar selepas merasmikan Kursus Pengenalan Kepada Mineral Perindustrian Untuk Kumpulan Pelaksana (Tahap Satu) di Hotel Putra Palace di sini hari ini.

Zainol berkata, sehingga kini simpanan dolomit di Perlis dalam anggaran sebanyak 600 juta tan dan paling besar di kawasan Felda Rimba Mas.

Beliau berkata, kualiti dolomit di Felda Rimba Mas juga setanding dengan dolomit di Jerman, Great Britain, Amerika Syarikat, India dan Sepanyol.

"Sehingga kini dolomit lebih popular untuk digunakan dalam bidang pertanian seperti untuk mengatasi tanah berasid dan jerlus serta pembuatan jalan dan juga batu blok dan sebagainya," katanya.

Beliau berkata, pihaknya akan membentangkan hasil penemuan itu kepada kerajaan negeri.

Tambahnya, sehingga kini kerajaan negeri menunjukkan minat dengan kejayaan penemuan tersebut.

Bagaimanapun katanya, keputusan terletak kepada kerajaan negeri ini untuk menjadikannya sebagai bentuk industri baharu yang boleh menarik pelabur ke negeri ini.

Zainol berkata, pihaknya telah menjalankan kajian ke atas dolomit itu sejak tahun 1985 dan dilakukan secara berperingkat sehingga Rancangan Malaysia Kesepuluh (RMK-10).

DOLOMIT

ZAINOL HUSIN menunjukkan hasil kajian Jabatan Mineral dan Geosains Malaysia Kedah/Perlis/Pulau Pinang mengenai penemuan dolomit bermutu tinggi di utara Perlis pada sidang akhbar di Hotel Putra Palace di Kangar.

01.04.2015: Berita Harian
Cengkerang 350 juta tahun ditemui di Perlis
Shells of 350 million years ago found in Perlis

NASIONAL

Cengkerang 350 juta tahun ditemui di Perlis

» Kawasan bakal diwarta, jadi tarikan pelancong

09.06.2015: Utusan Malaysia
Malaysia berisiko gempa bumi lebih besar
Malaysia at risk for higher magnitude earthquakes

Malaysia berisiko gempa bumi lebih besar

KUALA LUMPUR 8 JUN

GUNUNG Kinabalu dan Lahad Datu di Sabah berisiko mengalami gempa bumi lebih besar kerana berada di atas garisan sesar yang masih aktif.

Ketua Pengarah Jabatan Mineral dan Geosains, Datuk Yunus Abdul Razak berkata, berdasarkan kajian mendapati, lebih daripada 80 gempa bumi dengan skala antara 3.8 hingga 5.9 pada skala Richter berlaku sejak tahun 1897 hingga kini.

"Gempa bumi yang berlaku di Gunung Kinabalu pada Jumaat lalu merupakan gempa yang paling besar terjadi di negara ini dengan magnitud 5.9 apabila pusat gempanya berada sebaris dengan garis sesar aktif tersebut.

"Oleh itu, cadangan mewujudkan pusat khas untuk memantau gempa bumi wajar dilaksanakan agar pemantauan terhadap kelakuan dan pengerakan tanah di kawasan berisiko dapat dilakukan supaya dapat memberi amaran awal kepada kita," katanya ketika dihubungi Utusan Malaysia di sini hari ini.

YUNUS ABDUL RAZAK

Semalam, Tan Sri Muhyiddin Yassin mengarahkan agar sebuah pusat khas untuk memantau pergerakan atau gempa bumi perlu diwujudkan bagi mengesan sebarang kemungkinan bencana itu pada masa akan datang.

Timbalan Perdana Menteri mahu Jabatan Mineral dan Geosains mengkaji keperluan tersebut dengan melibatkan tenaga pakar dari dalam dan luar, khususnya pakar dari negara-negara yang selalu berdepan dengan gempa bumi seperti Jepun.

Menurut Yunus, beberapa langkah akan diambil dalam masa terdekat demi merealisasikan keperluan itu apabila beberapa cadangan serta langkah-langkah telah dikemukakan.

"Alat pengesanan gegaran gempa bumi seperti seismometer sebagaimana Jabatan Meteorologi laksanakan perlu ditambah lebih banyak bagi memantau kejadian itu dari semasa ke semasa.

"Selain itu, memandangkan kepakaran berkaitan pemantauan ada di negara jiran, maka ruang sedia ada melalui ASEAN akan digunakan bermula dengan negara Indonesia.

"Kita juga akan mengadaptasi sistem yang digunakan negara-negara yang berpengalaman berhadapan gempa bumi selain berbincang mengenai pengoperasian dan keperluan," katanya.

Sementara itu, Ketua Kumpulan Penyelidikan Kejuruteraan Seismologi dan Gempa Bumi Struktur, Universiti Teknologi Malaysia (UTM), Prof. Dr. Azlan Adnan berkata, Semenanjung Malaysia khususnya di Kuala Lumpur juga tidak terkecuali daripada mengalami gempa bumi kerana kebanyakan bangunan di Kuala Lumpur dibina berhampiran garisan sesar yang aktif.

28.04.2015: Sinar Harian
Tapak Geowarisan Kampung Padang Nyior, Kedah
Kampung Padang Nyior Geoheritage site, Kedah

Diisytihar tapak Geowarisan Kedah

Selepas terdapatnya peninggalan debu gunung berapi di kawasan Kampung Padang Nyior

Aktiviti Mineral
Mineral Activities

Aktiviti Mineral
Mineral Activities

Permintaan mineral dunia semakin meningkat berikutan penambahan penduduk dan mineral digunakan secara meluas dalam pelbagai aplikasi. Oleh itu, sebagai jabatan yang bertanggungjawab ke atas pengurusan sumber mineral negara, Jabatan Mineral dan Geosains Malaysia (JMG) komited untuk menyediakan maklumat pra-persaingan mineral untuk menyokong dan memudahkan aktiviti ekplorasi mineral, serta memberi khidmat nasihat berkenaan guna tanah dan pembebasan mineral kepada pihak berkuasa negeri, dan swasta.

Demand for minerals is increasing worldwide as population increases and minerals are used in a greater range of applications. Therefore, as the department responsible for the management of mineral resources of the country, Minerals and Geoscience Department (JMG) is committed to providing pre-competitive mineral information in support of and to facilitate mineral exploration activities, as well as provides advisory services pertaining to land use and mineral clearance to the state authorities, as well as the private sector.

Penilaian Sumber Mineral

Penilaian sumber mineral yang dijalankan oleh JMG melibatkan penilaian sumber mineral berlogam, mineral perindustrian, mineral tenaga, dan mineral strategik. Dari penilaian tersebut, sumber baharu bauksit, agregat batuan, andalusit, batu kapur, batuan silika, lempung, pasir dan kelikir, dan batu arang telah dikenal pasti.

Mineral Resource Evaluation

Mineral evaluation carried out by JMG involves resource evaluation for metallic, industrial, energy, and strategic minerals. From such evaluations, new deposits of bauxite, rock aggregate, andalusite, limestone, silica rock, clay, sand and gravel, and coal have been identified.

Mineral Berlogam

Penilaian sumber mineral berlogam melibatkan kajian peringkat tinjauan, susulan dan terperinci. Pada tahun 2015, kerja penilaian tinjauan sumber mineral berlogam telah dijalankan di tiga buah negeri iaitu Kedah, Perak dan Melaka dengan jumlah kawasan liputan seluas 310 km^2. Pada tahun yang sama, penilaian susulan/ terperinci sumber mineral berlogam telah dilaksanakan di enam buah negeri, iaitu Selangor, Johor, Pahang, Kelantan, Sarawak dan Sabah dengan jumlah kawasan liputan seluas 74 km^2. Simpanan bauksit (185,100 tan metrik) telah dikenal pasti di Johor. Anomali geokimia timah telah dikesan di Perak, manakala anomali pelbagai unsur geokimia telah dikenal pasti di Perak dan Selangor.

Kajian potensi sumber mineral Cadangan Projek Hidroelektrik Nenggiri Kelantan diteruskan pada tahun 2015. Projek ini merupakan usahasama dengan Tenaga Nasional Berhad (TNB) melibatkan persampelan geokimia dan pemetaan geologi terperinci.

Metallic Minerals

Metallic mineral resource evaluation involves initial reconnaissance, follow-up and detailed surveys. In 2015, reconnaissance evaluation for metallic mineral resources was carried out in three states, namely Kedah, Perak and Melaka covering a total area of 310 km^2. In the same year, follow-up/ detailed metallic mineral resource evaluation was carried out in six states, namely Selangor, Johor, Pahang, Kelantan, Sarawak and Sabah, covering a total area of 74 km^2. Reserves of bauxite (185,100 tonnes) have been identified in the state of Johor. Tin geochemical anomalies have been detected in the state of Perak, whereas multi-element geochemical anomalies have been detected in the state of Perak and Selangor.

Mineral resource potential study on the Proposed Nenggiri Hydroelectric Project in Kelantan was continued in year 2015. This is a joint project with Tenaga Nasional Berhad (TNB) that involved geochemical samplings and detailed geological mapping.

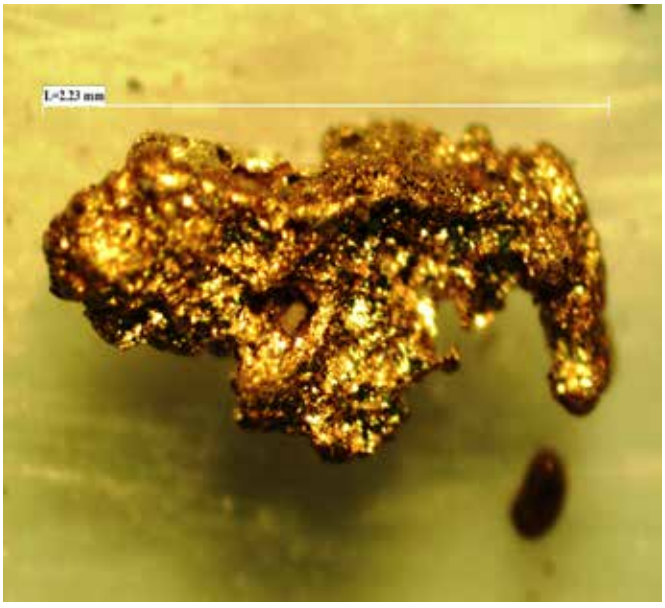
Penilaian sumber mineral berlogam (tinjauan)
Metallic mineral resources assessment (reconnaissance)

Komoditi Commodity	Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Timah Tin	Kedah	Sg. Bahoi Ulu Muda, Sik	142	Kandungan Sn yang tinggi dalam sampel kelodak dan konsentrat dulang. Pemineralan jenis telerang Sn-Sulfida dan skarn dijangka wujud berdasarkan kehadiran unsur-unsur bersekutu yang tinggi dan zon sentuhan antara batu kapur dan granit. High Sn content in silt and panned concentrate samples. Sn-sulphides vein type mineralisation and scarn were expected due to the presence of high content of associated elements and contact zones of limestones with granites.
		Sg. Mas, Baling	38	Kandungan Sn dan W yang tinggi dalam sampel kelodak dan konsentrat dulang. High content of Sn and W in the silt and panned concentrate samples.
	Perak	Lawin	80	Kandungan Sn berjulat dari 58 ppm hingga 394,700 ppm dalam sampel konsentrat dulang dan ia berjulat dari 0.5 ppm hingga 469 ppm dalam sampel kelodak. Tiga lokasi anomali timah, dan juga tiga lokasi anomali pelbagai unsur (As, Ba, Bi, Mo dan Pb) telah dikenal pasti. The content of Sn ranging from 58 ppm to 394,700 ppm in panned concentrate samples, and from 0.5 ppm to 469 ppm in silt samples. Three localities with tin anomalies and three localities with multi-element (As, Ba, Bi, Mo and Pb) anomalies have been delineated.
Bijih Besi Iron Ore	Melaka	Alor Gajah	50	Bijih besi dengan kandungan Fe berjulat dari 26.8% hingga 62.67%. Dua kawasan telah dicadangkan untuk kajian susulan. Iron ore with Fe content ranging from 26.8% to 62.67%. Two areas have been proposed for follow-up study.
Jumlah Liputan: **Total Coverage:**			**310**	

Penilaian sumber mineral berlogam (susulan/ terperinci)
Metallic mineral resources assessment (follow-up/ detailed)

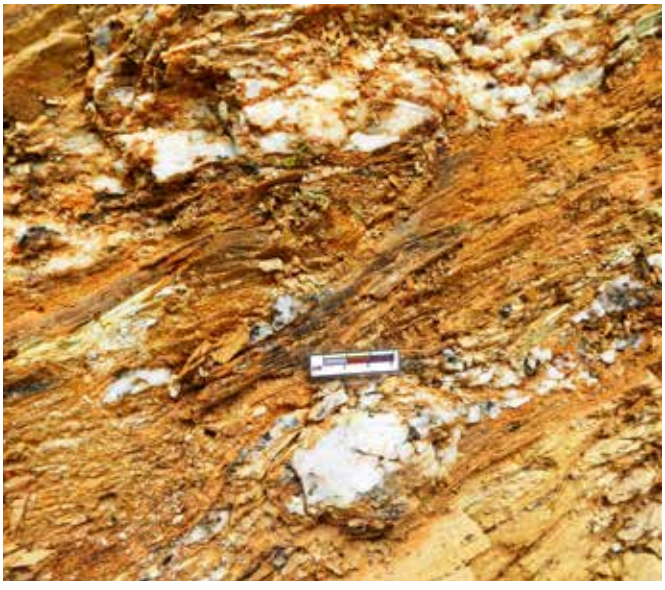
Komoditi Commodity	Negeri State	Lokasi Location	Liputan Coverage (km^2)	Penemuan Findings
Timah-Tungsten Tin-Tungsten	Selangor	Hulu Langat Selatan	50	Dua kawasan anomali pelbagai unsur berkeutamaan 1 telah dikenal pasti untuk kajian lanjut. Two priority 1 multi-element anomalous areas have been identified for further study.
Bauksit Bauxite	Johor	Bukit Tampol, Muar	5	Anggaran rizab bauksit adalah sebanyak 84,700 tan metrik. Estimated reserve is 84,700 tonnes.
		Ladang Aw Boon, Muar	2	Anggaran rizab bauksit adalah sebanyak 100,400 tan metrik. Estimated reserve is 100,400 tonnes.
Emas Gold	Johor	Sg. Jamari, Mersing	4	Sampel dalam proses analisis. Samples are still being analyzed.
	Kelantan	Kuala Betis	10	Singkapan syis dan batu kapur dipotong oleh telerang kuarza terbreksia yang mengalami pemineralan. Outcrops of schist and limestone were cut by brecciated mineralised quartz veins.
	Pahang	Sg. Kerak, Lipis	1	Potensi rendah. / Poor potential.
	Sarawak	Gunung Rawan, Serian	1	Sampel dalam proses analisis. Samples are still being analyzed.
	Sabah	Sg. Malati, Ulu Kalumpang, Kunak	1	Kajian polarisasi geofizik telah mengesan kehadiran mineral sulfida yang mungkin mencadangkan pemineralan emas di kawasan ini. Polarisation geophysical survey has detected the presence of sulphide minerals, which suggests possible gold mineraisation in this area.
Jumlah liputan / Total coverage			**74**	

Pendulangan emas di Sg. Kerak, Lipis, Pahang
Gold panning at Sg. Kerak, Lipis, Pahang



Butiran emas dari Sg. Kerak, Lipis, Pahang
Gold flakes from Sg. Kerak, Lipis, Pahang

Persampelan lelubang di Kuala Betis, Gua Musang, Kelantan
Pit sampling at Kuala Betis, Gua Musang, Kelantan



Telerang kuarza yang mengalami pemineralan di Sg. Tereg, Kuala Betis, Gua Musang, Kelantan
Mineralized quartz veins at Sg. Tereg, Kuala Betis, Gua Musang, Kelantan

Membina garisan geofizik merentasi zon beranomali emas di Sungai Malati, Kunak, Sabah
Construction of geophysical lines across the gold-anomalous zone at Sungai Malati, Kunak, Sabah

Mineral Perindustrian

Permintaan negara terhadap mineral mentah dan bahan binaan dijangka semakin meningkat, dan akan berterusan pada tahun-tahun yang akan datang. Dari sudut pandangan strategik, adalah mustahak bagi negara kita terus mengenalpasti sumber-sumber mineral perindustrian tempatan bagi memudahkan pembangunan negara. Pada masa yang sama, menggunakan sumber-sumber negara sendiri dan mengurangkan kebergantungan negara terhadap mineral-mineral import.

Sehubungan dengan itu, pada tahun 2015 penilaian telah dijalankan ke atas beberapa jenis mineral perindustrian iaitu agregat batuan, andalusit, batu kapur, batuan silika, dolomit, lempung, dan juga pasir binaan dengan jumlah kawasan liputan 115 km^2. Kajian yang dijalankan telah mengenalpasti anggaran 214 juta tan metrik agregat batuan, 0.07 juta tan metrik andalusit, 19 juta tan metrik batu kapur, 367 juta tan metrik batuan silika, 0.8 juta tan metrik lempung, dan 23 juta tan metrik pasir binaan.

Industrial Minerals

The demand for raw minerals and construction materials is expected to increase in years to come. From the strategic point of view, it is important for the country to continue to identify local industrial mineral resources to facilitate national development. At the same time, securing the country's own resources also reduces dependence on imported minerals.

In connection with this, evaluations on several types of industrial minerals such as rock aggregate, andalusite, limestone, silica rock, dolomite, clay, as well as construction sand was carried out in 2015 with a total area coverage of 115 km^2. The study has identified 214 million tonnes of rock aggregate, 0.07 million tonnes of andalusite, 19 million tonnes of limestone, 367 million tonnes of silica rock, 0.8 million tonnes of clay, and 23 million tonnes of construction sand.

Agregat Batuan / Rock Aggregate

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Johor	Bukit Batu, Kulai	1	Anggaran rizab adalah sebanyak 214 juta tan metrik batuan granit dan diorite. Estimated reserve is 214 million tonnes of granite and diorite.

Andalusit / Andalusite

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Terengganu	Sg Parang, Cerul, Kemaman	4	Anggaran rizab adalah sebanyak 75,000 tan metrik. Estimated reserve is 75,000 tonnes.

Batu kapur / Limestone

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Sarawak	Gunung Ropih, Bau, Bahagian Kuching	7	Anggaran rizab adalah sebanyak 19.06 juta tan metrik, sesuai sebagai bahan mentah untuk penghasilan baja, kapur, kimia, dan simen. Estimated reserve is 19.06 million tonnes, suitable as a raw material in the production of fertilizers, lime, chemicals, and cement.

Batuan silica / Silica rock

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Perak	Bendang Kering, Kuala Kangsar	2	Purata SiO_2 dalam batuan kuarza adalah 97.1%. Anggaran rizab adalah sebanyak 1.2 juta tan metrik. Average content of SiO_2 in quartz rock is 97.1%. Estimated reserve is 1.2 million tonnes.
Kelantan	Lojing, Gua Musang	10	Purata SiO_2 dalam batuan kuarza adalah 98.9%. Anggaran rizab adalah 366 juta tan metrik. Average content of SiO_2 in quartz rock is 98.9%. Estimated reserve is 366 million tonnes.
Jumlah liputan Total coverage		**12**	

Dolomit / Dolomite

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Perlis	Padang Besar	12	Batuan dolomit wujud secara asosiasi/ bertompok dalam batu kapur berkalsium tinggi di kawasan Bukit Mata Ayer tetapi wujud secara oolit dan masif di kawasan Rimba Mas. Dolomite rock occurred in association/ patch in high-calcium limestone in Bukit Mata Ayer area but exist as oolith and massive in Rimba Mas area.

Lempung / Clay

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Perak	Ladang Bikam	2	Anggaran simpanan adalah 817,000 tan metrik. Estimated reserve is 817,000 tonnes.
Selangor/ WP	Bestari Jaya	4	Ketebalan lempung bebola adalah lebih kurang 5 meter. The thickness of the ball clay was approximately 5 meters.
Jumlah liputan Total coverage		**6**	

Pasir dan kelikir / Sand and gravel

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan Findings
Pahang	Temerloh	40	Anggaran rizab adalah sebanyak 22.4 juta tan metrik. Estimated reserve is 22.4 million tonnes.
Sabah	Kota Belud	33	Empat zon sesuai untuk pengambilan pasir dan batu kelikir telah dikenal pasti dengan anggaran rizab sebanyak 345,000 tan metrik. Four zones suitable for extraction of sand and gravels have been identified, with estimated reserves of 345,000 tonnes.
Jumlah liputan Total coverage		**73**	

Krista kuarza di Bendang Kering, Kuala Kangsar, Perak
Quartz crystal in Bendang Kering, Kuala Kangsar, Perak

Persampelan batuan silika di Bendang Kering, Kuala Kangsar, Perak
Sampling of silica rock in Bendang Kering, Kuala Kangsar, Perak

Persampelan pasir sungai dengan kaedah penggerimitan di Sungai Pahang, Temerloh, Pahang
River sand sampling using augering method at Sungai Pahang, Temerloh, Pahang

Longgokan pasir di sepanjang Sungai Pahang semasa kemarau
Sand dune along Sungai Pahang during drought

Photo: Rengga Gendang

Singkapan batu kapur di kawasan Gunung Ropih, Bau, Sarawak
Limestone outcrop in Gunung Ropih area, Bau, Sarawak

Photo: Rengga Gendang

Sampel Batu kapur dari kawasan Gunung Ropih, Bau, Sarawak
Limestone samples from Gunung Ropih area, Bau, Sarawak

Pasir, kelikir dan bongkah batuan di sepanjang Sg. Kadamaian, Kota Belud, Sabah
Sand, gravel and boulder along Sg. Kadamaian, Kota Belud, Sabah

Kerja-kerja persampelan pasir dan kelikir di Sg. Kedamaian, Kota Belud, Sabah
Sand and gravel sampling at Sg. Kadamaian, Kota Belud, Sabah

Mineral Tenaga

Penilaian sumber batu arang telah dilaksanakan di Sabah dan Sarawak setiap satu meliputi keluasan 80 km^2. Tujuh lipit batu arang, dengan rizab tertunjuk sebanyak 6.91 juta tan metrik, telah dikenal pasti di Gunung Luis, Tawau, Sabah. Penilaian sumber batu arang yang dijalankan di Sarawak telah berjaya menggariskan sekurang-kurangnya satu lipit batu arang di kawasan Pa' Dalih dan dua lipit batu arang di kawasan Serian.

Energy Mineral

Coal resource evaluation was carried out in Sabah and Sarawak each covering an area of 80 km^2. Seven coal seams, with an indicated reserve of 6.91 million tonnes, have been delineated in the Gunung Luis, Tawau, Sabah. Coal resource evaluation conducted in Sarawak has successfully delineated at least one coal seam in the Pa' Dalih area and two coal seams in the Serian area.

Mineral Tenaga – Batu Arang
Energy Mineral – Coal

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Darjat Rank	Penemuan Findings
Sarawak	Pa' Dalih, Bario	80	*High Volatile Bituminous*	Tujuh singkapan batu arang dengan ketebalan berjulat dari 0.10 m - 0.51 m telah dijumpai. Seven coal outcrops, ranging in thickness from 0.10 m to 0.51 m, were found.
	Melikin, Serian		*Low Volatile Bituminous*	Sebelas singkapan batu arang dengan ketebalan berjulat dari 0.10 m - 0.80 m telah dijumpai. Eleven coal outcrops, ranging in thickness from 0.10 m to 0.80 m, were found.
Sabah	Gunung Luis, Tawau	80	*High Volatile A-C Bituminous*	26 singkapan batu arang telah ditemui dengan ketebalan berjulat dari 0.15 m - 1.04 m. 26 coal outcrops, ranging in thicknesses from 0.15 m - 1.04 m, were found.
Jumlah liputan Total coverage		**160**		

Penggerudian batu arang di Melikin, Serian, Sarawak
Hand-drilling coal seam at Melikin, Serian, Sarawak

Lapisan batu arang berketebalan 0.79 m di Gunung Luis, Tawau, Sabah
A 0.79 m thick coal bed at Gunung Luis, Tawau, Sabah

Mineral Strategik

Eksplorasi Unsur Nadir Bumi Berat

Sejak tahun 2014, projek eksplorasi mineral unsur nadir bumi berat (HREE) telah dilaksanakan di empat buah negeri, iaitu di Negeri Sembilan, Pahang, Perak dan Terengganu. Projek ini merupakan projek usaha sama antara Jabatan Mineral dan Geosains Malaysia dan Akademi Sains Malaysia. Projek ini bertujuan untuk mencari unsur nadir bumi beratyang terkandung dalam monazite $(Ce,La,Y,Th)PO_4$, alanit $(Ca,Ce,Th)_2(Al,Fe,Mg)_3Si_3O_{12}(OH)$, basnesit $(Ce,Th,La,Y,Ca)(CO_3)F$, euxenit $(Y,Ca,Er,La,Ce,U,Th)(Nb,Ta,Ti)_2O_6$, dan xenotim (YPO_4). Pada tahun 2015, eksplorasi hanya dijalankan di Terengganu meliputi kawasan kajian seluas 5 km² di Wakaf Tapai, Ajil.

Strategic Minerals

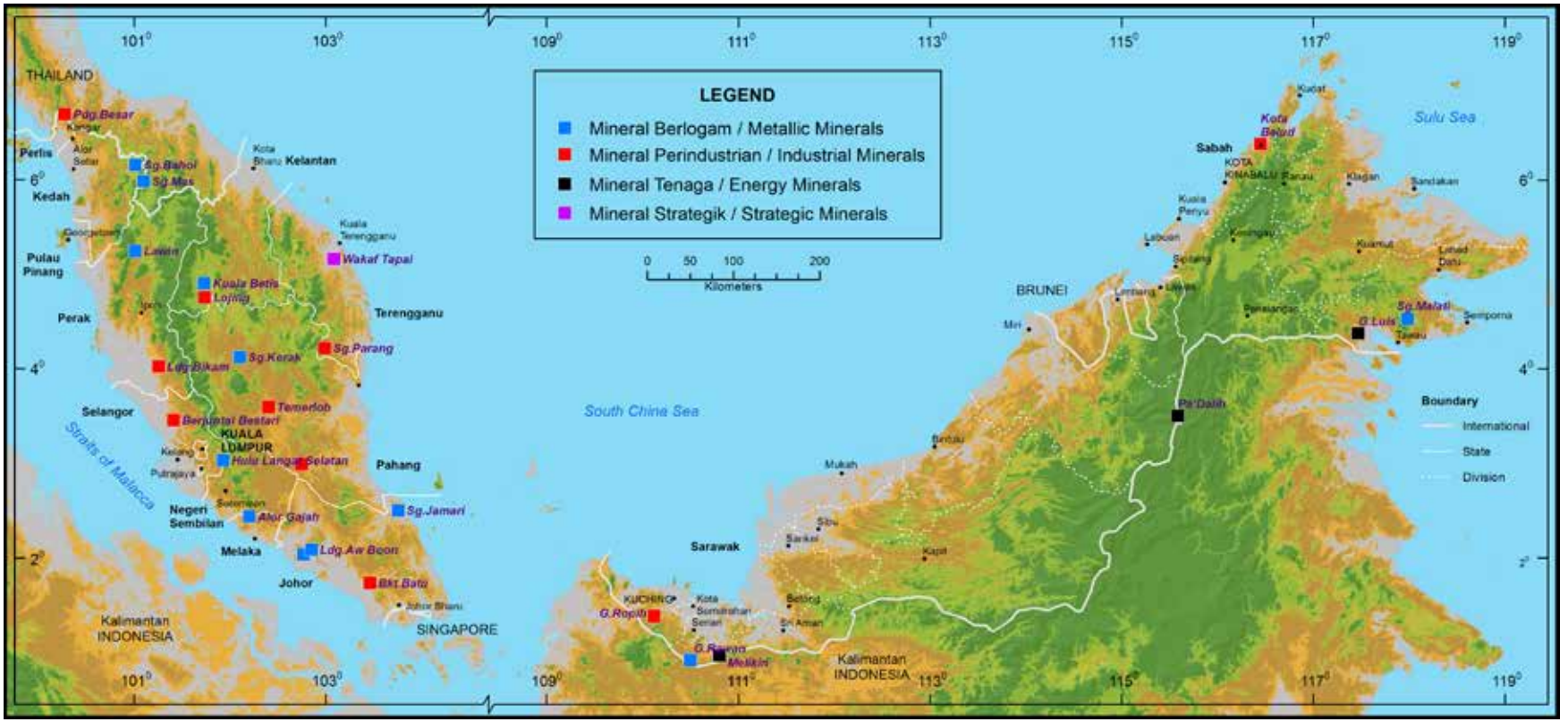
Heavy Rare Earth Elements Exploration

Started in 2014, heavy rare earth elements (HREE) exploration project has been conducted in four states, namely Negeri Sembilan, Pahang, Perak and Terengganu. The project is a collaborative effort between the Minerals and Geoscience Department Malaysia and the Academy of Sciences Malaysia. This project is aimed at finding heavy rare earth elements contained in monazite $(Ce,La,Y,Th)PO_4$, allanite $(Ca,Ce,Th)_2(Al,Fe,Mg)_3Si_3O_{12}(OH)$, bastnaesite $(Ce,Th,La,Y,Ca)(CO_3)F$, euxenite $(Y,Ca,Er,La,Ce,U,Th)(Nb,Ta,Ti)_2O_6$, and xenotime (YPO_4). In 2015, exploration was carried out only in Terengganu covering an area of 5 km² at Wakaf Tapai, Ajil.

Unsur nadir bumi berat
Heavy rare earth elements

Negeri State	Kawasan Area	Liputan Coverage (km²)	Penemuan Findings
Terengganu	Wakaf Tapai, Ajil, Kuala Berang	5	Sampel dalam proses analisis. Samples are still being analyzed.

Singkapan granit terluluhawa di Wakaf Tapai, Marang, Terengganu
Weathered granite outcrop at Wakaf Tapai, Marang, Terengganu



Aktiviti Penilaian Sumber Mineral 2015
Mineral Resource Evaluation Activities 2015

Ekonomi Mineral

Jabatan Mineral dan Geosains Malaysia juga telah dipertanggungjawabkan untuk menyebarkan informasi mineral dalam negara. Seperti tahun-tahun sebelumnya, pada tahun 2015 JMG telah menerbitkan lima laporan utama iaitu *Malaysian Minerals Yearbook 2014, Industrial Mineral Production Statistics and Directory of Producers in Malaysia 2014, Malaysian Mining Industry 2014, Malaysian Mineral Trade Statistics 2014* dan *Review of Mineral-Based Industries in Malaysia 2014*. Laporan tersebut telah diedarkan kepada pemegang taruh, pengusaha industri serta agensi-agensi lain yang berkaitan. Selain daripada tugas rutin ini, berdasarkan kepada survei yang telah dijalankan pada tahun 2011-2012, JMG juga telah menerbitkan laporan yang bertajuk "Iron Ore Resources Availability in Peninsular Malaysia".

Pada tahun 2015 JMG terus memberi input berkala mengenai status sektor mineral kepada Kementerian Sumber Asli dan Alam Sekitar (NRE) dan agensi-agensi kerajaan yang lain. Di antara data yang dibekalkan adalah laporan industri perlombongan kepada Bank Negara dan Jabatan Perangkaan, laporan pengeluaran bijih timah kepada Lembaga Timah, laporan pelaburan swasta kepada MIDA, serta laporan data pengeluaran batu arang, batu kapur serta serbuk kapur kepada Malaysian Green Technology Corporation (MGTC atau dahulu dikenali sebagai Pusat Tenaga Malaysia). Antara lain, input ini bertujuan untuk pengiraan sumbangan sektor perlombongan kepada ekonomi negara oleh Bank Negara. Informasi ini juga digunakan untuk membuat formulasi imbangan tenaga negara, serta mengemaskini data inventori *greenhouse gas* (GHG) oleh Malaysian Green Technology Corporation.

Pada tahun yang sama, JMG memberi input kepada NRE berkenaan isu akibat perlombongan bauksit di Kuantan, Pahang. Input JMG juga digunakan untuk formulasi perjanjian dalam mesyuarat dagangan dua hala dan kerjasama antarabangsa. Dalam hubungan ini sejumlah lima nota ikhtisar negara telah disediakan pada tahun 2015, iaitu dengan Perancis, Kazakhstan, India, Lao PDR dan China.

Mineral Economics

Minerals and Geoscience Department Malaysia is also tasked with dissemination of mineral information in the country. As in previous years, in year 2015 JMG continued to publish the Malaysian Minerals Yearbook, Industrial Mineral Production Statistics and Directory of Producers in Malaysia, Malaysian Mining Industry, Malaysian Mineral Trade Statistics and Review of Mineral-Based Industries in Malaysia. JMG distributed these reports to stakeholders, industry players and other related agencies. Apart from these routine activities, based on survey undertaken during 2011-2012, JMG has published a report entitled "Iron Ore Resources Availability in Peninsular Malaysia report".

In year 2015, JMG continued to provide periodical inputs on the status of the minerals sector to the Ministry of Natural Resources and Environment (NRE), as well as to other government agencies. Among the data that were supplied were mining industry reports to the Central Bank and the Statistics Department, tin ore production reports to the Tin Board, private investment reports to MIDA, as well as coal, limestone and lime production reports to the Malaysian Green Technology Corporation (formerly known as Pusat Tenaga Malaysia). The inputs were used, among other purposes, to calculate the contribution of the mineral sector to the country's economy by the Central Bank. The information was also used in the formulation of the national energy balance and in updating greenhouse gas (GHG) inventory data by the Malaysian Green Technology Corporation.

In the same year, JMG provided input to NRE on issue caused by bauxite mining in Kuantan, Pahang. JMG's input was also used in the formulation of agreements in meetings concerned with bilateral trade and international cooperation. In this context, a total of five country briefs were prepared in 2015 i.e. France, Kazakhstan, India, Lao PDR and China.

Di peringkat ASEAN, pegawai kanan JMG telah menghadiri mesyuarat dan bengkel berikut:

i) 12th ASEAN Senior Officials Meeting on Minerals (ASOMM) Working Group Meetings (Vientiane, Lao PDR)
ii) 2nd ASOMM Joint Working Group Meetings on the Asean Minerals Cooperation Action Plan (AMCAP) Phase 3 2016-2025 (Vientiane, Lao PDR)
iii) 3rd Special Task Force Meeting on ASEAN Mineral Awards (Vientiane, Lao PDR)
iv) 15th ASEAN Senior Officials Meeting on Minerals (ASOMM) (Vientiane, Lao PDR)
v) 8th ASOMM + 3 (China, Japan Japan & Korea) (Vientiane, Lao PDR)
vi) 5th ASEAN Ministerial Meeting on Minerals (AMMin) (Vientiane, Lao PDR)
vii) Enhancement of Management Capacity for ASEAN Web-based Mineral Resources Database (Tsukuba, Japan and Phnom Penh, Cambodia)

JMG secara berterusan membantu dan bekerjasama dengan NRE dalam urusan berkaitan pembangunan mineral, terutamanya dalam pelan pembangunan potensi mineral di Wilayah Ekonomi Pantai Timur (ECER) dan Program Seranta Sektor Mineral dan Geosains. Pegawai JMG juga terlibat dalam penyediaan kertas strategik sektor mineral dan geosains di bawah RMKe-11. Jabatan ini adalah anggota tetap Jawatankuasa Teknikal Sumber Mineral, Jawatankuasa Persediaan Rundingan (Intergovernmental Negotiating Committee) Konvensyen Merkuri, Task Force Pasir Kebangsaan dan Industry Standards Committee (ISCW) on Occupational Safety and Health. JMG juga bekerjasama dengan Lembaga Industri Timah Malaysia dalam penganjuran *International Tin Chemical & Solder Conference & Exhibition 2015* dan terlibat dalam Projek Eksplorasi Thorium yang merupakan projek kerjasama antara JMG dan Agensi Nuklear Malaysia.

Bagi mengekalkan hubungan jabatan dengan pihak industri, pegawai JMG secara berterusan melakukan lawatan kerja ke lombong-lombong, kuari-kuari dan juga industri berasaskan mineral dalam negara untuk mengumpul maklumat berkaitan dengan pembangunan dan penggunaan bahan mineral serta produk-produk hiliran berasaskan mineral yang dihasilkan. Dalam tahun 2015, beberapa sirilawatan telah dilakukan di lombong, kuari dan industri berasaskan mineral di negeri Perak, Selangor, Terengganu, Johor, Melaka, Kedah dan Pulau Pinang. Dalam tempoh yang sama JMG juga telah menerima sejumlah 56 pertanyaan berkenaan mineral dari dalam dan luar negara.

At the ASEAN level, senior officers of JMG attended the following meetings and workshops:

i) 12th ASEAN Senior Officials Meeting on Minerals (ASOMM) Working Group Meetings (Vientiane, Lao PDR)
ii) 2nd ASOMM Joint Working Group Meetings on the Asean Minerals Cooperation Action Plan (AMCAP) Phase 3 2016-2025 (Vientiane, Lao PDR)
iii) 3rd Special Task Force Meeting on ASEAN Mineral Awards (Vientiane, Lao PDR)
iv) 15th ASEAN Senior Officials Meeting on Minerals (ASOMM) (Vientiane, Lao PDR)
v) 8th ASOMM + 3 (China, Japan Japan & Korea) (Vientiane, Lao PDR)
vi) 5th ASEAN Ministerial Meeting on Minerals (AMMin) (Vientiane, Lao PDR)
vii) Enhancement of Management Capacity for ASEAN Web-based Mineral Resources Database (Tsukuba, Japan and Phnom Penh, Cambodia)

JMG continued to assist and cooperate with NRE in matters relating to the development of the minerals sector, especially the mineral potential development plan at Economic Corridor of East Region (ECER) and Mineral and Geoscience Sector Publicity Programme. JMG officers were also involved in the preparation of strategic paper on mineral and geoscience sectors under the Eleventh Malaysian Plan. The department is a permanent member of Intergovernmental Negotiating Committee for Mercury Convention, National Sand Task Force and Industry Standards Committee (ISCW) on Occupational Safety and Health. JMG has also cooperated with Tin Industry Board Malaysia in organizing the International Tin Chemical & Solder Conference & Exhibition 2015 and involved in Thorium Exploration Project which was a joint project between JMG and Malaysian Nuclear Agency.

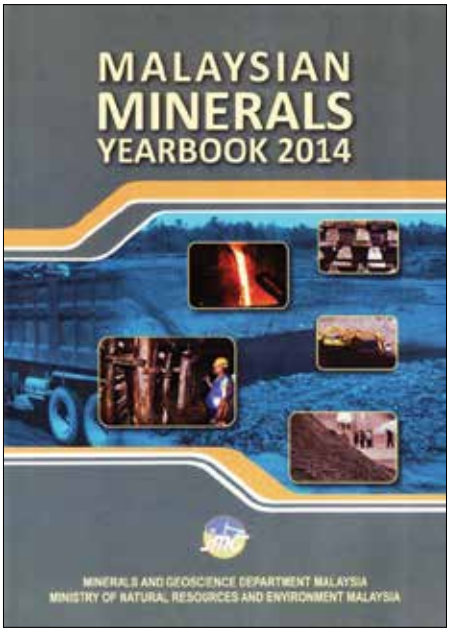
To maintain good rapport with the industry, JMG officers continually made working visits to various mines, quarries and mineral-based industries in the country to collect information related to the development and utilization of minerals, as well as the production of value-added downstream mineral products. In 2015, visits were conducted at mines, quarries and mineral-based industries in Perak, Selangor, Terengganu, Johor, Melaka, Kedah and Penang. During the same period, JMG received 56 enquiries on minerals from within the country and abroad.

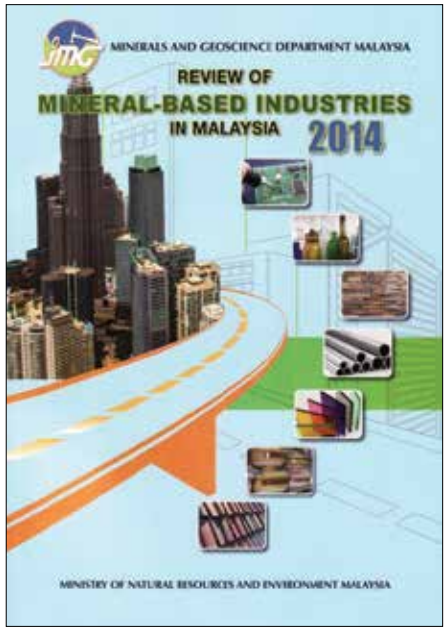
Lawatan ke pengeluar pinggan mangkuk hiasan SOA (M) Sdn. Bhd, Batu Gajah, Perak
Visit to tableware producer SOA (M) Sdn. Bhd., Batu Gajah, Perak

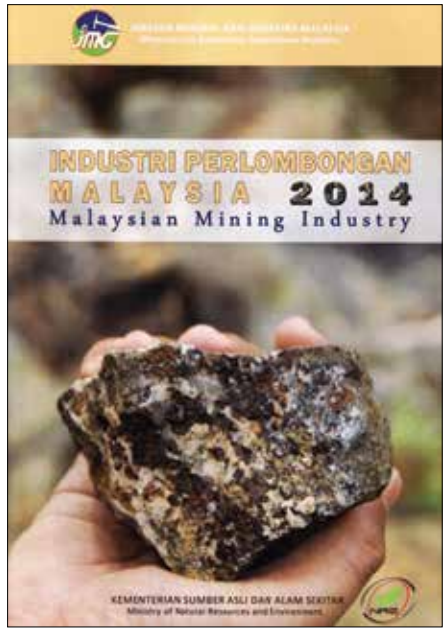
Lawatan ke Eastern Steel Sdn. Bhd., Kilang Besi bersepadu di Kemaman, Terengganu
Visit to Eastern Steel Sdn. Bhd., an Integrated Steel Mill in Kemaman, Terengganu

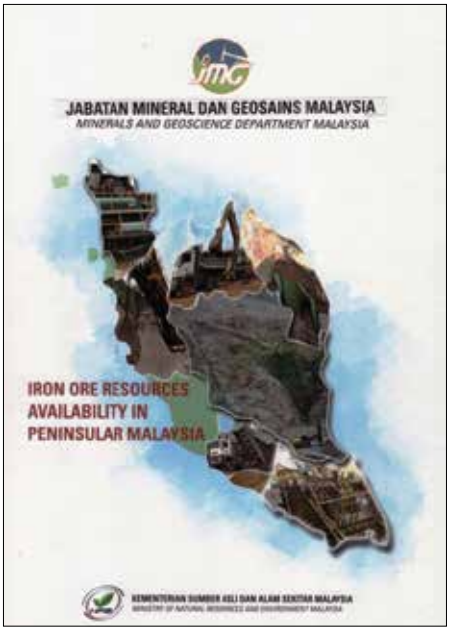
Penerbitan Berkaitan Mineral

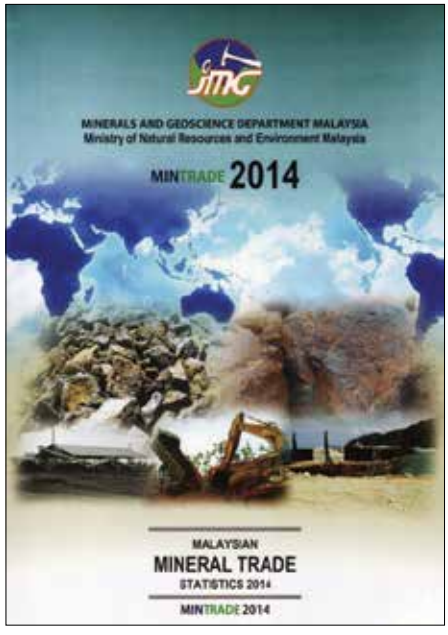
Mineral-Related Publications

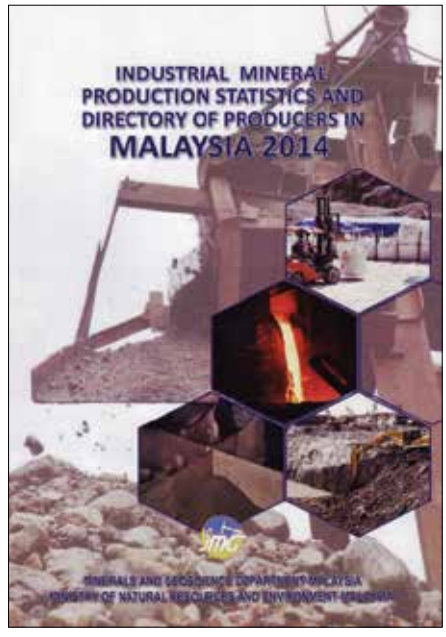












Laporan yang diterbitkan oleh JMG pada tahun 2015
Reports published by JMG in 2015

Khidmat Nasihat Mineral

Berbagai khidmat nasihat telah diberikan kepada pihak berkuasa negeri dan swasta berkenaan dengan ulasan guna tanah dan pembebasan mineral. Pertanyaan daripada pelanggan berkaitan maklumat mineral juga telah dilayani sama ada secara lisan atau ulasan bertulis.

Mineral Advisory Services

Various advisory services were rendered to the state authorities as well as the private sector concerning land use and mineral clearance reviews. Enquiries on mineral information from various interested sectors or individuals were attended to either verbally or in writing.

Pejabat JMG JMG Office	Jenis khidmat nasihat Type of advisory services		
	Ulasan guna tanah Land use review (bil. / no.)	Ulasan pembebasan mineral Mineral clearance review (bil. / no.)	Pertanyaan Enquiries (bil. / no.)
Ibu Pejabat / Headquaters	-	-	56
Johor	107	158	18
Melaka	-	-	-
Negeri Sembilan	108	-	10
Selangor	34	-	5
Perak	351	2	4
Kedah	27	0	6
Pulau Pinang	6	0	0
Perlis	27	0	6
Kelantan	2	16	22
Terengganu	4	50	18
Pahang	18	21	36
Sarawak	36	3	98
Sabah	50	-	-
Jumlah / Total:	**770**	**250**	**279**

Aktiviti Geosains
Geoscience Activities

Aktiviti Geosains
Geoscience Activities

Aktiviti geosains dilaksanakan untuk menyediakan maklumat geologi yang berguna dalam bidang seperti pemetaan geologi, geologi warisan, hidrogeologi, geologi kejuruteraan, geologi alam sekitar dan geologi marin. Maklumat geosains yang berkualiti serta memenuhi kehendak pemegang taruh dan pelanggan adalah input penting yang diperlukan dalam perancangan guna tanah bagi mencapai pembangunan mampan, mengurangkan risiko bencana dan memelihara alam sekitar.

Pemetaan geologi dijalankan bagi mengumpul maklumat asas geologi yang amat diperlukan dalam kerja-kerja carigali sumber mineral, perancangan guna tanah dan juga untuk menentukan kesesuaian tapak untuk pembangunan. Pemetaan warisan geologi pula dapat menilai dan memulihara tapak geologi yang berpotensi sebagai tapak warisan negara untuk dipromosikan sebagai kawasan geopelancongan serta kelestarian alam sekitar.

Maklumat hidrogeologi adalah penting dalam pengurusan sumber air tanah bagi memastikan ia dapat terus digunakan sebagai bekalan air negara, manakala maklumat pemetaan geobencana dan penilaian risiko bencana, terutamanya di kawasan perbandaran dan penempatan, amat berguna kepada pihak berkuasa tempatan dalam merancang pembangunan yang lebih sistematik.

Geoscience activities are carried out to gather useful geological information in the field of geological mapping, geological heritage, hydrogeology, engineering geology, environmental geology and marine geology. Quality geosciences information, which meets the needs of stakeholders and clients, provides vital input needed in land use planning for sustainable development, reducing the risks of disaster and protects the environment.

Geological mapping is carried out to collect basic geological information that is very much needed in the exploration of mineral resources and land use planning, as well as to determine whether a land is suitability for site development. Geological heritage mapping is carried out to assess and conserve potential geological sites as national heritage while promoting geotourism and environmental sustainability.

Hydrogeological information is important in the management of groundwater resources to ensure groundwater resource remains available for the nation's water supplies, while information from geohazard mapping and disaster risk assessment, especially in the urban and settlement areas, assiststhe local authorities in systematic development planning.

Pemetaan Geologi

Pemetaan Geologi Sempadan Negara

Sempadan Malaysia-Indonesia

Kerja-kerja pemetaan geologi sempadan iaitu Korelasi Geologi Kawasan Sintang-Silantek dengan keluasan 2300 km^2 di antara Malaysia (Sarawak) dan Indonesia (Kalimantan) telah diteruskan pada peringkat akhir. Pada tahun 2015 tumpuan diberikan kepada penyiapan laporan dan peta serta sesi penyuntingan bersama. Draf pertama laporan adalah pada 90% siap dan sedang menunggu data daripada Formasi Ketungau di sebelah Indonesia. Peta dalam format Coreldraw telah siap, usaha sedang dijalankan untuk menghasilkan peta dalam bentuk GIS.

Mesyuarat Tahunan Kumpulan Kerja Teknikal (TWG) dan Mesyuarat Kali Keenam Jawatankuasa Pemandu (SC) Kerjasama Saintifik dan Teknikal Dalam Bidang Geologi dan Sumber Mineral di antara JMG dan Agensi Geologi Indonesia (GAI) telah diadakan di Bali, Indonesia. Di Sabah, Pemetaan Geologi Sempadan telah dilaksanakan di kawasan Sebuku (Syit 7922) dengan keluasan 340 km^2.

Sempadan Malaysia-Thailand

Projek Penyiasatan Geologi Bersama Sempadan Malaysia-Thailand dilaksanakan di bawah payung *the Malaysia-Thailand Border Joint Geological Survey Committee (MT-JGSC).* Projek ini yang melibatkan kerjasama teknikal dalam bidang geosains dan mineral di antara Jabatan Mineral dan Geosains Malaysia dan *Department of Mineral Resources Thailand* (DMR) telah dijalankan sejak tahun 2000. Projek dijalankan bertujuan untuk menyelaraskan sempadan geologi serta korelasi unit-unit batuan di kawasan sempadan kedua-dua Negara. Semasa tahun 2015, kajian korelasi stratigrafi secara terperinci telah dijalankan bersama pihak Thai di kawasan yang telah dipetakan.

Kompilasi laporan-laporan Geologi dan sumber mineral dan kajian terperinci radiolari dalam batuan yang mengadungi radiolarian diteruskan sepanjang tahun 2015. Ianya dijangka siap pada tahun 2016.

Dua subprojek (aktiviti) telah dimulakan pada tahun 2015, iaitu:

i. Kajian-kajian kes bencana-bencana geologi (Gelongsoran tanah dan kesetabilan cerun) - akan bersambung sehingga tahun 2016
ii. Korelasi stratigrafi antara Formasi Setul dengan Kumpulan ThungSong – akan bersambung sehingga tahun 2017

Geological Mapping

Cross-Border Geological Mapping

Malaysian-Indonesian Border

The geological mapping correlation of the border area Sintang-Silantek with an area of 2300 km^2 between Malaysia (Sarawak) and Indonesia (Kalimantan) has entered the final stages. In 2015 the focus was on the preparation of reports and maps as well as joint editing sessions. The first draft of the report was 90% completed and currently waiting for data of the Ketungau Formation from the Indonesian team. The maps have been completed in CorelDraw format and would be converted to the GIS format.

Annual Meeting of the Technical Working Group (TWG) and the Sixth Meeting of The Scientific and Technical Cooperation in the Field of Geology and Mineral Resources Steering Committee (SC) between JMG and the Geological Agency of Indonesia (GAI) was held in Bali, Indonesia. In Sabah, geological cross border mapping was carried out in the Sebuku area (Sheet 7922) covering an area of 340 km^2.

Malaysia-Thailand Border

The Malaysia-Thailand Border Joint Geological Survey Project is implemented under the umbrella of the Malaysia-Thailand Border Joint Geological Survey Committee (MT-JGSC). The project which involves technical cooperation in the field of geoscience and minerals between Minerals and Geoscience Department Malaysia and Department of Mineral Resources Thailand is implemented since the year 2000. The project is carried out to correlate the geological boundary of rock units along the common border of both countries. During 2015, a detail study on stratigraphic correlation was jointly carried with Thai counterpart in areas which were previously mapped.

Compilation of reports on the Geology and mineral resources and also detailed study on radiolaria in radiolarian-bearing rocks along the Malaysia-Thailand border are continued during 2015. These will be completed in 2016.

Two subprojects (activities) were initiated during 2015, namely:

i. Case study on geological hazards (Landslide and slope stability) – to be continued to 2016
ii. Stratigraphic correlation between the Setul Formation and the ThungSong Group – to be continued to 2017

Pemetaan Geologi Rantau

Kerja pemetaan geologi yang dijalankan setakat ini telah meliputi 87.87% kawasan Semenanjung Malaysia, 29.12% kawasan Sabah dan 30.36% kawasan Sarawak. Di Semenanjung Malaysia, pemetaan geologi yang dilaksanakan di Johor, Kelantan, Negeri Sembilan, Pahang dan Terengganu pada tahun 2015 meliputi kawasan seluas 1020 km^2. Pemetaan geologi juga telah dilaksanakan di kawasan seluas 450 km^2 di Sabah dan 460 km^2 di Sarawak.

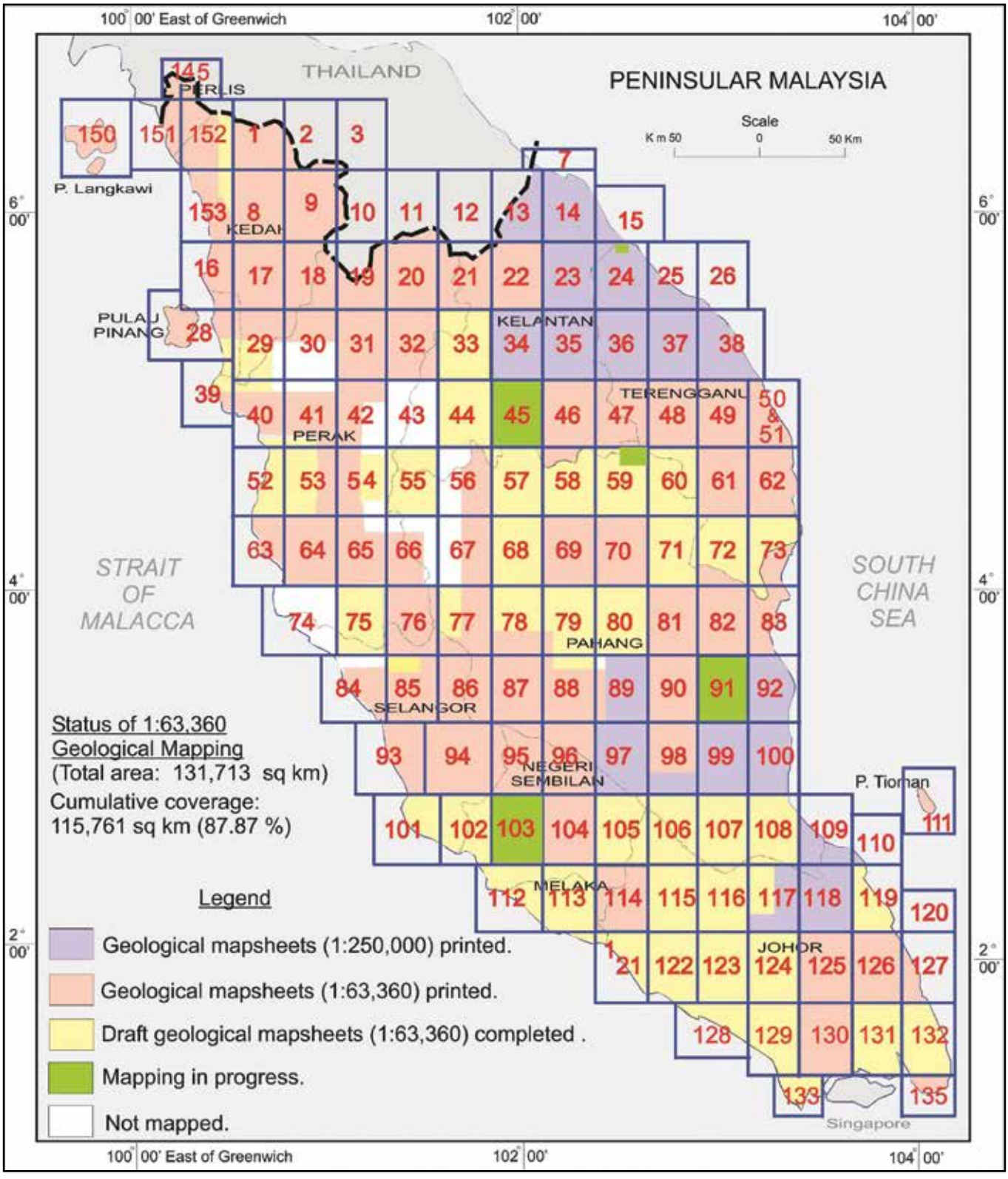
Regional Geological Mapping

Geological mapping work conducted so far have covered 87.87% of Peninsular Malaysia, 29.12% of Sabah, and 30.36% of Sarawak. In Peninsular Malaysia, geological mapping carried out in Johor, Kelantan, Negeri Sembilan, Pahang and Terengganu in 2015 have covered an area of 1020 km^2. Geological mapping was also carried out in Sabah and Sarawak covering an area of 450 km^2 and 460 km^2 respectively.

Pemetaan geologi rantau
Regional geological mapping

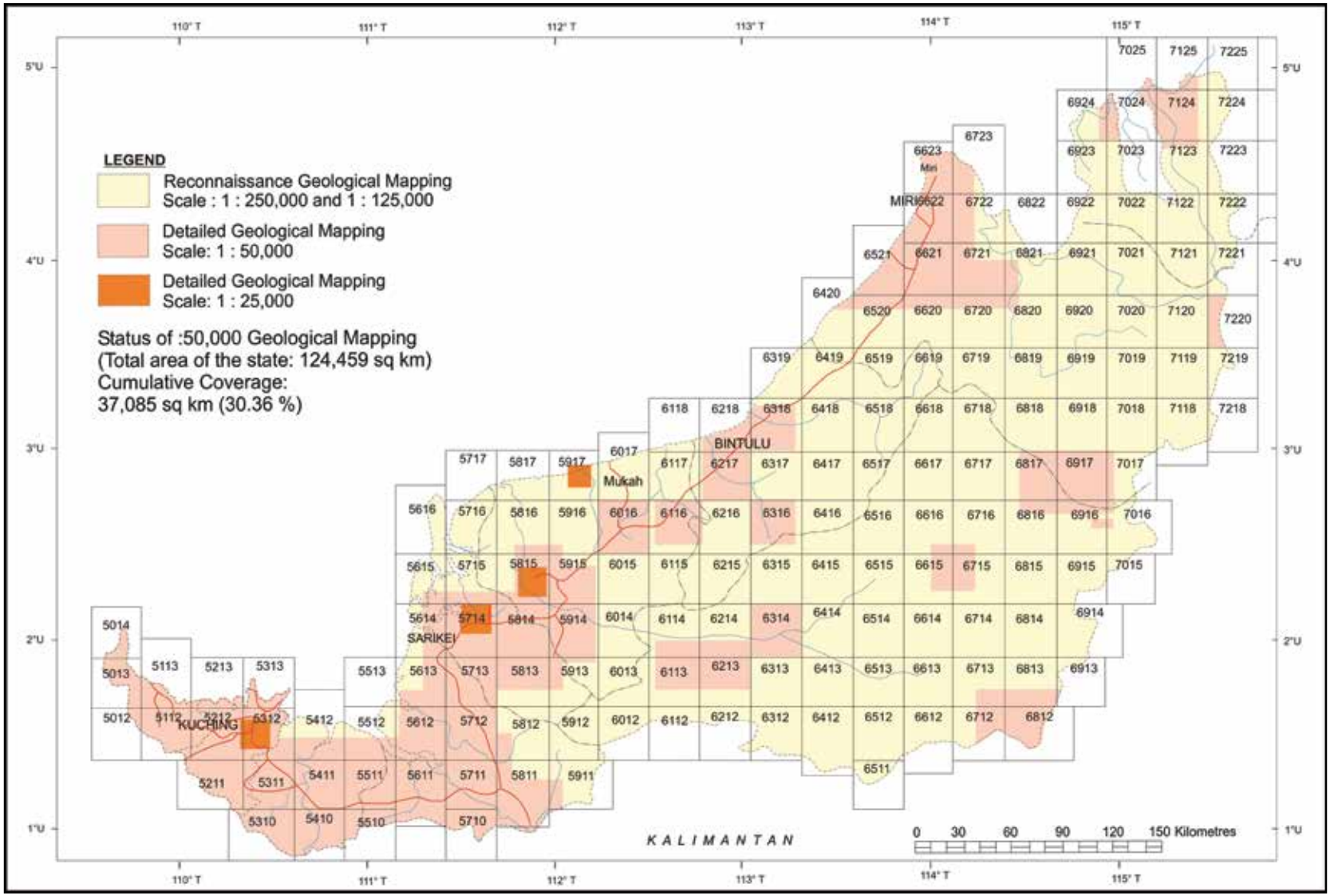
Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan/ Catatan Findings/ Remarks
N. Sembilan	Seremban, Senawang dan Kuala Pilah	300	Pemetaan semula sempadan litologi di kawasan tanah runtuh di sekitar Rumah Rakyat Kg. Panchor, Paroi, Negeri Sembilan serta projek pemetaan Syit 103 diteruskan. Permatang kuarza yang berorientasi Timur Laut-Barat Daya telah ditemui di kawasan kajian. Remapping of lithological boundaries was carried out at the landslide area near Rumah Rakyat Kg. Panchor, Paroi, Seremban and continuation in the mapping of sheet 103. An NE-SW oriented quartz ridge was found in the study area.
Pahang	Pulau Manis	600	Penemuan: 1. Jumpaan sempadan tak selaras antara batuan filit ahli Jempul Formasi Sri Jaya dengan batuan tuf berkonglomerat Formasi Serentang Kumpulan Tembeling 2. Jumpaan singkaan batuan tuf dan volkanik Formasi Serentang di dalam kawasan yang dipetakan sebagai alluvium sebelum ini. 3. Jumpaan alluvium tua di dalam kawasan yang dipetakan sebagai Formasi Mangkin sebelum ini. 4. Jumpaan zon sesar yang ditafsirkan sebagai lanjutan arah tenggara Sesar Lebir di kawasan berhampiran IKBN Paloh Hinai. 5. Sedikit perubahan sempadan alluvium antara gambut dan lempung, lodak. Findings: 1. Discovery of unconformity boundary between phyllite of Jempol member, Sri Jaya Formation with conglomeratic tuff of Serentang Formation. 2. Discovery of tuffaceous and volcanics rock outcrop of Serentang Formation in the area previously mapped as alluvium. 3. Discovery of old alluvium outcrop in the area previously mapped as Mangkin Formation. 4. Discovery of fault zone that is interpreted as a southeast extention of Lebir Fault near IKBN Paloh Hinai. 5. A few changes of alluvium boundary between peat, silt and clay.

Negeri State	Kawasan Area	Liputan Coverage (km²)	Penemuan/ Catatan Findings/ Remarks
Terengganu	Paya Peda	20	Penemuan sekurang-kurangnya sepuluh spesis fosil tumbuhan Cathaysian berusia Karbon iaitu *Pecopteris* sp, *Tingia* sp, *Lepidodendron* sp, *Sigillaria* sp, *Sphenophyllum* sp, *Neurotepris* sp, *Cordaites* sp, *Lepidostrobos*, *Stigmaria* dan *Artisia horizontalis.* The discovery of at least ten species of Cathaysian plant fossils of Carbonefereous age, namely *Pecopteris* sp, *Tingia* sp, *Lepidodendron* sp, *Sigillaria* sp, *Sphenophyllum* sp, *Neurotepris* sp, *Cordaites* sp, *Lepidostrobos*, *Stigmaria* and *Artisia horizontalis*.
Kelantan	Gua Musang	100	Dilaksanakan dari Kuala Betis ke Pulai dengan 22 lokaliti dikenal pasti dan keratan rentas dibuat untuk menentukan korelasi unit batuan dalam Formasi Gua Musang. Area mapped from Kuala Betis to Pulai with 22 locations identified and cross- section made to correlate the rock units in Gua Musang Formation.
Sabah	Tamparuli	450	Mengenal pasti litologi, stratigrafi, struktur dan sempadan baru formasi Trusmadi dan Crocker. To identify the lithology, stratigraphy, structure and new boundary of Trusmadi and Crocker formations.
Sarawak	Bario, Miri	460	Pemetaan geologi kawasan Bario (Lembar 7220) pada skala 1:50000 telah disiapkan. The geological mapping of Bario area (Sheet 7220) at a scale of 1:50000 have been completed.
Jumlah Liputan **Total Coverage**		**1930**	



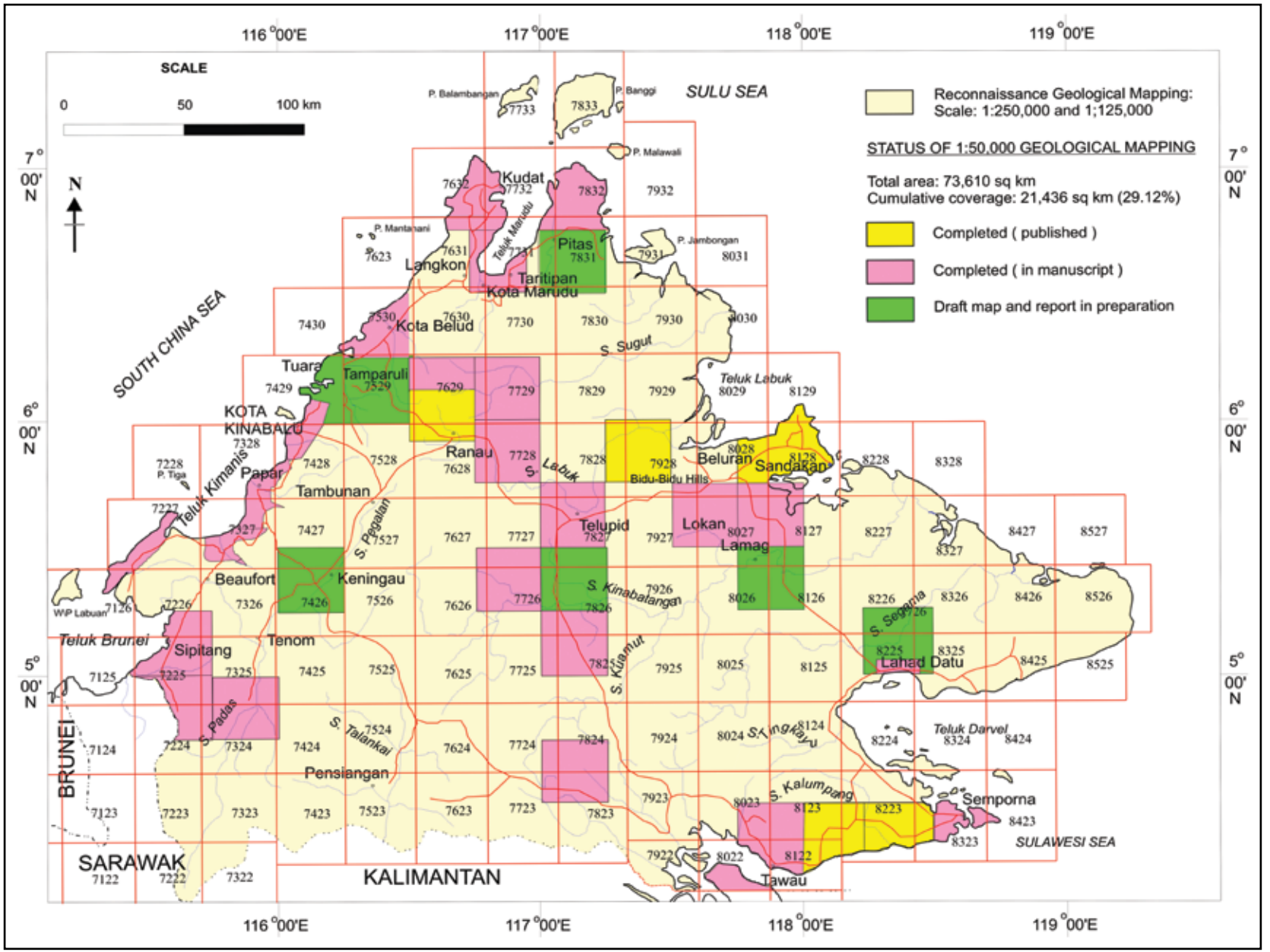
Status Pemetaan Geologi Semenanjung Malaysia 2015

Status of Geological Mapping Peninsular Malaysia 2015



Status Pemetaan Geologi Sarawak 2015

Status of Geological Mapping Sarawak 2015



Status Pemetaan Geologi Sabah 2015

Status of Geological Mapping Sabah 2015

Geologi Warisan

Kajian warisan geologi telah dijalankan bagi memastikan khazanah alam semulajadi yang sangat berharga dapat dipulihara bagi tatapan generasi akan datang. Menerusi kajian ini, konsep tapak terpelihara, monumen geologi, taman geologi dan lanskap berpemandangan indah dapat diperkenalkan kepada orang awam. Kajian kebolehlaksanaan bagi tapak warisan geologi telah dijalankan di tapak-tapak terpilih bagi cadangan penarafan sama ada sebagai geotapak, tapak warisan geologi kebangsaan atau geopark.

Misi menjejak dinosaur diteruskan dalam Ekspedisi Jura-Kapur 2015 yang telah dijalankan di Sungai Chichir, kawasan Gunung Gagau dari 10 hingga 23 Mei 2015. Ekspedisi ini turut disertai pihak Universiti Kebangsaan Malaysia dan Universiti Teknologi Petronas. Semasa ekspedisi ini, acuan fosil kesan tapak kaki dinasor yang ditemui sebelum ini telah disediakan. Walaupun tiada fosil tinggalan dinosaur yang berjaya ditemui tetapi lebih banyak fosil tumbuhan kuno telah diperolehi.

Heritage Geology

Geological heritage studies were carried out to ensure that the conservation of natural heritages for its future generations. Through these studies, the concept of preserved sites, geological monuments, geological parks and beautiful landscapes could be promoted and made known to the public. Feasibility studies for geological heritage were carried out at selected sites with the view to propose the various locations as possible geosites, national geological heritage or geoparks.

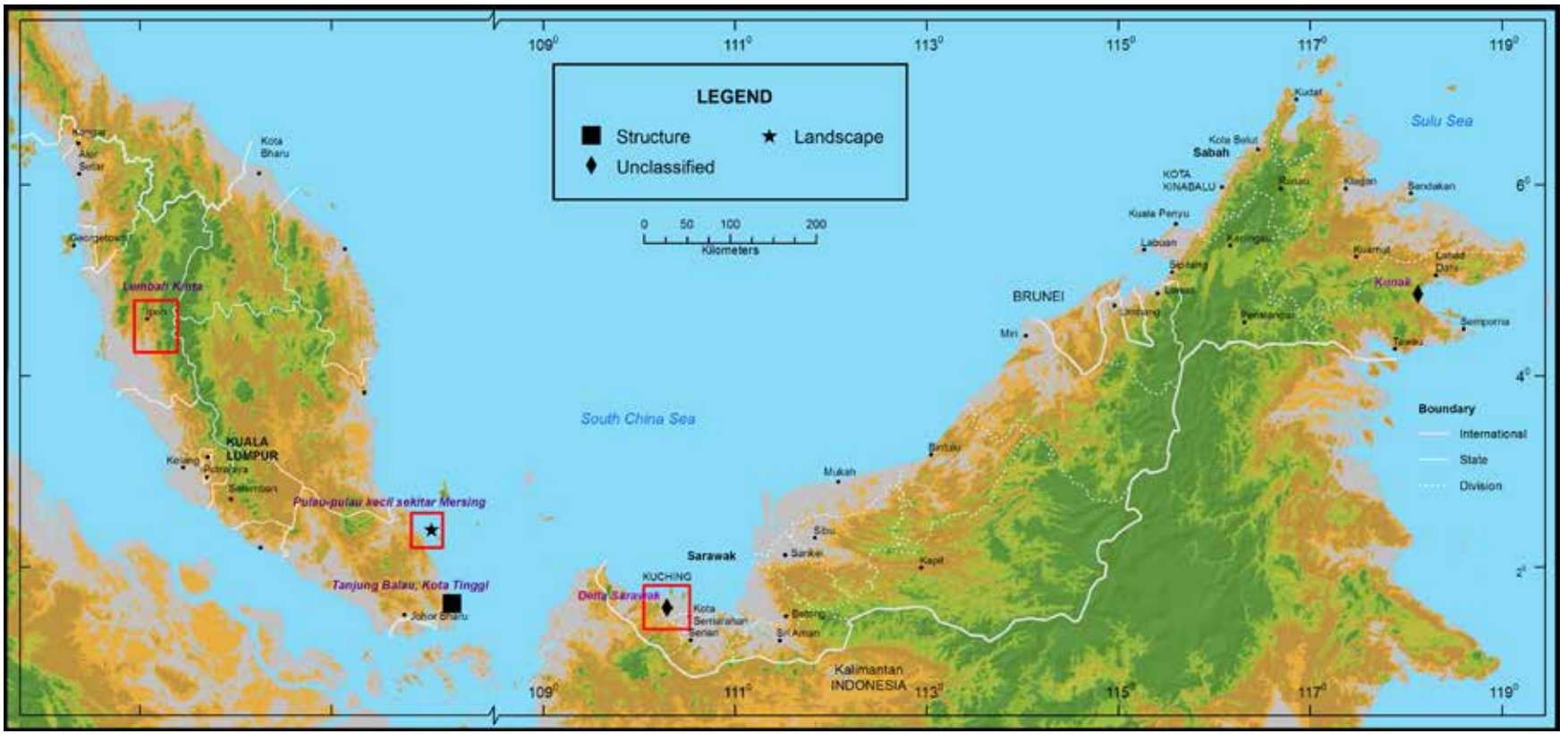
The mission to tracks dinasour is continued by Jurassic-Cretaceous Expedition 2015 which was undertaken at Sungai Chichir, Gunung Gagau area from 10 to 23 May 2015. Participants from Universiti Kebangsaan Malaysia and Universiti Teknologi Petronas were also involved in this expedition. During the expedition, cast of dinosaur footprint previously discovered had been prepared. New dinosaur fossil was not found. However, more flora fossils have been discovered.

Pemetaan warisan geologi
Geological heritage mapping

Negeri State	Kawasan Area	Status Status	Catatan Remarks
Johor	Pulau-pulau kecil sekitar Mersing	Geotapak	Morfologi dan landskap berpandangan indah 16 buah pulau-pulau kecil sekitar Mersing yang terdiri daripada P. Penyimbang, P. Ibol, P. Mentigi, P. Nanga Besar, P. Nanga Kecil, P. Simbang, P. Lima Kecil, P. Lima Besar, P. Rawa, P. Gual, P. Mensirip, P. Harimau, P. Setindan, P. Hujong, P. Tengah dan Pulau Batu Gajah telah dipetakan.
		Geosites	Beautiful landscape and morphology of the 16 small islands around Mersing comprising P. Penyimbang, P. Ibol, P. Mentigi, P. Nanga Besar, P. Nanga Kecil, P. Simbang, P. Lima Kecil, P. Lima Besar, P. Rawa, P. Gual, P. Mensirip, P. Harimau, P. Setindan, P. Hujong, P. Tengah dan P. Batu Gajah have been mapped.
	Tanjung Balau, Kota Tinggi	Cadangan tapak warisan geologi kebangsaan	Penyediaan buku Atlas Geologi Struktur Tanjung Balau sedang dijalankan.
		Proposed national geological heritage site	Atlas of Structural Geological of Tanjung Balau is being prepared.

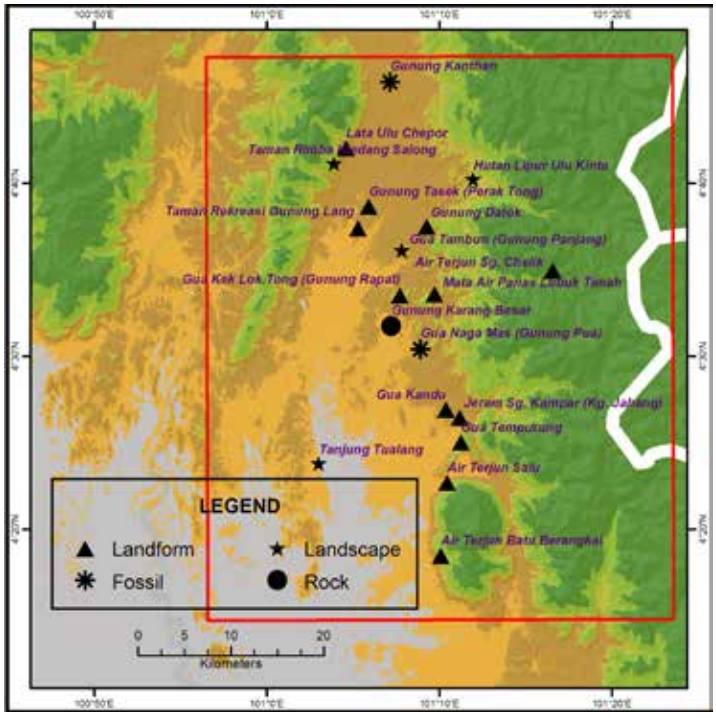
Negeri State	Kawasan Area	Status Status	Catatan Remarks	
Perak	Lembah Kinta	Penyediaan dosir awal pembangunan Geopark Lembah Kinta Initial dossier preparation for the development of Kinta Valley Geopark	Penarikan/ Attraction: 1. Gunung Kanthan – Fosil berusia Karbon-Permian 1. Gunung Kanthan – Fossil aged Carbon-Permian 2. Mata Air Panas Lubuk Timah - Kolam air panas dengan suhu 45°C; Tapak tinggalan aktiviti perlombongan bijih timah 2. Lubuk Timah Hotspring - Hot water pool with temperature 45°C; Ex-tin mining area 3. Hutan Lipur Ulu Kinta 3. Hutan Lipur Ulu Kinta 4. Gua Tambun (Gunung Panjang) - Lukisan Prasejarah berusia lebih 2000 tahun yang tersingkap di sepanjang 30 m pada dinding batuan 4. Tambun Cave (Gunung Panjang) – Prehistoric drawings dating more than 2000 years ago exposed along 30 m of the cave wall 5. Lata Ulu Chepor - Puncak Ulu Chepor: Gunung Peninjau 5. Ulu Chepor Waterfall - Peak of Ulu Chepor: Gunung Peninjau 6. Gua Kek Lok Tong (Gunung Rapat) - Kuil Kek Lok Tong; Kuil Sampoh Tong 6. Kek Lok Tong Cave (Gunung Rapat) - Kek Lok Tong Temple; Sampoh Tong Temple 7. Taman Rekreasi Gunung Lang - Kolam bekas lombong (sejarah perlombongan bijih timah pada tahun 1880) 7. Gunung Lang Recreational Park – Ex-mining pond (mining history since 1880) 8. Gunung Datok - Kolam mata air panas; Monumen batu pensil 8. Gunung Datok – Hotspring pool; pencil rock monument 9. Gunung Tasek (Perak Tong) - Kuil Perak Tong 9. Gunung Tasek (Perak Tong) - Perak Tong Temple	10. Air Terjun Sg. Chelik 10. Sg. Chelik Waterfall 11. Taman Rimba Kledang Saiong – Taman Herba 11. Taman Rimba Kledang Saiong – Herbal Garden 12. Air Terjun Salu 13. Salu Waterfall 14. Gua Tempurung - Sungai bawah tanah melalui gua (1.9 km) 14. Tempurung Cave – Underground river through cave (1.9 km) 15. Gua Kandu – speleotherms, stalaktik dan stalakmit berstruktur melata dan tiang 15. Kandu Cave – speleotherms, stalactite and stalacmite in cascading and pillars structure 16. Air Terjun Batu Berangkai 16. Batu Berangkai Waterfall 17. Jeram Sg. Kampar (Kg. Jahang) 17. Sg. Kampar Rapid (Kg. Jahang) 18. Kapal Korek Tanjung Tualang - Kapal korek T.T No. 5 ini pernah digunakan oleh syarikat Malaysian Mining Corporation Berhad sehingga tahun 1991 18. Tanjung Tualang Tin Dredge - Tin Dredge T.T No. 5 was used by Malaysian Mining Corporation Berhad Company until year 1991 19. Gua Naga Mas (Gunung Pua) - Fosil vertebrata harimau purba (1 m panjang) 19. Gua Naga Mas (Gunung Pua) – Ancient tiger vertebrate fossil (1 m long) 20. Gunung Karang Besar - Pelapisan batu kapur dan batuan pasir berwarna merah dengan mineral kuarza bersaiz sederhana 20. Gunung Karang Besar – Limestones and red colour sandstones layering with medium size quartz mineral

Negeri State	Kawasan Area	Status Status	Catatan Remarks
Sarawak	Delta Sarawak	Cadangan Geopark Delta Sarawak Proposed Sarawak Delta Geopark	Penubuhan Jawatankuasa Teknikal ke-2 untuk menyemak semula kertas MMKN. Setting up of 2nd Technical Committee to revise MMKN paper.
Sabah	Kunak	Geotapak Geosites	Enam geotapak berpotensi telah dipetakan pada tahap tinjauan. Six potential geosites were mapped during field reconnaissance.

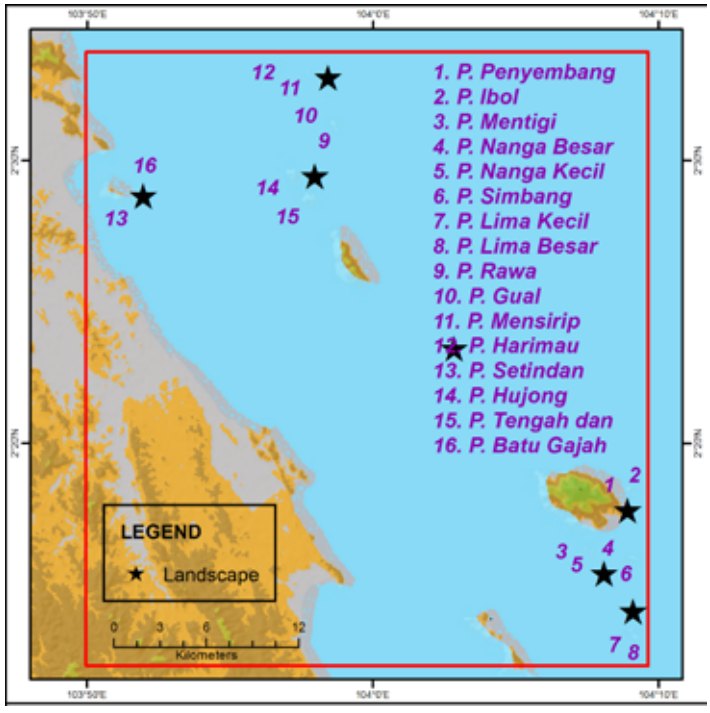


Aktiviti Pemetaan Warisan Geologi 2015

Geological Heritage Mapping Activities 2015



Tempat Menarik di Kawasan Cadangan Geopark Lembah Kinta
Places of Attraction in the Proposed Kinta Valley Geopark



Enam Belas Buah Pulau-Pulau Kecil di Sekitar Mersing Dengan Morfologi dan Landskap Berpandangan Indah
The Sixteen Small Islands Around Mersing with Beautiful Landscape and Morphology

Tanjung Balau, Kota Tinggi, Johor

Lapisan olistostrome setebal 10-15 cm pada lapisan selang lapis kuarzit-filit-sabak Formasi Mersing di Tanjung Siang
Oliststrome layer of 10-15 cm interbedding with quartz-phyllite-slate of the Mersing Formation

Lipatan sarung yang berbentuk kobis di Tanjung Balau
Cabbage-like sheath fold at Tanjung Balau

Lipatan sarung pada salah satu sayap lipatan
Sheath fold along the limb of fold

Photos: Mohd Fauzi Rajimin

Fabrik transposisi yang berasal dari telerang kuarza di dalam lapisan syal (filit) Formasi Mersing
Transposed cleavage fabric of quartz veins in the shale layer of Mersing Formation

Kunak, Sabah

1. Batu kapur Madai
   Madai limestone

2. Gua tiub lava Mostyn
   Mostyn lava tube cave

3. Lopak lumpur Binuang
   Binuang mudpool

4. Tasik Impian Mostyn
   Mostyn Dream Lake

Photos: Paulus Godwin

Hidrogeologi

Aktiviti hidrogeologi telah dijalankan oleh pejabat negeri bagi mendapatkan maklumat air tanah yang bertujuan untuk menilai potensi sumber air tanah dan untuk membekalkan air bersih kepada penduduk di kawasan yang sering menghadapi masalah bekalan air. Di samping itu, pihak jabatan juga menggalakkan penggunaan air tanah sebagai sumber air alternatif. Pada tahun 2015, sebanyak 33 telaga eksplorasi telah digerudi, 30 telaga pengeluaran dan 9 telaga pemantauan telah berjaya dibangunkan untuk sumber air. Selain itu, sebanyak 19 buah telaga telah dibina sebagai projek khas di bawah Projek Bantuan Bencana untuk membekal air pembersihan berikutan kejadian banjir besar yang melanda pantai timur Semenanjung Malaysia pada penghujung tahun 2014 sehingga awal tahun 2015.

Di bawah Projek Khas Bekalan Air, jabatan telah menyumbang kepakaran dalam bidang air tanah melalui kerjasama dengan pelbagai agensi kerajaan seperti Kementerian Tenaga, Teknologi Hijau dan Air Malaysia (KeTTHA), Kementerian Luar Bandar dan Wilayah (KKLW) serta beberapa agensi kerajaan negeri yang mengawalselia sumber air.

Jalinan kerjasama juga diadakan dengan pihak Jabatan Alam Sekitar bagi mengawal kebakaran kawasan tanah gambut yang sering berlaku pada musim kering. Penggerudian dan pembinaan telaga untuk tujuan memadam kebakaran di kawasan tanah gambut telah dijalankan oleh JMG di Johor, Kelantan, Pahang, Sarawak dan Selangor/ Wilayah Persekutuan. Pihak JMG juga membantu pihak Kementerian Kesihatan dalam membuat perakuan terhadap permohonan pengeluaran air mineral di negeri-negeri.

Pemantauan air tanah telah dijalankan sepanjang tahun sebagai sebahagian daripada usaha Jabatan untuk memantau kualiti air dan memastikan penggunaan air tanah secara mampan. Program pemantauan yang dijalankan termasuk pengukuran paras air tanah, pengumpulan sampel untuk analisis makmal dan penyelenggaraan Sistem Penapisan Air Tanah Ringkas (SPATR). Data daripada kerja-kerja pemantauan yang dijalankan pada tahun 2015 ke atas 396 buah telaga tidak menunjukkan perubahan yang ketara berkaitan dengan paras air dan kualiti air.

Pemodelan semula sumber air tanah telah dijalankan di Lembangan Langat, Selangor untuk menilai semula potensi sebenar air tanah di lembangan Langat. Kajian ini telah menghasilkan maklumat yang berguna dan penting berkaitan dengan kapasiti rizab air tawar dalam lembangan tersebut. Maklumat ini dapat membantu pihak berkuasa untuk perancangan masa hadapan dalam mengeksploitasi sumber air tanah.

Hydrogeology

Hidrogeological activities were carried out by state offices to acquire data for the assessment of groundwater potential and to provide clean drinking water in water-constrained areas. At the same time, the department also encourages the use of groundwater as an alternative water source. A total of 33 exploration wells were drilled, 30 production wells and 9 monitoring wells were successfully developed for water resources in 2015. Besides this, a total of 19 wells were constructed as special projects under the Disaster Relief Project to provide water for clean-up purposes following the floods that hit the east coast of Peninsular Malaysia in late 2014 till early 2015.

Under the Water Supply Special Project, the department contributed its expertise through collaboration with various agencies, such as the Ministry of Energy, Green Technology and Water (KeTTHA), Ministry of Rural and Regional Development (KKLW) and various state agencies which manage water resources.

The department also liaised with the Department of Environment to control peat fires which commonly occurs during the seasonal dry spells. Drilling and well development for fire-fighting in peat areas were carried out by JMG in Johor, Selangor/ Wilayah Persekutuan, Kelantan, Pahang and Sarawak. JMG also assisted the Ministry of Health (KKM) in processing applications for the production of mineral water in the states.

Groundwater monitoring was carried out throughout the year as part of the department's effort to monitor the quality of water resources, and to ascertain that the water resources were being sustainably utilised. Monitoring programmes included the measurement of groundwater levels, collection of samples for laboratory analyses and maintenance of Groundwater Filtration Systems (SPATR). Data from the monitoring works in 2015 on 396 wells indicated that there were no significant changes pertaining to the water level and water quality.

Groundwater remodelling was carried out in Langat Basin, Selangor to re-evaluate groundwater potential in the Langat Basin. The study yielded useful and important information pertaining to the capacity of freshwater reserves in that basin. This information would be crucial to the relevant authorities for future planning in the exploitation of groundwater resources.

Pembangunan Air Tanah
Groundwater Development

Penggerudian dan pembinaan telaga
Drilling and well construction

Negeri State	Lokasi Location	TE* EW*	TP* PW*	TM* MW*	Catatan Remarks
Kedah	Sekolah Kebangsaan Gulau, Sik	-	1	1	Kedalaman telaga adalah 63 m dengan kadar luahan 51.6 m^3/j. Telaga tiub adalah berpotensi dan akan dibangunkan untuk membekalkan air untuk kegunaan domestik. Depth of the well was 63 m and its yield was 5 m^3/h. The tube well showed potential for development to supply water for domestic consumption.
	Sekolah Menengah Kebangsaan Tobiar, Pendang	-	1	1	Kedalaman telaga adalah 102 m dengan kadar luahan 12.20 m^3/j. Telaga tiub adalah berpotensi dan akan dibangunkan untuk membekalkan air untuk kegunaan domestik. Depth of the well was 102 m and its yield was 12.20 m^3/h. The tube well showed potential for development to supply water for domestic consumption.
	Kg. Sawa Kecil, Pendang	-	1	1	Kedalaman telaga adalah 43 m dengan kadar luahan 9.12 m^3/j. Telaga tiub adalah berpotensi dan akan dibangunkan untuk tujuan pertanian. Depth of the well was 43 m and its yield was 9.12 m^3/h. The tube well showed potential for development to supply water for domestic consumption.
Perak	Daerah Hulu Perak	-	-	5	Berfungsi sebagai telaga pemantauan untuk memantau kualiti air. Served as monitoring wells to monitor water quality.
	Maahad Tahfiz Al Quran Wal Qiraat Addin 4, Air Kuning, Tapah	1	1	-	Telaga pengeluaran dengan kapasiti luahan sehingga 5 m^3/j telah dibangunkan serta 1 sistem penapisan air tanah ringkas turut dibina. Telaga ini turut dijadikan sebagai telaga pemantauan kualiti air tanah. A production well with discharge capacity of up to 5 m^3/h and a simple water filtration system were developed. This well also functions as a groundwater quality monitoring well.

Negeri State	Lokasi Location	TE* EW*	TP* PW*	TM* MW*	Catatan Remarks
Selangor/ Wilayah Persekutuan	Sungai Kelambu, Banting	1	-	-	Sebuah telaga eksplorasi sedalam 60 m telah dibina untuk mendapatkan profil subpermukaan. Telaga ini turut dijadikan telaga pengeluaran memandangkan ia mempunyai anggaran kadar luahan setinggi 60 m^3/j. An exploration tubewell was constructed up to a depth of 60 m for peat sub-surface profiling. The well also served as a production well in view of the high estimated discharge rate of 60 m^3/h.
N. Sembilan	Gemenceh	6	1	-	Kajian potensi sumber air tanah bagi akuifer alluvium dan batuan keras di kawasan bermasalah bekalan air. Study on groundwater resource potential for hardrock and alluvium aquifer in water-stressed areas.
Melaka	Kg. Chohong	4	1	-	Pembinaan telaga pengeluaran berkedalaman 6.5 m dengan anggaran luahan 5.91 m^3/j bagi membekalkan air untuk kegunaan aktiviti pertanian. Construction of production well to a depth of 6.5 m with an estimated yield of 5.91 m^3/h to supply water for agricultural uses.
Johor	Pulau Besar	4	-	-	Pengejetan untuk profil tanah. Soil profiling by water jetting.
	Pulau Aur	7	-	-	Pengejetan untuk profil tanah. Soil profiling by water jetting.
Terengganu	Besut	9	8	-	Kajian akuifer cetek lembangan Sungai Besut. Purata luahan air tanah ialah 3.76 m^3/j. Shallow aquifer study in Besut River Basin. Average groundwater yield was 3.76 m^3/h.
	Kuala Nerus, Kuala Terengganu, Setiu dan Kemaman	-	4	-	Telaga dibina bagi mengatasi masalah bekalan air. Purata luahan air tanah ialah 3.90 m^3/j. These wells were constructed to overcome water scarcity problems. Average groundwater yield was 3.90 m^3/h.

Negeri State	Lokasi Location	TE* EW*	TP* PW*	TM* MW*	Catatan Remarks
Kelantan	SK Dewan Beta, Kota Bharu	-	1	-	Telaga pengeluaran berkedalaman 19.5 hingga 29.5 m dengan kadar luahandi antara 1.5 hingga 5.5 m^3/j telah dibina. Production wells with depths 19.5 to 29.5 m with yield ranging from 1.5 to 5.5 m^3/h were constructed.
	SMK Kutan, Tumpat	1	-	-	
	Kg Kutan Hilir, Tumpat	-	1	-	
	Pasti Ar Rahmah, Kg. Kok Pasir, Tumpat	1	-	-	
	Pondok Hj Mat Zin, Wakaf Bharu, Tumpat	-	1	-	
Sabah	Kota Belud	-	1	1	Telaga pengeluaran (kedalaman 50 m) dan telaga pemantauan (kedalaman 30 m) dibina di Kg. Pandasan, Kota Belud bagi membekalkan air untuk kegunaan domestik. Production well (50 m depth) and monitoring well (30 m depth) were constructed at Kg. Pandasan, Kota Belud.
	Tuaran	-	5	-	Lima buah telaga pengeluaran telah dibina dengan kedalaman 8-10 m dan purata luahan 7 m^3/j di sepanjang tali air Kg. Dungang bagi tujuan kegunaan aktiviti pertanian. Five tubewells with depths 8-10 m with yield of 7 m^3/h were constructed along the irigation drainage in Kg. Dungang, Tuaran.

Negeri State	Lokasi Location	TE* EW*	TP* PW*	TM* MW*	Catatan Remarks
Sarawak	Kg. Ensebang Jaya, Balai Ringin, Serian	-	1	-	Pembinaan telaga pengeluaran berkedalaman 87 m dengan kadar luahan 2.28 m^3/j dan memberi manfaat kepada 171 penduduk kampung. Construction of a production well with a depth of 87 m and discharge rate of 2.28 m^3/h which benefitted 171 village folks.
	Rh Unggai Ak Kunding, Ulu Dijih, Selangau, Sibu	-	1	-	Pembinaan telaga pengeluaran berkedalaman 71 m dengan kadar luahan 5.1 m^3/j dan memberi manfaat kepada 175 penduduk kampung. Construction of a production well with a depth of 71 m and discharge rate of 5.1 m^3/h which benefitted 175 village folks.
Jumlah / Total:		**33**	**29**	**9**	

TE* / EW* = Telaga Eksplorasi / Exploration Well
TP* / PW* = Telaga Pengeluaran / Production Well
TM* / MW* = Telaga Pemantauan / Monitoring Well

Perkhidmatan pembangunan air tanah oleh Bahagian Perkhidmatan Teknikal
Groundwater development services by Technical Services Division

Negeri State	Lokasi Location	Bil. Telaga No. of wells	Aktiviti / Activity	Catatan Remarks
Kelantan	Lojing	1	Penggerudian dan pembinaan telaga Drilling and well construction	Bekalan air tambahan untuk tujuan pertanian. Kedalaman telaga adalah 130 m dan kadar luahan 4.5 m^3/j. Additional water supply for agricultural uses. Tubewell depth at 130 m with an estimated discharge rate of 4.5 m^3/h.
Perak	SMK Pulau Pangkor	1	Penggerudian dan pembinaan telaga Drilling and well construction	Bekalan air untuk mengairi tanaman rumput turf. Kedalaman telaga adalah 18 m dan kadar luahan 2 m^3/j. Additional water supply for turfgrass watering. Tubewell depth at 18 m with an estimated discharge rate of 2 m^3/h.

Penggerudian dan pembinaan telaga di kawasan kebakaran tanah gambut
Drilling and construction of wells in fire prone peat area

Negeri State	Lokasi Location	Luahan telaga (m^3/j) Yield (m^3/h)	Kedalaman Depth (m)	Catatan Remarks
Kelantan	Kg. Beris Lalang, Bachok	>90	60	Pembinaan telaga siap sepenuhnya. Well construction completed.
Johor	Kg. Parit Sembilan, Air Papan, Mersing	27.42	104.5	Pembinaan telaga siap sepenuhnya. Well construction completed.
Selangor/ Wilayah Persekutuan	Tanjung Sepat, Hutan Simpan Kuala Langat Selatan	60	72	Pembinaan telaga siap sepenuhnya. Well construction completed.
Pahang	Ladang Yayasan Pahang Nenasi	30	72.4	Pembinaan satu telaga pengeluaran dan empat telaga eksplorasi. Construction and completion of one production well and four exploration wells.
Sabah	Kuala Penyu	5	50	Dua buah telaga tiub telah dibina di Kg. Kayul dan Kg. Nukahan, Kuala Penyu. Two tubewells were constructed at Kg. Kayul and Kg. Nukahan, Kuala Penyu.

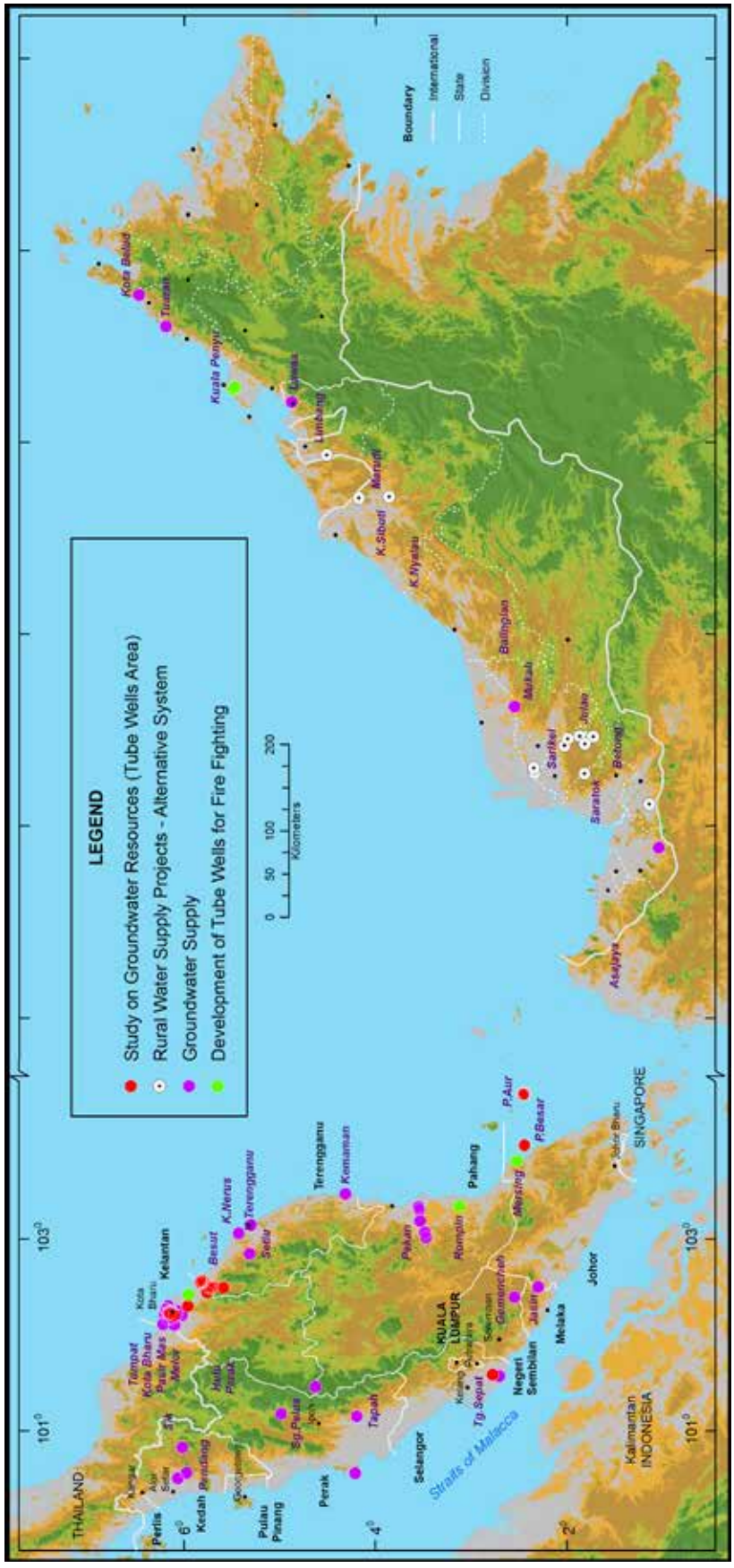
Projek khas bekalan air
Water supply special project

Negeri State	Lokasi Location	Projek Project	Sumber Kewangan Fund Source	Catatan Remarks
Kelantan	Klinik Kesihatan Kota Bharu, Kota Bharu Kem Kijang 1, Kota Bharu Kem Kijang 2, Kota Bharu Klinik Kesihatan Mahligai, Bachok Klinik Kesihatan Kubang Kerian, Kota Bharu Klinik Kesihatan Pengkalan Kubur, Tumpat Klinik Kesihatan Bendang Kerian, Tumpat Klinik Kesihatan Meranti, Pasir Mas Masjid Kg. Laut, Tumpat SMK Tendong, Pasir Mas SK Ismail Petra 1, Kota Bharu SMK Kg. Laut, Tumpat SRK Seri Kg. Laut, Tumpat SRK Padang Garong, Kota Bharu SRK Kg. Laut, Tumpat SMS Tengku Muhammad Faris Petra, Kota Bharu Wisma Persekutuan, Kota Bharu SK Tiong, Kota Bharu Masjid Teluk Renjuna, Tumpat	Projek Bantuan Bencana Disaster Relief Project	Peruntukan pembangunan jabatan Departmental development allocation	Sebanyak 19 telaga telah dibina untuk keperluan kerja-kerja pembersihan selepas banjir besar melanda pantai timur Semenanjung Malaysia. A total of 19 wells were constructed for clean-up purposes after the floods hit the east coast of Peninsular Malaysia.

Negeri State	Lokasi Location	Projek Project	Sumber Kewangan Fund Source	Catatan Remarks
Perak	Perkampungan Orang Asli Kg. Kajang, Lasah, Sg. Siput	Projek bekalan air kawasan masalah bekalan air Water stress area project	Jabatan Kemajuan Orang Asli Malaysia (JAKOA) Department of Orang Asli Development Malaysia (JAKOA)	Pembinaan telaga untuk 300 orang pengguna yang mengalami masalah bekalan air bersih. Luahan sehingga 25 m^3/j serta sistem penapisan air tanah ringkas dibina. A well was built to benefit about 300 users that experienced clean water supply problem with yield of 25 m^3/h and installation of water filtration systems.
Pahang	Loji Air Bilut, Raub	Projek pembinaan sistem susupan tebing buatan air tanah Construction of riverbank infiltration system project	Projek Sumber Air Tanah Negara	Pembinaan satu sistem pengumpulan air bersih melalui kaedah susupan tebing buatan sebagai sumber alternatif bagi kegunaan loji air apabila kekeruhan air sungai sangat tinggi. Construction of a fresh water collection system by riverbank infiltration system as an alternative source for the water treatment plant.

Senarai bekalan air luar bandar - sistem alternatif 2015
List of rural water supply projects - alternative system 2015

Negeri / State : Sarawak		
Sumber Kewangan: Peruntukan sebanyak RM2,235,000 dari Kementerian Kemajuan Luar Bandar dan Wilayah. **Fund Source:** An allocation of RM2,235,000 from the Ministry of Rural and Regional Development.		
Skop Projek: 18 projek bekalan air luar bandar. Memberi manfaat kepada 533 buah rumah atau 2730 penduduk. **Project Scope:** 18 Rural water supply projects. The project have benefitted 533 household or 2730 residents.		
Lokasi / Location		
Pa' Lungan, Bario, Miri	Rh. Dempa, Julau, Sarikei	Rh. Galo, Sijau Melikat, Marudi, Miri
Rh. Barang Ak Sindong, Kara Bangunan, Jalan Kara, Pantu, Sri Aman	Rh. Ikeh, Julau, Sarikei	Rh. Fabian Ak Unggang, Sg. Sapi, Julau, Sarikei
Rh. Unggin Gara, Kara Tinting Jagu Pantu, Quarry Lachau, Pantu, Sri Aman	Rh. Andrew Dagang, Julau, Sarikei	Rh. Jamba, Kaki Wong Tukuk, Sg. Paku, Mujong, Baleh, Kapit
Rh. Banyah, Sg. Sebubu, Marudi, Miri	Rh. Tujang, Julau, Sarikei	Rh. George, Merurun, Entabai, Julau, Sarikei
Rh. Getai, Sg. Ilas, Meradong, Sarikei	Rh. Embol, Lubok Pasu, Limbang	Rh. Unjong, Ulu Sugai, Pakan, Sarikei
Rh. Franchis Ak Pengarah, Ng. Singat, Sibu	Rh. Entili, Ng. Rayah Ili, Julau, Sarikei	Rh. Jimbai Ak Megat, Ulu Empit, Wak Pakan, Sarikei



Pembangunan Air Tanah dan Pembinaan Telaga di Kawasan Kebakaran Tanah Gambut 2015
Groundwater Development and Construction of Wells in Fire Prone Peat Area 2015

Program pemantauan air tanah
Groundwater monitoring programme

Negeri State	Bil. telaga dipantau No. of wells monitored	Catatan Remarks
Kedah	24	Pemantauan dijalankan dua kali setahun di seluruh negeri. Tiada perubahan kualiti air tanah yang ketara. Monitoring was conducted twice a year throughout the state. No obvious change in groundwater quality.
Perlis	1	Pemantauan dijalankan dua kali setahun di seluruh negeri. Tiada perubahan kualiti air tanah yang ketara. Monitoring was conducted twice a year throughout the state. No obvious change in groundwater quality.
Pulau Pinang	2	Pemantauan dijalankan dua kali setahun di seluruh negeri. Tiada perubahan kualiti air tanah yang ketara. Monitoring was conducted twice a year throughout the state. No obvious change in groundwater quality.
Perak	47	Kerja pemantauan dijalankan sebanyak 2 kali setahun. Paras dan kualiti air tanah tidak menunjukkan perubahan yang sangat ketara. Monitoring was conducted twice a year. No obvious change in groundwater quality and level.
Selangor/ Wilayah Persekutuan	40	Pemantauan dijalankan dua kali setahun di seluruh negeri. Monitoring was conducted twice a year throughout the state.
N. Sembilan	33	Pemantauan dijalankan sekali setahun di seluruh negeri untuk mendapatkan data asas kualiti dan paras air tanah. Monitoring was conducted once a year throughout the state to obtain the baseline data on groundwater quality and level.
Melaka	12	Pemantauan dijalankan sekali setahun di seluruh negeri untuk mendapatkan data asas kualiti dan paras air tanah. Monitoring was conducted once a year throughout the state to obtain the baseline data on groundwater quality and groundwater level.
Johor	28	Pemantauan dijalankan dua kali setahun. Tiada perubahan kualiti air yang ketara. Monitoring was conducted twice a year. No obvious change in groundwater quality.
Pahang	12	Sebanyak dua kali program pemantauan air tanah telah dijalankan. Tiada perubahan ketara berlaku terhadap kualiti dan paras air tanah. Groundwater monitoring was conducted twice. No obvious change in groundwater quality and level.

Negeri State	Bil. telaga dipantau No. of wells monitored	Catatan Remarks
Terengganu	71	Persampelan dan analisis kualiti air tanah dijalankan 2 kali setahun kecuali bagi kawasan pulau di mana ianya dijalankan sekali setahun. Tiada perubahan kualiti air tanah yang ketara. Monitoring was conducted twice a year throughout the state, except for the islands where monitoring was carried out once a year. No obvious change in groundwater quality.
Sabah	106	Sejumlah 106 telaga tiub dipantau pada tahun ini di sekitar kawasan Pantai Barat Utara, Pantai Barat Selatan, Pantai Timur dan sebahagian pedalaman Sabah. Sebanyak 88 sampel air telah dianalisis bagi tujuan pemantauan kualiti air telaga tiub. Hasil pemantauan mendapati tiada sebarang pencemaran air tanah yang berlaku pada kesemua telaga yang dipantau. A total of 106 tubewells were monitored in the Northwest, Southwest, Eastern and some areas in the interior of Sabah. 88 water samples were analysed for its quality. There was no groundwater contamination in any of the tube wells monitored.
Sarawak	20	Pemantauan dijalankan sekali setahun di seluruh negeri untuk mendapatkan data asas kualiti air dan paras air tanah. Tiada perubahan kualiti air tanah yang ketara. Monitoring was conducted once a year throughout the state to obtain baseline data on water quality and groundwater level. No obvious change in groundwater quality.
Jumlah / Total	**396**	

Program Pemantauan Air Tanah 2015
Groundwater Monitoring Programme 2015

Program Pengurusan Tanah Gambut Yang Sering Terbakar. Penggerudian kaedah pengejetan bagi pembinaan telaga tiub di Kuala Penyu, Sabah
Peat Fire Management Program. Construction of monitoring tubewells using jetting method at Kuala Penyu, Sabah

Photo: Mohd. Shahrizal Mohamed Sharifodin

Kerja-kerja pembinaan telaga tiub pemantauan air tanah menggunakan kaedah pengejetan di Hulu Perak
Construction of monitoring tubewells using jetting method at Hulu Perak

Photo: Mohd. Shahrizal Mohamed Sharifodin

Kerja lapangan pemantauan kualiti air tanah
Groundwater quality monitoring fieldwork

Pengubahsuaian caisson sebagai telaga pengumpul dengan pemasangan GI paip di dindingnya, Raub, Pahang
Modification of caisson as an accumulation well by installing GI pipe to the wall, Raub, Pahang

Penyediaan paip UPVC berskrin dua lapis di Raub, Pahang
Two layers screen UPVC pipe preparation in Raub Pahang

Geologi Kejuruteraan

Pembangunan negara yang pesat telah menyebabkan kawasan yang sesuai untuk pembangunan, terutamanya kawasan bandar dan pinggir bandar, semakin berkurangan sehingga memasuki kawasan yang dikelaskan sebagai kawasan sensitif alam sekitar termasuk lereng-lereng bukit. Sehubungan itu, jabatan telah mengambil langkah-langkah proaktif bagi mencegah atau mengurangkan berlakunya kejadian geobencana dengan menjalankan pemetaan geologi terain dan geologi kejuruteraan. Maklumat daripada aktiviti pemetaan tersebut digunakan secara meluas di dalam perancangan guna tanah oleh pihak berkuasa tempatan dan pelbagai agensi kerajaan lain untuk menghindar atau mengurangkan berlakunya geobencana seperti tanah runtuh, lubang benam dan lain-lain. Jabatan juga telah diminta untuk membantu dalam siasatan geobencana seperti tanah runtuh, lubang benam serta aliran lumpur dan puing untuk mencari punca kejadian dan faktor-faktor geologi pencetus kejadian, dan mencadangkan langkah-langkah kawalan dan pencegahan kepada kerajaan negeri dan pihak berkuasa tempatan.

Engineering Geology

The nation's rapid pace of development has resulted in the corresponding decrease of suitable areas for development, especially in urban and suburban areas, and at times the development has encroached into environmentally sensitive areas including hillsides. Accordingly, the department has taken proactive measures to prevent or reduce geohazard incidents by conducting geological terrain mapping and engineering geological mapping. Information from these mapping activities has been extensively referred to in land use planning by the local authorities and government agencies to prevent, or at least reduce the occurrence of geohazards such as landslides, sinkholes, etc. The department has also been asked to assist in geohazard investigations such as landslide, sinkhole and debris/ mud flow occurrences in order to determine the possible causes and contributing geological factors, and to propose for mitigation and preventive measures.

Pemetaan geologi kejuruteraan
Engineering geological mapping

Negeri State	Kawasan Area	Jenis Pemetaan Type of Mapping	Liputan Coverage (km^2)	Catatan Remarks
Perlis	Bukit Lagi	Pemetaan cerun kritikal dan zon bahaya bukit batu kapur Mapping of critical slopes and limestone hill danger zones	2	Penilaian potensi jatuhan batuan bukit batu kapur. Assessment of rockfall potential of limestone hills.
	Bukit Lagi	Pemetaan bahaya dan risiko cerun dengan kaedah LiDAR Slope hazard and risk mapping using LiDAR technique	1.5	Projek dalam peringkat pemprosesan data LiDAR. Project was in the stage of processing LiDAR data.
Selangor/ Wilayah Persekutuan	Ampang Jaya	Pemetaan geologi kejuruteraan dan geoteknikal Engineering geology and geotechnical mapping	95	Penghasilan peta geologi kejuruteraan dan geoteknikal untuk digunakan dalam perancangan guna tanah. Production of an engineering geology and geotechnical map for land use planning.

Negeri State	Kawasan Area	Jenis Pemetaan Type of Mapping	Liputan Coverage (km²)	Catatan Remarks
Sabah	Sandakan	Pemetaan kerentanan tanah runtuh Landslide susceptibility mapping	25	Input geologi untuk perancangan guna tanah. Geological input for land use planning.
Sarawak	Santubong	Penilaian geologi kejuruteraan dan risiko geobencana Engineering geology and geohazard risk assessment	75	Geobencana di kawasan kajian terdiri daripada hakisan, tanah runtuh dan aliran serpihan. The geohazards at the study area consist of erosion, landslide and debris flow.
Jumlah Liputan **Total Coverage**			**198.5**	

Pemetaan geologi kejuruteraan kawasan gambut dan tanih lembut
Engineering geological mapping in peat and soft soil areas

Negeri State	Kawasan Area	Jenis Pemetaan Type of Mapping	Liputan Coverage (km²)	Catatan Remarks
Johor	Pekan Nanas – Ayer Baloi, Pontian	Pemetaan gambut Peat mapping	60	Membekalkan data geoteknikal dan input geologi berkenaan gambut dan tanih lembut untuk untuk penilaian kesesuaian guna tanah dan perancangan pembangunan. To provide geotechnical data and geological input of peat and soft soils for land use suitability assessment and development planning.
Sarawak	Mukah	Pemetaan gambut Peat mapping	26	Membekalkan data jenis dan ketebalan tanah gambut untuk projek pencegahan kebakaran dan pengurusan tanah gambut yang sering terbakar. To provide type and depth of peat for fire prevention and management for frequently burned peat project.
	Lawas	Pemetaan gambut Peat mapping	4.125	Membekalkan data jenis dan ketebalan tanah gambut untuk projek pencegahan kebakaran dan pengurusan tanah gambut yang sering terbakar. To provide type and depth of peat for fire prevention and management for frequently burned peat project.
Jumlah Liputan **Total Coverage**			**90.125**	

Aktiviti Geologi Kejuruteraan 2015

Engineering Geology Activities 2015

Photo: Syahrizal Zakaria

Kerja-kerja penggerudian gambut menggunakan *peat sampler*, Pontian, Johor
The extraction of peat core using peat sampler, Pontian, Johor

Photo: Syahrizal Zakaria

Kerja-kerja survei untuk pemetaan tanah gambut di Pontian, Johor
Field survey for peat mapping at Pontian, Johor

Pemetaan geologi terain
Geological terrain mapping

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Catatan Remarks
Perak	Lahat	50	Pemetaan geologi terain untuk perancangan guna tanah. Laporan dihasilkan: JMG.PRK (GBN) 01/2015 Geological terrain mapping for land use planning. Report Produced: JMG.PRK (GBN) 01/2015
	Batu Gajah	50	Pemetaan geologi terain untuk perancangan guna tanah. Laporan dihasilkan: JMG.PRK (GBN) 02/2015 dan JMG.PRK (GBN) 03/2015 Geological terrain mapping for land use planning. Report Produced: JMG.PRK (GBN) 02/2015 and JMG.PRK (GBN) 03/2015
	Kuala Kangsar	60	Pemetaan geologi terain untuk perancangan guna tanah. Laporan dihasilkan: JMG.PRK (GBN) 04/2015 Geological terrain mapping for land use planning. Report Produced: JMG.PRK (GBN) 04/2015
Pahang	Kuala Lipis	50	Pemetaan geologi terain untuk perancangan pembangunan. Geological terrain mapping for development planning.
	Kuantan	20	Sambungan pemetaan geologi terain kawasan tambahan Kuantan Continuation of geological terrain mapping at additional area in Kuantan
Terengganu	Ajil dan Penghulu Diman	100	Pemetaan geologi terain untuk perancangan gunatanah. Geological terrain mapping for land use planning.
Kelantan	Blok 223, Blok 224 dan Blok 299 dalam Jajahan Machang	162	Input geologi bagi kegunaan perancangan pembangunan. Geological input for development planning.
Sabah	Gunung Walker, Sandakan	20	Input geologi bagi kegunaan perancangan pembangunan. Geological input for development planning.
Jumlah Liputan / Total Coverage:		**512**	

Siasatan geobencana
Geohazard investigation

Negeri State	Lokasi Area	Jenis Bencana Type of Hazard	Catatan Remarks
Perak	Sekolah Menengah Agama Izzudin Shah, Ipoh	Lubang benam Sinkhole	Siasatan kejadian lubang benam yang berlaku pada 8 Januari 2015 yang telah mengakibatkan kerosakan pada dinding bangunan baru dibina. Investigation on sinkhole which occurred on the 8 January 2015 that caused damage to the newly built building wall.
	Taman Taiping Villa, Taiping	Tanah runtuh Landslide	Siasatan kejadian tanah runtuh yang telah mengakibatkan kerosakan pada Substesen Janakuasa TNB. Investigation on landslide that caused damage to TNB Power Substation.
	Lhoist (Malaysia) Sdn. Bhd. Tapah	Lubang benam Sinkhole	Siasatan kejadian lubang benam yang berlaku pada 26 Februari 2015 yang telah mengakibatkan 2 kematian. Investigation on sinkhole which occurred on the 26 February 2015 that caused the death of 2 peoples.
	Kampung Belum Baru, Gerik	Aliran puing Debris flow	Siasatan kejadian aliran puing yang berlaku pada 17 Jun 2015 yang telah merosakkan sebahagian kawasan kebun penduduk. Investigation on debris flow incident that occurred on the 17 June 2015 that caused partially damage to agricultural area.
	Sekolah Menengah Kebangsaan Sultan Yussuf, Batu Gajah	Lubang benam Sinkhole	Siasatan kejadian lubang benam yang berlaku pada 10 Ogos, 2015 yang telah mengakibatkan kerosakan pada bangunan dan tandas. Investigation on sinkhole which occurred on the 10 August 2015 that caused damage to the building and toilet.
	Gua Tempurung, Kampar	Jatuhan batuan Rock fall	Siasatan kejadian jatuhan batuan yang berlaku pada 10 Ogos 2015 yang menyebabkan debris berselerak di laluan rekreasi pengunjung. Investigation on rock fall incident that occurred on the 10 August 2015 that caused the debris scattered along the visitor's recreational trails.
	Loji Rawatan Air, Pulau Banding, Gerik Water Treatment Plant, Pulau Banding, Gerik	Tanah runtuh Landslide	Siasatan kejadian tanah runtuh yang berlaku pada 26 November 2015 yang menyebabkan kerosakkan pada parit tebing dan paip. Investigation on landslide incident that occurred on the 26 November 2015 that caused damage to the concrete drain and pipes.

Negeri State	Lokasi Area	Jenis Bencana Type of Hazard	Catatan Remarks
Selangor/ Wilayah Persekutuan	Bukit Nenas	Kegagalan cerun Slope failure	Siasatan kejadian kegagalan cerun potongan yang berlaku di kawasan letak kereta. Investigation of slope failure occurrence at car park area.
	Hulu Selangor Sungai Buaya	Kegagalan cerun Slope failure	Siasatan kejadian kegagalan cerun potongan jalan. Investigation of road slope cutting failure.
	Jalan Kebun, Klang	Kepanasan tapak rumah Heated house floor	Siasatan kejadian kepanasan tapak rumah. Investigation on the cause of heated house floor.
N. Sembilan	Rumah Rakyat Kg. Panchor, Seremban	Tanah runtuh Landslide	Siasatan kejadian tanah runtuh menggunakan teknik *'Terrestrial Laser Scanning'*. Investigation on landslide occurrence using Terrestrial Laser Scanning technique.
Melaka	Bukit Beruang, Ayer Keroh	Tanah runtuh Landslide	Siasatan kejadian tanah runtuh menggunakan teknik *'Terrestrial Laser Scanning'*. Investigation on landslide occurrence using Terrestrial Laser Scanning technique.
Johor	Gunung Pulai, Kulai	Aliran puing Debris flow	Penilaian semula risiko kemudahterancaman geobencana di Hutan Lipur Gunung Pulai, Kulai. Geohazard vulnerability risk reassessment at Hutan Lipur Gunung Pulau, Kulai.
Pahang	Cameron Highlands	Tanah runtuh Landslide	Siasatan kejadian tanah runtuh yang telah mengakibatkan 1 kematian. Investigation on landslide that caused the death of 1 victim.
	KM52.4 Lebuhraya Kuala Lumpur-Karak	Aliran puing Debris flow	Siasatan lanjut telah dijalankan pada 23-29 November 2015 dan satu laporan telah disiapkan. Further investigation was carried out from 23-29 November, 2015 and a report had been completed.
Sarawak	Sungai Mandi, Santubong	Aliran puing Debris Flow	Daripada analisis kinematik, cerun berkemungkinan mengalami 2 jenis kegagalan iaitu kegagalan satah dan rebahan. Serpihan dari kejadian tanah runtuh itu telah mewujudkan empangan semula jadi. From the kinematic analysis, the slope is possible to experience 2 types of failure which are planar failure and toppling. Debris from the landslide was creating a natural dam.

Kejadian aliran puing dan lumpur di KM52.4 Lebuhraya KL-Karak, Bentong, Pahang pada November 2015 yang menutupi keseluruhan lebuhraya berkenaan serta menyebabkan gangguan trafik selama 3 hari

Debris and mudflow event at KM52.4 KL-Karak Highway, Bentong, Pahang on November 2015 that covered the highway, disrupting traffic for three days

Kuarters Jabatan Perhutanan Lentang, Bentong, Pahang yang mengalami kerosakan teruk akibat limpahan aliran puing dan lumpur pada November 2015

Damaged quarters of Lentang Forestry Department, Bentong, Pahang due to the debris and mudflow on November 2015

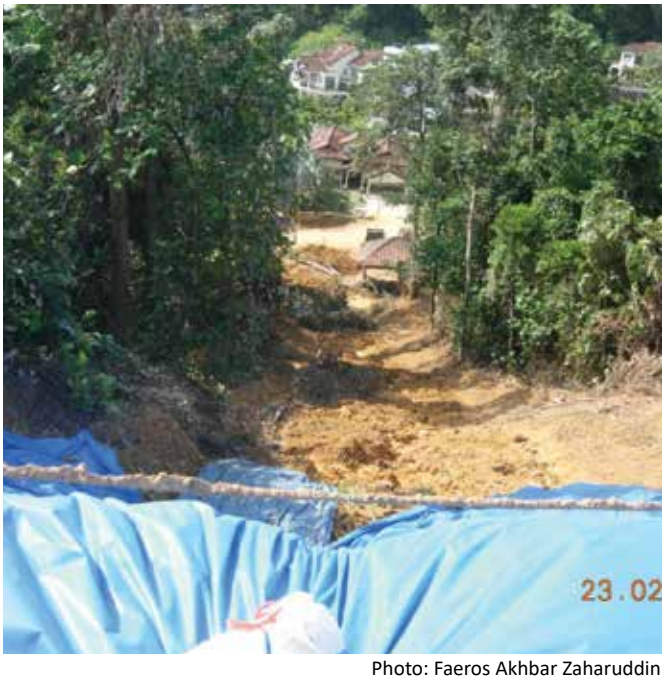


Photo: Faeros Akhbar Zaharuddin

Kejadian tanah runtuh di Taman Taiping Villa, Taiping, Perak

Landslide occurrence at Taman Taiping Villa, Taiping, Perak

Photo: Roslan Rajali

Jalan yang mengalami kerosakan akibat aliran puing berhampiran Damai Beach Resort, Kuching, Sarawak

Damaged section of road near Damai Beach Resort, Kuching, Sarawak

Geologi Alam Sekitar

Environmental Geology

Ulasan Laporan Penilaian Kesan Alam Sekeliling

Review of Environmental Impact Assessment Reports

Ulasan laporan penilaian kesan alam sekeliling untuk projek pembangunan
Review of environmental impact assessment reports for development projects

Negeri State	Bil. ulasan No. of review	Catatan Remarks
Perak	4	Menyediakan ulasan teknikal terhadap laporan EIA/ DEIA yang disediakan. Provided technical review for the EIA/ DEIA reports.
Selangor/ Wilayah Persekutuan	15	Menyediakan ulasan teknikal terhadap laporan EIA yang disediakan. Provided technical review for the EIA reports.
N. Sembilan	5	Menyediakan ulasan teknikal terhadap laporan EIA bertajuk *"Preliminary Impact Environmental Planning".* Provided technical review for the EIA report titled "Preliminary Impact Environmental Planning". Menyediakan 3 ulasan teknikal DEIA (*Detail Impact Environmental Planning*) Provided 3 technical reviews of DEIA (Detail Impact Environmental Planning)
Johor	28	Memberi khidmat nasihat berhubung pembangunan bercampur, perumahan, industri, tempat pembuangan sampah, infrastruktur dan pertanian. Provided advisory services pertaining to mixed development, housing, industry, landfill, infrastructure and agriculture.
Pahang	23	Menyediakan ulasan teknikal bagi laporan EIA bagi kawasan sensitif alam sekitar daerah-daerah Kuantan, Bentong, Raub, Temerloh, Jerantut, Cameron Highlands dan Bera, termasuk kawasan pembangunan, projek hidro elektrik, pembalakan dan skim penanaman semula ladang untuk pokok hutan-balak, hutan getah dan ladang kelapa sawit. Provided technical review for EIA Reports for environmentally sensitive areas in Kuantan, Bentong, Raub, Temerloh, Jerantut, Cameron Highlands and Bera districts, including development areas, hydro-electric projects, logging and land replanting scheme for forest, rubber forest and palm oil plantations.
Terengganu	1	Menyediakan ulasan teknikal terhadap laporan EIA bertajuk "Proposed Quarry Operation in Mukim Kuala Nerus, District of Kuala Terengganu, Terengganu Darul Iman". Provided technical review for the EIA report titled "Proposed Quarry Operation in Mukim Kuala Nerus, District of Kuala Terengganu, Terengganu Darul Iman".
Kelantan	12	Ulasan EIA merangkumi aktiviti untuk tujuan pertanian dan pengkuarian. EIA reports review on agricultural and quarry.
Sarawak	36	Ulasan laporan EIA untuk infrastruktur, hartanah, kuari dan perlombongan, tapak pelupusan dan perladangan. EIA reports review on the infrastructure, property, quarry and mining, landfill dan agriculture.
Sabah	56	Ulasan Laporan EIA untuk pembangunan perumahan, infrastruktur (jalanraya), hotel/ resort, kuari, pertanian/ perikanan dan perlombongan. EIA reports review on the housing projects, infrastructure (road), hotel/ resorts, quarry, agricultural and mining.
Jumlah / Total:	**180**	

Kajian geologi alam sekitar
Environmental geology studies

Negeri State	Kawasan Locality	Liputan Coverage (km^2)	Catatan Remarks
Pahang	Bentong	1	Siasatan awal kejadian aliran debris di KM52.4 Lebuhraya KL-Karak, dan Kuarters Jabatan Perhutanan Lentang, Bentong, Pahang Preliminary study on debris flow occurences at KM52.4 KL-Karak Highway and Lentang Forestry Department quarters, Bentong, Pahang
Terengganu	Tok Kah	1.4	Hasil daripada maklumat sub-permukaan tersebut, lokasi yang sesuai untuk pembinaan infrastruktur telah dicadangkan kepada pihak JAS. Results from sub-surface information given to DOE to propose for the location to construct the infrastructure.
Jumlah / Total:		**2.4**	

Geologi Marin

Pada tahun 2015, aktiviti Unit Geologi Marin tertumpu kepada pelaksanaan dua projek, iaitu Kajian Sumber Pasir Laut Negara Fasa 3 (NOSRS3) di perairan Pahang, serta Kajian Tumbesar dan Kematian Kerang di Tapak Ternakan Kerang di Selangor. Dalam pada itu laporan bagi Projek Pelantar Benua Malaysia - Fasa 2 telah dikemukakan kepada *Commision on the Limits of the Continental Shelf* (CLCS).

Projek Sumber Pasir Laut Negara Fasa 3, melibatkan survei geofizik kaedah seismos, sonar imbasan sisi dan eko sounding telah dilaksanakan di sepanjang 6 garis survei dengan liputan sebanyak 3000 km-garis. Kawasan-kawasan berpotensi longgokan pasir di lepas pantai Pahang telah dikenal pasti dari hasil survei ini.

Institut Penyelidikan Perikanan telah memohon JMG mengkaji sedimen dasar laut di lot-lot tapak ternakan kerang, Negeri Selangor bagi membantu mengenalpasti faktor-faktor yang menyebabkan kematian kerang. Untuk tujuan tersebut persampelan teras sedimen dilakukan di beberapa kawasan dan sedimen ini telah dianalisis dari segi saiz, kandungan kimia, karbonat, organik serta logam berat.

Aktiviti Projek Pelantar Benua (Fasa 2) sepanjang 2015 adalah menghasilkan laporan akhir submission ke CLCS. Laporan telah dikemukakan kepada Majlis Keselamatan Negara (MKN) untuk tujuan penelitian. MKN merupakan Penaung bagi Projek Pelantar Benua Malaysia. Beberapa siri mesyuarat, perbincangan, kursus dan bengkel pasukan kerja teknikal pelantar benua telah diadakan bagi merangka dan

Marine Geology

In 2015, Marine Geology activities were focused on the implementation of two projects, namely the National Offshore Sand Resources Study Phase 3 (NOSRS3) in the waters off the coast of Pahang, as well as the study of cockle growth and death at cockle farm offshore Selangor. In the mean time report of the Continental Shell Project - Phase 2 has been submitted to the Commission on the Limits of the Continental Shelf (CLCS).

The National Offshore Sand Resources Study Phase 3, which involved geophysical survey using seismic, side scan sonar and echo sounding was carried out along 6 survey lines with a total of 3000 line-km coverage. Potential sand deposit areas in offshore Pahang had been identified from the survey results.

Fisheries Research Institute had requested JMG to conduct a study on the seabed sediments at the cockle farms offshore Selangor to identify the factors that cause cockle mortality. Sediment core sampling was conducted in several areas and the samples were analyzed for their physical size, chemical compositions, carbonate, organic and heavy metal content.

The Phase 2 Continental Shelf Project activities for the year 2015 are to produce a final report submission to the CLCS. The report was submitted to the National Security Council (MKN) for editing purposes. MKN is the Patron of Malaysia Continental Shelf Project. A series of meetings, talks, courses and workshops on the continental shelf of the technical working group has been convened to draft and prepare

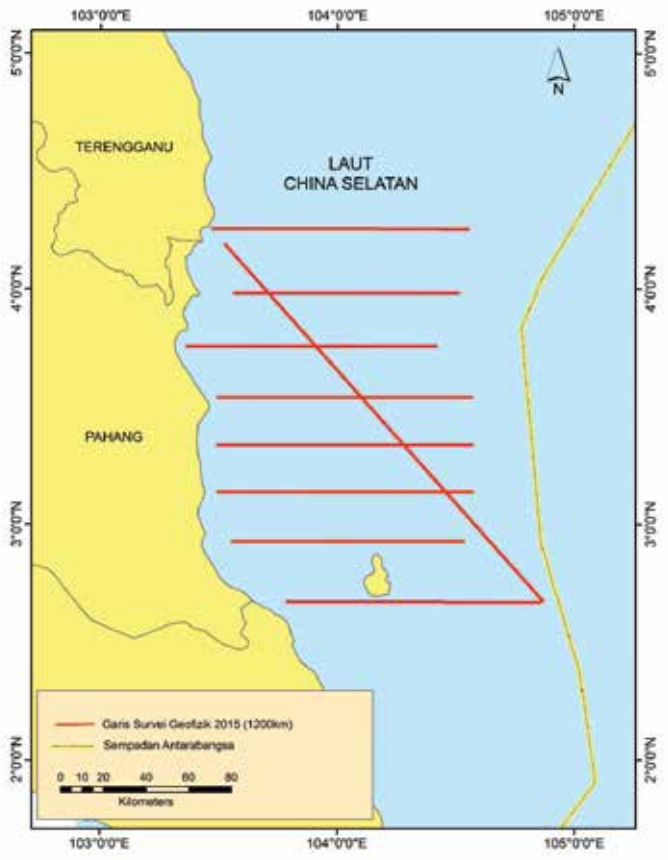
menyediakan submission ke CLCS, Bangsa-bangsa Bersatu serta memberi pengetahuan kepada semua pegawai pelapis dari pelbagai agensi kerajaan.

Sebanyak 22 ulasan permohonan lesen melombong pasir laut di bawah Seksyen 4 Akta Pelantar Benua 1966 (Disemak 1972) oleh pelbagai syarikat telah dikemukakan kepada JKPTG. Beberapa siri mesyuarat One Stop Center telah dihadiri oleh pegawai-pegawai dari Unit Geologi Marin sepanjang tahun 2015. Permohonan tersebut melibatkan perlombongan pasir laut di kawasan lepas pantai di Kedah, Johor, Labuan, Melaka, Negeri Sembilan, Pahang, Perak, Pulau Pinang dan Selangor.

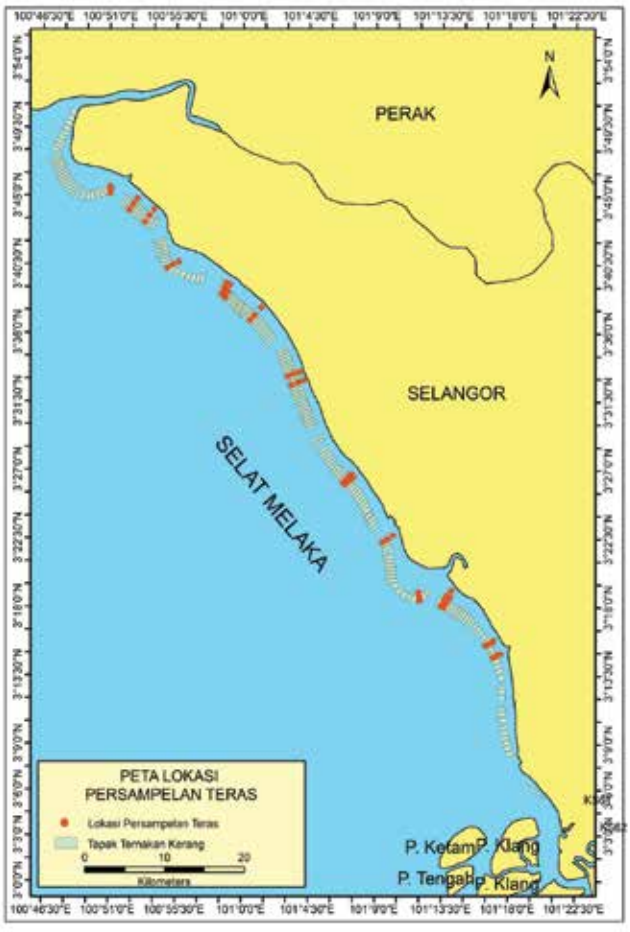
submission to the CLCS, United Nations and also provide knowledge to all junior officers from various government agencies.

A total of 22 applications from various companies to obtain offshore sand mining license, under Section 4 Continental Shelf Act 1966 (Revised 1972), were reviewed for the Department of Director-General Land and Mines (JKPTG). One Stop Center meetings held at JKPTG for the application of mining license were attended by officers from Marine Geology Unit. The applications involved sand mining in offshore waters of Kedah, Johor, Labuan, Melaka, Negeri Sembilan, Pahang, Perak, Pulau Pinang and Selangor.

Pemetaan pantai untuk Projek Kajian Sumber Pasir Laut Negara Fasa III
Coastal mapping for the National Offshore Sand Resource Study Project Phase III

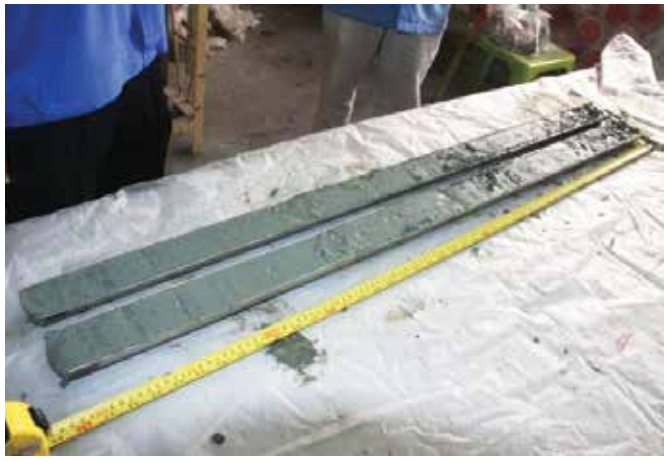


Garis survei geofizik Projek Kajian Sumber Pasir Laut Negara Fasa III di Lepas Pantai Pahang
Geophysical survey lines of National Offshore Sand Resource Study Phase III, offshore Pahang



Lokasi persampelan teras bagi Kajian Tumbesaran dan Kematian Kerang di Tapak Ternakan Kerang di Selangor

Core sampling locations for The Study of Cockle Growth and Death at Cockle Farm, Selangor



Persampelan teras dilaksanakan bagi Kajian Tumbesaran dan Kematian Kerang di Tapak Ternakan Kerang di Selangor

Core sampling executed during The Study of Cockle Growth and Death at Cockle Farm offshore Selangor

Survei Geologi Marin Marine Geological Survey										
Kajian Study	Negeri State	Kawasan Area	Liputan Coverage (km^2)	Jenis Pemetaan Type of Mapping	Geofizik Geophysics	Sampel Sampling	Analisa Analysis			Catatan Remarks
							Saiz Butiran/ Karbonat/ Organik Grain Size/ Carbonate/ Organic	Geokimia Geochemistry	QME QME	
Survei Geofizik bagi Projek Kajian Sumber Pasir Laut Negara Fasa 3 (NOSRS3) Geophysical Survey for National Sand Resources Study Phase 3	Pahang	Lepas Pantai Pahang Offshore Pahang.	20, 839	Sumber pasir laut	3,000 km-garis (Seismos, Sonar Imbasan Sisi dan batimetri) Seismic, side scan sonar and bathymetry	Tiada	Tiada	Tiada	Tiada	Semua data telah dianalisa dan dibuat interpretasi. All data were analyzed and interpreted.
Kajian Tumbesaran dan Kematian Kerang di Tapak Ternakan Kerang di Selangor. The Study of Cockle Growth and Death at Cockle Farm offshore Selangor	Selangor	Perairan Selangor Selangor Waters	225	Persampelan teras sedimen Sediment core sampling	Tiada	61 sampel teras 61 core samples	183	142	Tiada	Semua data telah dianalisa dan dibuat interpretasi. All data were analyzed and interpreted.

Penilaian Sumber Geoterma

Tenaga geoterma ialah tenaga yang wujud dalam bentuk haba di bawah permukaan bumi. Ia boleh digunakan untuk menjana kuasa elektrik dan juga rekreasi. Penggunaan tenaga geoterma sebagai sumber tenaga boleh baharui masih lagi baharu di negara kita. Janakuasa geoterma pertama Malaysia terletak di Apas Kiri Tawau, Sabah yang sedang dibangunkan oleh Tawau Green Energy. Ia akan menjanakan sebanyak 30 MW tenaga elektrik untuk kegunaan kawasan sekitarnya.

JMG telah dilantik oleh Pihak Berkuasa Pembangunan Tenaga Lestari Malaysia (SEDA) sebagai agensi pelaksana kajian untuk Projek Penilaian Sumber Geoterma di Ulu Slim, Perak. Projek yang bermula pada 1 September 2013 dijangka akan siap sepenuhnya pada 30 April 2016.

Pada tahun 2015, aktiviti penilaian sumber geoterma juga telah dijalankan di kawasan Sungai Malati – Sungai Mantri, Ulu Kalumpang, Kunak, Sabah meliputi kawasan seluas 100 km^2.

Geothermal Resource Assessment

Geothermal energy is the energy that exists in the form of heat beneath the earth's surface; it can be used for the generation of electrical power and also for recreation. At the time of writing, the use of geothermal energy as a renewable energy source is still new in our country. The first geothermal power plant in Malaysia is located in Apas Kiri Tawau, Sabah. It would generate around 30 MW of electricity for use in the surrounding areas.

JMG was appointed by Sustainable Energy Development Authority (SEDA) Malaysia as the implementing agency for the Geothermal Resource Assessment Project at Ulu Slim, Perak. The project which began on 1st September, 2013 was expected to be completed by 30th April, 2016.

In 2015, geothermal resource assessment activities were also carried out around Sungai Malati – Sungai Mantri, Ulu Kalumpang, Kunak, Sabah covering an area of 100 km^2.

Penilaian sumber geoterma
Geothermal resource assessment

Negeri State	Kawasan Area	Liputan Coverage (km^2)	Penemuan / Catatan Findings / Remarks
Perak	Ulu Slim	75	10 lokasi mata air panas telah ditemui. Kajian geologi, geofizik dan geokimia telah dilaksanakan. Analisis usia batuan dan isotop masih dalam proses. 10 hot springs have been identified. Geology, geophysics and geochemistry studies were conducted. Age dating and isotope analysis are still in the process.
Sabah	Sg. Malati-Sg. Mantri, Ulu Kalumpang, Kunak	100	Mengenal pasti reservoir bersaiz 8.3 km^2. Identified reservoir of approximately 8.3 km^2 in size.
Jumlah / Total:		**175**	

Photo: Mohd. Shahrizal Mohamed Sharifodin

Pembinaan stesen cerapan hujan dan persampelan air bagi Projek Penilaian Sumber Geoterma di Ulu Slim, Perak
Construction of rain observation and water sampling station for Geothermal Resource Assessment Project at Ulu Slim, Perak

Photo: Mohd. Shahrizal Mohamed Sharifodin

Persampelan isotop air panas, air hujan, air tanah dan air sungai di Ulu Slim, Perak
Isotope sampling from hotspring, groundwater and river at Ulu Slim, Perak

Khidmat Nasihat Geosains

JMG secara aktif memberi khidmat perundingan dan nasihat kepada agensi kerajaan, pihak swasta dan individu dalam aspek ulasan pembangunan guna tanah berserta maklumat geosains seperti hidrogeologi dan geologi kejuruteraan.

Khidmat nasihat hidrogeologi termasuk penyediaan ulasan dalam permohonan pelesenan air tanah dan air tanah sebagai sumber air mineral semulajadi serta potensi penggunaan air tanah untuk tujuan pertanian, industri dan domestik. JMG adalah ahli tetap di dalam Jawatankuasa Penggunaan Sumber Air Peringkat Negeri, Jawatankuasa Kelulusan Pembungkusan Sumber Air Semulajadi dan Jawatankuasa Pelesenan Sumber Air Bumi.

Khidmat nasihat geologi kejuruteraan dan pembangunan guna tanah pula merangkumi aspek perancangan pembangunan bandar baru, penjajaran jalan dan perancangan guna tanah. Jabatan ini terlibat di dalam beberapa jawatankuasa peringkat negeri berkaitan dengan geobencana, seperti Jawatankuasa Perancangan Negeri, Jawatankuasa Bencana Negeri, Jawatankuasa Kawasan Sensitif Alam Sekitar serta Jawatankuasa Pembangunan Tanah Tinggi dan Lereng Bukit.

Geoscience Advisory Services

JMG also provides consultative and advisory services to government agencies, the private sectors and individuals on aspects regarding land use planning reviews and geoscience information such as hydrogeology and engineering geology.

Hydrogeology advisory services include providing reviews on groundwater licence applications and groundwater as a natural mineral water resource and assessment of the potential of groundwater for agriculture, industrial and domestic usage. JMG is a permanent member of the State Water Consumption Committee, Natural Water Resource Packaging Approving Committee and Groundwater Resource Licensing Committee.

Engineering geology and land use advisory services includes new township development planning, road alignment and land use planning. The department is also involved at several state level committees related to geodisasters, such as the State Planning Committee, State Disaster Committee, Environmentally Sensitive Area Committee, as well as Highland and Foothill Development Committee.

JMG secara aktif memberi khidmat nasihat dan juga menawarkan input geologi untuk cadangan pembangunan kepada PBT menerusi Pusat Setempat (OSC). Jabatan juga menyediakan ulasan teknikal kepada pihak swasta dan pemaju. Pada tahun 2015, sebanyak 6160 ulasan OSC telah dikeluarkan.

JMG also provides advisory services and offers geological input on proposed developments to local authorities through One Stop Centres (OSC). It also provides technical reviews to the private sectors and property developers. In 2015, a total of 6160 OSC reviews were issued

Ulasan pembangunan tanah dan maklumat geosains am
Review of land development and general geosciences information

Negeri / State	Jenis Ulasan / Type of Reviews		
	Pusat Setempat One Stop Centre (OSC) (bil. / no.)	Pembangunan guna tanah Land use development (bil. / no.)	Maklumat geosains am General geoscience information (bil. / no.)
Ibu Pejabat	0	0	0
Johor	1082	0	74
Kedah	303	6	3
Kelantan	112	15	1
Melaka	334	0	0
N. Sembilan	428	0	0
Pahang	781	14	131
Perak	456	0	12
Perlis	25	9	2
Pulau Pinang	105	37	7
Sabah	0	0	6
Sarawak	0	36	0
Selangor / WP	1598	27	15
Terengganu	936	16	8
Jumlah / Total:	**6160**	**151**	**259**

Khidmat nasihat hidrogeologi
Hydrogeology advisory services

Negeri State	Bil. ulasan No. of reviews	Catatan Remarks
Perak	4	i. Irfa Consult Sdn Bhd (Kontraktor PLUS Malaysia) ii. Maahad Tahfiz dan Kemukjizatan Al Quran, Kg. Ulu Kenderong, Gerik iii. Pusat Latihan Pertanian Lekir, Setiawan, Perak iv. Chalet Pak Ya, Teluk Senangin, Lumut, Perak
N. Sembilan	28	Menyediakan ulasan teknikal bagi tujuan permohonan baru dan pembaharuan lesen pengeluaran air tanah kepada Badan Kawal Selia Air (BKSA). Memberi khidmat nasihat berkaitan potensi air tanah serta memberi cadangan pembangunan air mineral kepada agensi kerajaan, pihak swasta dan orang perseorangan. Provided technical reviews on new applications and renewal of groundwater abstraction licence for Badan Kawal Selia Air (BKSA). Provided technical advice regarding groundwater potential and proposed development of mineral water to government agencies, the private sectors, and individuals.
Melaka	13	Menyediakan ulasan teknikal bagi tujuan permohonan baru dan pembaharuan lesen pengeluaran air tanah kepada Badan Kawal Selia Air (BKSA). Memberi khidmat nasihat berkaitan potensi air tanah serta memberi cadangan pembangunan air mineral kepada agensi kerajaan, pihak swasta dan orang perseorangan. Provided technical reviews on new applications and renewal of the groundwater abstraction licence for Badan Kawal Selia Air (BKSA). Provided technical advice regarding groundwater potential and proposed development of mineral water to government agencies, the private sectors, and individuals.
Pahang	4	Khidmat nasihat, lawatan tapak dan ulasan permohonan perakuan perlesenan air mineral daripada KL Water Specialist (M) Sdn. Bhd., Borneo Spring Sdn. Bhd., Syarikat Perniagaan Tasnim dan TMG Water Sdn. Bhd. Advisory services, site visits and mineral water licensing certification reviews from KL Water Specialist (M) Sdn Bhd, Syarikat Perniagaan Tasnim and TMG Water Sdn Bhd.
Sabah	6	Cadangan pembangunan telaga tiub bagi kawasan kritikal bekalan air dan sekitar kawasan yang terjejas akibat gempa bumi. Proposed development of tubewells for water stress areas affected by the earthquake.
Jumlah / Total:	**55**	

Khidmat nasihat geologi kejuruteraan
Engineering geology advisory services

Negeri State	Bil. ulasan No. of review	Catatan Remarks
Perak	10	Khidmat nasihat kepakaran terutama terhadap cadangan pembangunan di sekitaran bukit batu kapur dan hal-hal berkaitan geologi. Expert advisory services, especially for the proposed development in the vicinity of limestone hills and on geological matters.
Selangor/ Wilayah Persekutuan	3	Khidmat nasihat geologi dalam kajian kestabilan cerun di makam Sultan Abdul Samad di Bukit Jugra, Banting, pembinaan kilang membuat kipas kapal terbang di Bukit Sentosa dan pembinaan Kem Kejuruteraan di Bandar Kuala Kubu Bharu. Geological advisory services on slope stability assessment at Sultan Abdul Samad cemetry at Bukit Jugra, Banting, construction of airplane propeller factory at Bt.Sentosa and construction of engineering camp at Kuala Bubu Bharu.
Johor	4	Khidmat nasihat berkenaan permohonan kebenaran merancang dan pelan kerja tanah projek pembangunan. Advisory services regarding applications on planning permission and work plan for land development projects.
Pahang	122	Khidmat nasihat berkaitan cadangan pembangunan kawasan, perancangan kerja tanah, pembukaan tanah, semakan kecerunan serta aspek kesesuaian pembinaan kawasan cadangan pembangunan. Advisory services related to the proposed development area, earthwork planning, land clearing, checking the suitability of the slope and aspect of the proposed development area.
Jumlah / Total:	**139**	

Khidmat Nasihat Lain

Di Pahang, khidmat nasihat perakuan dan pengesahan batuan granit untuk kegunaan program tebatan banjir Jabatan Pengairan dan Saliran (JPS) Pahang kepada 3 syarikat iaitu Balok Pine Ent., MMN Bina Sdn. Bhd. and Khazanah Bahtera Sdn. Bhd.

Other Advisory Services

In Pahang, advisory services for verification and certification of granite rocks for Drainage and Irrigation Department (JPS) for the Pahang flood mitigation programme to 3 companies, namely Balok Pine Ent., MMN Bina Sdn. And Khazanah Bahtera Sdn. Bhd.

Aktiviti Lombong & Kuari
Mine & Quarry Activities

Aktiviti Lombong & Kuari
Mine & Quarry Activities

Kawalseliaan & Penguatkuasaan

Antara fungsi utama jabatan ini adalah untuk memastikan bahawa aktiviti-aktiviti perlombongan, pengkuarian dan yang berkaitan dijalankan dengan selamat dan efisien, serta memenuhi piawaian alam sekitar dan amalan kejuruteraan terbaik. Selain daripada membuat pemeriksaan yang kerap ke atas operasi perlombongan dan pengkuarian, jabatan ini juga ditugaskan untuk pengeluaran kelulusan operasi dan lesen, serta menyediakan khidmat nasihat dan pakar.

Aktiviti-aktiviti seperti pemeriksaan lombong yang dijalankan oleh jabatan bergantung kepada tahap kerancakan industri perlombongan negara. Walaupun angka pengeluaran perlombongan di Malaysia menunjukkan sedikit penurunan pada tahun 2015 berbanding dengan tahun sebelum, industri ini berjaya mengekalkan tahap kerancakan aktiviti yang tinggi.

Monitoring & Enforcement

Among the primary functions of the department is to ensure that mining, quarrying and related activities are carried out safely and efficiently, and that they conform to environmental standards and best engineering practices. Besides frequent inspections of mine and quarry operations, the department is also tasked with the issuance of operational approvals and licences and providing advisory and expert services.

Activities like mine inspections carried out by the department depend to an extent on the vibrancy of the country's mining industry. Even though mining production figures in Malaysia showed a slight decline in 2015 as compared with the previous year, the industry managed to maintain a high level of activity.

Pemeriksaan Teknikal Operasi Lombong dan Kuari

Pemeriksaan teknikal operasi perlombongan, pengkuarian dan pemprosesan mineral telah dijalankan bertujuan untuk memastikan pematuhan syarat-syarat lesen atau kelulusan yang berkaitan dengan keselamatan dan perlindungan alam sekitar. Jabatan ini juga menjalankan pemeriksaan dan penyiasatan lapangan yang merupakan sebahagian daripada pra-syarat untuk penyediaan laporan yang berkaitan dengan permohonan tenemen mineral, kelulusan kerja peletupan, aduan serta kejadian kemalangan di lombong dan kuari.

Pada tahun 2015, sebanyak 4612 pemeriksaan teknikal telah dijalankan, yang meliputi 1111 pemeriksaan ke atas operasi perlombongan, 2192 pemeriksaan ke kuari, 502 pemeriksaan kilang amang (hasil sampingan perlombongan bijih timah) dan loji pemprosesan mineral, serta 381 pemeriksaan ke atas urus niaga pemegang lessen bijih mineral dan emas mentah.

Tambahan kepada pengawalseliaan ke atas kerja peletupan yang dijalankan di lombong dan kuari, pihak jabatan juga dirujuk oleh Pihak Berkuasa Tempatan untuk membantu menilai serta memantau kerja-kerja peletupan yang dijalankan dalam kawasan pembangunan. Kerja perletupan untuk 403 projek pembangunan telah diperiksa dan dinilai sepanjang tahun ini.

Technical Inspection of Mine and Quarry Operations

Technical inspections of mining, quarrying and mineral processing operations were conducted to ensure compliance with the conditions stipulated in the licences or approvals with regard to safety and the protection of the environment. The department also carried out field inspections and investigations, a prerequisite for the preparation of reports pertaining to applications for mineral tenements, blasting works approvals, complaints, and mine or quarry accidents.

In 2015, a total of 4612 technical inspections were carried out, covering 1111 inspections on mining operations, 2192 on quarries, 502 on amang (a tin mining by-product) and mineral processing plant operations, and 381 on mineral ores and raw gold licence holders.

In addition to the supervision of blasting works carried out in mines and quarries, the department was also referred to by the Local Authorities for assistance in the evaluation and monitoring of blasting activities in areas undergoing development. Blasting works in 403 developmental projects were assessed and evaluated during the year.

Pemantauan dan Kawalseliaan Aktiviti Perlombongan dan Pengkuarian

Pemantauan dan penyeliaan aktiviti perlombongan dan kuari bertujuan untuk memastikan aktiviti ini dijalankan dengan teratur, bersistematik, mengikut amalan kejuruteraan terbaik dan mematuhi peruntukan perundangan. Aspek keselamatan operasi perlombongan berada di bawah bidang kuasa Akta Pembangunan Mineral 1994 dan Enakmen atau Ordinan Perlombongan Negeri, manakala operasi kuari dikawal selia oleh Peraturan Kuari Negeri.

Operasi perlombongan dan pengkuarian lazimnya memberi kesan kepada alam sekitar. Oleh itu, adalah penting operasi tersebut melaksanakan langkah-langkah yang perlu untuk menangani kemungkinan pencemaran terhadap air dan udara serta kesan gegaran bumi dan ledakan udara (bunyi bising) akibat kerja peletupan. Justeru itu bagi memastikan aktiviti perlombongan dan pengkuarian dijalankan dengan baik, kerja pemantauan berkala senantiasa dilakukan. Sepanjang tahun 2015, sebanyak 47 kerja ukur tanah sempadan dan cerun, serta 735 pemantauan gegaran peletupan telah dijalankan. Selain daripada itu, sepanjang tahun 2015 jabatan juga telah menjalankan sebanyak 367 persampelan efluan lombong.

Walaupun perhatian telah diberikan kepada aspek keselamatan oleh Jabatan sepanjang tahun, jabatan telah menyediakan sebanyak 7 laporan kemalangan. Pada masa yang sama, jabatan turut menerima aduan daripada orang awam dan media massa samada secara bertulis atau lisan. Hasil siasatan jabatan ke atas 123 aduan, 75 perintah dan arahan telah dikeluarkan kepada pelombong dan pengusaha kuari yang ingkar.

Monitoring and Supervision of Mining and Quarrying Activities

Monitoring and supervision of mining and quarrying activities ensures that these activities are carried out orderly and systematically in accordance with the best engineering practices and in compliance with the provisions of the laws and regulations. Safety aspects of mining operations come under the purview of the Mineral Development Act 1994 and State Mining Enactments or Ordinances while quarry operations are regulated by State Quarry Rules.

Mine and quarry operations inevitably have an impact on the environment. Therefore, it is important for such operations to implement necessary measures to mitigate potential water and air pollution as well as the impact of ground vibration and air blast (noise) due to blasting. Thus, to ensure that mine and quarry activities are carried out properly, periodic monitoring is conducted. In 2015, a total of 47 survey works on land boundary and slope, and 735 monitoring exercises on vibration and blasts were carried out. Besides that, 367 mine effluent samplings were also undertaken by the department throughout the year.

Despite the attention given to safety aspects year-round, there were 7 accidents for which reports were written by the department. At the same time, the department also received written or verbal complaints from the public and mass media. Following the department's investigation into 123 complaints, 75 orders and instructions were issued to errant miners and quarry operators.

Pelesenan

Di bawah Akta Pembangunan Mineral 1994 (APM), pemegang pajakan melombong hendaklah mengemukakan dan mendapatkan kelulusan bagi suatu skim pengendalian melombong daripada Pengarah Galian sebelum sebarang operasi pembangunan atau perlombongan bermula. Pada tahun 2015, jabatan telah meluluskan sebanyak 171 Skim Pengendalian Melombong di bawah APM, dan telah mengeluarkan 171 Surat Kebenaran Pengkuarian di bawah Peraturan Kuari Negeri.

Lesen Bijih Mineral dan Lesen Pembeli Emas yang dikeluarkan di bawah Enakmen Bijih Mineral dan Enakmen Pembeli Emas Mentah membenarkan pemegangnya untuk membeli, menjual, menyimpan dan memproses bijih mineral dan emas mentah masing-masing. Lesen-lesen ini dikeluarkan secara tahunan dan mereka luput pada akhir setiap tahun kalender. Sejumlah 232 Lesen Bijih Mineral, 7 Lesen Pembeli Emas Mentah dan 205 Permit Mengangkut Bijih Padat Timah telah dikeluarkan pada tahun 2015.

Adalah menjadi objektif jabatan untuk memastikan semua kerja peletupan di lombong, kuari dan juga projek pembangunan lain di bawah kawalseliaan jabatan dijalankan dengan selamat. Oleh itu, jabatan telah menjalankan Ujian Pembedil Amali untuk calon yang telah lulus Peperiksaan Pembedil Teori. Hanya calon yang telah lulus kedua-dua ujian akan dikeluarkan Sijil Pembedil sebagai pembedil berkelayakan dan dibenarkan menjalankan kerja peletupan. Pada tahun 2015, pihak jabatan telah menjalankan sebanyak 33 Ujian Amali Pembedil, dan telah mengeluarkan sebanyak 33 Sijil Pembedil baru. Jabatan juga telah memperbaharui 111 sijil kepada pemohon yang layak.

Sebahagian daripada mineral yang dihasilkan di negara ini dieksport ke luar negara. Bagi tujuan mengeksport bahan mineral dan batuan, pengekspot perlu mempunyai permit eksport yang dikeluarkan oleh Kementerian Sumber Asli dan Alam Sekitar (NRE). Satu laporan penilaian teknikal yang disediakan oleh JMG perlu disertakan untuk setiap permohonan. Pada tahun 2015, sebanyak 523 dan 1426 laporan penilaian teknikal telah disediakan bagi eksport mineral dan bahan batuan masing-masing.

Licensing

Under the Mineral Development Act 1994 (MDA), a mining lease holder needs to submit and obtain approval from the Director of Mines for an operational mining scheme before any development or mining commences. In 2015, the department approved a total 171 Operational Mining Schemes under the Mineral Development Act 1994, and issued 171 Letters of Authority to Quarry under the state Quarry Rules.

The Mineral Ores and Gold Buyers Licences issued under the Mineral Ores Enactment and Gold Buyers Enactment authorise licence holders to buy, sell, store, and treat mineral ores and raw gold respectively. These licences are issued annually and they expire at the end of each calendar year. A total of 232 Mineral Ore Licences, 7 Raw Gold Buyers Licences, and 205 Tin Ore Concentrate Transport Permits were issued in 2015.

It is the objective of the department to ensure that all blasting works in mines, quarries, and other development projects under the supervision of the department are carried out in a safe manner. Thus, the department conducted Shotfirer Practical Tests for candidates who had passed the Shotfirer Theory Examination. Only candidates who had passed both tests were issued Shotfirer Certificates as qualified shotfirers and allowed to carry out blasting work. In 2015, the department conducted 33 Shotfirer Practical Tests, and issued a total of 33 new Shotfirer Certificates. The department also renewed 111 certificates to qualified applicants.

Some of the minerals produced in the country are exported. For the purpose of exporting minerals and rock material, an exporter needs to have an export permit issued by the Ministry of Natural Resources and Environment (NRE). A technical assessment report prepared by JMG has to be attached to each application. In 2015, a total of 523 and 1426 technical assessment reports were prepared for the export of minerals and rock material respectively.

Khidmat Nasihat dan Kepakaran

Selain daripada menjalankan penguatkusaan undang-undang dan pemantauan operasi perlombongan/ pengkuarian, jabatan juga berperanan dalam memberikan khidmat nasihat dan kepakaran kepada Pihak Berkuasa Negeri, industri dan juga orang ramai. Sebagai sebuah jabatan teknikal, Pihak Berkuasa Negeri kerap merujuk permohonan-permohonan berkaitan tanah lombong, tapak kuari dan lain-lain bagi mendapatkan pandangan dan perakuan teknikal sebelum sesuatu keputusan dibuat. Pada tahun 2015, jabatan telah menyediakan sebanyak 242 laporan bagi Perakuan Permohonan Carigali/ Pajakan lombong. Manakala bagi permohonan tapak kuari, sebanyak 45 laporan telah disediakan kepada pihak berkuasa negeri.

Jabatan juga terlibat dalam menyediakan Laporan Penilaian Impak Alam Sekitar (EIA). Sebanyak 47 laporan EIA yang berkaitan dengan aktiviti perlombongan dan pengkuarian telah diulas. Di samping itu, 540 laporan pembebasan mineral telah dikeluarkan oleh jabatan yang bertujuan membantu pihak berkuasa membuat keputusan peranangan yang lebih baik untuk mengelakkan pemajiran enapan mineral. Selain itu, jabatan juga telah menerima sebanyak 1904 pertanyaan berkaitan aktiviti perlombongan dan pengkuarian. Lapan surat perakuan Laporan Magazin Letupan telah disediakan pada tahun 2015.

Advisory and Expertise Services

Apart from the enforcement and monitoring of the mining/ quarrying operations, the department's duties include the rendering of advisory technical services to the State Authorities, industry, and also to the public. Being a technical department, State Authorities frequently refer to this department for comments and assessment on applications for mining land, quarries, and other legal aspects before decisions were taken. In 2015, the Department prepared a total of 242 reports on applications for prospecting and mining rights. With regard to applications for quarries, 45 technical reports were prepared and sent to various State Authorities.

The department was also involved in preparing Environmental Impact Assessment (EIA) Reports. It made comments on 47 of the EIA reports based on mining and quarrying proposals. In addition, 540 Mineral Clearance reports were prepared to assist the relevant authority make better planning decisions and to avoid sterilization of mineral deposit. Apart from that, the department also received a total of 1904 enquiries on mine and quarry activities. Eight reports on Explosives Magazines were prepared in 2015.

Aktiviti-aktiviti lain

Pihak jabatan juga menjalankan dialog, seminar dan pameran bagi meningkatkan kesedaran pihak awam terhadap industri mineral serta juga sebagai wadah untuk menyelesaikan masalah yang dihadapi penduduk berkaitan dengan aktiviti perlombongan dan pengkuarian. Sebanyak 42 seminar/ dialog/ pameran telah dibuat pada tahun 2015.

Other Activities

Dialogues, seminars, and exhibitions were conducted by the department to increase public awareness of the mineral industry as well as to resolve issues and problems faced by the public pertaining to mining and quarrying activities. A total of 42 seminars/ dialogues/ exhibitions were conducted in 2015.

Senarai Aktiviti Pembangunan Lombong & Kuari Dalam Tahun 2015
List of Mine & Quarry Development Activities in 2015

	Johor	Negeri Sembilan	Kelantan	Selangor	Perak	Kedah	Perlis	Pulau Pinang	Melaka	Terengganu	Pahang	Sarawak	Sabah	Jumlah
Pemeriksaan Teknikal Operasi Lombong dan Kuari / Technical Inspection of Mine & Quarry Operations														
Pemeriksaan teknikal operasi lombong / Mining operation technical inspection	104	12	151	24	246	47	0	0	0	83	422	22	0	**1111**
Pemeriksaan teknikal operasi kuari / Quarrying operation technical inspection	157	86	87	624	598	49	20	203	8	39	269	10	42	**2192**
Pemeriksaan teknikal operasi kilang amang /loji pemprosesan mineral / Amang plant / mineral processing plant operations technical inspection	52	1	0	12	117	8	0	6	2	0	301	3	0	**502**
Pemeriksaan teknikal tapak peletupan (selain kuari) / Technical inspection of blasting sites (other than quarries)	14	3	0	200	13	11	5	140	0	0	0	5	12	**403**
Pemeriksaan teknikal kawasan carigali / Technical inspection of exploration areas	0	6	17	0	0	0	0	0	0	0	0	0	0	**23**
Pemeriksaan buku urusniaga mineral (termasuk kedai bijih / kedai emas) / Account books inspection on mineral dealings (including tin ore dealer / gold dealer)	24	0	5	18	75	12	0	10	0	0	237	0	0	**381**
														4612
Pemantauan dan Kawalselia Aktiviti Perlombongan dan Pengkuarian / Monitoring of Mining & Quarrying Activities														
Persampelan efluen lombong Mine effluent sampling	0	0	11	0	172	35	0	0	0	0	145	1	3	**367**
Siasatan aduan / Complaint investigation	16	3	5	15	14	1	0	18	0	4	40	2	5	**123**
Perintah dan arahan Orders and instructions	6	0	1	5	18	1	0	1	0	1	40	2	0	**75**
Kompaun / Compounds	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Laporan kemalangan lombong dan kuari Mining and quarrying accident reports	0	0	3	2	0	0	0	1	0	0	0	1	0	**7**

	Johor	Negeri Sembilan	Kelantan	Selangor	Perak	Kedah	Perlis	Pulau Pinang	Melaka	Terengganu	Pahang	Sarawak	Sabah	Jumlah
Kerja ukur tanah sempadan dan cerun Survey works on land boundary and slope	0	0	0	0	0	0	0	0	0	0	47	0	0	**47**
Kerja ukur gegaran/habuk/kebingitan dan pemantauan peletupan Vibration and blast monitoring	26	9	13	157	230	3	2	250	0	5	35	2	3	**735**
Pelesenan / Licensing														
Skim Pengendalian Melombong Operational Mining Scheme	16	3	16	2	24	7	0	0	0	16	76	11	0	**171**
Surat Kebenaran Pengkuarian Letter of Authority to Quarry	0	20	1	26	78	0	0	0	0	14	32	0	0	**171**
Lesen Bawah Tanah / Underground Licence	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Lesen Air Tahunan / Negeri/ Permit Air Annual /State Water Licence/Water Permit	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Lesen Membeli Emas Mentah Gold Buyers Licence	0	0	0	0	0	0	0	1	0	0	6	0	0	**7**
Lesen Bijih Mineral Mineral Ores Licence	32	0	0	19	56	12	0	9	0	0	104	0	0	**232**
Permit Mengangkut Bijih Padat Timah Tin Ore Concentrate Transport Permit	20	0	1	4	162	2	0	0	0	0	16	0	0	**205**
Laporan penilaian teknikal eksport mineral Technical assessment report for mineral export	230	44	32	100	19	8	0	28	0	35	0	27	0	**523**
Laporan teknikal perakuan eksport bahan batuan / Technical assessment report for rock material export	398	0	11	260	403	260	0	5	0	9	0	30	50	**1426**
Permit Letupan / Blasting Permit	2	6	0	0	2	22	17	5	0	1	3	0	0	**58**
Laporan perakuan magazin letupan Report for explosives magazine approval	2	2	0	0	0	1	0	0	0	0	0	1	2	**8**
Pengeluaran / pembaharuan Sijil Pembedil Issuance / renewal of Shot Firer Certificate	7	12	4	10	23	10	3	12	0	3	5	11	11	**111**

	Johor	Negeri Sembilan	Kelantan	Selangor	Perak	Kedah	Perlis	Pulau Pinang	Melaka	Terengganu	Pahang	Sarawak	Sabah	Jumlah
Lencongan sungai / River diversion	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ujian pengurus lombong/kuari Test for mine / quarry managers	0	0	6	0	0	0	0	0	0	0	0	0	0	**0**
Ujian amali pembedil Shot firer practical test	3	7	0	3	3	3	3	0	0	0	3	8	0	**33**
Khidmat Nasihat dan Kepakaran / Advisory and Professional Services														
Ulasan laporan EIA EIA report review	3	1	0	2	2	0	0	0	0	0	0	2	37	**47**
Laporan permohonan lesen carigali / pajakan / Prospecting and mining lease application report	0	7	37	5	13	6	0	0	0	40	131	3	0	**242**
Laporan permohonan tanah kuari Quarry land application report	11	1	0	2	16	0	0	0	0	3	8	3	1	**45**
Laporan pembebasan mineral Mineral clearance report	0	0	7	20	205	5	3	0	0	17	280	3	0	**540**
Lain-lain laporan teknikal untuk agensi lain Miscellaneous technical report for other agencies	62	10	3	5	55	40	10	90	0	0	8	8	135	**426**
Pertanyaan mengenai maklumat lombong /kuari / Enquiries on mining / quarrying information	270	15	82	11	45	37	5	23	0	9	1253	73	81	**1904**
Lain-lain / Others														
Seminar / Dialog / Pameran Seminar / Dialogue / Exhibition	11	1	0	1	8	1	1	2	0	0	10	3	4	**42**

Penyelidikan & Pembangunan
Research & Development

Penyelidikan & Pembangunan
Research & Development

Pusat Penyelidikan Mineral (PPM) merupakan bahagian penyelidikan dan pembangunan (R&D) kepada Jabatan Mineral dan Geosains (JMG) Malaysia.

Objektif PPM adalah:

- Untuk menggalak dan mempelbagai penggunaan sumber mineral tempatan bagi menyumbang kepada pembangunan sektor perindustrian negara melalui R&D
- Untuk menggalak pengusahahasilan sumber mineral secara mapan melalui R&D

Antara fungsi PPM ialah:

- Menjalankan R&D berasaskan mineral tempatan supaya dapat menghasilkan bahan mula dan bahan tambah nilai untuk digunakan oleh industri
- Membangun teknologi pemprosesan mineral dan kitar semula yang bersesuaian
- Menjalankan penyelidikan bersama Institusi Pengajian Tinggi, agensi R&D yang lain serta pihak industri dalam bidang mineral
- Mengkomersil hasil R&D yang signifikan melalui pemindahan teknologi kepada pihak yang berminat
- Berperanan sebagai penasihat dan pusat rujukan dalam perkara-perkara yang berkaitan dengan penyelidikan mineral tempatan
- Menjalankan R&D berkaitan pengusahahasilan mineral, impak alam sekitar dan pemulihan serta menyediakan perkhidmatan sokongan kepada jabatan dalam menangani masalah yang berkaitan

The Mineral Research Centre (PPM) is the research and development (R&D) arm of the Minerals and Geoscience Department (JMG)

The objectives of PPM are:

- To encourage and diversify use of local mineral resources so as to contribute towards the development of the country's industrial sector through R&D
- To encourage the development of mineral resources in a sustainable manner through R&D

Among its functions are:

- To carry out R&D on local minerals in order to produce starting and value added materials for industrial use
- To develop suitable mineral processing and recycling technologies
- To carry out collaborative research with institutes of higher learning, other R&D agencies and industries in the field of minerals
- To commercialise significant R&D results through technology transfer to interested parties
- To assume advisory role and act as a reference centre in areas related to research in local minerals
- To undertake R&D in mineral extraction, environmental impact and rehabilitation as well as providing support services to the department in overcoming related problems

Teknologi Berasaskan Lempung
Clay-Based Technology

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
1	Teknologi penghasilan jasad seramik teknikal kalis nyala	Kesemua lima jasad seramik yang direkabentuk adalah sesuai untuk menghasilkan produk-produk "anti-thermal shock". Satu jasad jenis porselin keras, yang mempunyai nilai pekali pengembangan terma (CTE) agak rendah 4.16 x 10^{-6} inci per ^{o}C, telah dipilih untuk kajian R&D selanjutnya bagi meningkatkan lagi modulus kepecahan (MOR) dan menurunkan nilai CTE jasad tersebut ke paras kalis nyala atau "flameproof". Kajian meningkatkan MOR telah dijalankan melalui ujian kecekapan kepadatan *(packing efficiency)* partikel dengan kaedah pengisaran terpilih untuk mendapatkan nisbah partikel kasar kepada halus melebihi 10 tetapi tidak melebihi 20. Kajian menurunkan nilai CTE telah dijalankan dengan merekabentuk bahan prabakar, yang mempunyai komposisi selepas pembakaran terkawal terdiri daripada fasa-fasa kristal yang mempunyai CTE rendah, seperti anortit, mulit, dan diopsid, sebagai bahan komponen tambahan jasad. Hasil kajian telah berjaya meningkatkan MOR ke tahap keperluan komersil (50-70 MPa) dan nilai CTE diturunkan ke spesifikasi biasa yang disyorkan untuk kalis nyala iaitu di bawah 4 x 10^{-6} inci per ^{o}C.
	Production technology of flameproof technical ceramic body	All five ceramic bodies developed were suited to the production of anti-thermal shock products. One material, of the hard porcelain body-type, that had a lower value of coefficient of thermal expansion (CTE) of 4.16 x 10^{-6} inch per ^{o}C, was selected for further R&D studies to improve its modulus of rupture (MOR) and to lower the CTE value to flameproof level. A study to enhance MOR was carried out using the packing efficiency test through the selective milling method to obtain a bimodal distribution that presented two maximum points of fine and course particles, with size ratio exceeding 10 but below 20. A study to lower CTE was carried out by developing pre-fired material as additional body component materials. Following firing according to a suitable heating profile, the material consisted mainly of low CTE crystalline phases such as anortite, diopside and mullite. MOR was successfully increased to levels that met commercial requirements (50-70 MPa), while CTE was lowered to the recommended flameproof specification, i.e. below 4 x 10^{-6} inch per ^{o}C.

Produk-produk seramik teknikal "anti-thermal shock" bernilai komersil
Commercial value anti-thermal shock technical ceramic products






Teknologi Berasaskan Silika
Silica-Based Technology

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
1	Penghasilan jubin kaca di loji pandu menggunakan kaca kitar semula	Tujuan projek ini adalah untuk menghasilkan jubin kaca daripada kaca kitar semula di peringkat loji pandu menggunakan proses penghabluran (sinter-crystallisation) yang murah. Proses ini adalah teknologi alternatif pembuatan kaca-seramik di mana penumpatan dan pembentukan fasa hablur berlaku serentak pada suhu yang sama. Ciri-ciri produk berjaya memenuhi piawai ISO 13006:2012 (ceramic tile) dan setanding dengan kualiti jubin kaca yang berada di pasaran seperti Neoparies@kaca-seramik dan jubin batuan granit.

Sampel	Purata ketumpatan (g/cm^3)	Penyerapan air (%)	Modulus kepecahan (MOR) (MPa)
Jubin kaca merah	2.348	0.013	36.22
Jubin kaca hijau	2.439	0	37.04
Neoparies@Tile	2.70 – 2.72	0	41 – 50
Granite Tile	2.60 – 2.70	0.40	13.5 – 14.7
Guocera Porcelain Tile	-	≤ 0.5	≥ 35

Ciri-ciri produk jubin kaca yang dihasilkan boleh diringkaskan seperti berikut:

a) Jubin kaca-seramik dengan sifat-sifat fizikal-mekanikal yang mematuhi dengan standard ISO 13006 dan setanding dengan jubin komersial dapat disediakan dengan kaedah pensinteran menggunakan kaca soda-lime kitar semula, pigmen berwarna dan bentonit sebagai pengikat
b) Nilai penyerapan air untuk sampel ujian jubin kaca memenuhi nilai piawaian yang ditetapkan (kurang daripada 0.5% nilai serapan air)
c) Nilai modulus kepecahan sampel memenuhi nilai piawaian minimum yang ditetapkan (sama atau melebihi daripada 35 N/mm^2)
d) Ujian kerintangan stain yang dijalankan ke atas sampel Je dan Jf menunjukkan bahawa kedua-dua sampel tersebut mempunyai nilai kerintangan dan daya tahan yang tinggi terhadap tindak balas bahan-bahan
e) Perbandingan produk jubin kaca dengan sampel jubin komersial menunjukkan bahawa kualiti sampel jubin kaca ujian adalah setara dengan kualiti jubin kaca komersial. Walaupun nilai modulus kepecahannya lebih rendah daripada jubin kaca-seramik Neoparies tetapi masih lagi memenuhi keperluan MS ISO 13006

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
	Glass tile production in pilot plant using recycled glass	The aim of this project was to produce glass tiles from recycled glass in a pilot plant using an inexpensive crystallization (sinter-crystallization) process. This process is an alternative technology for manufacturing glass-ceramic in which densification and formation of crystalline phases occur simultaneously at the same temperature. The product features successfully met the ISO13006 standard: 2012 (ceramic tile), and were comparable to the quality of commercial glass tiles in the market such as Neoparies@glass-ceramic and Granite Tiles.

Sample	Density (g/cm^3)	Water absorption (%)	Modulus of rupture (MOR) (MPa)
Red glass tiles	2.348	0.013	36.22
Green glass tiles	2.439	0	37.04
Neoparies@Tile	2.70 – 2.72	0	41 – 50
Granite Tile	2.60 – 2.70	0.40	13.5 – 14.7
Guocera Porcelain Tile	-	≤ 0.5	≥ 35

Characteristics of glass tiles produced are summarized as follows:

a) Glass-ceramic tiles with physical-mechanical compliance with ISO 13006 standard and on par with commercials could be prepared by the sintering method using recycling soda-lime glass, colored pigments, and bentonite as a binder
b) Water absorption of the test samples met the set standards (less than 0.5% absorption)
c) The modulus of rupture of the samples met the minimum standards (equal to, or greater than 35 N/mm^2)
d) Stain resistance tests performed on samples Je and Jf showed that the two samples had the resistance and high durability of reaction materials
e) Comparison of glass tile products with commercial samples showed that the quality of the test piece is similar to that of commercial glass tiles. Although the modulus of rupture was lower than Neoparies glass-ceramic tiles, it still met the requirements of MS ISO 13006

Penghasilan jubin kaca di loji pandu menggunakan kaca kitar semula
Glass tile production in pilot plant using recycled glass

Serbuk kaca
Glass powder

Uniaxial Pressing Machine (100 - 200 bar)

Proses pensinteran (700 - 800°C)
Sintering process (700 - 800°C)

Sampel jubin kaca selepas proses pensinteran
Glass tile samples after sintering

Teknologi Berasaskan Batuan
Rock-Based Technology

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
1	Penghasilan kertas cetak dengan teknik *in situ*	Kapur karbida telah digunakan sebagai bahan mula untuk penyediaan larutan ionic bersukrosa dengan nilai kepekatan larutan gula 10° Brix tanpa bahan tambahan untuk menghasilkan kertas cetak melalui teknik *in situ*. Parameter yang optimum bagi penggunaan PCC dalam kertas dikaji dalam makmal sebelum ujian lanjut pada skala loji pandu di Western Michigan University, Amerika Syarikat. Kertas yang dihasilkan menepati spesifikasi piawai SIRIM. Justeru, teknik *in situ* yang dibangunkan ini adalah sesuai untuk dikomersialkan.
	Production of printing paper by the *in situ* technique	In paper making using the *in situ* technique, carbide lime was used as the starting material for the preparation of an ionic sucrose solution without additives and with the sugar solution concentration maintained at 10° Brix. The optimum parameters for Precipitated Calcium Carbonate (PCC) in paper making were investigated in the laboratory before further testing on a pilot plant scale at Western Michigan University, USA. The paper produced conformed to the SIRIM Standard for printing paper. Hence, the *in situ* technique developed was deemed suitable for commercialisation.
2	Penghasilan PCC nano	Pelbagai teknik dan bahan mula serta aditif telah digunakan dalam cubaan untuk menghasilkan PCC nano. Antara teknik yang digunakan ialah gas-cecair-pepejal dan cecair-cecair-pepejal. Bahan aditif yang telah diuji ialah sukrosa, glukos, fruktos, EDTA dan sorbitol, sementara bahan mula yang digunakan ialah kapur karbida, kalsium oksida dan kalsium hidroksida. Gas nitrogen dan gelang getah telah digunakan sebagai perencat kepada pembentukan kristal kalsit. Sebanyak 41 ujian menggunakan bahan mula dan aditif yang berbeza telah dijalankan. Saiz butiran PCC <100 nm telah diperolehi dengan menggunakan teknik cecair-cecair-pepejal, dengan kalsium hidroksida sebagai bahan mula, sukros sebagai bahan aditif dan gelang getah sebagai bahan perencat.
	Production of nano PCC	Various techniques and starting materials and additives were tested for the production of nano PCC. The approaches attempted were gas-liquid-solid and liquid-liquid-solid. The additives tested were sucrose, glucose, fructose, EDTA and sorbitol while the starting materials were carbide lime, calcium oxide and calcium hydroxide. Nitrogen and rubber bands were used as retardants in the formation of calcite crystals. A total of 41 tests using different starting materials and additives were carried out. A particle size of PCC <100 nm was obtained using the liquid-liquid-solid technique, with calcium hydroxide as the starting material, sucrose as additive and rubber bands as retardant.

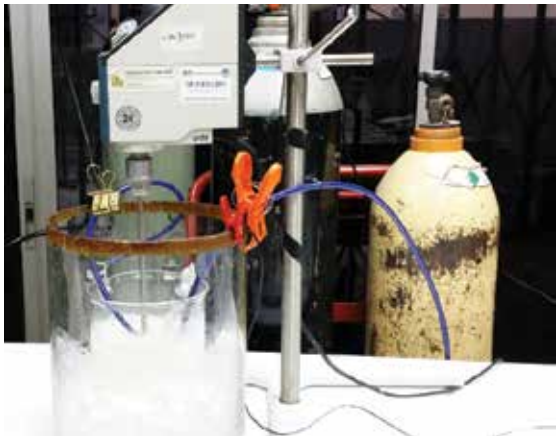
Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
3	Penghasilan PCC untuk industri cat	Penghasilan PCC untuk industri cat telah dikaji dengan menggunakan bahan mula dari bahan buangan industri gas asitelina iaitu kapur karbida yang mempunyai kandungan CaO 68.7%. Sebanyak 200 kg PCC telah berjaya dihasilkan menggunakan kaedah larutan ionik bersukrosa di dalam tangki berkapasiti 600 liter untuk memaksimumkan jumlah PCC yang dihasilkan. Kaedah ini adalah kos efektif kerana lebihan air gula boleh dikitar semula. Keputusan ujian menunjukkan PCC yang dihasilkan mempunyai ketulenan yang tinggi iaitu melebihi 98%. Ketumpatan bandingan (SG) dalam julat 2.3-2.4 dan mempunyai nilai komersial. Kecerahan dan keputihan PCC yang dihasilkan juga adalah baik iaitu masing-masing 83.3% dan 75.2%. PCC yang dihasilkan telah dikaji dengan mendalam di syarikat Bina Paint Sdn. Bhd., Bangi Selangor untuk penggunaannya di dalam penghasilan cat.
	Synthesis of PCC for the paint industry	Synthesis of PCC for the paint industry was investigated using carbide lime (an industrial waste of the acetylene gas industry) as the starting material, with CaO content of about 68.7%. Two hundred kilograms of PCC were successfully synthesized using the sucrose ionic solution method in a 600 litre tank to maximize the volume of synthesized PCC. This method was cost effective as unspent sugar solution could be recycled. The analysis showed that the PCC synthesized had a high purity exceeding 98%. Its specific gravity was in the range of 2.3-2.4, which is of commercial value. The brightness and whiteness were also quite high, at 83.3% and 75.2% respectively. The PCC produced was investigated further at Syarikat Bina Paint Sdn. Bhd. for its utility in paint formulation.
4	Perkhidmatan ujian batu dimensi	Sejumlah 143 spesimen dari pihak swasta telah diuji.
	Dimension stone testing services	A total of 143 specimens from private sectors were tested.

Penghasilan kertas cetak dengan teknik *in situ*
Production of printing paper by the *in situ* technique

Penyediaan buburan pulpa berpengisi PCC
Preparation of pulp slurry impregnated with PCC

Kertas cetak yang terhasil menggunakan teknik *in situ*
Printing paper produced using *in situ* technique

Penghasilan PCC nano
Production of nano PCC



Penghasilan PCC nano menggunakan gas CO_2 dan nitrogen sebagai aditif
Production of nano PCC using CO_2 gas and nitrogen as additive

Penghasilan PCC untuk industri cat
Synthesis of PCC for the paint industry

Larutan ionik bersukrosa ditapis dan dimasukkan terus ke dalam tangki penyediaan PCC bagi kajian cat
Ionic sucrose solution is filtered and fed directly into PCC preparation tank for paint formulation

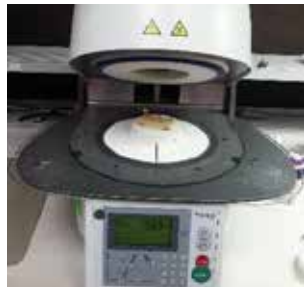
Teknologi Bahan Termaju
Advanced Material Technology

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
1	Kebolehacuan dan keserasian biologi ingot gigi leusit	Kajian ini memberi tumpuan kepada keserapan air, keterlarutan dan kebolehacuan kaca seramik leusit yang dihasilkan dari pasir silika tempatan bergred tinggi. Keserapan air dan keterlarutan sampel-sampel meningkat dengan ketara setelah direndam dalam larutan berasid. Media rendaman berasid (jus limau dan minuman berkarbonat) menunjukkan kesan yang ketara ke atas mikrokekerasan kaca seramik leusit manakala air suling tidak memberikan apa-apa kesan ke atas bahan tersebut. Mikrokekerasan permukaan berkurang apabila keasidan media rendaman meningkat, dengan minuman berkarbonat yang mempunyai pH 3.1 menyebabkan perubahan yang tertinggi terhadap mikrokekerasan permukaan. Ingot leusit menujukkan keputusan mampatan yang baik dan ketepatan padanan.
	Moldability and biological compatibility of leucite dental ingot	The study focused on water sorption, solubility and mouldability of the leucite glass-ceramics produced from local high grade silica sand. Water sorption and solubility of the samples were significantly increased after immersion in acidic solution. The acidic immersion media (orange juice and carbonated drink) had a significant effect on the microhardness of leucite glass ceramics while distilled water had no effect on the material. Surface microhardness decreased as the acidity of the immersion media increased, with a commercial carbonated drink with pH 3.1 causing the greatest change in surface microhardness. The leucite ingots showed excellent press results and accuracy of fit.
2	Penghasilan komposit marmar menggunakan dolomit dan andalusit tempatan	Komposit marmar yang dihasilkan dari campuran resin polimer, dolomit dan andalusit tempatan merupakan bahan sintetik yang menyerupai marmar semulajadi. Dalam kajian ini, sifat komposit marmar tempatan telah dibandingkan dengan komposit marmar menggunakan pengisi Alumina Tri-hidrat (ATH) yang merupakan pengisi import komersial yang biasa digunakan dalam pembuatan produk komposit *solid surface*. Kajian ini menunjukkan bahawa marmar komposit terisi dengan dolomit dan andalusite tempatan mempunyai kekuatan mampatan dan lenturan yang tinggi, serta dengan nilai keliangan yang rendah. Marmar komposit tempatan menawarkan pelbagai corak di permukaan, bergantung kepada komposisi dan jenis pengisi.
	Production of marble composite using local dolomite and andalusite	Composite marble made from a mixture of polymer resin, local dolomite, and andalusite is a synthetic material which mimics natural marble. In this study, the properties of local composite marble were compared to composite marble filled with Alumina Trihydrate (ATH) which is a commercial imported filler commonly used in the manufacture of composite solid surfaces. The study showed that composite marble filled with local dolomite and andalusite had high compression and flexural strength and low porosity. Local composite marble offered a variety of patterns on the surface, depending on the composition and types of filler.

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
3	Penghasilan kalsium silikat (Ca_2SiO_4) bersaiz nano	Pasir silika dan batu kapur telah digunakan untuk menghasilkan kalsium silikat melalui pembakaran pada 1400 °C. Penggunaan alat Pengisar Bebola Planetari dengan pelbagai bantuan pengisaran telah dapat menghasilkan serbuk kalsium silikat dengan purata partikel saiz (d50) 66.44 nm. Penyelidikan seterusnya dijalankan untuk menilai potensi kalsium silikat sebagai bahan pengisi dalam komposit kayu-plastik. Keputusan kajian mendapati bahawa kalsium silikat tidak mempunyai impak yang besar kepada kekuatan lenturan komposit kayu-plastik. Bagaimanapun, ia dapat mengurangkan penggunaan polimer dan serbuk kayu sehingga 20% sementara masih mengekalkan ciri-ciri astetiknya.
	Production of nano-sized calcium silicate (Ca2SiO4)	Silica sand and limestone were used to produce calcium silicate through combustion at 1400 °C. The Planetary Ball Mill used in conjunction with various grinding aids produced calcium silicate powder with an average particle size (d50) of 66.44 nm. Further research was conducted to assess the potential of calcium silicate as a filler material in wood-plastic composites. The results indicated that calcium silicate did not have a major impact on the bending strength of wood-plastic composites. However, it could reduce the use of polymers and wood by up to 20% while still retaining its aesthetic qualities.

Kebolehacuan dan keserasian biologi ingot gigi leusit
Moldability and biological compatibility of leucite dental ingot

Bahan ujian direndam dalam media rendaman
Test material was immersed in an immersion media



Bahan ujian dibakar selepas proses pembentukan
Test material was fired in an electric furnace after build up process

Ujian kebolehacuan ke atas kaca-seramik leusit
Moldability test of leucite glass-ceramics

Penghasilan komposit marmar menggunakan dolomit dan andalusit atempatan
Production of marble composite using local dolomite and andalusite

Produk komposit kayu-plastik yang dihasilkan dengan menggunakan kalsium silikat sebagai pengisi
Wood-plastic composite products produced using calcium silicate as a filler

Teknologi Pemprosesan Mineral
Mineral Processing Technology

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
1	Ujian-ujian pemprosesan fiziko-kimia peringkat loji pandu untuk sampel feldspar Pilot plant scale physico-chemical processing tests for feldspar samples	Parameter-parameter untuk proses pengapungan peringkat loji yang menghasilkan gred feldspar yang tinggi telahpun diperolehi. Ia seterusnya telah memungkinkan pemakaian kaedah pengasingan fiziko-kimia untuk operasi peringkat loji yang bersesuaian. The parameters for a pilot plant scale flotation process to produce and recover high grade feldspar were established. It was consequently possible to adopt appropariate pysico-chemical separation methods for a pilot plant scale operation.
2	Pemodelan proses pembebasan dan pemisahan mineral untuk mengoptimumkan parameter-parameter pemprosesan bijih kompleks Modeling mineral liberation and separation processes to optimize ore complex processing parameters	Pelbagai model untuk proses pembebasan mineral dari bijih kompleks telah dibandingkan dengan menggunakan perisian JKSimmet. Various models for processes to liberate minerals from ore complexses were compared using JKSimmet software.
3	Peningkatan perolehan kasiterit bersaiz halus dari bijih timah kompleks Improved recovery of fine-sized cassiterite from tin ore complexes	Pemulihan kasiterit bersaiz halus daripada kompleks bijih telah dijalankan dengan menggunakan pendekatan fiziko-kimia. Kajian ini menunjukkan bahawa kaedah ini boleh digunakan untuk mendapatkan semula bijih bersaiz halus. The recovery of fine-sized cassiterite from ore complexes was carried out using a physico-chemical approach. The study showed that the method could be used to recover fined-sized ore.

Latihan pemprosesan mineral dengan menggunakan meja ayun
Training on mineral processing using shaking table

Perbincangan mengenai projek dengan Agensi Nuklear Malaysia
Project discussion with Malaysia Nuclear Agency

Teknologi Perlombongan dan Pengkuarian
Mining and Quarrying Technology

Bil. No.	Aktiviti / Projek R&D Activity / R&D Projects	Hasil / Penemuan / Catatan Results / Findings / Remarks
1	Pengkelasan efluen di kawasan lombong dan pembangunan teknik rawatan *acid mine drainage* (AMD)	Aktiviti projek ini tertumpu kepada kajian lapangan, persampelan dan penganalisisan efluen di 48 kawasan lombong emas, bijih besi dan bijih timah yang aktif dan juga tidak aktif di Terengganu, Kelantan, Perak dan Pahang. Ujian pencirian secara *in situ* bagi parameter kualiti seperti pH, oksigen terlarut, konduktiviti, jumlah pepejal terlarut, potensi penurunan-pengoksidaan dan kekeruhan telah dilakukan ke atas sampel air. Analisis kandungan logam berat telah dilakukan di makmal Pusat Penyelidikan Mineral di Ipoh, Perak. Pengkelasan AMD dibuat selepas kesemua keputusan ujian telah dianalisis.
	Classification of effluent in mining areas and the development of Acid Mine Drainage (AMD) treatment techniques	The project activities focused on field studies, sampling and analysis of effluents at 48 active and inactive gold, iron ore and tin mines in Terengganu, Kelantan, Perak, and Pahang. *In situ* tests for water quality parameters such as pH, dissolved oxygen, conductivity, total dissolved solid, oxidation - reduction potential and turbidity were performed on the water samples. Analyses of heavy metals were conducted at the Minerals Research Centre laboratory in Ipoh, Perak. AMD classification was carried out after the results were analysed.
2	Penyisihan logam berat daripada air sisa lombong menggunakan penyerap yang murah	Objektif kajian ini adalah untuk mengkaji keberkesanan zeolit yang disintesis daripada abu arang terbang yang diperolehi dari Manjung dalam merawat AMD. Keputusan kajian menunjukkan zeolit mempunyai ciri penjerapan yang lebih baik dalam mengurangkan kandungan logam berat dan meningkatkan pH berbanding dengan abu arang terbang. Ini mungkin disebabkan oleh ciri kealkalian dan kapasiti penukaran kation yang lebih tinggi untuk zeolit. Kesimpulannya, pH memainkan peranan yang penting dalam penyingkiran bahan pencemar. pH dan kapasiti penukaran kation yang lebih tinggi dapat menggalakkan pengurangan logam berat yang lebih banyak.
	Removal of heavy metals from mine waste water using low cost absorbent	Zeolite synthesised from Manjung coal fly ash was investigated for its effectiveness as an absorbent in treating AMD. Zeolite showed better adsorption properties than coal fly ash for heavy metal reduction as the pH increased, probably due to the higher cation exchange capacity in in the former under more alkaline conditions. This study suggested that pH played a very important role in the removal of contaminants. Increments in pH and cation exchange capacity promoted heavy metal reduction through precipitation and adsorption processes.

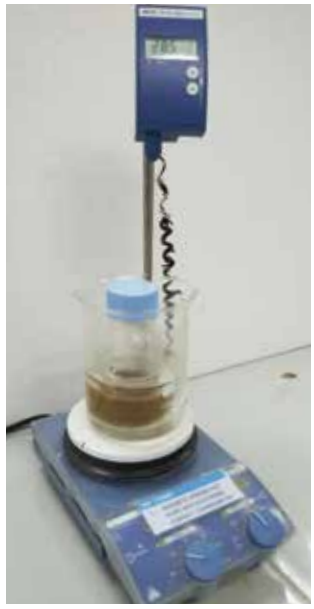
Bil. No.	Aktiviti / Projek R&D Activity / R&D Projects	Hasil / Penemuan / Catatan Results / Findings / Remarks
3	Penggunaan produk sampingan daripada sisa rawatan AMD	Produk sampingan daripada sisa rawatan AMD di lombong bijih timah di Hulu Perak telah diproses lanjut di makmal. Berdasarkan kandungan SiO_2, Al_2O_3, Fe_2O_3 dan CaO yang tinggi pada sampel hasilan menunjukkan ia sesuai digunakan sebagai suapan kepada pembuatan simen Portland biasa dengan tidak menjejaskan sifat-sifat simen portland. Dalam industri perlombongan yang mapan, pengurangan sisa yang keluar dari lombong adalah penting kerana ia dapat mengurangkan kesan negatif terhadap alam sekitar.
	Utilisation of by-products from AMD treatment waste	By-products of AMD treatment from tin mines located in Hulu Perak were processed further in the laboratory. The ensuing product that contained high levels of SiO_2, Al_2O_3, Fe_2O_3 and CaO might be suitable as feed material for the manufacture of Portland cement without compromising the cement properties. In a sustainable mining industry, waste reduction from mines is important as it reduces the negative impact on the environment.
4	Pembangunan Indeks Zarah Quarry dan Bunyi Software (QPINs)	Kajian ini bertujuan untuk membangunkan satu perisian yang dikenali sebagai "Quarry Particulate Index and Noise Software" (QPINs) dengan mengkaji sumber pencemaran debu dan pencemaran bunyi bising daripada trafik di sesebuah kuari. Pembolehubah yang dikaji adalah seperti faktor pengeluaran debu, keadaan meteorologi setempat, kecerunan jalan, aliran trafik, bilangan dan kategori kenderaan pada setiap jam, kelajuan trafik dan komposisi kenderaan. Perisian ini telah berjaya didaftarkan hakcipta dengan Perbadanan Harta Intelek Malaysia (MyIPO) pada 25 Jun 2015 dengan No Pendaftaran: LY2015001020
	Development of Quarry Particulate Index and Noise Software (QPINs)	This study was aimed at developing a new software called Quarry Particulate Index and Noise Software (QPINs) by investigating sources of dust pollution and noise pollution from traffic in a quarry. The variables considered in this studied were dust production factors, local meteorological conditions, road gradient, traffic flow, the number and categories of vehicles at every hour, traffic speed and vehicle composition. The software was successfully registered with the Intellectual Property Corporation of Malaysia (MyIPO) Copyright on June 25, 2015 with Registration Number: LY2015001020
5	Rawatan AMD di tanah bekas lombong tembaga Mamut	Projek ini adalah projek usahasama antara JMG dan Mine Reclamation Corporation (MIRECO), Korea. Pengambilan data dari loji pandu pasif telah siap dijalankan pada 2014. Data tersebut telah dianalisa di mana penemuan telah dibentangkan di Mine Hazards Management Seminar yang telah diadakan di Pusat Penyelidikan Mineral pada 12-14 May 2015. Seminar ini adalah anjuran bersama pihak JMG dan MIRECO. Hasil penemuan projek ini juga akan dikongsikan dengan agensi negeri Sabah.
	Treatment of AMD at the ex-Mamut copper mine land	Acquisition of data from a passive pilot plant in the project, a joint venture between JMG and Mine Reclamation Corporation (MIRECO), Korea, was completed in 2014. The collected data were analysed and a report of the findings was presented at the Mine Hazards Management Seminar held at the Mineral Research Centre on 12-14 May 2015. The seminar was jointly organized by the JMG and MIRECO. The findings of the study would also be shared with Sabah state agencies.

Bil. No.	Aktiviti / Projek R&D Activity / R&D Projects	Hasil / Penemuan / Catatan Results / Findings / Remarks
6	Kesan aktiviti perlombongan terhadap kualiti air Tasik Chini, Pahang	Penilaian *in situ* telah diadakan ke atas kualiti air dan sisa logam berat terpilih di Tasik Chini dan kawasan sekitarnya berikutan kesan aktiviti perlombongan. Ia adalah kesinambungan daripada kajian yang telah dijalankan pada tahun 2010 dan 2012 oleh JMG Pahang. Pusat Penyelidikan Mineral, JMG telah dilantik untuk mengetuai kumpulan bagi projek ini. Kajian mendapati bahawa aktiviti perlombongan telah memberi impak kepada kandungan logam berat di beberapa lokasi yang berhampiran dengan lombong. Kandungan logam berat yang tinggi juga dikesan di lokasi persampelan di sekitar tasik yang berjarak jauh dari lombong. Oleh itu, aktiviti perlombongan tidak boleh dianggap sebagai penyumbang tunggal yang membawa kepada kandungan logam berat yang tinggi dalam Tasik Chini. Tasik dan kawasan sekitarnya yang kaya dengan enapan laterit dan barit telah membawa kepada kandungan Al, Fe, Mn dan Ba yang tinggi dalam air. Berikutan dengan penyerahan laporan kajian kepada JMG Pahang, satu sesi pembentangan juga telah dijalankan oleh pihak PPM di JMG Pahang pada 17 April 2015.
	Impact of mining activities on the water quality of Tasik Chini, Pahang	An *in situ* evaluation was carried out on water quality and selected metal residues at Tasik Chini and the surrounding areas impacted by mining activities. This was a continuation of the study undertaken in 2010 and 2012 by JMG Pahang. The Mineral Research Centre, JMG, was appointed as the lead group for this project. The study found that mining activities created an impact on metal loads at specific sampling points close to mining areas. High metal levels were also detected in the lake at sampling points which were not in close proximity to the mines. Therefore, mining activities could not be deemed the sole contributor for the high metal load in Tasik Chini. The lake and its surroundings are rich in laterite and barite deposits, leading to an expected high natural background levels of Al, Fe, Ba and Mn. Following submission of the study report to JMG Pahang, a presentation session was conducted by PPM in JMG Pahang on 17 April 2015.

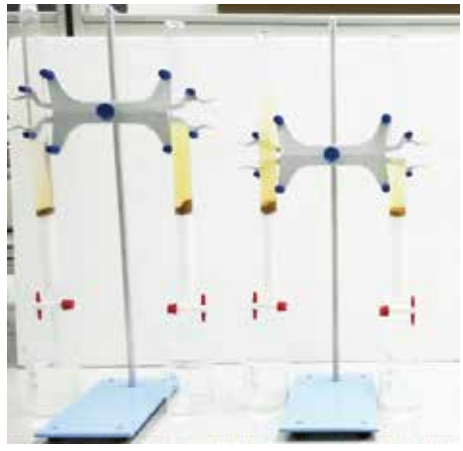
Bil. No.	Aktiviti / Projek R&D Activity / R&D Projects	Hasil / Penemuan / Catatan Results / Findings / Remarks
7	Kualiti air dan potensi penjanaan *acid mine drainage* (AMD) di sekitar Bukit Ibam, Pahang	Kajian ini adalah lanjutan kepada kajian yang telah dimulakan pada September tahun 2014 untuk mendapatkan data asas bagi kawasan Bukit Ibam sebagai persediaan kepada kajian AMD pada masa akan datang. Sampel-sampel air, sedimen, tanah dan batuan sisa lombong telah diambil di beberapa lokasi sekitar Bukit Ibam. Analisis potensi AMD melalui ujian seperti NAG, ANC dan kandungan sulfur yang dijalankan terhadap sampel tanah menunjukkan kebanyakan sampel adalah berpotensi untuk menjana AMD. Sampel air yang diperolehi mencatatkan bacaan pH di antara 2.7 hingga 4.1 di kawasan berhampiran lombong manakala bagi kawasan di bahagian hulu sungai, bacaan pH yang direkodkan adalah di antara 6.3 hingga 6.8. Analisis sedimen menunjukkan beberapa sampel mengandungi aluminium yang tinggi, manakala kandungan logam berat lain didapati rendah dan tidak melebihi had piawai yang boleh diterima.
	Water quality and potential for acid mine drainage (AMD) around Bukit Ibam, Pahang	This study was an extension of the initial study initiated in September 2014 to obtain basic data (baseline data) of Bukit Ibam in preparation for future studies. Samples of water, sediment, soil, and mine waste rocks were taken at various locations around Bukit Ibam. Analysis of AMD potential through a number of tests such as NAG, ANC and sulphur content was carried out on soil samples. The result showed that most of the area had the potential to generate AMD. Water samples obtained showed pH readings between 2.7 to 4.1 in the vicinity of the mine, while pH ranged from 6.3 to 6.8 in the upstream region of the mine area. Sediment analysis showed that a few samples contained high concentrations of aluminium, while the levels of heavy metals content were very low and did not exceed acceptable standards.

Penyisihan logam berat daripada air sisa lombong menggunakan penyerap yang murah
Removal of heavy metals from mine waste water using low cost absorbent

Abu arang terbang dan zeolite yang dihasilkan
Coal fly ash and zeolite produced



Ujian hidroterma
Hydrothermal test



Ujian penjerapan menggunakan *column*
Absorption test using column

Pengkelasan efluen di kawasan lombong dan pembangunan teknik rawatan *acid mine drainage* (AMD)
Classification of effluent in mining areas and the development of acid mine drainage (AMD) treatment techniques

Kolam hampas basah di beberapa buah lombong
Wet tailings pond in a few mines

Pengukuran kualiti air secara *in situ*
In situ water quality measurement

Teknologi Pemulihan Lombong dan Kuari
Mine and Quarry Rehabilitation Technology

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
1.	Teknik penanaman mampan untuk pemulihan muka kuari dan projek SPAK untuk pemulihan kawasan bekas kolam lombong	Pusat Penyelidikan Mineral (PPM) dengan kerjasama dengan Syarikat Imerys Resources (M) Sdn. Bhd telah menjalankan kajian penghijauan muka kuari di Kuari Imerys, Ipoh. Pengairan secara automatik telah dipasang untuk mengairi pokok yang ditanam di muka kuari. Projek Sistem Penanaman Atas Kolam (SPAK) telah memenangi dua anugerah inovasi pada tahun ini, iaitu: i. Pertandingan Inovasi 1NRE (Peringkat Kementerian) yang telah diadakan pada 20 Ogos 2015 di Putrajaya ii. Pertandingan Inovasi 'The Inclusive Innovation Challenge 2015' yang telah diadakan pada 10 September 2015 di Kuantan, Pahang
	Sustainable greening technique for rehabilitation of quarries and the SPAK project for rehabilitation of ex-mining pools	The Mineral Research Centre (PPM), in collaboration with Imerys Resources (M) Sdn. Bhd., conducted a study on greening of the quarry face at Imerys Quarry, Ipoh. Automatic irrigation was installed to water the trees planted at the quarry face. The Upper Pond Planting System (SPAK) project won two innovation awards this year, namely: i. Innovation Competition 1NRE (Ministry level) on 20 August 2015 at Putrajaya ii. Innovation Competition 'The Inclusive Innovation Challenge 2015' on 10 September 2015 at Kuantan, Pahang
2.	Maklumat *Geospatial* Tanah Bekas Lombong in Peninsular Malaysia	Projek kajian mengenai pengumpulan maklumat geospatial tanah bekas lombong diteruskan di Pulau Pinang dan Selangor. Disamping itu, PPM juga terlibat dalam Projek kajian perhutanan semula bekas Kuari Granit di Batu Undan, Lumut, Perak.
	Geospatial information study of ex-mining land in Peninsular Malaysia	The research project on collecting geospatial information for ex-mining land continued in Penang and Selangor. In addition, PPM was also involved in the research project, 'Reforestation of former granite quarry at Batu Undan, Lumut, Perak'.

Teknik penanaman mampan untuk pemulihan muka kuari dan projek SPAK untuk pemulihan kawasan bekas kolam lombong

Sustainable greening technique for rehabilitation of quarries and the SPAK project for rehabilitation of ex-mining pools

Aplikasi kaedah pengairan secara automatik di Kuari Imerys, Ipoh
The application of automatic irrigation methods at Quarry Imerys, Ipoh

Plak kemenangan Projek SPAK di Pertandingan Inovasi *The Inclusive Innovation Challenge* 2015
Plaque victory of SPAK project on Innovation Competition at The Inclusive Innovation Challenge 2015

Peserta Pertandingan Inovasi 'The Inclusive Innovation Challenge 2015' bersama hadiah yang dimenangi
Participants of Innovation Competition 'The Inclusive Innovation Challenge 2015' with their prizes

Pegawai Penyelidik Tn Hj Abdullah Hussin menerima hadiah yang dimenangi dalam Pertandingan Inovasi 1NRE dari Timbalan Ketua Pengarah, Tn Hj Shahar Effendi Abdullah Azizi
Research Officer Hj Abdullah Hussin received the prize in the Innovation Competition 1NRE from the Deputy Director General, Tn Hj Shahar Effendi Abdullah Azizi

Pelaksana dan Pengkomersialan
Commercialization

<table>
<tr><th>Bil.
No.</th><th>Aktiviti / Projek R&D
R&D Activity / Project</th><th>Hasil / Penemuan / Catatan
Output / Finding / Remarks</th></tr>
<tr><td>1</td><td>Harta intelek berhubung dengan hasil penyelidikan

Intellectual property in relation to research findings</td><td>Pada tahun ini, satu penemuan penyelidikan telah didaftarkan untuk permohonan paten dan satu perisian telah didaftarkan di bawah kategori hakcipta.

This year, one research finding was registered for patent filing and one software was filed under the category of copyright.
<table>
<tr><th>Bil
No</th><th>Tajuk
Title</th><th>Tarikh Pendaftaran
Filing Date</th><th>No. Permohonan
Application No</th></tr>
<tr><td>1</td><td>Quarry Particulate Pollution Index and Noise Software Volume 1.0.0 (Qpins V1.0.0)</td><td>29.06.2015</td><td>LY2015001020</td></tr>
<tr><td>2</td><td>Method for Recovery of Sulphide Minerals from Sulphide-containing Material</td><td>06.11.2015</td><td>PI 2015704029</td></tr>
</table></td></tr>
<tr><td>2</td><td>Pensijilan MS ISO 9001:2008

MS ISO 9001:2008 Certification</td><td>PPM-JMG telah melaksanakan Sistem Pengurusan Kualiti yang menepati MS ISO 9001:2008 sejak tahun 2012. Pada tahun 2015, pensijilan ini telah diperbaharui dan akan kekal sah sehingga tahun 2018.

Skop Pensijilan adalah merangkumi:
i) Perkhidmatan Ujian Batu Dimensi (UBD)
ii) Perkhidmatan Ujian Pemprosesan Bijih Timah (UPBT)

PPM-JMG has implemented the Quality Management System conforming to MS ISO 9001: 2008 since 2012. In 2015, this certification was renewed and would remain valid until 2018.

The scope of certification include:
i) Dimension Stone Testing Service (UBD)
ii) Tin Ore Processing Testing Service (UPBT)</td></tr>
<tr><td>3</td><td>Penganjuran SIMPOMIN 2015

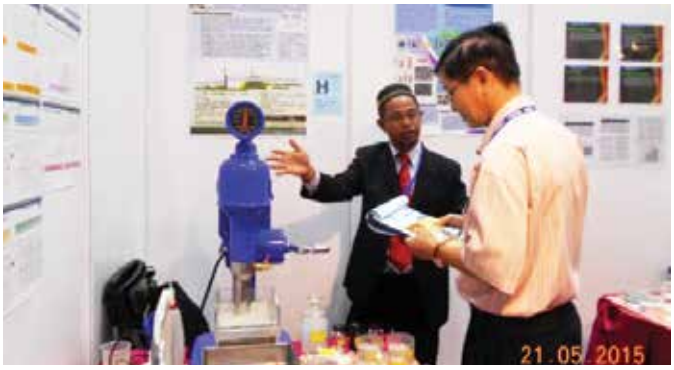
Organization of the Mineral Symposium ‘SIMPOMIN 2015’</td><td>Pusat Penyelidikan Mineral, Jabatan Mineral dan Geosains Malaysia (PPMJMG) dan Pusat Pengajian Kejuruteraan Bahan dan Sumber Mineral telah menganjurkan secara bersama persidangan ‘8th International Conference on Geological and Geo-Resources Engineering (IC-GeoE 2015) & 7th Mineral Symposium (Simpomin 2015)’. Persidangan dengan tema “Towards Sustainable Development and Management of Mineral Resources” ini telah diadakan pada 29–30 September 2015 bertempat di Hotel Cititel, Pulau Pinang.

The Mineral Research Center, Minerals and Geoscience Department Malaysia (JMG-PPM) and School of Materials and Mineral Resources Engineering, USM, jointly organized the 8th International Conference on Geological and Geo-Resources Engineering (IC-GeoE2015) and the 7th Minerals Symposium (Simpomin 2015). The conference with the theme “Towards Sustainable Development and Management of Mineral Resources” was held from 29 – 30 September 2015 in Cititel Hotel, Penang.</td></tr>
</table>

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
4	Penyertaan dalam pameran dan pertandingan	a) *26th International Invention and Innovation Exhibition (ITEX'15)* Pusat Penyelidikan Mineral telah menghantar dua penyertaan dalam *26th International Invention and Innovation Exhibition* (ITEX'15) yang telah diadakan pada 21–23 Mei 2015 di Pusat Konvensyen Kuala Lumpur (KLCC). Hasil rekacipta Dr. Rohaya Othman dan pasukannya yang bertajuk 'Papermaking Using Calciumbased Industrial Waste As Filler by *in situ* Technique' telah memenangi pingat perak manakala hasil rekacipta Dr. Ismail Ibrahim dan pasukannya yang bertajuk 'Bench Scale Flotation of Feldspar Using Non-Toxic Activator and Mixed Cationic/ Anionic Collector' telah menerima pingat gangsa. Hasil rekacipta Dr. Ismail ini juga telah mendapat pengiktirafan pencapaian cemerlang dalam kategori 'Water Technology' yang telah ditaja oleh Yayasan King Abdul Aziz, Arab Saudi. b) *6th Muslim World Biz Exhibition and Conference 2015 (Muslim World Biz 2015)* Pusat Penyelidikan Mineral telah menyertai *6th Muslim World Biz Exhibition and Conference 2015 (Muslim World Biz 2015)* yang telah diadakan pada 27–30 Oktober 2015 di Pusat Dagangan Dunia Putra (PWTC), Kuala Lumpur. Acara ini dianjurkan oleh OIC International Business Centre dengan kerjasama Islamic Centre for Development of Trade (ICDT). Sebanyak 8 projek penyelidikan telah dipilih untuk dipamerkan, iaitu *Eco Friendly Crystal Glass*, *In situ Technique for Paper Making, Engineered Poly Art Marble, Floating Farming System, Quarry Particulate Pollution Index and Noise Software, Anti-Thermal Shock Kitchen Wares, Nontoxic Processed of Feldspar* dan *Zeolite as Adsorbent for Mine Water Treatment.* c) Pertandingan Inovasi 1NRE 2015 Pusat Penyelidikan Mineral menyertai Pertandingan Inovasi 1NRE 2015 anjuran Kementerian Sumber Asli dan Alam Sekitar (NRE). Pertandingan ini telah diadakan pada 20 Ogos 2015 bertempat di Dewan Baiduri, Kementerian Sumber Asli dan Alam Sekitar, Putrajaya. Inovasi daripada Hj. Abdullah Hussin yang bertajuk SPAK (Sistem Penanaman Atas Kolam) telah berjaya merangkul tempat ke-2 dan membawa pulang hadiah wang tunai sebanyak RM3000. d) The Inclusive Innovation Challenge Pusat Penyelidikan Mineral turut memasuki pertandingan inovasi The Inclusive Innovation Challenge yang telah diadakan pada 9 September 2015 bertempat di Pahang Skill Development Centre, Pahang Darul Makmur. Pertandingan ini telah dianjurkan oleh Kementerian Sains, Teknologi dan Inovasi (MOSTI) dan Yayasan Inovasi Malaysia (YIM). Hasil inovasi Hj. Abdullah Hussin yang bertajuk SPAK (Sistem Penanaman Atas Kolam) telah memenangi tempat ke-2 dan membawa pulang hadiah wang tunai sebanyak RM3000.

Bil. No.	Aktiviti / Projek R&D R&D Activity / Project	Hasil / Penemuan / Catatan Output / Finding / Remarks
	Participation in exhibitions and competitions	a) 26th International Invention and Innovation Exhibition (ITEX'15) The Mineral Research Center submitted two entries to the 26th International Invention and Innovation Exhibition (ITEX'15) held on 21-23 May 2015 at the Kuala Lumpur Convention Centre (KLCC). The invention of Dr. Rohaya Othman and her team, entitled 'Paper making Using Calcium-based Industrial Waste as Filler by *in situ* Technique', won a silver medal while the invention of Dr. Ismail Ibrahim and his team, entitled 'Bench Scale Flotation of Feldspar Using Non-Toxic Activator and Mixed Cationic/ Anionic Collector', received a bronze medal. Dr. Ismail's invention was also recognized as an outstanding achievement in the "Water Technology" category sponsored by the Foundation of King Abdul Aziz, Saudi Arabia. b) 6th Muslim World Biz Exhibition and Conference 2015 (Muslim World Biz 2015) The Mineral Research Center participated in the 6th Muslim World Biz Exhibition and Conference 2015 (Muslim World Biz 2015) held from 27-30 October 2015 at the Putra World Trade Centre (PWTC), Kuala Lumpur. The event was organized by the OIC International Business Centre in collaboration with the Islamic Centre for Development of Trade (ICDT). A total of 8 research projects were selected for display. They were Eco Friendly Crystal Glass, *In situ* Technique for Paper Making, Poly Art Engineered Marble, Floating Farming System, Quarry Particulate Pollution and Noise Index Software, Anti-Thermal Shock Kitchen Wares, Nontoxic Processed of Feldspar, and Zeolite as Adsorbent for Mine Water treatment. c) 1NRE Innovation Competition 2015 The Mineral Research Center participated in the 1NRE Innovation Competition 2015 organized by the Ministry of Natural Resources and Environment (NRE). The competition was held on 20 August, 2015 at the Dewan Baiduri, Ministry of Natural Resources and Environment, Putrajaya. The Upper Pond Planting System (SPAK), an innovation by Hj. Abdullah Hussin, won 2nd place and was awarded a cash prize of RM 3000. d) The Inclusive Innovation Challenge The Mineral Research Center also participated in the Inclusive Innovation Challenge held on 9 September 2015 at the Pahang Skills Development Centre, Pahang Darul Makmur. The competition was organized by the Ministry of Science, Technology and Innovation (MOSTI) and Malaysian Innovation Foundation (YIM). The innovation by Hj. Abdullah Hussin called Upper Pond Planting System (SPAK) secured second place and a cash prize of RM3000.

26th International Invention and Innovation Exhibition (ITEX'15)



6th Muslim World Biz Exhibition and Conference 2015 (Muslim World Biz 2015)

The Inclusive Innovation Challenge 2015

Perkhidmatan Sokongan Teknikal
Technical Support Services

Perkhidmatan Sokongan Teknikal
Technical Support Services

Pengurusan Maklumat

Infrastruktur, Keselamatan dan Aplikasi ICT

Infrastruktur Pusat Data JMG beroperasi dengan lancar sepanjang tahun 2015. Bandwidth rangkaian 1Gov*Net di Kompleks JMG Ipoh kekal dengan kelajuan antara 6 sehingga 20 Mbps, sementara kelajuan internet di JMG Terengganu telah dinaiktaraf ke 6 Mbps.

Dari segi aspek keselamatan siber, Pusat Data JMG mengekalkan persijilan Information Security Management System (ISMS) dari SIRIM bagi tahun 2015 dengan mematuhi keperluan-keperluan berikut:

a) Audit dalam ISMS: 7 to 9 Julai 2015
b) Audit SIRIM (Pemantauan Tahun Pertama): 24-26 Ogos 2015
c) Kursus Pemantapan ISMS: 21-23 April 2015

Dalam tempoh yang sama, pasukan ISMS JMG telah diarahkan untuk melaksanakan peralihan pematuhan kepada piawaiaan baru iaitu MS ISO/IEC 27001:2013.

Kontrak penyelenggaraan Pusat Data masih diteruskan bagi memastikan operasi dan fasiliti Pusat Data dapat beroperasi dengan lancar serta untuk meningkatkan tahap ketersediaan maklumat dalam MINGEOSIS (Sistem Maklumat Mineral dan Geosains).

Pada tahun 2015, Pusat Data JMG sekali lagi terlibat dalam pelaksanaan projek Government Data Center (GDC-2) di bawah pengelolaan pihak MAMPU. Aplikasi portal JMG yang dahulunya ditempatkan di i-City Shah Alam telah dipindahkan ke Pusat Data Sektor Awam (PDSA) di MAMPU, Putrajaya pada pertengahan bulan September 2015. Manakala, pengujian Pemulihan Bencana (DR) telah berjaya dilaksanakan pada 2 November 2015 di bangunan Strateq, Petaling Jaya, Selangor.

Seramai 13 orang mahasiswa/i dari dua buah university tempatan telah menjalani latihan industri di JMG Sabah dari 1 Julai sehingga 19 September 2015.

Information Management

ICT Infrastructure, Security and Application

The JMG Data Center operated smoothly throughout 2015. The 1Gov*Net network bandwidth in JMG Ipoh Complex was maintained at speeds ranging from 6 to 20 Mbps, while internet speed in JMG Terengganu was upgraded to 6 Mbps.

In terms of cyber-security, JMG Data Center maintained the Information Security Management System (ISMS) certification from SIRIM for 2015 by fulfilling the following requirements:

a. ISMS Internal Audit: 7 to 9 July 2015
b. SIRIM Audit (second Year Surveillance): 24-26 August 2015
c. ISMS Enhancement Course: 21-23 April 2015

During the same period, the JMG ISMS team was directed to implement the transition to the new standard MS ISO / IEC 27001:2013.

Contracts on the maintenance of the Data Center were continued to ensure that the data center and facilities operate smoothly, and to enhance the availability of information in the MINGEOSIS (Minerals and Geoscience Information System).

In 2015, the JMG Data Center was again involved in the implementation of Government Data Centre (GDC-2) project under MAMPU management. JMG portal applications, which were formerly hosted in Shah Alam, moved to the Public Sector Data Center (PDSA) in MAMPU Putrajaya in mid-September 2015. The Disaster Recovery (DR) test was successfully executed on 2 November 2015 at Strateq, Petaling Jaya, Selangor.

Thirteen undergraduates from two local universities underwent industrial training in JMG Sabah from 1 July until 19 September 2015.

Pengurusan Data Berkomputer

Penyelenggaraan sistem MINGEOSIS meliputi penyediaan dokumentasi, *source codes, minor changes, query & report* bagi IMdat dan *Au tenor calculation* GEOCHEMdat telah disiapkan pada Disember 2015. Pemasangan perisian *Cold Fusion Version 11 Std.* Edition telah dilakukan di Pusat Data, BPT Ipoh bagi menggantikan versi lama yang terhad penggunaannya.

Bagi modul HYDROdat, terdapat sebanyak hampir 5000 data dalam sistemnya. Manual pengguna telah disiapkan dan telah diedarkan ke pejabat-pejabat negeri. ID pengguna telah diselaras dan diseragamkan mengikut negeri untuk kemudahan akses ke dalam sistem. Latihan kepada para pegawai dan kakitangan terlibat berkaitan HYDROdat versi 2.0 telah diadakan di BPT Ipoh. Ia merangkumi modul eksplorasi, makmal dan pentadbir.

Sistem ST@LK telah dipindahkan dari GDC-2 ke PDSA Putrajaya pada November 2015. Sebelum ini, sistem ini telah diguna pakai oleh pengusaha-pengusaha lombong dan kuari di negeri-negeri Selangor, Pahang, Negeri Sembilan dan Perak. Pada masa ini, sebanyak 298 data berkaitan pengkuarian dan 144 data berkaitan perlombongan telah dimasukkan ke dalam system yang merangkumi maklumat asas seperti nama kuari atau lombong berserta alamat, nombor pajakan, nombor lot dan tarikh luput, nombor SKSK/ SKSPM dan tarikh luput, koordinat lokasi dan kawasan DUN/ Parlimen. Maklumat-maklumat ini telah dikemaskini setiap bulan oleh para pengusaha lombong atau kuari sendiri. Para pengusaha lombong juga dikehendaki mengemaskini maklumat berkaitan pengeluaran dan penjualan atau eksport mineral utama dan mineral-mineral sampingan, penggunaan bahan letupan, bilangan tenaga kerja ke dalam sistem ST@LK.

METALdat dan GEOCHEMdat telah dikemaskini untuk memastikan kedua-dua aplikasi ini berfungsi dengan baik. Sehingga akhir 2015, sebanyak 3781 data yang terdiri daripada 2385 data kelodak, 896 data konsentrat mineral berat, 279 data tanih dan 279 data batuan telah direkodkan ke dalam modul GEOCHEMdat.

Computerized Data Management

The MINGEOSIS system maintenance, encompassing documentation, source codes, minor changes, query and report for the IMDat module and gold tenor calculation for GEOCHEMdat module, was completed in December 2015. A newer version of Cold Fusion Version 11 Std. Edition software was installed at the Data Centre, BPT Ipoh to replace the older version which had limited utility.

The HYDROdat module has a collection of almost 5000 data in its system. The user manual was completed and distributed to state offices. Its user ID was standardized according to states for easier access into the system. Training for officers and personnel involved in HYDROdat version 2.0 was conducted in BPT Ipoh. It comprised exploration, laboratory, and administrator modules.

The ST@LK system was migrated from GDC-2 to PDSA, Putrajaya on November 2015. Prior to this, the system had been utilised by mining and quarrying operators in the states of Selangor, Pahang, Negeri Sembilan and Perak. Currently, 298 quarrying and 144 mining data were held in the system which encompassed basic information such as quarry or mine names and addresses, lease numbers, lot numbers and expiry dates, SKSK/ SKSPM numbers and expiry dates, location coordinates and DUN/ Parliamentary constituencies. The data were updated monthly by the quarry or mining operators themselves. The operators also were required to access the ST@LK system in order to update information regarding major and minor minerals produced, sales, and export figures, explosives usage, and workforce.

METALdat and GEOCHEMdat were updated to ensure both applications were in working order. Up to the end of 2015, a total of 3781 data which comprised 2385 on silt data, 896 on heavy metal concentrate data, 279 on soil data and 279 on rock data had been recorded into the GEOCHEMdat module.

Sistem Maklumat Geografi dan Kartografi Berdigit

Pada tahun 2015, aktiviti penyediaan peta geologi digital, penghasilan peta tematik, pengumpulan dan perkongsian data spatial serta percetakan peta telah diteruskan. Di samping itu, kerja kartografi untuk penghasilan peta dan rajah dengan menggunakan perisian grafik masih diteruskan.

Unit Aplikasi GIS di Ibu Pejabat telah ditugaskan untuk kompilasi data dan perkongsian maklumat geospatial dengan pemegang taruh dan juga pelanggan dalaman dan juga luaran.

Geographical Information System and Digital Cartography

In 2015, activities such as the preparation of digital geological maps, thematic map production, spatial data collection and sharing, as well as printing of maps continued. In addition, cartographic work for the production of diagrams and figures using graphics software also continued.

The Unit of Application of GIS at the Headquarters was tasked with data compiling and geospatial data information sharing with stakeholders, and both internal and external customers.

Bil. No.	Aktiviti Activities	Pelanggan Customers	Bil. data No. of data
1.	Perkongsian set data geospatial Geospatial data sets sharing	Dalaman/ Internal	10 set data
		Agensi luar External agencies	10 set data
2.	Memuat-naik maklumat geospatial (mygdi Explorer) Uploading geospatial information	MaCGDI, NRE	73 metadata
3.	Katalog Peta NRE/ NRE Map catalogue	MaCGDI, NRE	10 peta/ maps

Penerbitan dan Perpustakaan

Untuk mencapai salah satu fungsi JMG yang penting iaitu mengumpul, menganalisis dan menyebarkan data dan maklumat berkaitan mineral dan geosains, JMG telah menerbitkan hasil penemuan dan kajiannya dalam berbagai laporan teknikal dan peta. Penerbitan ini disebarkan melalui perpustakaan negeri di seluruh Malaysia.

Di samping enam terbitan berkala tahunan, JMG juga telah menerbitkan laporan peta iaitu "Geologi dan Sumber Mineral Kawasan Yong Peng, Johor Darul Takzim" (Laporan Peta 26). Sebanyak dua garis panduan juga telah diterbitkan iaitu Garis Panduan Penyediaan Laporan Hidrogeologi dan Geologi Bagi Maksud Permohonan Lesen Punca Air Mineral Semula Jadi (JMG.GP.19) dan Garis Panduan Ekplorasi Unsur Nadir Bumi (JMG.GP.20).

Dua peta geologi telah diterbitkan, iaitu Peta Geologi Negeri Sabah (Edisi Ke-4) dan Peta Geologi Kawasan Yong Peng. Satu peta sumber mineral iaitu bagi negeri Sarawak juga telah diterbitkan.

Publications and Library

One of the important functions of JMG is to collect, analyse and disseminate data and information pertaining to minerals and geoscience. In fulfilling this important role, JMG publishes its findings and research results in various technical reports and maps, and also disseminates these publications through its libraries in various states in the country.

Apart from six annual publications, a map report titled "Geologi dan Sumber Mineral Kawasan Yong Peng, Johor Darul Takzim" (Map Report No. 26) was also published. Two guidelines, namely "Guidelines on the Preparation of Hydrogeological and Geological Report for Natural Mineral Water Sources Licence Application (JMG.GP.19)" and "Guidelines on Rare Earth Elements Exploration (JMG. GP.20)" were also published.

Two geological maps were published, namely Geological Map of Sabah (4th Edition) and Geological Map of the Yong Peng. Mineral resources map for the state of Sarawak was also published.

JMG telah menerima seramai 2499 orang pelawat yang membuat rujukan, penyelidikan serta membeli laporan dan peta di perpustakaan. Jumlah kutipan hasil pada tahun 2015 adalah sebanyak RM82,505, sedikit penurunan berbanding tahun lepas.

A total of 2499 visitors visited the libraries for reference, research, and the purchase of reports and maps. The total revenue collected for 2015 was RM82,505, a slight decrease compared to the previous year's.

Perpustakaan Library	Jumlah pelawat No. of visitor	Penjualan bahan terbitan jabatan Sales of departmental publication					
		Laporan Report		Peta Map		Lain-lain Others	Jumlah penjualan Total sales (RM)
		Bil. No. of item	Jumlah Amount (RM)	Bil. No. of item	Jumlah Amount (RM)	Jumlah Amount (RM)	
Ibu Pejabat/ Headquarters	1489	285	15,024	336	26,665	75	41,764
Bahagian Perkhidmatan Teknikal Technical Services Division	144	48	3175	46	4560	419	8154
Sarawak	275	96	6900	68	5010	340	12,250
Sabah	96	20	1190	35	3300	80	4570
Pusat Penyelidikan Mineral Mineral Research Centre	25	-	-	-	-	-	-
Johor	16	7	430	14	1350	-	1780
Negeri Sembilan/ Melaka	50	16	1023	14	1400	-	2423
Kedah/ Perlis/ Pulau Pinang	126	34	1700	7	700	350	2750
Terengganu	58	23	1170	18	1800	-	2970
Pahang	200	13	1100	27	1424	1000	3524
Kelantan	20	19	1120	12	1200	-	2320
Jumlah/ Total	**2499**	**561**	**32,832**	**577**	**47,409**	**2264**	**82,505**

*Nota: Ibu Pejabat JMG bertanggungjawab ke atas penjualan laporan dan peta di Selangor dan Wilayah Persekutuan Kuala Lumpur.
Notes: JMG headquarters is responsible for the sales of reports and maps in Selangor and the Federal Territory of Kuala Lumpur.

Muzium Geologi

Muzium geologi yang ditempatkan di BPT (Ipoh), JMG Sarawak (Kuching) dan JMG Sabah (Kota Kinabalu) memainkan peranan penting sebagai pusat pembelajaran dan pendidikan geosains di negara ini. Jumlah pelawat ke muzium geologi di Ipoh dan Kuching adalah masing-masing 7235 dan 141, sementara muzium geologi di JMG Sabah telah ditutup untuk ubahsuai.

Geological Museum

Geological museums located at BPT (Ipoh), JMG Sarawak (Kuching), and JMG Sabah (Kota Kinabalu) play an important role as centres of learning and education of geoscience in the country. The number of visitors to geological museum at Ipoh and Kuching was 7235 and 141, respectively; the geological museum at JMG Sabah was closed for renovation.

Photo: Mat Niza Abdul Rahman

Lawatan ke Muzium Geologi di Ipoh pada 2 Disember 2015 oleh Sekolah Pengajian Hidrografi (SPH) Tentera Laut Di Raja Malaysia, KD PELANDOK, Lumut, Perak
Visit to the Geological Museum in Ipoh on the 2 December 2015 by Royal Malaysian Navy Hydrographic School, KD PELANDOK, Lumut, Perak

Perkhidmatan Lombong & Kuari

Pada tahun 2015 Cawangan Perkhidmatan Lombong & Kuari (CPLK) di Bahagian Perkhidmatan Teknikal (BPT) terus menggalas tugasan terutamanya dalam bidang khidmat nasihat dan kepakaran berkenaan undang-undang. Walau bagaimanapun, perkhidmatan pemantauan habuk, gegaran serta ledakan udara tidak dapat ditawarkan seperti biasa kerana ketiadaan staf yang mengendalikan peralatan dan ujian berkenaan berikutan perpindahan kakitangan kerana kenaikan pangkat dan persaraan pilihan.

Unit Makmal Kejuruteraan telah dikeluarkan daripada CPLK dan diletakkan di bawah Cawangan Perkhidmatan Kepakaran. Untuk menggambarkan imej serta peranan yang dimainkan, CPLK di BPT telah dibahagikan kepada dua unit iaitu Unit Pengurusan Dasar & Perundangan dan Unit Kejuruteraan Perlombongan/ Pengkuarian.

Mines and Quarry Services

In 2015, the Mines & Quarry Services Section (CPLK) in the Technical Services Division (BPT) shouldered advisory and expert services in legal matters. However, dust vibration and air-blast monitoring services could not be offered at the usual frequency because the section lacked manpower to perform the tests owing to the promotional transfer and optional retirement of relevant support staff.

The Engineering Laboratory was taken out from CPLK and placed under the Expert Services Section. To portray the distinct roles played by CPLK of BPT, they were separated into two units, namely the Policy Management and Laws Unit and the Mining/ Quarrying Engineering Unit.

Khidmat Pemantauan Kualiti Udara

Kerja-kerja pemantauan kualiti udara telah dijalankan untuk memenuhi syarat-syarat di bawah Akta Kualiti Alam Sekeliling 1974. Hanya sebanyak 20 perkhidmatan pemantauan kualiti udara menggunakan high volume sampler (HVS) dapat dilaksanakan berbanding dengan 61 kali pada tahun sebelumnya kerana ketiadaan staf sokongan. Kerja-kerja pemantauan habuk telah dilaksanakan di kuari-kuari, kawasan perumahan, projek pembangunan dan juga kawasan pelupusan sisa industri. Jumlah hasil yang dikutip adalah sebanyak RM5000 berbanding RM15,250 pada tahun sebelumnya disebabkan oleh bilangan pemantauan yang kurang.

CPLK, BPT juga telah menjalankan khidmat analisis sampel habuk yang diperolehi melalui kaedah *Dustfall Deposition Gauge* (DDG). Pada 2015, hanya satu khidmat analisis kandungan habuk dalam sampel air telah dijalankan. Pengukuran sampel habuk DDG ini telah dijalankan oleh perunding untuk Loji Simen Pahang, Kuantan, Pahang. Hasil yang dipungut bagi perkhidmatan analisis ini adalah sebanyak RM80.

Satu kali pengukuran gegaran bumi dan ledakan udara telah dijalankan pada tahun 2015 iaitu di Kuari Lafarge Aggregates, Pantai Remis. Pemantauan ini dilaksanakan dengan bantuan Unit Lombong & Kuari (LK), JMG Perak dan Cawangan Teknologi Perlombongan dan Pengkuarian, Pusat Penyelidikan Mineral. Nilai kutipan hasil yang telah diperolehi bagi khidmat pengukuran gegaran bumi dan ledakan udara yang telah dijalankan ialah sebanyak RM100 sahaja.

Air Quality Monitoring Services

Air quality monitoring works were carried out to fulfil the requirements under the Environmental Quality Act 1974. Only 20 monitoring services using the high volume sampler (HVS) were carried out, compared to 61 services during the previous year owing to the shortage of support staff. These dust monitoring works were carried out in quarries, housing areas, development projects, and industrial waste disposal sites. The collected revenue was RM5000 compared to RM15,250 during the previous year owing to the smaller number of monitoring jobs.

CPLK, BPT also provided analytical service for dust samples obtained using the Dustfall Deposition Gauge (DDG) method. In 2015, only one analytical service for dust content in water sample was conducted. The DDG dust sample measurement was carried out by a consultant for the Pahang Cement Plant, Kuantan, Pahang. The revenue collected for this analytical service was RM80.

One measurement on vibration and air blast monitoring work was carried out in 2015 at Kuari Lafarge Aggregates, Pantai Remis. The monitoring was conducted with the assistance of Mines and Quarry Unit, JMG Perak and Mines and Quarry Technology Section, Mineral Research Centre. The revenue collected for the ground vibration and air blast measurements was RM100.

Latihan

Salah satu aktiviti teras CPLK ialah menganjurkan kursus dan latihan untuk peringkat jabatan. Disebabkan oleh kekangan kewangan, pada tahun 2015 CPLK hanya mampu menganjurkan satu bengkel dengan kerjasama Unit Pembangunan Sumber Manusia (PSM) Ibu Pejabat iaitu Bengkel Pengauditan Penunjuk Kemampanan yang telah diadakan di Hotel Impiana, Ipoh, Perak pada 14-17.06.2015. Seramai 46 orang peserta kebanyakannya Pegawai Geosains dari Unit Lombong dan Kuari JMG Negeri telah menghadiri Bengkel ini. Tenaga penceramah terdiri dari tiga orang pegawai dari Unit Audit Dalam, NRE.

Trainings

One of the core activities of CPLK is to provide training for the department. However, owing to financial constraints in 2015, CPLK with the cooperation of Human Resource Development Unit (HRD), HQ was able to organize only one workshop i.e. Workshop on Auditing Sustainable Indicators on 14-17.06.2015 at Impiana Hotel, Ipoh. There were forty-six participants, many of whom were Geoscience Officers from the Mines and Quarry Unit of the State JMG. The lecturers involved were three officers from the Internal Audit Unit, NRE.

Bengkel ini telah dijalankan dengan objektif seperti berikut:

- untuk mendedahkan kepada para peserta teknik dan proses mengaudit terkini dan relevan untuk industri perlombongan dan pengkuarian
- untuk menjelaskan penunjuk kemampanan yang terpilih untuk *sustainability reporting* bagi industri perlombongan/ pengkuarian
- untuk mengaudit penunjuk kemampanan untuk tujuan penarafan kemampanan industri perlombongan dan pengkuarian Malaysia

Bengkel ini telah diadakan selaras dengan Projek Pembangunan Malaysia ke-10 yang dilaksanakan oleh Unit Lombong dan Kuari JMG di bawah sub-projek Membangunkan Penunjuk Kemampanan bagi industri perlombongan/ kuari.

The workshop was conducted with the following objectives:

- to expose participants to the latest techniques and relevant auditing processes for mining/ quarrying industry
- to explain selected sustainable indicators for sustainability reporting for the mining/ quarrying industry
- to audit sustainable indicators for sustainability rating of the mining/ quarrying industry

The workshop was conducted in line with the 10th Malaysia Development Project carried out by the Mines and Quarry entity, JMG under the subproject of Developing the Sustainable Development Indicators for mining/ quarrying industry.

Bengkel Pengauditan Penunjuk Kemampanan
Workshop on Auditing Sustainable Indicators

Peserta Bengkel Pengauditan Penunjuk Kemampanan
Participants of the Workshop on Auditing Sustainable Indicators

Perundangan

Pada tahun 2015, JMG terus terlibat dengan penggubalan dan semakan draf beberapa peraturan di bawah Akta Pembangunan Mineral 1994 bersama-sama dengan Pejabat Penasihat Undang-Undang NRE dan Jabatan Peguam Negara. Pada tahun 2015, sebanyak lapan mesyuarat telah diadakan bagi menyemak dan memuktamadkan draf bersama-sama dengan Penasihat Undang-Undang NRE dan Penggubal Undang-Undang, Jabatan Peguam Negara. Dua draf peraturan yang masih dalam semakan bersama Jabatan Peguam Negara ialah Peraturan-Peraturan Pembangunan Mineral (Pelesenan) dan (Pemprosesan Mineral).

Di samping itu, CPLK, BPT juga terlibat secara langsung menyelaras perundangan sektor mineral dengan mengkaji dan membuat semakan pertelingkahan atau pertindihan undang-undang antara Akta Pembangunan Mineral 1994 dan Enakmen Mineral Negeri dengan Kanun Tanah Negara 1965, Akta Perhutanan Negara 1984, Akta Kualiti Alam Sekeliling 1974 dan perundangan lain yang relevan.

Legislation

In 2015, JMG continued to be involved in the drafting and vetting of several regulations under the Mineral Development Act 1994 with the NRE's Legal Advisor Office and the Attorney General's Office. In 2015, a series of eight meetings were conducted to vet and finalise the drafts with the NRE's Legal Advisor and drafters from the Attorney General's Office. Two drafts for Regulations still under review were the Mineral Development Regulations (Licensing) and (Mineral Processing).

The CPLK, BPT was also directly involved in rationalising mineral sector laws by reviewing conflicting or overlapping laws in the Mineral Development Act 1994 and State Mineral Enactments on one hand, and the National Land Code 1965, National Forestry Act 1984, Environmental Quality Act 1974 and other relevant legislations on the other hand.

Mesyuarat pemurniaan draf peraturan di bawah Akta Pembangunan Mineral 1994 pada 29.06.2015 hingga 01.07.2015 di Seremban
Meeting on vetting of draft regulation under the Mineral Development Act 1994 on 29.06.2015 till 01.07.2015 at Seremban

Peperiksaan Pembedil

Selaku urusetia peperiksaan pembedil jabatan, CPLK, BPT telah menganjurkan tiga siri peperiksaan pembedil teori pada bulan Mac, Mei dan November 2015 yang melibatkan seramai 179 orang calon. Bagi peperiksaan pembedil amali pula, CPLK dengan kerjasama pejabat JMG negeri telah mengendalikan 13 peperiksaan amali untuk seramai 42 orang calon dari pelbagai negeri seperti Johor, Perak, Selangor, N. Sembilan, Kedah, Perlis, Terengganu, Sarawak dan Pahang.

Shotfirer Examinations

As the Secretariat for the Department's shotfirer examinations, the CPLK, BPT organised three series of Shotfirer Examination (Theory) in March, May, and November 2015, involving 179 candidates. Following that, the CPLK, in collaboration with the state JMG offices, conducted 13 practical tests for the shotfirer practical examination attended by a total number of 42 candidates from Johor, Perak, Selangor, N. Sembilan, Kedah, Terengganu, Sarawak, and Pahang.

Peperiksaan Pembedil (Teori) 2015
Shotfirer Examination (Theory) 2015

Peperiksaan pembedil (teori) Shotfirer examination (theory)	Bilangan pusat peperiksaan Number of examination centre	Bilangan calon Number of candidates
Bil./ Session 1/2015 (26.03.2015)	8	36
Bil./ Session 2/2015 (28.05.2015)	8	60
Bil./ Session 3/2015 (26.11.2015)	8	83

Hal-Hal Lain

Pada tahun 2015, CPLK BPT juga terlibat dalam perkara berikut:

(a) Pembentangan kertas kerja mengenai Mine Rehabilitation Practices in Malaysia di Regional Meeting on the Production of CCOP Coffee Table Book on Best Practices On Mine Rehabilitation and Decommissioning di Manila/ Palawan, Filipina pada 22- 25 Jun 2015
(b) Menyertai China-ASEAN Mining Cooperation Forum (CAMCF) yang telah diadakan di Nanning, China pada 18-19.09.2015
(c) Pembentangan kertas di Bengkel Mengatasi Isu Pencemaran Akibat Aktiviti Perlombongan Bauksit di Kuantan, Pahang pada 04-06.10.2015 di Cherating anjuran NRE

Other matters

In 2015, CPLK BPT was also involved in the following:

(a) Presentation of a paper on Mine Rehabilitation Practices in Malaysia at the Regional Meeting on the Production of the CCOP Coffee Table Book on Best Practices On Mine Rehabilitation and Decommissioning. The meeting was held at Manila/ Palawan, Filipina on 22-25 June 2015
(b) Participation in the China-ASEAN Mining Cooperation Forum (CAMCF) held in Nanning, China on 18-19 September 2015
(c) Presentation of paper at the Workshop on Overcoming Pollution Issues Due To Bauxite Mining Activities in Kuantan, Pahang on 04-06 October 2015 at Cherating, organised by NRE

Mesyuarat kawasan bagi penghasilan CCOP Coffee Table Book on the Best Practices on Mine Rehabilitation and Decommissioning di Manila/ Palawan, Filipina pada 22-25.06.2015
Regional meeting on the production of CCOP Coffee Table Book on Best Practices on Mine Rehabilitation and Decommissioning in Manila/ Palawan, Filipina on 22-25.06.2015

China-ASEAN Mining Cooperation Forum (CAMCF) yang telah diadakan di Nanning, China pada 18-19.09.2015
China-ASEAN Mining Cooperation Forum (CAMCF) held at Nanning, China on 18-19.09.2015

Perkhidmatan Geofizik

Semenanjung Malaysia

Perkhidmatan geofizik yang diberikan oleh jabatan termasuk survei keberintangan imej 2-D, micrograviti, dan pengelogan geofizik. Pada tahun ini, survei keberintangan imej 2-D telah dilaksanakan di 16 lokasi meliputi sejumlah 22,340 meter-garis untuk kajian air tanah, memetakan kawasan dan ketebalan perlapisan gambut yang basah/ lembap, serta membantu dalam menentukan kehadiran struktur geologi.

Survei mikrograviti telah dijalankan di satu lokasi meliputi sejumlah 410 stesen untuk siasatan tapak dan penilaian sumber geoterma. Siasatan dengan menggunakan kaedah pengelogan geofizik telah dijalankan di satu lokasi.

Pengelogan geofizik telah dijalankan ke atas 14 telaga untuk kajian hidrogeologi, termasuk untuk tujuan kelulusan perakuan dan pelesenan air mineral. Objektif utama siasatan pengelogan geofizik adalah untuk menentukan kedalaman lubang gerudi, kedudukan skrin, lokasi selongsong dan mengesan kebocoran pada selongsong sekiranya ada.

Geophysical Services

Peninsular Malaysia

The geophysical services provided by the department included 2-D resistivity imaging, microgravity, and geophysical logging activities. During the year, 2-D resistivity imaging surveys were carried out at 16 locations covering 22,340 line-meters for groundwater studies, to map the area and thickness of wet/ damp peat beds, as well as to determine the geological structures that were present.

Microgravity surveys for site investigations were conducted at one location covering 410 stations for site investigations and geothermal resource assessment. Investigations using the geophysical logging method were conducted at one location.

Geophysical logging was carried out at 14 wells for a hydrogeological study, including for the approval of certification and licensing of mineral water. The main objective for geophysical logging was to determine the depth of boreholes, screen location, casing location, and to detect casing leakage if any.

Keberintangan imej 2-D
2-D resisitivity imaging

Negeri State	Kawasan Area	Liputan (meter-garis) Coverage (line-metres)	Penemuan / Catatan Findings / Remark
Kelantan	Gua Musang	720	Kajian air tanah / Groundwater study
Terengganu	Dungun	1500	Pemetaan gambut / Peat mapping
	Setiu	920	Pemetaan gambut / Peat mapping
	Kemaman	1600	Penilaian sumber andalusit Andalusite resource assessment
Kelantan	Machang	800	Kajian air tanah / Groundwater study
Johor	Segamat	800	Kajian air tanah / Groundwater study
	Mersing	3600	Kajian air tanah / Groundwater study
Melaka	Jasin	2800	Kajian air tanah / Groundwater study
		5600	Kajian air tanah / Groundwater study

Negeri State	Kawasan Area	Liputan (meter-garis) Coverage (line-metres)	Penemuan / Catatan Findings / Remark
Negeri Sembilan	Gemencheh	2000	Kajian air tanah / Groundwater study
Perak	Tapah	800	Kajian air tanah / Groundwater study
	Ulu Slim	1200	Pemetaan struktur geologi Geological structure mapping
Jumlah liputan/ Total coverage		**22,340**	

Mikrograviti/ Graviti
Microgravity/ Gravity

Negeri State	Kawasan Area	Liputan (bilangan stesen) Coverage (no. of stations)	Penemuan/ Catatan Findings/ Remark
Perak	Ulu Slim	410	Penilaian sumber geoterma Geothermal resource assessment

Pengelogan geofizik/ Geophysical logging

Negeri State	Kawasan Area	Liputan (bil. telaga) Coverage (no. of wells)	Penemuan/ Catatan Findings/ Remark
Pahang	Nenasi	1	Kajian Hidrogeologi/ Hydrogeology study
	Pekan	2	Kajian Hidrogeologi/ Hydrogeology study
	Gambang	3	Perakuan air mineral Mineral water certification
	Bentong	2	Perakuan air mineral Mineral water certification
	Temerloh	1	Perakuan air mineral Mineral water certification
Johor	Pulau Besar, Mersing	1	Kajian Hidrogeologi/ Hydrogeology study
	Jemaluang, Mersing	2	Perakuan air mineral Mineral water certification
Selangor	Hulu Langat	1	Perakuan air mineral Mineral water certification
Kedah	Padang Temak, Kuala Nerang	1	Perakuan air mineral Mineral water certification
Jumlah/ Total		**14**	

Sabah

Survei geofizik keberintangan 2D telah dijalankan di sekitar kawasan air panas sistem geoterma Sg. Malati – Sungai Mantri untuk mengenal pasti keadaan luahan sumber tenaga hijau geoterma ini. Hasil kajian menunjukkan bahawa air panas sistem geoterma ini berasal dari air meteorik.

Sabah

A 2D resistivity imaging survey was carried out around the area of Sg. Malati – Sg. Mantri hot spring geothermal system to determine the outflow condition of energy source from meteoric water.

Keberintangan imej 2-D
2-D resisitivity imaging

Negeri State	Kawasan Area	Liputan (bil. stesen) Coverage (no. of stations)	Penemuan/ Catatan Findings/ Remark
Sabah	Sg. Malati - Sungai Mantri, Ulu Kalumpang, Kunak	11	Penilaian sumber geoterma Geothermal resource assessment

Sarawak

Siasatan geofizik dengan menggunakan kaedah keberintangan imej 2-D telah dijalankan di kawasan pemprosesan garam bukit di Bario. Sebanyak satu garisan profil sepanjang 400 m meter telah disiasat.

Survei Pengkutuban Teraruh telah dilaksanakan di Gunung Rawan, Serian. Hasil siasatan boleh menentukan litologi bawah permukaan. Siasatan melibatkan tujuh garisan survey dengan jumlah jarak 5600 m.

Sarawak

Geophysical investigations using the 2-D imaging resistivity method were carried out at the salt processing area in Bario. One profile line of 400 meters was investigated.

An Induced Polarization survey was carried out at Gunung Rawan, Serian. The outcome of the investigation could determine the subsurface rock lithology. The investigation involved seven survey lines with acumulative distance of 5600 m.

Keberintangan 2-D
2-D resistivity

Negeri State	Kawasan Area	Liputan (meter-garis) Coverage (line-metres)	Penemuan/ Catatan Findings/ Remark
Sarawak	Bario	400	Untuk mengesan persempadanan kawasan air masin dan memetakan ketebalan lapisan penglitup. To delineate the boundary of salt water and to map thickness of the top layer.

Pengkutuban teraruh
Induced polarization

Negeri State	Kawasan Area	Liputan (meter-garis) Coverage (line-metres)	Penemuan/ Catatan Findings/ Remark
Sarawak	Gunung Rawan, Serian	5600	Menentusahkan wujudnya struktur penerobosan batuan igneus, zon sesar dan rekahan. To determine and confirm the existence of igneous body intrusion, fault zone and jointing.

Siasatan keberintangan 2-D menggunakan peralatan ABEM SAS 4000 di Bario
2-D resistivity investigation using ABEM SAS 4000 at Bario

Photo: Shahrul Ridzuan Zainal Rashid

Photo: Shahrul Ridzuan Zainal Rashid

Siasatan pengkutuban teraruh di Gunung Rawan, Serian
Induced polarization investigation at Gunung Rawan, Serian

Photo: Shahrul Ridzuan Zainal Rashid

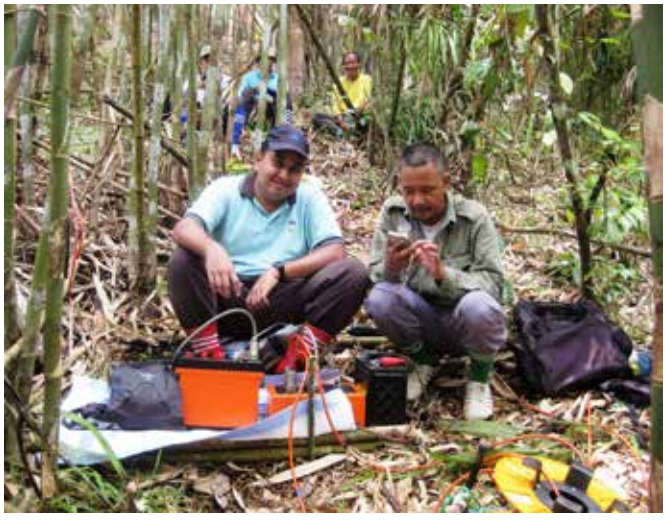


Photo: Shahrul Ridzuan Zainal Rashid

Mineralogi & Petrologi

Semenanjung Malaysia

Sebanyak 1469 unit kerja dengan nilai kerja RM47,674 telah dijalankan untuk jabatan, agensi kerajaan dan sektor swasta.

Mineralogy & Petrology

Peninsular Malaysia

A total of 1469 units of routine work valued at RM47,674 were completed for the department, other government agencies and the private sector.

Khidmat analisis yang dijalankan oleh Unit Mineralogi dan Petrologi, Bahagian Perkhidmatan Teknikal
Analytical services carried out by the Mineralogy and Petrology Unit, Technical Services Division

	Untuk industri mineral For mineral industries		Untuk agensi kerajaan For government agencies	
	Unit kerja Number of work unit	Nilai kerja Value of work (RM)	Unit kerja Number of work unit	Nilai kerja Value of works (RM)
Pengenalan batuan dan mineral Identification of hand specimen	24	1736	18	1260
Pemeriksaan petrografi terperinci Detailed petrographic examination	--	--	--	--
Anggaran mineral kuantitatif Quantitative mineral estimation	122	10,980	8	720
Pengasingan magnetic Magnetic separation	122	6100	24	1200
Pengasingan Bromoform Bromoform separation	122	2440	24	480
Penyediaan keratan mikro Microsectionpeparation	57	2280	15	600
Ujian kimia Chemical test	2	60	--	--
Koleksi batuan dan mineral Rock and mineral collection	1	70	--	--
Belauan Sinar-X X-ray refraction	36	4368	97	11,640
Pengenalan batu permata Identification of gemstone	--	--	--	--
Ujian Spesifik Graviti Specific gravity test	1	20	--	--
Kerja fotografi Photographic work	--	--	795	7950
Ujian kekerasan Hardness test	1	30	--	--
Jumlah kecil Sub -total	488	28,084	981	19,590
Jumlah unit kerja Total number of work units	**1469**	Jumlah nilai kerja Total value of work		**47,674**

Sarawak

JMG Sarawak telah melaksanakan 513 unit kerja rutin dengan nilai kerja sebanyak RM12,620. Kerja-kerja yang dilakukan merangkumi penyediaan keratan nipis batuan, pengenalan batuan dan penyediaan laporan petrografi. Kebanyakan kerja tersebut adalah atas permintaan pihak swasta.

Sabah

Aktiviti Mineralogi dan Petrologi telah menjalankan pelbagai tugas, seperti menyedia keratan nipis batuan untuk kajian petrografi, mengenalpasti batuan dan mineral serta menyediakan gambar mikro. Sebanyak 135 kerja mineralogy dan petrografi dengan nilai kerja RM4400 telah dilaksanakan atas permintaan dalam dan luar jabatan.

Sarawak

Routine work totalling 513 units with a work value of RM12,620 was carried out by JMG Sarawak. The work carried out included the preparation of rock thin-sections, petrographical examinations and the preparation of petrographic reports. Most of the work was carried out at the request of the private sector.

Sabah

The Mineralogy and Petrology Activity performed various tasks such as the preparation and petrographical studies of rock thin sections, identification of rocks and minerals, as well as preparation of photomicrographs. A total of 135 mineralogy and petrography studies with a work value of RM4400 were carried out on internal and outside request.

Kerja yang dijalankan oleh Unit Mineralogi dan Petrologi, JMG Sarawak dan Sabah
Work carried out by the Mineralogy and Petrology Activity, JMG Sarawak and Sabah

Kerja/ Works	Jumlah unit Number of units	
	Sarawak	Sabah
Penyediaankeratannipis batuan/ Preparation of rock thin-section		
a. Permintaan dalaman Jabatan/ Internal request	9	3
b. Permintaan luarJabatan/ External request	125	36
Analisis petrografi/ Petrographical analysis:		
a. Permintaan dalaman Jabatan/ Internal request	--	32
b. Permintaan luar Jabatan/ External request	379	--
Pemeriksaan kuantitatif mineral/ Quantitative mineral Examination	--	--
Gambar mikrokeratan nipis Photomicrographs of rock thin section	--	64
Jumlah kerja/ Total number of work unit	513	135
Nilai kerja/ Value of work	RM12,620	RM4400
Bilangan pelanggan/ Client		
a. Orang awam/ General public	4	37
b. Pelajar/ Students	1	142

Fotogeologi Dan Penderiaan Jauh
Photogeology And Remote Sensing

Fotogeologi dan penderiaan jauh
Photogeology and remote sensing

Bil. No.	Kawasan Area	Luas Coverage (km^2)	Tujuan Purpose	Catatan Remarks
A	**Pemetaan foto geologi Photogeological mapping**			
1	Kawasan Lenggong (Lembar 30), dan Gerik (Lembar 31), skala 1:63,360 Lenggong area (Sheet 30), and Gerik (Sheet 120), scale 1:63,360	240	Kumpulan Kerja Pemetaan Geologi Sempadan Border Geological Mapping Working Group	Peta fotogeologi disediakan Photogeological map has been prepared
B	**Perkhidmatan tafsiran foto Photo-interpretation services**			
1.	Tafsiran imej satelit IFSAR kawasan Bentong, Pahang Satellite images interpretation of IFSAR for Bentong area, Pahang	130	Permintaan untuk projek remote sensing dan analisis survey lapangan sesar aktif di Malaysia Request for remote sensing project and field survey analysis of actively fault in Malaysia	Peta tafsiran lineamen disediakan Lineament interpretation map has been prepared
C	**Perkhidmatan lain Other services**			
1.	Penghasilan peta kecerunan kawasan Cameron Highlands, Pahang Derivation of slope map for Cameron Highlands area, Pahang	275	Permintaan daripada Jabatan Perhutanan Semenanjung Malaysia Request from Department of Forestry Peninsular Malaysia	Peta kecerunan kawasan Cameron Highlands, Pahang Slope map of Cameron Highlands area, Pahang

Makmal Geokimia

Perkhidmatan Analisis Geokimia

Makmal-makmal Geokimia di Ipoh, Kuantan, Kuching dan Kota Kinabalu terus memberi perkhidmatan analisis kimia/ ujian fizikal dan khidmat nasihat kepada pelanggan dalaman dan luaran Jabatan seluruh Malaysia. Aktiviti-aktiviti ini adalah untuk membantu pembangunkan sektor mineral, industri berasaskan mineral, aktiviti kitar semula logam dan eksplorasi/ pembangunan sumber air tanah dalam negara. Dalam tahun 2015 sejumlah 79,306 analisis telah disiapkan dengan nilai kerja keseluruhan RM1,725,540 di mana 3090 analisis telah diselesaikan untuk pelanggan swasta Jabatan dengan kutipan hasil bernilai RM127,258.

Sistem Pengurusan dan Akreditasi Makmal MS ISO/IEC 17025:2005

Keempat-empat Makmal Geokimia di Ipoh, Kuantan, Kuching dan Kota Kinabalu telah berjaya melaksana dan mengekalkan sijil akreditasi MS ISO/IEC 17025:2005 sehingga ke tahun 2017/2018 setelah audit dilaksanakan oleh Jabatan Standard Malaysia di makmal masing-masing.

Geochemical Laboratory

Geochemical Analytical Services

The Geochemical Laboratories in Ipoh, Kuantan, Kuching and Kota Kinabalu continued to provide testing and consultancy services to internal dan external customers of the Department throughout Malaysia. These activities assist the development of the mineral and mineral-based industries, metal recycling activities and groundwater exploration/ development in the country. For the year 2015, a total of 79,306 analyses were completed with a total work value of RM1,725,540 of which 3090 analyses were completed for the private sector with a revenue collection of RM127,258.

MS ISO/IEC 17025:2005 Laboratory Management System and Accreditation

All four Geochemical Laboratories in Ipoh, Kuantan, Kuching and Kota Kinabalu successfully implemented and retained their MS ISO/IEC 17025:2005 accreditation certificates until 2017/2018 after assessment audits were conducted by the Department of Standards, Malaysia in the respective laboratories.

Persijilan Akreditasi MS ISO/IEC 17025:2005
MS ISO/IEC 17025:2005 Accreditation Certification

Makmal Laboratory	No. Sijil Certificate No.	Sah sehingga Valid until	Tempoh persijilan Certification duration	Skop akreditasi Scope of accreditation	Penandatangan Sijil Ujian SAMM Approved signatory for SAMM test certificates
Ipoh	SAMM 116	31 Ogos 2017	1997-2015 18 tahun/ years	Pasir silika/ silica sand: 11 Batu kapur / limestone: 14 Bullion emas/ gold bullion: 1 Air tanah/ groundwater: 15 Jumlah ujian/ test:-41	15 Pegawai Geosains (Kimiabumi)/ Geoscience Officers (Geochemistry)

Makmal Laboratory	No. Sijil Certificate No.	Sah sehingga Valid until	Tempoh persijilan Certification duration	Skop akreditasi Scope of accreditation	Penandatangan Sijil Ujian SAMM Approved signatory for SAMM test certificates
Kuching	SAMM 173	12 Ogos 2017	1999-2015 16 tahun/ years	16 ujian arang batu/ coal test	5 Pegawai Geosains (Kimiabumi)/ Geoscience Officers (Geochemistry)
Kota Kinabalu	SAMM 263	07 Jan 2018	2004-2015 11 tahun/ years	3 ujian tanih/ soil test	4 Pegawai Geosains (Kimiabumi)/ Geoscience Officers (Geochemistry)
Kuantan	SAMM 508	04 Apr 2017	2011-2015 5 tahun/ years	1 ujian sampel geokimia/ geochemical sample test	4 Pegawai Geosains (Kimiabumi)/ Geoscience Officers (Geochemistry)
Jumlah/ Total:				**61 ujian/ tests**	28 Pegawai Geosains (Kimiabumi)/ Geoscience Officers (Geochemistry)

Nota:- SAMM :- Skim Akreditasi Makmal Malaysia/ Malaysian Laboratory Accreditation Scheme

Di samping itu, audit dalaman di antara makmal serta mesyuarat kajian semula pengurusan berjadual terus diadakan mengikut jadual yang ditetapkan untuk memantau dan memastikan sistem pengurusan MS ISO/ IEC 17025 dilaksanakan dengan efektif.

Bagi memenuhi keperluan mandatori standard pengurusan MS ISO/IEC 17025:2005 dan usaha berterusan untuk meningkatkan lagi kualiti perkhidmatan analisis kepada pelanggan Jabatan, makmal di Ipoh, Kuching dan Kota Kinabalu telah berjaya mengelolakan dan mengambil bahagian dalam program ujian kecekapan/ perbandingan antara makmal. Makmal Jabatan telah menunjukkan prestasi baik dan kecekapan teknikal melaksanakan ujian-ujian dalam kesemua program ujian kecekapan/ perbandingan antara makmal yang disertai.

In addition, interlaboratory internal audits and management review meetings were conducted regularly as scheduled to monitor and ensure the effective implementation of the MS ISO/ IEC 17025 management system.

As part of the mandatory requirements for compliance with the MS ISO/IEC 17025:2005 management standard and as a continuous effort to further improve the quality of testing services provided to the Department's clients, the laboratories in Ipoh, Kuching and Kota Kinabalu successfully organised and participated in several proficiency testing (PT) / Interlaboratory Cross-check programmes. The Department's laboratories demonstrated good performance and competency in all the Proficiency Testing/ Interlaboratory Cross-check programmes.

Penyertaan dalam Program Ujian Kecekapan dan Perbandingan antara makmal
Participation in Proficiency Testing and Interlaboratory Cross-check Programmes

Bil. No.	Nama Program Ujian Kecekapan dan Perbandingan di antara makmal Name of Proficiency Testing (PT) and Interlaboratory X-check programme	Penganjur/ Pengelola program Programme provider/ Organiser	Penyertaan Participation
1.	**8 PT programme on Water testing:-** **ENVITEST 2 (Round 1)** – Trace metals Al, Cd, Cr & Cu **ENVITEST 2 (Round 2)** – Trace metals Fe, Mn, Pb, Ni & Zn **ENVITEST 4** - Total Solids, Suspended Solids & Total Dissolved solids **ENVIEST 5** – Turbidity & Alkalinity **ENVITEST 6** – Hg & As **WAPAS 1** – Anions-Cl, SO_4, NO_3& F **WAPAS 5** - Na & K **WAPAS 6** – Hardness, Ca & Mg	Jabatan Kimia Malaysia Chemistry Department Malaysia	Makmal Ipoh Ipoh Laboratory
2.	**Determination of CaO, MgO, Acid Insol., SiO_2, Fe_2O_3, TiO_2, Al_2O_3, K_2O, P_2O_5 & MnO in Limestone** by a) Wet classical method b) XRF determination	Makmal Ipoh Ipoh Laboratory	8 makmal swasta and 4 makmal kerajaan 8 private laboratories and 4 government laboratories

Penyertaan dalam Pembangunan Standard Malaysia

Pegawai Geosains (Kimiabumi) Makmal Geokimia Ipoh terus mewakili Jabatan dalam beberapa Jawatankuasa Teknikal/ Kumpulan Kerja Pembangunan Standard dan telah menyumbang secara aktif dalam pembangunan Standard Malaysia (MS) yang baru dan yang dikaji semula selepas melebihi usia lima tahun.

Participation in the development of Malaysian Standards

Geoscience Officers (Geochemistry) of the Ipoh Geochemical Laboratory continued to represent the Department in several Technical Committees/ Working Groups. They contributed actively to the development of new Malaysian Standards as well as the revision of Malaysian Standards which were more than five years old.

No. No.	Jawatankuasa/ Kumpulan Kerja Teknikal Technical Committee/ Working Group
1.	Industrial Standard Committee B for Chemicals and Materials (ISC B)
2.	Working Group for Lime and Lime Products
3.	Working Group for Clay and Clay Products
4.	Technical Committee on Soil Quality
5.	Technical Committee on Raw materials for Iron and Steel and Intermediary products
6.	Technical Committee on “Non-Ferrous Metals and Ores”
7.	Working Group on Precious Metals

Penghasilan kerja perkhidmatan makmal geokimia tahun 2015
Geochemical laboratory services work output for 2015

Jenis sampel Type of sample	Penghasilan Output	Perkhidmatan makmal (Semenanjung) Laboratory services (Peninsular)			Perkhidmatan makmal (Sarawak) Laboratory services (Sarawak)			Perkhidmatan makmal (Sabah) Laboratory services (Sabah)		
		Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector	Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector	Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector
Sampel geokimia (Sedimen, tanih, konsentrat & batuan) **Geochemical** (Sediment, soil, concentrate & rock)	Bilangan analisis Number of analysis	34,149	3	129	5037	-	5	2105	76	35
	Nilai Kerja Work value (RM)	462,030	240	4570	72,840	-	386	28,905	1660	1200
Air (Air tanah, air permukaaan, effluen) **Water** (Groundwater, surface water, effluents)	Bilangan analisis Number of analysis	24,207	388	345	608	-	-	3684	168	48
	Nilai Kerja Work value (RM)	610,210	9755	7685	14,250	-	-	80,000	4475	1210
Arang Batu **Coal**	Bilangan analisis Number of analysis	-	-	-	647	-	413	-	-	-
	Nilai Kerja Work value (RM)	-	-	-	30,967	-	13,834	-	-	-
Silikat (batuan silikat, aggregat & debu arang batu) **Silicates** (silicate rock, aggregate & coal ash)	Bilangan analisis Number of analysis	1725	48	4	-	-	-	-	-	-
	Nilai Kerja Work value (RM)	118,285	3360	204	-	-	-	-	-	-
Mineral perindustrian (pasir silika, batu kapur, lempung, feldspar) **Industrial minerals** (silica sand, limestone, clay, feldspar)	Bilangan analisis Number of analysis	752	525	1601	839	-	35	531	-	213
	Nilai Kerja Work value (RM)	29,260	24,400	73,155	39,010	-	1947	35,910	-	12,160

Jenis sampel Type of sample	Penghasilan Output	Perkhidmatan makmal (Semenanjung) Laboratory services (Peninsular)			Perkhidmatan makmal (Sarawak) Laboratory services (Sarawak)			Perkhidmatan makmal (Sabah) Laboratory services (Sabah)		
		Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector	Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector	Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector
Bijih berlogam (ilmenit, bijehbesi, struverit, zircon) **Metalliferous ores** (ilmenite, iron ore, struverite, zircon)	Bilangan analisis Number of analysis	405	7	239	-	-	-	-	-	-
	Nilai Kerja Work value (RM)	24,500	490	9477	-	-	-	-	-	-
Logam & aloi (Emas, ingot logam & pelbagai aloi) **Metals & Alloy** (gold, metal ingot & miscellaneous alloy)	Bilangan analisis Number of analysis	-	14	2	-	-	-	298	-	10
	Nilai Kerja Work value (RM)	-	1080	100	-	-	-	6655	-	535
Pelbagai sampel (Sludge, sisa industri) **Miscellaneous** (sludges, industrial waste etc.)	Bilangan analisis Number of analysis	-	-	11	-	-	-	-	-	-
	Nilai Kerja Work value (RM)	-	-	795	-	-	-	-	-	-
Jumlah **Total**	Bilangan analisis Number of analysis	61,238	985	2331	7131	0	453	6618	244	306
	Nilai Kerja Work value (RM)	1,244,285	39,325	95,986	157,067	0	16,167	151,470	6135	15,105
Jumlah keseluruhan Overall total	Bilangan analisis Number of analysis		64,554			7584			7168	
	Nilai Kerja Work value (RM)		1,379,596			173,234			172,710	

Jumlah besar Grand total	Bilangan analisis / Number of analysis				Nilai kerja (RM) Work value (RM)			Nilai kerja termasuk bayaran (RM) Work value including payment (RM)	Kutipan Hasil (RM) Revenue collection (RM)
	Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector	Jumlah Total	Sampel dalaman jabatan Internal sample	Agensi kerajaan Government agencies	Sektor swasta Private sector		
	74,987	1,229	3090	79,306	1,552,822	45,460	127,258	**1,725,540**	**127,258**

Makmal Geologi Marin

Makmal Geologi Marin di Bahagian Perkhidmatan Teknikal, Ipoh telah menjalankan analisis sampel sedimen dari Projek JMG-FRI dan Kajian Tumbesaran dan Kematian Kerang di Tapak Ternakan Kerang di Selangor. Bilangan sampel yang dianalisa adalah sebanyak 183. Analisis yang dibuat adalah saiz butiran [sieving dan Laser Particle Size Analyzer (LPSA)], karbonat dan organik. Di samping itu, makmal juga telah melaksanakan perkhidmatan analisa saiz butiran mengunakan LPSA bagi sampel sedimen daripada JMG Negeri Sembilan/ Melaka (22 sampel), JMG Selangor/ Wilayah Pesekutuan (19) dan MRC Industries (5).

Makmal Geologi Marin juga turut mengendalikan latihan industri untuk lima pelajar di mana dua pelajar dari Universiti Malaysia Kelantan (UMK), dari 20 Mei hingga 19 Jun 2015, selama sebulan bermula, dan tiga pelajar dari UiTM Arau, Perlis, bermula dari 13 Julai hingga 18 September 2015, selama 12 minggu.

Marine Geology Laboratory

The Marine Geology Laboratory of the Technical services Division, Ipoh has carried out analysis for sediment samples from the JMG-FRI Project and The Study of Cockle Growth and Death at Cockle Farm offshore Selangor. The number of samples analysed were 183. The analysis conducted includes grain size [mechanical sieves and Laser Particle Size Analyzer (LPSA)], carbonates and organic. In addition, the laboratory also performed grain size analysis using LPSA services for sediment samples from JMG Negeri Sembilan/ Malacca (22 samples), JMG Selangor/ Federal Territory (19) and MRC Industries (5).

The Marine Geology Laboratory also conducted industrial training for five students i.e. two students from Universiti Malaysia Kelantan, from 20 May till 19 June 2015, for a period of 4 weeks and three students from UiTM Arau, Perlis, from 13 July till 18 September 2015, for a period of twelve weeks.

Makmal Kejuruteraan Geosains

Makmal Kejuruteraan Geosains di Bahagian Perkhidmatan Teknikal telh menjalankan perkhidmatan ujian penentuan ciri-ciri mekanikal, fizikal dan kekuatan agregat batuan dan tanih. Ia juga memberi perkhidmatan sokongan geoteknik kepada aktiviti geologi kejuruteraan, perlombongan, pengkuarian dan aktiviti-aktiviti lain jabatan. Makmal ini juga menawarkan perkhidmatan geoteknik kepada agensi-agensi kerajaan dan pihak industri.

Sebanyak 217 sampel batuan dan 10 sampel tanah telah diterima manakala sebanyak 449 ujian untuk batu dan 30 ujian untuk tanah masing-masing telah dijalankan dengan jumlah nilai kerja sebanyak RM18,314.

Engineering Geoscience Laboratory

Engineering Geoscience Laboratory at the Technical Services Division provides test to determine mechanical and physical properties and strength of rock aggregates and soil. It also provides geotechnical support services to the engineering geology, mining, quarrying and other activities of the department. This laboratory also offers geotechnical test services to other government agencies and private sectors.

A total of 217 rock and 10 soil samples were received while a total of 449 tests of rock and 30 tests of soil were carried out respectively with the total work value of RM18,314.

Aktiviti-aktiviti Lain

Jabatan turut menerima lawatan sambil belajar dan membantu para pelajar IPTA/ IPTS menjalankan ujikaji dengan menggunakan kemudahan di Makmal Geologi Kejuruteraan. Seramai 38 orang pelajar telah melawat Makmal Kejuruteraan sepanjang tahun 2015.

Other Activities

The department also received study visits and assisted students from the higher learning institutions in carrying out tests using the Engineering Geology Laboratory facilities. A total of 38 students visited The Engineering Geology Laboratory in 2015.

Senarai terperinci kerja yang dijalankan oleh Makmal Geologi Kejuruteraan
Details of work carried out by the Engineering Geology Laboratory

Ujian agregat / tanah Aggregate / soil test	Untuk industri For the industry		Untuk agensi kerajaan For government agencies	
	Bilangan unit Number of unit	Nilai kerja Work value (RM)	Bilangan unit Number of unit	Nilai kerja Work value (RM)
Specific Gravity	111	2220	2	40
Water Absorption	19	475	2	50
Moisture Content	0	0	0	0
Sound Value	14	1120	2	160
Flakiness Index	13	390	2	60
Elongation Index	6	180	0	0
Impact Value	18	720	2	80
Crushing Value	18	900	2	100
Ten % Fines Value	14	700	2	100
Los Angeles Abrasion	13	780	2	120
Sieve Analysis	151	7550	0	0
Cube Test	1	19	16	304
Plasticity Index	0	0	0	0
Mechanical Sieving	17	476	0	0
Crush To Size	14	700	0	0
Fractured Face (flakiness)*	0	0	0	0
Bulk Density (SG)*	1	20	6	0
Clay Silt Dust Content (SA)*	1	50	0	0
Hardness Number Test	0	0	0	0
Crushing Strength	0	0	0	0
Porosity	0	0	0	0
Shell Content	0	0	0	0
Rebound Hammer	0	0	0	0
Gradation (Hydrometer)	10	300	0	0
Sieve Analysis (Soil)	10	500	0	0
Atterberg Limits	0	0	0	0
Moisture Content	0	0	0	0
Specific Gravity	10	200	0	0
Linear Limit	0	0	0	0
Shrinkage Limit	0	0	0	0
Sub-total	**441**	**17,300**	**38**	**1014**

Total no. of unit	Total work value (RM)
479	**18,314**

Penerbitan
Publications

Penerbitan
Publications

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8. Anuar Othman, Azli Sulaiman & Shamsul Kamal Sulaiman, 2015: Limestone as Material to Reduce Sulphate and Arsenic Content in Acid Mine Drainage. 3rd International Science Postgraduate Conference. Ibnu Sina, Institute for Fundamental Studies, UTM, Johor Bahru, 24 – 25 February 2015.

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Conservation and Geological Tourism in Langkawi-Tarutao Islands. Geological Papers Volume 13.

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12. JMG: Garis Panduan Penyediaan Laporan Hidrogeologi Dan Geologi Bagi Maksud Permohonan Lesen Punca Air Mineral Semula Jadi. JMG.GP.19

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   Skala / Scale 1:63,360

2. Peta Sumber Mineral Sarawak
   Mineral Resources Map of Sarawak
   Skala / Scale 1:750,000

3. Peta Geologi Sabah (2015)
   Geological Map of Sabah
   Skala / Scale 1:500,000

Peta Tidak Diterbitkan
Unpublished Maps

1. Peta Potensi Bauksit Kawasan Kuantan, Pahang
   Bauxite Potential Map Kuantan, Pahang
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Kemaman, Terengganu. No. Laporan: JMG.BPT(GF) 10/2015.

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Dari kiri / From left: Che Aslinaliza Che Ahmed (Ketua Pegawai Teknologi Maklumat, Unit Infrastruktur dan Keselamatan ICT), Abdul Rahman Yusoff (Pengarah), Mohd Zulkiflee Che Soh (KPP, Unit Aplikasi GIS & Kartografi), Dr. Sia Say Gee (KPP, Unit Penyuntingan & Perpustakaan)

Cawangan Ekonomi Mineral
Mineral Economics Section

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Pengarah / Director: Kamal Daril
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Dari kiri / From left: Haniza Zakri (KPP, Unit Dagangan Antarabangsa), Joanes Muda (Timbalan Pengarah / KPPK, Unit Risikan Mineral), Kamal Daril (Pengarah), Yusari Basiran (KPP, Unit Perhubungan Industri), Nurul Huda Romli (KPP, Unit Tekno Ekonomi)

Cawangan Perancangan Dan Pengurusan
Planning and Management Section

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Dari kiri / From left: Habibah Tahir (KPP, Unit Perhubungan Awam & Perundingan), Mohd Badzran Mat Taib (Timbalan Pengarah / KPPK, Unit Perancangan & Pemantauan Pembangunan), Ling Nan Ley (KPPK, Unit Perancangan Geosains), Kamuradin Md. Slar (Pengarah), Danial Lee Abdullah (KPPK, Unit Pentadbiran Dan Kewangan), Azemi Hj. Eki (KPPK, Unit Pembangunan Sumber Manusia)

Cawangan Penyelarasan Pelaksanaan Operasi
Operation Implementation Coordination Section

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Pengarah / Director: Ab Halim Hamzah
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Dari kiri / From left: Kamaruddan Abdullah (Timbalan Pengarah, KPPK, Unit lombong & Kuari), Ab Halim Hamzah (Pengarah), Siti Aminah Abdul Sarif (KPP, Unit Geosains)

Bahagian Perkhidmatan Teknikal
Technical Services Division

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Dari kiri / From left: Mat Niza Abd Rahman (KUPG), Nur Rasyiqah Yusof (PPT), Mahisham Ibrahim (KPPKPM), Hisamuddin Termidi (TPLK), Azhari Ahmad (TPGS), Dr. Kamaludin Hassan (Pengarah), Mohd Ariff Omar (TPMK), Zamri Ramli (KUGK), Asminah Rajuli (KUHG), Wong Vui Chung @ Webster Wong (KUSM)

Pusat Penyelidikan Mineral
Mineral Research Centre

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Pengarah / Director:
Shahar Effendi Abdullah Azizi
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Berdiri dari kiri / Standing from left: Hasnita Mat Isa, Md. Muzayin Alimon, Kori Mohammad, Ramli Mohd Osman, Nasharuddin Isa, Mahadi Abu Hassan, Dr. Shamsul Kamal Sulaiman, Aminudin Mahmud, Dr. Rashita Abd Rashid
Duduk / Sitting: Shahar Effendi Abdullah Azizi (sehingga 27 September 2015 / until 27 September 2015)

Pejabat JMG Negeri
State JMG Offices

JOHOR

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Duduk / Sitting: Zakaria Hussain (Pengarah)

NEGERI SEMBILAN / MELAKA

Jabatan Mineral dan Geosains Malaysia,
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Duduk / Sitting: Zulkipli Che Kasim (Pengarah)

PEJABAT SELANGOR / WILAYAH PERSEKUTUAN
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Jabatan Mineral Dan Geosains Malaysia,
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(dari 17 Jun 2015 / from 17 June 2015)

Dato' Zakaria Mohamad
(sehingga 16 Jun 2015 / until 16 June 2015)

Dari kiri / From left: Marina Mansor (PPT), Che Ibrahim Mat Saman (KUSM), Henry Litong Among (Pengarah), Faizal Arshad (KULK), Ropidah Mat Zin (KUPM)

PERAK

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Dari kiri / From left: Tuan Rusli Tuan Mohamed (KUGS), Mohd. Zaidi Mohd. Hasan (Timbalan Pengarah / KUSM), Mohd. Sidi Daud (Pengarah), Juna Azleen Abdul Ghani (KULK), Suzannah Akmal (KUPM), Zaiton Mohamed Latif (PPT)

KEDAH / PERLIS / PULAU PINANG

Jabatan Mineral Dan Geosains Kedah/Perlis/
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Berdiri dari kiri / Standing from left: Saiful Nizam (PPT), Fathullah Naim (KUPM), Ir. Tony Chew (KULK)
Duduk dari kiri / Sitting from left: Badrol Mohamad (KUSM), Zainol Husin (Pengarah), Hamdan Arifin (KUGS)

KELANTAN

Jabatan Mineral Dan Geosains Malaysia,
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Dari kiri / From left: Mat Wadi Ab Satar (KULK), Mohamad Yusof Che Sulaiman (KUPM), Mohamad Hussein Jamaluddin (Timbalan Pengarah/ KUSM), Mohd Nazan Awang (Pengarah), Yusuf Bujang (KUGS), Azliyah Che Long (PPT)

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Dari kiri / From left: Nailah @ Nazirah Abdullah (PPT), Suhaimizi Yusoff (KUPM), Hamlee Ismail (KUGS), Tan Hai Hong (KULK), Che Abdul Rahman Jaafar (Timbalan Pengarah / KUSM), Mohd. Zukeri Ab. Ghani (Pengarah)

PAHANG

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Pengarah / Director: Dato' Mohd Za'im Abdul Wahab
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Dari kiri / From left: Normaiziera Abd Rahim (PPT), Dato' Ahmad Zukni Ahmad Khalil (KULK), Dato' Mohd Zaim Dato' Hj. Abdul Wahab (Pengarah), Wan Saiful Bahri Wan Mohamad (Timbalan Pengarah / KUGS), Shari Ismail (KUSM), Mohammad Aznawi Hj. Mat Awan (KUPM)

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Dari kiri / From left: Tracy Upong (PPT), Rushtom Rushdi (KULK), Ismail Hanuar (KUMK), Dr. Richard Mani Banda (Pengarah), Sulong Enjop (KUGS), Enggong Aji (Timbalan Pengarah / KUSM), Manggon Abot (KUPM)

SABAH

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Pengarah / Director: Mustafar Hamzah
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Dari kiri / From left: Jenneth @ Liliana Cyril (KUPM), Jontih Inggihon @ Enggihon (KUSM), Mohd Yusop Ramli (Timbalan Pengarah / KUGS), Mustafar Hamzah (Pengarah), Abdul Kadir Ahmad (KUMK), Ir. Azman Ab. Majid (KULK), Jeffery Paping (PPT)

Sorotan Peristiwa
Event Highlights

Sorotan Peristiwa
Event Highlights

01.03.2015

Lawatan kunjungan hormat Tuan Haji Zakaria Hussain (kanan), Pengarah JMG Johor, ke pejabat Y.B. Dato' Haji Ismail Karim, Setiausaha Kerajaan Johor, di Kota Iskandar, Nusajaya, Johor

Courtesy visit by Tuan Haji Zakaria Hussain (right), Director of JMG Johor, to the office of the Honourable Dato' Haji Ismail Karim, State Secretary of Johor, at Kota Iskandar, Nusajaya, Johor

Photo: JMG Johor

27.04.2015

Majlis Perasmian Tapak Geowarisan Debu Gunung Berapi di Kg. Padang Nyior, Padang Sanai, Kedah

Inauguration Ceremony of Volcanic Ash Geoheritage Site at Kg. Padang Nyior, Padang Sanai, Kedah

09.06.2015

Pegawai Geosains JMG Sabah bersama Tan Sri Sukarti Wakiman (kedua dari kanan), Setiausaha Negeri Sabah, semasa Operasi SAR gempa bumi Ranau

JMG Sabah officer together with Tan Sri Sukarti Wakiman (second from right), Sabah State Secretary, during Ranau Earthquake SAR Operation

11.09.2015

Persaraan Dato' Yunus Abd Razak sebagai Ketua Pengarah JMG

The retirement of Dato' Yunus Abd Razak as the Director General of JMG

Dato' Yunus Abd Razak (kanan) menerima cenderahati dari Ketua Pengarah baru, Tuan Haji Mior Sallehhuddin Bin Mior Jadid (kiri), sempena persaraan beliau

Dato' Yunus Abd Razak (right) receives a memento from the new Director General, Mr. Mior Sallehhuddin Bin Mior Jadid (left), on his retirement

20-23.11.2015

Lawatan sambil belajar ke Tapak Geoterma Tawau, Sabah oleh Dr. Vijayan A/L V.V Rajan, Timbalan Ketua Pengarah – Operasi

Visit to Tawau Geothermal site, Sabah by Dr. Vijayan A/L V.V Rajan, Deputy Director General – Operations

Photo: Mohd. Shahrizal Mohamed Sharifodin

Media / Publisiti
Media / Publicity

21-23.03.2015
Pameran sempena Hari Hutan di Taman Jubli Emas, Alor Star, Kedah
Exhibition in conjunction with Forest Day at Taman Jubli Emas, Alor Star, Kedah

08.04.2015
Taklimat penemuan fosil dinosaur dan tumbuhan kepada Jabatan Muzium Malaysia, Kementerian Penerangan, Komunikasi dan Kebudayaan Malaysia, Putrajaya
Briefing on the discovery of dinosaur and plant fossils to the Department of Museums Malaysia, Ministry of Information, Communications and Culture Malaysia, Putrajaya

28-30.07.2015

Kem Pemimpin Muda Prihatin Air-ESD Bagi Kumpulan Sekolah ASPnet Peringkat Kebangsaan 2015 anjuran International Hidrological Programme (IHP) UNESCO di Tapak Rekreasi Burmese Pool, Taiping, Perak

Young Leaders Water Caring-ESD Camp for ASPnet School Groups National Level 2015 organized by the International Hydrological Programme (IHP) UNESCO in the Burmese Pool Recreation Site, Taiping, Perak

Photo: Mohd Rodzi Mohd Saman

30.07.2015

Pameran JMG Pahang dalam Program Kesedaran Geobencana – Gempabumi, Tanah Runtuh dan Perubahan Cuaca Ekstrem anjuran Jabatan Meteorologi Malaysia di Dewan Seri Mentakab, Mentakab, Pahang

JMG Pahang exhibition during the Geohazard Awareness Programme – Earthquakes, Landslides and Extreme Weather Changes organized by the Malaysian Meteorological Department at Dewan Seri Mentakab, Mentakab Pahang

Khidmat Masyarakat
Community Services

Memenuhi Keperluan Bekalan Air Bersih
Meeting the Needs of Clean Water Supply

Pembekalan air bersih untuk pelajar di Maahad Tahfiz Al-Quran Wal Qiraat Addin 4, Air Kuning, Tapah, Perak
Supply of clean water for students at Maahad Tahfiz Al-Quran Wal Qiraat Addin 4, Air Kuning, Tapah, Perak

Photo: Mohd. Shahrizal Mohamed Sharifodin

Penilaian sumber air tanah dengan survei geofizik keberintangan geoelektrik telah dijalankan untuk menilai potensi sumber air tanah
Groundwater resource assessment by geoelectric geophysical resistivity survey was carried out to assess the potential of groundwater resources

Photo: Mohd. Shahrizal Mohamed Sharifodin

Tangki aerasi (atas) dan tangki penapisan pasir-arang (bawah)
The aeration tank (top) and sand-coal filtering tank (bottom)

Photo: Mohd. Shahrizal Mohamed Sharifodin

Penapisan kolum (kiri) dan tangki transit (kanan)
Column filtering (left) and transit tank (right)

Photo: Mohd. Shahrizal Mohamed Sharifodin

Air bersih dibekalkan untuk kegunaan pelajar
Clean water is supplied for student use

01.08.2015

Majlis perasmian air graviti di Bukit Rumah Unsan, Nanga Beduie, Julau, Sarawak

Inauguration ceremony of gravity water at Rumah Unsan, Nanga Beduie, Julau, Sarawak

06.10.15

Majlis penyerahan sistem telaga tiub oleh En. Mustafar Hamzah (kiri), Pengarah JMG Sabah, Kg. Dungang, Tuaran, Sabah

Handing over ceremony of tubewell system by Mr. Mustafar Hamzah (left), Director of JMG Sabah, Kg. Dungang, Tuaran, Sabah

13.10.2015

Majlis perasmian sistem telaga tiub di SK Chinta Mata, Tenom, Sabah

Inauguration ceremony of tubewell system at SK Chinta Mata Tenom, Sabah

Upacara pemotongan ribbon yang dilaksanakan bersama oleh Dr. Vijayan A/L V.V Rajan (kiri), Timbalan Ketua Pengarah – Operasi, dan En. Mustafar Bin Hamzah (kanan), Pengarah JMG Sabah

A ribbon-cutting ceremony conducted joinly by Dr. Vijayan A/L V.V Rajan (left), Deputy Director General – Operations, and Mr. Mustafar Bin Hamzah (right), Director of JMG Sabah

Mengawal Kebakaran Kawasan Tanah Gambut
Control of Fires in Peatlands

Paya Indah, Kuala Langat, Selangor

Photo: Unit Pengurusan Bencana Negeri Selangor

Photo: Unit Pengurusan Bencana Negeri Selangor

Photo: Mazatul Akma Aros

Air tanah dipam ke dalam peparit untuk meningkatkan aras air tanah gambut kering
Groundwater being pumped to the trench to raise the water table of the dry peat ground

Misi Bantuan Pasca Banjir Di Kelantan
Kelantan Post Flood Aid Mission

09.01.2015
Pembinaan telaga dengan kaedah pengejetan di UDK Mahligai
Well construction by jetting method at UDK Mahligai

09.01.2015
Pengepaman air dari telaga tiub yang telah siap di UDK Mahligai
Pumping of water from the completed tubewell at UDK Mahligai

10.01.2015
Kerja-kerja pembinaan telaga tiub menggunakan kaedah pengejetan di Wisma Persekutuan Kota Bharu
Construction of tubewells using jetting method at Wisma Persekutuan Kota Bharu

25.01.2015
Luahan air dari telaga pengejetan di Teluk Renjuna
Discharge of water from the jetting well at Renjuna Bay

Misi Bantuan Pasca Gempa Bumi Sabah
Sabah Post-Earthquake Aid Mission

Staf Jabatan, En. Mahadi Santa (kiri) dan En. Bailon Golutin (kanan), mengambil bahagian dalam operasi mencari dan menyelamat
The Department's staff, Mr. Mahadi Santa (left) and Mr. Bailon Golutin (right), took part in the search and rescue operations

Pasukan Mencari dan Menyelamat yang terdiri dari JMG, Pasukan Khas Taktikal Operasi Penyelamat Malaysia (STORM), Pasukan Mencari dan Menyelamat Khas (SMART), Forensik polis dan Sabah Park Rangers
Search and Rescue Team consists of JMG, Special Tactical Operation Rescue Malaysia (STORM), Special Malaysia Disaster Assistance and Rescue Team (SMART), police forensic and Sabah Park Rangers

Penilaian kesan gempa bumi Sabah
Post Sabah earthquake impact assessment

Pemantauan kualiti air sungai pasca bencana gempa bumi
Monitoring of water quality after the devastating earthquake

Persampelan air di Kolam Air Panas Poring, Ranau untuk memantau kesan gempa bumi

Water sampling at Poring Hot Springs, Ranau to monitor the effects of earthquake

Pemeriksaan bersama agensi terhadap kualiti air telaga tiub di Kota Belud selepas gempa bumi

Inter agencies joint inspection on tubewell water quality in Kota Belud after the earthquake

Bantuan Kemanusiaan
Humanitarian Aid

17.06.2015: Pekan Nabalu

17.06.2015: Kg Kelawat, Tamparuli

17.06.2015: Kg Kiau Toburi

03.09.2015: Kg Melangkap Kota Belud

Senarai Pegawai Profesional
List of Professional Officers

Senarai Pegawai Profesional
List of Professional Officers

Ibu Pejabat/ Headquarters		
Ketua Pengarah, JUSA A Director General	Dato' Yunus bin Abd Razak (retired as of 11.09.2015)	BSc(Hons)(Geology)(UKM) MSc(Eng. Geology)(London), DIC
	Mior Sallehuddin bin Mior Jalid (from 28.09.2015)	BSc(Hons) (Geology)(UKM) MSc(Environmental and Ecological Science) (Lancaster)
Timbalan Ketua Pengarah (Operasi) JUSA B Deputy Director General	Mustapha bin Mohd Lip (retired as of 30.03.2015)	BEng(Hons)(Mining)(NSW Australia) MSc(Environment Resources)(Saltford)
	Dr. Vijayan a/l V.V. Rajan (from 28.09.2015)	BSc(Hons)(Applied Geology)(UM) MSc(Geophysics)(UM) MSc(Marine Geophysics)(Mississippi) PhD(Marine Geology)(Mississippi)
Timbalan Ketua Pengarah (Korporat dan Ekonomi Mineral) JUSA C Deputy Director General	Shahar Effendi bin Abdullah Azizi (from 28.09.2015)	Bsc(Hons)(Mining Eng.)(Leeds) DESS (Econ. Evaluation of Mining Projects) (Paris School of Mines)
Pengarah, C54 Director	Mohamad Pauzi bin Abdullah (retired as of 01.06.2015)	BSc(Hons)(Geology)(UKM)
	Ab Halim bin Hamzah	BSc(Hons)(Geology)(UKM) MSc(Mineral Resources Eng.)(USM)
	Kamal bin Daril	BSc(Hons)(Geology)(UKM) MS(Mineral Economics)(Michigan)
	Kamuradin bin Md Slar	BSc(Hons)(Geology)(UKM)
	Abdul Rahman bin Mohd Yusoff	BSc(Hons)(Earth Science)(UKM)
Timbalan Pengarah, C52 Deputy Director	Joanes Muda (from 16.03.2015)	BSc(Hons)(Earth Science)(UKM) MSc(Geology)(UMS)
	Mohd Badzran bin Mat Taib	BSc(Hons)(Geology)(UKM)
	Hisamuddin bin Termidi (until 22.02.2015)	BEng.(Hons)(Mining) (Laurentian)
	Kamaruddan bin Abdullah (from 09.03.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM) MSc(Occupational Safety & Health)(Murray State of University, USA)
Ketua Penolong Pengarah Kanan, C52 Senior Principal Assistant Director	Ling Nan Ley @ Ling Nan Leh (from 17.03.2015)	BSc(Hons)(Earth Science)(UKM) MSc (Engineering Geology), Durham Uni, UK
	Azemi bin Hj Eki (from 09.03.2015)	BSc(Hons)(Geology)(UKM) MSc(Material Eng.)(USM)

Ketua Pegawai Geosains Kanan, C52 Senior Principal Geoscience Officer	Ir. Azman bin Abdul Majid (until 08.03.2015)	BSc(Hons)(Mining Eng.)(Leeds), PE
	Mohd Nazan bin Awang (until 22.02.2015)	BSc(Hons)(Geology)(UKM)
Ketua Penolong Pengarah Kanan, M52 Senior Principal Assistant Director	Danial Lee bin Abdullah (from 01.04.2015)	MSc(Genetik)(UKM)
Ketua Penolong Pengarah, C48 Principal Assistant Director	Siti Aminah binti Abdul Sarif	BSc(Hons)(Applied Geology)(UM)
	Mohd. Zulkiflee bin Che Soh	BSc(Hons)(Geology)(UKM)
	Nurul Huda bin Romli	BEng.(Hons)(USM) MSc(OSH)UNSW
	Habibah binti Tahir	BSc(Hons)(Geology)(UKM) MSc(Environment)(UPM)
	Yusari bin Basiran	BSc(Hons)(Applied Geology)(UM) MSc(Mineral Industry)(UKM)
	Ahmad Zulkifli bin Kamaruzaman (until 22.02.2015)	BAppSc(Hons)(Geophysics)(USM)
	Azizan bin Ali (until 22.02.2015)	BSc(Hons)(Applied Geology)(UM) MSc(Engineering Geology)(UKM)
	Dr. Sia Say Gee (from 23.02.2015)	BSc(Hons)(Applied Geology)(UM) PhD(Coal Geology)(UM)
	Haniza binti Zakri (from 23.02.2015)	BSc(Hons)(Geology)(UKM) MSc(Geology)(UKM)
Ketua Penolong Pengarah, F48 Principal Assistant Director	Tan Teong Ming (until 09.09.2015)	BSc(Information Technology)(UKM)
	Che Aslinaliza binti Che Ahmed (from 10.09.2015)	BSc(Information Technology)(UKM) MSc(Information Technology)(UiTM)
Ketua Penolong Pengarah, M48 Principal Assistant Director	Mas Ayu Siti Asmah Hani binti Zainul Abidin (from 15.10.2015)	BBA(Hons)(UIAM)
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Norsham binti Samsudin	BSc(Hons)(Geology)(UKM)
	Nurzaidi bin Abdullah	BSc(Hons)(Geology)(UKM) MSc(Remote Sensing)(UPM)
	Dr. Ferdaus bin Ahmad	BSc(Hons)(Geology)(UM) MSc(Engineering Geology)(Leeds) PhD(Earth & Environment)(Leeds)
	Shari bin Ismail (until 22.02.2015)	BSc(Hons)(Applied Geology)(UM)
	Abd Rahim bin Harun	BSc(Hons)(Geology)(UKM)
	Basharuddin bin Ismail	BSc(Hons)(Geology)(UKM)

Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Ummi Daeimah binti Hussin	BSc(Hons)(Applied Geology)(UM) MSc (Environment)(UPM)
	Brendawati binti Ismail	BSc(Hons)(Geology)(UM)
	Ahmad Zamani bin Samat	BSc(Hons)(Geology)(UM)
	Mohamad Tarmizi bin Mohamad Zulkifly (resigned on 30.04.2015)	BSc(Hons)(Geology)(UM) MSc(Engineering Geology)(UM) PhD(Engineering Geology)(UM)
	Safura binti Alias	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Mohd Anuar bin Ishak	BSc(Hons)(Geology)(UM)
	Zamila binti Abd Rahman (from 16.03.2015)	BSc(Hons)(Geology)(UKM)
	Zahidi Bin Hamzah (from 09.09.2015)	BSc(Hons)(Geology)(UM)
	Khairul Zaman bin Ibrahim (from 02.11.2015)	BSc(Hons)(Geology)(UKM) MSc(Industrial Mineral)(UKM)
	Iszaynuddin bin Abd. Hamid (from 01.12.2015)	BSc(Hons)(Geology)(UKM)
Pegawai Geosains C41 Geoscience Officer	Ir. Suhaimi bin Nordin (from 23.02.2015)	BSc(Hons)(Mining Eng.)(Newcastle-Upon-Tyne) Msc (Rock Mechanics & Excavation Eng.)(Newcastle-Upon-Tyne)
	Abdul Razak bin Zainal Abidin	BSc(Hons)(Applied Geology)(UM)
	Nightingale Lian Marto	BSc(Hons)(Geology)(UKM) MSc(Environmental Management)(UMS)
	Mat Wadi bin Ab Satar (until 22.02.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Mohd Shafiq Farhan bin Mohd Zainudin	BSc(Hons)(Geology)(UM)
Pegawai Tadbir, M41 Administration Officer	Abd Jalil bin Tahir (from 21.03.2015)	MBA Hawaii Pacific University, USA

Bahagian Perkhidmatan Teknikal
Technical Services Division

Pengarah, JUSA C Director	Dr. Kamaludin bin Hassan	BSc(Hons)(Geology)(UM) MSc(Palynology)(Sheffield) PhD(Quaternary Envi. Change)(Durham)
Timbalan Pengarah, C54 Deputy Director	Ismail bin Iman (retired as of 09.02.2015)	BSc(Hons)(Geology)(UM) MSc(Quaternary Geology)(VUB Brussels)
	Mohd Ariff bin Omar	BSc(Hons)(Chemistry)(Nottingham), AMIC
	Hisamuddin bin Termidi (from 23.02.2015)	BEng.(Mining)(Laurention University)
	Azahari bin Ahmad	BSc(Hons)(Geophysics)(USM)

Ketua Pegawai Geosains, C52 Principal Geoscience Officer	Chan Fook Onn	BSc(Hons)(Chemistry)(UM) MSc(Analytical Chemistry and Instrumentation)(Loughborough), AMIC
	Baharuddin bin Wanik	BSc(Hons)(Chemistry)(USM)
	Mahisham bin Ibrahim	BSc(Hons)(Geology)(UKM)
	Hazan Maheran binti Mohd	BSc(Hons)(Chemistry)(UKM), AMIC
	Abdul Kadir bin Ahmad (until 02.03.2015)	BSc(Hons)(Chemistry)(UKM), AMIC
	Mohd Zaidi bin Mohd Hasan (until 22.02.2015)	BSc(Hons)(Geology)(UKM)
	Dato' Zainal Abidin bin Md. Md. Nor (retired as of 01.09.2015)	BSc(Hons)(Mining Eng.)(London) MSc(Mining Eng.) Pennsylvania
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Dzazali bin Ayub (retired as of 01.07.2015)	BSc(Hons)(Geophysics)(USM)
	Ismail bin C. Mohamad (retired as of 05.10.2015)	BSc(Hons)(Geology)(UKM) MSc(Geology)(UKM)
	Mohamad Hussein bin Jamaluddin (until 22.02.2015)	BSc(Hons)(Geology)(UKM)
	Ahmad Zulkifli bin Kamaruzaman (from 23.02.2015)	BSc(Hons)(Geophysics)(USM)
	Abdullah bin Sulaiman	BSc(Hons)(Applied Geology)(UM) MSc(Oceonography)(Southampton)
	Zamri bin Ramli (from 23.02.2015)	BSc(Hons))(Applied Geology)(UM) MSc(Environment)(UPM)
	Webster Wong @ Wong Vui Chung (from 04.05.2015)	BSc(Hons)(Applied Geology)(UM) MSc(Environmental Management)(UMS)
	Mohamad Sari bin Hasan	BSc(Hons)(Geology)(UKM)
	Asminah binti Rajuli (from 23.02.2015)	BSc(Hons)(Geology)(UKM) MSc(Environment)(UPM)
	Mat Niza bin Abd Rahman	BSc(Hons)(Geology)(UKM)
	Mohamad bin Abd Manap	BSc(Hons)(Earth Science)(UKM) MSc(Remote Sensing)(UPM) PhD(Environmental Hydrology and Hydrogeology)(UPM)
	Mohd Rais bin Ramli	BAppSc(Hons)(Geophysics)(USM)
	Hairani Sham binti Manas	BAppSc(Hons)(Geophysics)(USM)
	Thangavelu a/l Ramen	BSc(Hons)(Chemistry/ Mathematic)(USM) MSc(IT)(Nottingham), AMIC
	Mohamad bin Kasim	BSc(Hons)(Chemistry)(USM), AMIC
	Dr. Pauline Dushyanthi a/p Paul Nesaraja	BSc(Hons)(Chemistry)(UM) MSc(Hydrogeology)(Birmingham), AMIC PhD(Environmental Chemistry), University of Buffalo, State University of New York
	Mohd. Saad bin Samsudin	BSc(Hons)(Chemistry)(UKM), AMIC
	Wan Ibrahim bin Wan A Rahman	BSc(Hons)(Chemistry)(UKM), AMIC
	Mohd Fauzi bin Muhammad Said	BSc(Hons)(Chemistry)(UKM), AMIC

Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Amin Noorasid bin Abd Jalil	BSc(Hons)(Geology)(UMS)
	Lee Beng Huat (from 23.02.2015)	BSc(Hons)(Geology)(UKM) MSc(Geology)(UKM)
	Hamid bin Ariffin	BSc(Hons)(Applied Geology)(UM)
	Mohd Anuar bin Md Razali	BAppSc(Hons)(Geophysics)(USM)
	Halim bin Darahim	BAppSc(Hons)(Geophysics)(USM)
	Noran Alwakhir bin Shaarani	BSc(Hons)(Geology)(UM) MSc(Applied Marine Geoscience)(Bangor University, UK)
	Sharizan bin Ibrahim	BAppSc(Hons)(Applied Chemistry)(UiTM) MSc(Mechanical Eng.)(UNIMAP)
	Yusril A'mali bin Mohd Yusuf @ Hamid	BSc(Hons)(Chemistry)(UPM), AMIC
	Azrul bin Arifin	BSc(Hons)(Applied Chemistry)(UiTM)
	Noor Akhmar bin Kamarudin	BSc(Hons)(Chemistry)(UPM)
	Mohd Fahami bin Abas	BAppSc(Hons)(Analytical Chemistry)(USM) MSc (Management)(UUM)
	Halime bin Azahari @ Adnan	BSc(Hons)(Applied Chemistry)(UiTM)
	Mohd Fuzi bin Hashim	BSc(Hons)(Chemistry)(UM)
	S. Pasupathi a/l Subramaniam	BSc(Hons)(Chemistry)(USM)
Pegawai Teknologi Maklumat Kanan, F44 Senior IT Officer	Syamilah bt Samsudin @ Murad	BSc(Hons)(Information Technology)(UUM)
Pegawai Geosains, C41 Geoscience Officer	Mohd Zahar bin Ibrahim	BSc(Hons)(Chemistry)(USM)
	Nurul Husna binti Ismayatim	BSc(Hons)(Chemistry)(UKM)
	Intan Shazwani binti Abdul Ghani	BSc(Hons)(Chemistry)(UM), AMIC
	Mohd Farid bin Abd Kadir	BSc(Hons)(Geology)(UKM)

PUSAT PENYELIDIKAN MINERAL/ MINERAL RESEARCH CENTRE		
Pengarah, JUSA C Director	Shahar Effendi bin Abdullah Azizi (until 27.09.2015)	Bsc(Hons)(Mining Eng.)(Leeds) DESS (Econ. Evaluation of Mining Projects) (Paris School of Mines)
Pegawai Penyelidik Kanan, Q54 Senior Research Officer	Md Muzayin bin Alimon	BSc(Hons)(Chemistry)(UKM) MSc(Mineral Processing)(Pennsylvania State)
	Nasharuddin bin Isa	BAppSc(Hons)(Minerals Science and Technology) (USM) MSc(Minerals Engineering)(Exeter), MCSM
	Mahadi bin Abu Hassan	BSc(Hons)(Geology)(UKM)
	Kori bin Mohammad	BSc(Hons)(Geology)(UKM) MSc(Engineering Geology)(Leeds)
	Aminudin bin Mahmud	BSc(Hons)(Geology)(UKM) MSc(Engineering Geology)(Leeds)

Pegawai Penyelidik Kanan, Q52 Senior Research Officer	Abdul Rois bin Abdul Mois	BAppSc(Hons) (Minerals Science and Technology) (USM) MSc(Ceramic Engineering)(Sheffield)
	Ramli bin Mohd Osman	BSc(Hons)(Applied Geology)(UM) MSc(Environmental Science & Engineering) (Colorado)
	Mohamad Haniza bin Mahmud	BEng(Hons)(Mineral Resources Eng.)(USM) Adv. Diploma(Environmental Engineering) (Manchester) MSc(Materials Engineering)(USM)
	Dr. Shamsul Kamal bin Sulaiman	BSc(Hons)(Mining Engineering)(Alabama) MSc(Mineral Resources Eng.)(USM) PhD(Advanced Material)(Leeds)
	Dr. Nazwin binti Ahmad	BEng.(Hons)(Mining Engineering)(Nova Scotia) PhD(Advanced Material)(Leeds)
	Dr. Ismail bin Ibrahim	BEng.(Hons)(Mineral Resources Eng.) (USM) MSc(Mineral Resources Engineering)(USM) PhD(Mineral Processing)(USM)
	Dr. Izhar Abadi bin Ibrahim Rais	BEng(Hons)(Mineral Resources Eng.)(USM) MSc(Mineral Resources Eng.)(USM) PhD(Mineral Resources Processing)(USM)
	Dr. Rashita binti Abd Rashid	Diploma(Chemical Engineering)(UTM) BEng.(Hons)(Chemical Engineering)(UTM) MSc(Mineral Resources Eng.)(USM) PhD(Materials Science)(UKM)
Pegawai Penyelidik Kanan, Q48 Senior Research Officer	Malek bin Selamat	BEng.(Hons)(Mineral Resources Engineering)(USM) MPhil(Advanced Material)(Leeds)
	Salmah binti Baharuddin	BSc(Computer Science)(Hons)(USM) MSc(Image Processing)(USM)
	Abdullah bin Hussin	Adv. Diploma(Land Survey)(ITM) BSc(Land Survey)(ITM)
Pegawai Penyelidik, Q44 Research Officer	Marlinda binti Daud	BEng.(Hons)(Materials Engineering)(USM)
	Siti Mazatul Azwa binti Saiyed Mohd Nurddin	Diploma(Science)(ITM) BAppSc(Hons)(Industrial Chemistry)(USM) MSc(Advanced Materials Engineering)(UPM)
	Dr. Rohaya binti Othman	Diploma(Textile Technology)(ITM) BSc(Hons)(Textile Technology)(UiTM) PhD(Materials Science)(UKM)
	Hamdan bin Yahya (study leave)	BSc(Hons)(Materials Science)(UKM)
	Mohd Syahrir bin Mohd Rozi	BEng.(Hons)(Chemical Engineering)(UTM)
	Mohd Idham bin Mustaffar	BEng.(Hons)(Chemical Engineering)(UTM) MEng.(Bioprocess Engineering)(UTM)
Pegawai Penyelidik, Q41 Research Officer	Norinsafrina binti Mustaffa Kamal	BEng.(Hons)(Environmental Engineering) (Melbourne)
	Anuar bin Othman	BSc(Hons)(Industrial Chemistry)(UTM)
	Roshaida binti Arbain	BEng.(Hons)(Mineral Resources Eng.) (USM) MSc(Mineral Resources Eng.)(USM)
	Aspaniza binti Ahmad	BEng.(Hons)(Materials Engineering)(USM) MSc(Materials Engineering)(USM)
	Fatihah binti Azmi	BEng.(Hons)(Civil Engineering)(UMP) MSc(Enviromental Engineering)(USM)

Pegawai Penyelidik, Q41 Research Officer	Hamizah binti Abdul Samad	BEng.(Hons)(Materials Engineering)(USM) MSc(Materials Engineering)(USM)
	Siti Noorzidah binti Mohd Sabri (from 10.6.2015)	BEng.(Hons)(Materials Engineering)(USM); MSc(Materials Engineering)(USM)

SARAWAK		
Pengarah, C54 Director	Dr. Richard Mani ak Banda	BSc(Hons)(Geology)(UM) PhD (Adv. Industrial Tech.)(Tsukuba)
Timbalan Pengarah, C52 Deputy Director	Enggong ak Aji	BSc(Hons)(Earth Science)(UKM) MSc(Exploration Mineral)(UKM)
Ketua Unit, C52 Head Of Unit	Rushtom bin Rushdi	BSc(Hons)(Mining Eng)(Newcastle-Upon-Tyne)
	Henry Litong Among (until 16.06.2015)	BSc(Hons)(Geology)(UKM)
	Ismail bin Hanuar	BSc (Chemistry) (USM)
	Sulong ak Enjop	BSc(Hons)(Earth Science)(UKM) MSc(Hydrogeology)(London), DUCL
Ketua Pegawai Geosains Kanan, C52 Senior Principal Geoscience Officer	Tennent ak Ahai	BSc(Hons)(Earth Science)(UKM)
	Joanes Muda (until 15.03.2015)	BSc(Hons)(Earth Science)(UKM) MSc(Geology)(UMS)
	Ling Nan Ley @ Ling Nan Leh (until 16.03.2015)	BSc(Hons)(Earth Science)(UKM) MSc(Engineering Geology), Durham Uni, UK
	Azemi bin Hj Eki (until 08.03.2015)	BSc(Hons)(Geology)(UKM) MSc(Material Eng.)(USM)
	Paulius Godwin (until 15.03.2015)	BSc(Hons)(Geology)(UKM)
Ketua Unit, C48 Head Of Unit	Sabtuyah binti Hj. Su'ut (retired as of 02.03.2015)	BSc(Hons)(Chemistry)(UKM), AMIC
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Yusuf bin Bujang (until 22.02.2015)	BSc(Hons)(Geology)(UKM) MSc(Hydrogeology)(London)
	Richard Batoi @ Lipai ak Jantau	BSc(Hons)(Geology)(UM)
	Siti Faridah binti Yusuf	BSc(Hons)(Geology)(UM)
	Ajon Winnie	BSc(Hons)(Earth Science)(UKM)
	Hussein bin Mohd Juni	BSc(Hons)(Geology)(Texas, USA)
	Setebin @ Roslan bin Rajali	BSc(Hons)(Applied Geology)(UM) MSc(Env. Hydrogeology)(Cardiff, U.K)
	Jaithish John	BSc(Hons)(Applied Geology)(UM) MSc(Applied Geology)(Univ. of Pennsylvania, USA)
	Edward ak Muol	BSc(Hons)(Applied Geology)(UM)
	Segar a/l Velayutham	BSc(Hons)(Chemistry)(USM), AMIC
	Zamzuri bin Ghazalee	BSc(Hons)(Geology)(UM)

Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Japri bin Bujang	BSc(Hons)(Geology)(UKM)
	Azzudin bin Shebli	Adv. Dip(Applied Chemistry)(UiTM), AMIC BSc(Hons) (Chemistry) (UNIMAS) MSc (Chemistry) (UNIMAS)
	Rengga ak Gendang	BSc(Hons)(Geology)(UM)
	Manggon ak Abot	BSc(Hons)(Geology)(UKM) Dip. Ed. (IPGBL) MSc(Geology, Mineralogy & Petrology)(Oregon State, USA)
	Mohd Aswandi bin Ariff	BSc(Hons)(Industrial Chemistry)(UPM)
	Dr. Joseph Jubin ak Aruh @ Aro	BSc(Hons)(Geology)(UM) MSc (Pengurusan Sumber Lestari)(UPM) PhD (Env. Hydrology and Hydrogeology) (UPM)
	Freddy ak Heward Chinta	BSc(Hons)(Earth Science)(UKM)
	Julia ak Kaya	BSc(Hons)(Geology)(UKM)
	Luqman bin Hj. Kaluni	BSc(Hons)(Geology)(UKM)
	Hermawati binti Tambeng	BSc(Hons)(Applied Chemistry)(UiTM)
	Salehuddin bin Mohamad	BEng.(Hons) (Mineral Resources Engineering) (USM)
	Thomson ak Galin	BSc(Hons)(Geological Science)(Leeds) MSc(Geology)(London)
	Balachandar a/l Subramaniyan	BSc(Hons) Applied Chemistry (UM) MSc(Analytical Chemistry and Instrumental Analysis) (UM)
	Lee Beng Huat (until 22.02.2015)	BSc(Hons)(Geology)(UKM) MSc(Geology)(UKM)
	Mohamad Zahir bin Che Amad	BSc(Hons)(Applied Geology)(UM)
	Shahrul Ridzuan bin Zainal Rashid	BAppSc(Hons)(Geophysics)(USM)
Pegawai Geosains, C41 Geoscience Officer	Nik Mohd Nishamuddin bin Nik Rahimi	BSc(Hons)(Geology)(UKM)
	Clarence Anyau ak Tibu	BSc(Hons)(Geology)(UKM)
	Nazirrahmat bin Suleiman	BSc(Hons)(Geology)(UKM)
	Ledyhernando Taniou	BSc(Hons)(Geology)(UMS)
	Zaidulkhair bin Jasmi	BSc(Hons)(Geology)(UKM)
	Mohd Farid bin Abdul Kadir	BSc(Hons)(Geology)(UKM)
	Mohd Afiq bin Mohd Atan	BSc(Hons)(Geology)(UMS)
	Angela Ee	BSc(Hons)(Geology)(UMS)
Pegawai Teknologi Maklumat, F41 IT Officer	Silvia Joseph	BSc(Hons)(Computer Science) (UPM)

	Sabah	
Pengarah, C54 Director	Mustafar bin Hamzah	BSc(Hons)(Geology)(UKM) MSc(Geographical Information System) (University of Leicester)(UK)
Timbalan Pengarah, C52 Deputy Director	Mohd Yusop bin Ramli	BSc(Hons)(Geology)(UKM)

Ketua Unit, C52 Head Of Unit	Jontih Inggihon@Enggihon	BSc(Hons)(Geology)(UKM) Adv. Diploma(Computer Science)(UKM)
	Kamaruddan bin Abdullah (until 08.03.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM) MSc(Occupational Safety & Health)(Murray State of University)(USA)
	Ir. Azman bin Ab. Majid (from 09.03.2015)	BSc(Hons)(Mining Engineering)(University of Leeds)(UK)
	Abdul Kadir bin Ahmad (from 03.03.2015)	BSc(Hons)(Chemistry)(UKM), AMIC
Ketua Pegawai Geosains Kanan, C52 Senior Principal Geoscience Officer	Paulius Godwin @ Paulus (from 16.03.2015)	BSc(Hons)(Geology)(UKM)
Ketua Unit, C48 Head Of Unit	Jenneth Cyril @ Liliana	BSc(Hons)(Geology)(UKM)
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Zamri bin Ramli (until 15.03.2016)	BSc(Hons)(Applied Geology)(UM) MSc(Environment)(UPM)
	Hilary Muyan Nicholas Thomas	BSc(Hons)(Geology)(UM)
	Che Aziz bin Che Soh	BSc(Hons)(Geology)(UKM)
	Webster Wong @ Wong Vui Chung (until 03.05.2015)	BSc(Hons)(Applied Geology)(UM) MSc(Environmental Management)(UMS)
	Dr. Frederick Francis Tating	BSc(Hons)(Earth Science)(UKM) MSc(Environment)(Kumamoto University) PhD(Eng. Geology & Rock Mechanic)(University of Twente)(Netherlands)
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Rokiah binti Abdullah	BSc(Hons)(Chemistry)(UKM), AMIC
	Morius Bantas	BSc(Hons)(Chemistry)(UKM) MSc(IT Management)(UTM) AMIC
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Fredolin Javino	BSc(Hons)(Applied Geology)(UM)
	Dana ak Badang (until 31.05.2015)	BSc(Hons)(Geology)(UKM) MSc(Environment)(UKM)
	Daulip @ Dee Dee Langkait	BSc(Hons)(Earth Science)(UKM)
	Jaineh Lingi	BSc(Hons)(Applied Geology)(UM)
	Bailon Golutin	BSc(Hons)(Geology)(UMS)
	Cleafos Totu	BSc(Hons)(Earth Science)(UKM)
	Jayawati Fanilla Sahih binti Montoi	BSc(Hons)(Geology)(UM)
	Faye Donna Edmund	BSc(Hons)(Geology)(UKM) MSc(Applied Geosciences)(Univ. of Pennsylvania, USA)
	Khairun Nasir bin Mokhtar	BSc(Hons)(Chemistry)(UM), AMIC
	Arthur Clement Makulim	BSc(Hons)(Geology)(UMS)
	Eddie Affandy bin Mohd Yuslee	BSc(Hons)(Geology)(UMS)
	Farid bin Zainudin	BSc(Hons)(Geology)(UMS)
	Alvyn Clancey Mickey	BSc(Hons)(Geology)(UMS) MSc(Geology)(UMS)

Pegawai Geosains, C41 Geoscience Officer	Mazrali bin Alway	BSc(Hons)(Applied Geology)(UM)
	Muhammad Umar bin Sarimal	BSc(Hons)(Geology)(UMS)
	Mahadi bin Santa	BSc(Hons)(Geology)(UMS)
	Mison bin Ajum	BSc(Hons)(Geology)(UMS)
	Kennedy bin Mohd Imran	BSc(Hons)(Applied Geology)(UM) MSc(Eng. Geology)(University of Newcastle Upon-Tyne)(England) MD(Zamboanga Medical School Foundation)
	Redzuan bin Ahmad Banjar	BSc(Hons)(Geology)(UM)
	Mazuan bin Roslan	BSc(Hons)(Geology)(UMS)
	Ahmad Khairut Termizi bin Mohd Daud	BSc(Hons)(Geology)(UMS) MSc(Geology)(UMS)
	Lim Li Chien	BSc(Hons)(Geology)(UMS)
	Goh Khean Siong	BSc(Hons)(Geology)(UKM) MSc(Geology)(UKM)
	Akrimi Masua binti Mohamad	BAppSc(Hons)(Analytical Chemistry)(USM), AMIC
	Mohd Shafreen bin Mad Isa	BEng(Hons)(Mineral Resources Eng.)(USM)
Pegawai Teknologi Maklumat, F41 IT Officer	Azlan bin Ahmad	BSc(Hons)(Computer Science)(UKM)

	Pahang	
Pengarah, C54 Director	Dato' Hj. Mohd Za'im bin Dato' Abdul Wahab	Diploma Kejuruteraan Jentera (UTM) BSc(Hons)(Mining Eng.)(Newcastle-Upon-Tyne) DESS(Econ. Evaluation of Mining Project) (Paris School of Mines)
Timbalan Pengarah, C52 Deputy Director	Wan Saifulbahri bin Wan Mohamad	BSc(Hons)(Geology)(UKM)
Ketua Unit, C52 Head Of Unit	Dato' Ahmad Zukni bin Ahmad Khalil	BEng.(Hons)(Mineral Resources Eng.)(USM)
Ketua Unit, C48 Head Of Unit	Hj. Shari bin Ismail (from 23.02.2015)	BSc(Hons)(Applied Geology)(UM)
Ketua Unit, C44 Head Of Unit	Mohammad Aznawi bin Hj. Mat Awan	BSc(Hons)(Geology)(UKM)
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Mazlan bin Mohamad Zain	BSc(Hons)(Applied Geology)(UM) MSc(Engineering Geology)(UKM)
	Zainal Abidin bin Jamaluddin	BSc(Hons)(Geology)(UKM) MSc (Eng. & Environmental Geophysics)(UKM)
	Yusuf bin Imbun	BSc(Hons)(Geology)(UKM)
	Adha Syuraini bin Abd Ghani	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Zaki bin Alias	BSc(Hons)(Applied Geology)(UM)
Pegawai Geosains, C41 Geoscience Officer	Mohd Asnizam bin Ayub	BSc(Hons)(Geology)(UKM)

PERAK		
Pengarah, C54 Director	Mohd. Sidi bin Daud (from 23.02.2015)	Bsc(Hons)(Geology)(UKM)
Timbalan Pengarah, C52 Deputy Director	Mohd. Zaidi bin Mohd. Hasan (from 23.02.2015)	Bsc(Hons)(Geology)(UKM)
Ketua Unit, C48 Head Of Unit	Tuan Rusli bin Tuan Mohamed	BSc(Hons)(Geology)(UKM) MSc(Eng. Geology)(UKM)
	Juna Azleen bin Abdul Ghani (from 16.03.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM) MSc(Mineral Resources Eng.)(USM)
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Nor Azian bin Hamzah	BSc(Hons)(Geology)(UKM)
	Othman bin Kangsar	BAppSc(Hons)(Geophysics)(USM) MSc(Eng. & Environmental Geophysics)(UKM)
	Mustaza bin Mustafa	BEng.(Hons)(Mineral Resources Eng.)(USM)
Pegawai Geosains, C41 Geoscience Officer	Suzannah binti Akmal	BSc(Hons)(Geology)(UM)
	Mohd Irwan bin Ariff (until 11.10.2015)	BSc(Hons)(Geology)(UKM)
	Azmi bin Abu Bakar	BSc(Hons)(Applied Geology)(UM)
	Mohd. Shahrizal bin Mohamed Sharifodin	BSc(Hons)(Geology)(UKM)
	Zaiton binti Abdullah (study leave)	BEng.(Hons)(Mineral Resources Eng.)(USM)
Pegawai Geosains, C41 Geoscience Officer	Azizan anak Juhin	BSc(Hons)(Geology)(UMS)
	Saiful bin Abdullah	BSc(Hons)(Geology)(UKM)
	Hanizam Shah bin Saidin	BEng.(Hons)(Mineral Resources Eng.)(USM) MSc(Mineral Resources Eng.)(USM)
	Nurul 'Amalina binti Md. Nor	BSc(Hons)(Geology)(UM) MSc(Geotechnical Eng.)(UiTM)
	Asman bin Alias	BSc(Hons)(Geology)(UMS)

JOHOR		
Pengarah, C54 Director	Zakaria bin Hussain	BSc(Hons)(Geology)(UKM) MSc(Mineral Exploration)(UKM)
Timbalan Pengarah, C52 Deputy Director	Abdullah Sani bin H. Hashim	BSc(Hons)(Geology)(UKM)
Ketua Unit, C48 Head Of Unit	Nizarulikram bin Abdul Rahim (until 15.04.2015)	BSc(Hons)(Geology)(UM)
	Nurul Huda bin Romli (until 22.02.2015)	BEng.(Hons) (USM) MSc(OSH)(UNSW)
	Noorazhar bin Ngatimin	BSc(Hons)(Geology)(UM)
	Mohamed Hizam bin Abdul Kadir (from 13.04.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM)

Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Nor Asmah binti Abd Aziz	BSc(Hons)(Geology)(UKM)
	Mohd Fauzi bin Rajimin @ Jeman	BSc(Hons)(Geology)(UKM)
	Khairul Zaman bin Ibrahim (until 01.11.2015)	BSc(Hons)(Geology)(UKM) MSc(Industrial Mineral)(UKM)
	Hasnida binti Zabidi @ Zainudi (until 01.06.2015)	BSc(Hons)(Earth Science)(UKM)
	Muhammad Hazli bin Mohamed Hanapi	BSc(Hons)(Applied Geology)(UM)
	Mohammed Syahrizal bin Zakaria	BSc(Hons)(Geology)(UKM)
	Noraini binti Basiri	BSc(Hons)(Geology)(UKM)
	Norhazidi bin Masrom	BSc(Hons)(Geology)(UKM)
	Mohd Hisham bin Md Nawi	BEng.(Hons)(Mineral Resources Eng.)(USM)
Pegawai Geosains, C41 Geoscience Officer	Arda Anasha binti Jamil	BSc(Hons)(Geology)(UM)

SELANGOR/ WILAYAH PERSEKUTUAN		
Pengarah, C54 Director	Dato' Zakaria bin Mohamad (retired as of 16.06.2015)	BSc(Hons)(Geology)(UKM) MSc(Applied Quaternary Geology)(Free University of Brussel)
	Henry Litong Among (from 17.06.2015)	BSc(Hons)(Geology)(UKM)
TimbalanPengarah, C52 Deputy Director	Mohd. Sidi bin Daud (until 22.02.2015)	BSc(Hons)(Geology)(UKM)
	Abdul Rashid bin Bachik (from 09.03.2015; retired as of 13.07.2015)	BSc(Hons)(Geology)(UKM)
Ketua Unit, C48 Head Of Unit	Faizal bin Arshad (until 16.03.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Che Ibrahim bin Mat Saman	BSc(Hons)(Geology)(UKM)
Ketua Unit, C44 Head Of Unit	Ir. Tony Chew (until 15.03.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Ropidah binti Mat Zin	BSc(Hons)(Applied Geology)(UM) MSc(GIS)(UiTM)

Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Mahat bin Sibon	BSc(Hons)(Geology)(UM)
	Qalam A'zad bin Rosle	BSc(Hons)(Geology)(UM) MSc(Structural Geology With Geophysics)(Leeds)
	Mazatul Akmar binti Aros	BSc(Hons)(Geology)(UM)
	Iszaynuddin bin Abd. Hamid (until 30.11.2015)	BSc(Hons)(Geology)(UKM)
	Hasnida binti Zabidi @ Zainudi (from 29.06.2015)	BSc(Hons)(Earth Science)(UKM)

Pegawai Geosains, C41 Geoscience Officer	Muhamad Ezwan bin Dahlan	BSc(Hons)(Geology)(UKM)
	Mustaza bin Mustafa (until 16.03.2015)	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Maziadi bin Mamat	BEng.(Hons)(Mineral Resources Eng.)(USM)

KELANTAN		
Pengarah, C54 Director	Mohd Nazan bin Awang	BSc(Hons)(Earth Science)(UKM)
TimbalanPengarah, C52 Deputy Director	Mohamad Hussein bin Jamaluddin	BSc(Hons)(Geology)(UKM)
	Che Abdul Rahman bin Jaafar (until 22.02.2015)	BSc(Hons)(Earth Science)(UKM)
Ketua Unit, C48 Head Of Unit	Yusuf bin Bujang	BSc(Hons)(Geology)(UKM) MSc(Hydrgeology)(London)
Ketua Unit, C44 Head Of Unit	Mat Wadi bin Ab Satar	BEng.(Hons)(Mineral Resources Eng.)(USM)
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	John ak Joseph Jinap	BSc(Hons)(Applied Geology)(UM)
	Mohamad Yusof bin Che Sulaiman	BSc(Hons)(Geology)(UM)
	Mohd Yuzlan bin Yusoff	BSc(Hons)(Applied Geology)(UM)
	Ahmad Rosli bin Othman	BSc(Hons)(Applied Geology)(UM) MSc (Alam Sekitar & Pembangunan)(UKM)
	Mohamed Asri bin Omar	BSc(Hons)(Geology)(UM)
	Amir Mizwan bin Mohd Akhir	BSc(Hons)(Geology)(UKM)
Pegawai Geosains, C41 Geoscience Officer	Aidil bin Arnolous Rema	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Nur Asikin binti Rashidi	BSc(Hons)(Geology)(UKM) MA(Archaeology)(USM)

NEGERI SEMBILAN/ MELAKA		
Pengarah, C54 Director	Zulkipli bin Che Kasim	BSc(Hons)(Geology)(UM) MSc(Mineral Exploration and Mining Geology) England
Ketua Unit, C48 Head Of Unit	Azizan bin Ali (from 23.02.2015)	BSc(Hons)(Applied Geology)(UM) MSc (Engineering Geology)(UKM)
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Dorsihah binti Mohamad Jais	BSc(Hons)(Geology)(UM)
	Haniza binti Zakri (until 22.02.2015)	BSc(Hons)(Geology)(UKM) MSc(Geology)(UKM)
Ketua Unit, C44 Head Of Unit	Hairul bin Mohamed Shaharudin	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Azhar bin Ahmad Nazri	BSc(Hons)(Earth Sciences)(UKM)
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Norhayati binti Mohd Rawi	BSc(Hons)(Geology)(UKM)
	Masrita binti Mohd Aras	BSc(Hons)(Geology)(UKM)
	Mohd Nizam bin Md Nordin	BSc(Hons)(Geology)(UKM)
Pegawai Geosains, C41 Geoscience Officer	Muhammad Fawwaz bin Zainal Abedin	BSc(Hons)(Geology)(UMS)

TERENGGANU		
Pengarah, C54 Director	Mohd. Zukeri bin Ab. Ghani	BSc(Hons)(Geology)(UKM)
Timbalan Pengarah, C52 Deputy Director	Che Abdul Rahman bin Jaafar (from 23.02.2015)	BSc(Hons)(Earth Science)(UKM)
Ketua Unit, C48 Head Of Unit	Hamlee bin Ismail	BSc(Hons)(Geology)(UKM) MSc (Industrial Mineral)(UKM)
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Abdul Hadi bin Abdul Rahman	BSc(Hons)(Geology)(UM) MSc (Industrial Mineral)(UKM)
Ketua Unit, C44 Head Of Unit	Tang @ Tan Hai Hong	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Suhaimizi bin Yusoff	BSc(Hons)(Earth Science)(UKM) MSc(Geomatic Engineering)(UPM)
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Muhammad Fadzli bin Deraman	BSc(Hons)(Geology)(UM) BEng.(Hons)(Civil)(UiTM)
Pegawai Geosains, C41 Geoscience Officer	Norzuhairil bin Zubir	BSc(Hons)(Geology)(UM)
	Muhamad Safid bin Saad	BAppSc(Hons)(Geophysics)(USM)
	Razaidi Shah bin A Kadir	BSc(Hons)(Geology)(UMS)
	Khairul Nazri bin Yaakub	BSc(Hons)(Geology)(UM)
	Muhammad Azfar bin Kamaruddin	BSc(Hons)(Geology)(UMS)

KEDAH/ PERLIS/ PULAU PINANG		
Pengarah, C54 Director	Zainol bin Hj. Husin	BSc(Hons)(Geology)(UKM)
Ketua Unit, C48 Head Of Unit	Hamdan bin Ariffin	BSc(Hons)(Applied Geology)(UM) MSc(Mineral Resources Eng.)(USM)
Ketua Unit, C44 Head Of Unit	Badrol bin Muhammad	BSc(Hons)(Earth Science)(UKM)
	Ir. Tony Chew (from 16-3-2015)	BEng.(Hons)(Mineral Resources Eng.)(USM) MBA(UMS)
	Fathullah bin Abu Naim	BSc(Hons)(Geology)(UM)
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Nur Susila binti Md Saaid	BSc(Hons)(Applied Geology)(UM)
	Wan Salmi bin Wan Harun (study leave)	BSc(Hons)(Applied Geology)(UM) MSc(Eng. & Environmental Geophysics)(UKM)
	Zamila binti Abd Rahman (until 15.03.2015)	BSc(Hons)(Geology)(UKM)
Pegawai Geosains, C41 Geoscience Officer	Muhammad Mustadza bin Mazni	BSc(Hons)(Geology)(UMS)
	Azihan bin Mat Arshad	BEng.(Hons)(Mineral Resources Eng.)(USM)
	Fakhruddin Afif bin Fauzi	BSc(Hons)(Geology & Geophysics) (University of Adelaide)
	Anis Nasuha binti Mustapha @ Rosli	B.Sc(Hons) (Applied Science Geophysics)(USM)

Jawatan Kader di Agensi luar
Cader Posts in other Agencies

Jabatan Kerja Raya **Public Works Department**		
Cawangan Kejuruteraan Cerun **Slope Engineering Branch**		
Ketua Pegawai Geosains Kanan, C52 Senior Principal Geoscience Officer	Mohd Anuar bin Mohd Yusof (retired as of 07.01.2015)	BSc(Hons)(Geology)(UKM) MSc(Industrial Mineralogy)(Leicester)
	Abdul Rashid bin Bachik (until 08.03.2015)	BSc(Hons)(Geology)(UKM)
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Nicholas Jacob a/l T. Jacob	BSc(Hons)(Geology)(UKM) MSc (Environment)(UPM)
	Zaidi bin Daud	BSc(Hons)(Geology)(UM)
Cawangan Kejuruteraan Jalan & Geoteknik **Road & Geotechnique Engineering Branch**		
Pegawai Geosains Kanan, C44 Senior Geoscience Officer	Syed bin Omar (study leave)	BSc(Hons)(Applied Geology)(UM) MSc (Eng. Geology)(Newcastle-Upon-Tyne)
	Hisam bin Haji Ahmad (from 18.05.2015)	BSc(Hons)(Geology)(UM)
Kementerian Tenaga, Teknologi Hijau & Air **Ministry of Energy, Green Technology & Water**		
Pasukan Projek Penyaluran Air Mentah Pahang-Selangor		
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Kamarulbahrin bin Hashim	BSc(Hons)(Applied Geology)(UM)
Jabatan Bekalan Air		
Pegawai Geosains, C41 Geoscience Officer	Mohamed Fadzli bin Rahman	BSc(Hons)(Geology)(UM)
Kementerian Wilayah Persekutuan Malaysia **Ministry of Federal Territories**		
Ketua Pegawai Geosains, C48 Principal Geoscience Officer	Nizarulikram bin Abdul Rahim (from 16.04.2015)	BSc(Hons)(Geology)(UM)
Pegawai Geosains, C41 Geoscience Officer	Mohamad Zahir bin Che Ahmad (from 16.04.2015)	BSc(Hons)(Geology) (UM)

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