



*Parliamentary Standing Committee on Public Works*

## **REPORT**

relating to the proposed

# **CSIRO NATIONAL CENTRE FOR PETROLEUM AND MINERAL RESOURCES RESEARCH, BENTLEY, WA**

(Second Report of 1999)

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

1999

**The Parliament of the Commonwealth of Australia**

**Parliamentary Standing Committee on Public Works**

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**CSIRO National Centre for Petroleum and  
Mineral Resources Research, Bentley, WA**

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**MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE  
ON PUBLIC WORKS**

(Thirty-Third Committee—appointed 8 December 1998)

The Hon Judi Moylan MP (Chair)

The Hon Janice Crosio MBE, MP (Vice-Chair)

**Senate**

**House of Representatives**

Senator Paul Calvert

Mr John Forrest MP

Senator Alan Ferguson

Mr Colin Hollis MP

Senator Shayne Murphy

Mr Peter Lindsay MP

Mr Bernard Ripoll MP

Committee Secretary: Bjarne Nordin

Inquiry Secretary: Michael Fetter

Administrative Officers: Belynda Zolotto

June Murphy

**EXTRACT FROM**  
***THE VOTES AND PROCEEDINGS***  
***OF THE HOUSE OF REPRESENTATIVES***

*No. 13 dated 8 December 1998*

**PUBLIC WORKS—PARLIAMENTARY STANDING COMMITTEE—  
REFERENCE OF WORKS—CSIRO NATIONAL CENTRE FOR  
PETROLEUM AND MINERAL RESOURCES RESEARCH, BENTLEY,  
WA**

Mr Slipper (Parliamentary Secretary to the Minister for Finance and Administrative Services), by leave, pursuant to notice, moved—That, in accordance with the provisions of the *Public Works Committee Act 1969*, the following proposed work be referred to the Parliamentary Standing Committee on Public Works for consideration and report: CSIRO National Centre for Petroleum and Mineral Resources Research, Bentley, WA.

Question—put and passed.



## PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

### CSIRO National Centre for Petroleum and Mineral Resources Research, Bentley, WA

On 8 December 1998, the House of Representatives referred to the Parliamentary Standing Committee on Public Works for consideration and report the proposed CSIRO National Centre for Petroleum and Mineral Resources Research, Bentley, WA.

#### THE REFERENCE

1. The terms of the reference were as follows:

*The National Centre for Petroleum and Mineral Resources Research is being established by the Western Australian Government and CSIRO to substantially increase Western Australia's technological capability and its capacity to support the sustained development of its resource industries. Located at Technology Park in Bentley, the National Centre will provide a focal point for research excellence and collaboration between CSIRO, Cooperative Research Centres (CRCs) university researchers, Government agencies, resource companies and associated technology suppliers and providers.*

*The National Centre will provide a unique opportunity to bring together world-class scientific and engineering research groups to work closely with the petroleum and minerals industries. Collaborative research will embrace a wide range of activities aimed not only at providing solutions to current industry issues but also at providing the research leadership necessary to address the key research needs and research issues of these industries now and in the decades ahead.*

*The concentration of capability and expertise at the National Centre will also provide a major incentive for leading edge companies and organisations to locate their operations in Western Australia, further enhancing the prospects for research collaboration and technology transfer and the delivery of innovative research solutions,*

*services and products to the petroleum and minerals industries. The Centre represents a marriage of the leading edge research in minerals and petroleum exploration and production with the industry sector.*

*The proposed development will include laboratories and research facilities, process bays, support and stores areas, staff amenities, public facilities, associated site works, roadworks, carparking, engineering and communication services and landscaping.*

2. When referred to the Committee, the estimated out turn cost of the proposed work was \$31.8 million.

### **THE COMMITTEE'S INVESTIGATION**

3. The reference is identical to the proposal which was referred by the House of Representatives to the former Committee on 29 June 1998.

4. The former Committee received a written submission from the CSIRO and took evidence from CSIRO officials at a public hearing held at Technology Park, Bentley on 26 August 1998. The former Committee also took evidence from:

- Western Australia Department of Commerce and Trade;
- Curtin University of Technology; and
- Woodside Energy Ltd.

5. In conjunction with the public hearing, the former Committee was briefed by CSIRO officials on the proposed works and undertook an extensive inspection of CSIRO facilities at Floreat Park and the site proposed for the new facility at Bentley.

6. Written submissions for the inquiry undertaken by the former Committee were received from the following organisations and were incorporated in the transcript:

- Environment Australia;
- Western Australian Heritage Council;

- Commonwealth Department of Employment, Education and Youth Affairs;
- Disability Services Commission of Western Australia; and
- Agriculture Western Australia.

7. The House of Representatives was dissolved on 31 August 1998 and the former Committee was unable to report on the reference. The 39th Parliament commenced on 10 November 1998. Members of the present Committee were appointed by the Senate and the House of Representatives on 8 December and the Committee met for the first time on 10 December 1998. On 11 February 1999, the Committee resolved:

*That, pursuant to the provisions of section 24 of the Public Works Committee Act 1969, the evidence taken by the former Committee be considered as evidence taken by the present Committee and that a further public hearing into the proposal is not necessary.*

8. Witnesses who appeared before the former Committee at the public hearing are listed in APPENDIX A. The former Committee's proceedings will be printed as Minutes of Evidence.

## **CSIRO RESEARCH AND FACILITIES IN WA**

### **A presence spanning 80 years**

9. CSIRO, or its predecessor organisations, has had a presence in WA for more than 80 years. A WA based Committee of the National Advisory Council of Science and Technology was formed in 1916. Investigations undertaken during the early years in WA covered a range of activities including the following:

- 1917—utilisation of waste timbers;
- 1917—prevention of sparrows entering WA via the transcontinental railway line;
- 1917—pearling in the north west;
- 1918—pottery clays; and
- 1919—cattle tick eradication.

## **National Institute of Science and Industry**

10. In 1920, a new national statutory authority, the Institute of Science and Industry, was created. Projects in WA undertaken ranged from the study of fertiliser values of iron and aluminium phosphates to the extraction of tannins from eucalypts. The latter was undertaken in 1922, in cooperation with the WA Forestry Department and the University of Western Australia. This reflects a theme which continues to the present day—cooperation between Commonwealth and State Governments. Examples of additional collaborative projects undertaken involved clays and pottery, paper pulp, cattle ticks and Kimberley horse disease.

## **Establishment of scientific research facilities**

11. In 1926, the Commonwealth Parliament established the Council for Scientific and Industrial Research (CSIR), the progenitor of CSIRO. During the Second World War, pasture research was carried out at seven centres in WA. The war years also saw a variety of additional activities. These included;

- establishment of a WA branch of the Division of Fisheries;
- establishment of the Kimberley research station;
- research into the production of potassium sulphate and alumina;
- treatment of gold ore; and
- opium poppy growing, as a source of morphine, at Muresk.

## **Post-war development**

12. In 1949, the Commonwealth Parliament established the CSIRO (*Science and Industry Research Act 1949*) and several research centres and projects were commenced in WA subsequently. These comprised:

- 1952—WA regional laboratory;
- 1967—new laboratory complex to house most research activities in WA at Floreat Park on a 27 hectare site;
- 1973—Marmion Laboratory of the Division of Fisheries This Division carried out several important studies including the WA Coastal Ecology Project and the North-West Shelf fisheries project; and

- 1971—headquarters of the Division of Mineralogy transferred to Floreat Park.

### **Expansion of activities at Floreat Park**

13. Activities at Floreat Park have subsequently expanded further. Significant activities now include:

- agriculture;
- land and water;
- exploration and mining;
- mineral processing;
- wildlife; and
- mathematics and information technology.

14. In 1993, the CSIRO Centre for Mediterranean Agricultural Research was established. This is now the largest research group at Floreat Park. Combining several Divisions, such as Animal Production, Entomology, Forestry and Forest Products and Plant Industry, the Centre aims to increase the productivity and sustainability of grazing and cropping systems.

15. In early 1987, the Division of Geomechanics established a small outpost at Floreat park to conduct research into rock mechanics. In early 1990, this group relocated to accommodation at the University of Western Australia, in association with the relocation, from Melbourne, of the leader of the Rock Mechanics Research Group. This led to the establishment, in 1992 of the Australian Centre for Geomechanics which became the Australian Geodynamics Research Centre in 1993.

### **Extent of current facilities and workforce**

16. CSIRO currently operates from six locations in WA. These locations range in size from Floreat Park (over 300 staff) to the Yalanbee Field Station (3 staff). Eleven of CSIRO's 22 Divisions are represented in WA. The importance of agriculture and mining to the WA economy has meant that these are important research areas for CSIRO in WA.

17. Staff numbers have grown steadily from just under 300 ten years ago to about 414 today. CSIRO also expects to transfer or recruit about 90 people, including a second Chief of Division, to WA over the next five years to staff the National Centre for Petroleum and Mineral Resources Research.

## Exploration and Mining

18. The Division of Exploration and Mining has operated out of Perth since the early 1970s in various guises beginning with the Division of Mineralogy. In mid-1988, the Division of Exploration Geoscience was formed and set up in refurbished accommodation at Floreat Park. In July 1993, elements of the Division of Exploration were merged with those of Geomechanics to form the Division of Exploration and Mining. In 1994, the Division of Minerals occupied leased premises on the Curtin University campus at Waterford.

19. A Memorandum of Understanding, between the WA Government and the CSIRO led to the construction of a building at Floreat Park to house the WA Remote Sensing Industry Development and Education Centre. This centre, now known as the Leewin Centre for Earth Sensing Technologies, was established to develop collaborative multidisciplinary remote sensing, image processing and related research, development and applications programs between industry, universities and the State Government.

20. CSIRO advised the Committee that the majority of activities in support of Australia's world-class minerals industry occur within the Division of Exploration and Mining. The Division currently has a staff with specialised skills in the scientific and engineering disciplines of structural geology, petrology, geochemistry, airborne and borehole geophysics, remote sensing, computer modelling, geomechanics, environmental science and electronic and mechanical engineering. Laboratories are maintained in Western Australia (Perth), Queensland (Brisbane), New South Wales (Sydney), and an office in Santiago (Chile).

21. CSIRO Exploration and Mining is the largest supplier of strategic research and development to Australia's world-class minerals industry. The Division's research portfolio addresses the critical success factors facing the industry, namely:

- a better knowledge and understanding of the processes that lead to the formation of world-class ore deposits, and their associated 'signatures';
- an improved knowledge of Australia's landscape evolution;
- enhanced geophysical and geochemical exploration technologies;
- improved mine planning and design;
- better mine production control;

- improved or new mining processes and equipment;
- overcoming water supply constraints;
- the development of environmentally benign mining processes;
- improved strategies for whole-of-mine rehabilitation planning; and
- enhanced levels of occupational health and safety.

22. Research is conducted through 17 discipline-based or outcome focussed Research Groups working across the spectrum of mining activities. This ranges from primary exploration, through resource delineation and exploitation to minesite rehabilitation.

23. The adoption of more successful exploration methods is of critical importance. This, CSIRO advised, will shorten the time taken in making discoveries, expand the terrain types that can be cost effectively explored and ultimately lead to the discovery of new world-class ore deposits. For example, CSIRO exploration research has played significant roles in:

- the discovery of major new gold deposits in the Yilgarn region of Western Australia, in particular Plutonic and Bronzewing which have an estimated value of \$4.5 billion; and
- assistance with the discovery of a number of major nickel deposits subsequently leading to an anticipated increase in Australia's share of the world nickel market from 8 per cent to around 24 per cent over the next five years.

24. Similar advances in the areas of deposit delineation, extractive processes, minesite rehabilitation and occupational health and safety have the potential to save the industry many millions of dollars per annum.

25. The benefits which accrue from improved industry performance extend far beyond the direct income, employment and taxation impacts. The Committee was advised that recent studies on the Western Australian mining industry have demonstrated significant flow-on effects as follows:

- a \$1 million increase in the output of mining generates an additional \$1 million in the output of non-mining industries;
- a \$1 million rise in wages and benefits paid by mining generates nearly \$2 million of wages in non-mining industries; and

- for each additional 100 people employed by the mining industry, roughly 300 new jobs are created elsewhere in the State.

### **Petroleum research**

26. The Division of Petroleum Research provides development and related technology services to the oil and gas industry. Research by the Division covers the development of Australia's oil and gas resources from exploration through to the delivery of processed products. It includes the environmental implications of off-shore oil and gas development. CSIRO has designated petroleum research as one of its two top priority areas for expansion in the current triennium which commenced in July 1997.

27. CSIRO Petroleum works with the petroleum industry to develop a long-term outlook for its future technology needs. It makes a long-term commitment to the research which will underpin its ability to respond at the right time. For example:

- knowledge of the marine environment is now being used to address issues ranging from waste disposal to pipeline scour;
- basic isotope geochemistry and fluid inclusion research is now delivering a suite of solutions concerning time, temperature and migration; and
- sedimentary geomechanics research is now supporting solutions concerning bore stability, reservoir compaction and a range of well productivity issues.

28. The decision to concentrate the majority of CSIRO Petroleum Research in Perth recognises that Perth and the North West Shelf region of Australia are the future growth areas of the Australian petroleum industry. For these reasons, a strong technology base in Perth, built around service companies and research institutions, will be necessary to support this growth.

29. CSIRO advised the Committee that a number of new initiatives by CSIRO Petroleum in Seismic Geophysics and Drilling Fluids will be focussed in Perth. From this, it is expected that the CSIRO Petroleum Research capability will gradually increase.

30. Petroleum exploration research undertaken by CSIRO will concentrate on the occurrence, migration and trapping of oil and gas at a tenement or oil field scale. This is intended to complement the regional scale work of the Australian Geological Survey Organisation (AGSO). In addition, there will also be strong interaction with the geochemistry and seismic geophysics groups at Curtin



University of Technology who are part of the Australian Petroleum Cooperative Research Centre (APCRC).

31. Drilling activities will address the problems of drilling fluids and disposal of drilling wastes, from an environmental and an engineering perspective. Research will also be directed toward the development of better management of near-wellbore processes through new technologies based on the integration of multi phase flows, petrophysics and geomechanics.

### **Exploration and Mining—research alliances**

32. A number of CSIRO research groups have formed successful alliances with other Australian research and development providers to facilitate closer ties between public and private research groups and to assist the uptake of new technologies by industry. These alliances include:

- ***Australian Geodynamics Cooperative Research Centre (AGCRC)***  
This is a joint venture between CSIRO Exploration and Mining, AGSO, Monash University, Latrobe University and the Digital Equipment Corporation, Australia. Ltd.

Through this CRC, the Division conducts research into the geodynamics of the earth's crust with special emphasis on the origin of world-class mineral deposits.

- ***Cooperative Research Centre for Australian Mineral Exploration Technologies (CRCAMET)*** This is a joint venture between CSIRO Exploration and Mining, Macquarie University, Curtin University of Technology, World Geoscience Corporation Ltd, Geological Survey of Western Australia, AGSO and the Australian Minerals Industries Research Association (AMIRA).

The Division conducts research into technologies, particularly airborne electromagnetic methods, used in the search for ore deposits in the Australian regolith through this CRC.

- ***Cooperative Research Centre for Landscape Evolution and Mineral Exploration (CRCLEME)*** This is a joint venture between CSIRO Exploration and Mining, the Australian National University, the University of Canberra and AGSO.

Through this CRC, the Division conducts research into the three-dimensional evolution of the Australian landscape.

- ***Australian Centre for Geomechanics (AGC)*** This is a joint venture between CSIRO Exploration and Mining, the University of Western Australia, the Western Australian School of Mines and the Department of Minerals and Energy of Western Australia.

The Division conducts selected research into mining geomechanics.

## **THE NEED**

### **A national centre to increase research**

33. The oil, gas and mining industries are the mainstays of the Western Australian economy, with oil and gas production expected to be one of the State's top growth areas in the next ten years. Discussions between CSIRO and the Western Australian Government have identified the need for a strong CSIRO presence in Western Australia to increase substantially the State's research capability and its capacity to support the sustained development of resource industries.

34. To achieve this objective, the State and the CSIRO entered into an agreement, in 1997, to establish the National Centre for Petroleum and Mineral Resources Research in Perth. The Centre will provide the opportunity to bring together world class scientific and engineering groups to work closely with the petroleum and minerals industries.

35. The parties to this initiative agreed that collaborative research will embrace a wide range of activities aimed at not only providing solutions to current industry issues but also at providing the research leadership necessary to address the key research needs and issues of these industries now and in the decades ahead.

36. The concentration of capability and expertise at the Centre will also provide a major incentive for leading edge companies and organisations to locate their operations in Western Australia, further enhancing the prospects for research collaboration and technology transfer and the delivery of innovative research solutions, services and products to the petroleum and minerals industries.

## Research focus

37. The Centre's research focus will initially be on activities associated with:

- Petroleum Exploration
  - petroleum generation
  - petroleum migration and reservoirs
  - petrophysics
- Drilling
  - drilling systems
  - drilling fluids and disposal of drilling wastes
  - prediction of pore pressure and seismic geophysics
  - cement injection systems
  - well productivity
- Mineral Exploration
  - ore deposit processes
  - landscape evolution
  - geodynamics and geological modelling
  - airborne geophysics
  - advanced computing and image processing and three dimensional visualisation
- Mining
  - mine systems engineering and drilling
  - advanced computing and image processing and three dimensional visualisation
  - optimisation of bulk handling systems
  - mine site design and rehabilitation

38. CSIRO advised the Committee that in the longer term, this range of activities may be expected to change in response to industry requirements and may also expand into other areas of research in consultation with the State and industry.

### **Economic benefits from the Centre**

39. The Committee was advised that independent economic and financial analysis, undertaken in 1994, demonstrated that the returns to the community and resource companies from investment in research and technology transfer can be significant and are highly influential in the creation of new investment and employment opportunities.

40. The analysis, which was based on the creation of 170 jobs (now 90), indicated that the likely benefits from establishing the Centre would apply at both the State and National level. The benefits were identified as follows:

- \$17.5 million would be injected into the State's economy annually at the Centre;
- over a 10 year period the State would expect to receive a total of \$12 million from increased tax receipts;
- for every innovation produced by the Centre which increases productivity or reduces average production costs by 1 per cent, gross annual research benefits would amount to \$83 million. These national gains would have a present value of \$560 million over 10 years based on commencement immediately. If the productivity gain is assumed to commence in five years time after the Centre commences, the gain has a present value of \$396 million for 10 years;
- the rate of return to research is approximately three to five times the present value of the costs associated with setting up and operating the Centre over 10 years, which is estimated at \$127 million; and
- a one per cent increase in production attributable to the Centre's research programs would generate additional royalties with a net present value of \$12.6 million over 10 years. A five per cent increase in production would generate royalties with a present value of \$62.81 million over the 10 years.

41. The WA Government advised the Committee that it expects the benefits identified in the economic impact study, prepared to assess the benefit of the Centre to the State, will be exceeded.

42. Two areas of CSIRO minerals research were described to the Committee by CSIRO in the following terms:

*...the work that will go on in this laboratory will concentrate around those two areas that have a really high impact on mineral exploration; that is, trying to understand why very large ore bodies like Broken Hill or Mount Isa or Chuquicamata in Chile or the Witwatersrand in South Africa are where they are and how one would then go about trying to find one of those deposits somewhere in Australia. That is one aspect of the work.*

*A second aspect...is cutting the time to actually discover and outline where an ore body is, once you have decided you are in the right patch of ground. That involves things like not only our very successful regolith chemistry group but also a lot of airborne geophysics, and some of that airborne physics will start to be developed in this laboratory..<sup>1</sup>.*

43. The objectives and benefits of petroleum research were described to the Committee by CSIRO in the following terms:

*The particular areas that we are addressing are the areas of risk that can be addressed through technology. Environment is one where we are collaborating with Baroid, one of the major providers of drilling fluids, to produce a water-based, environmentally safe drilling fluid... A feature of the oil industry is that it is, in general, very unsuccessful at finding oil. It puts a lot of holes down. They are expensive. In the North West Shelf-Timor Sea region, they cost anywhere between \$5 million and \$20 million. One of the technologies we have recently developed looks at very minute shows of oil and analyses them. From data that the Australian Geological Survey produces, we now realise we could reduce the discovery rate in the Timor Sea, which has been about one in 25, to about one in three, and there is a significant cost saving there<sup>2</sup>.*

## **Staff**

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<sup>1</sup> Minutes of Evidence, public hearing 26 August 1998, p. 56

<sup>2</sup> *Ibid*, p. 57

44. Under the terms of the agreement with the State Government, CSIRO will increase its research effort in Western Australia by 90 staff. This expansion will be achieved either by the transfer of existing CSIRO staff from Melbourne and Sydney or through the recruitment of new staff locally, from interstate and overseas as required. Assistance with recruitment and appointment costs will be provided as part of the financial arrangements under the agreement with the State.

45. Approximately 130 existing staff will also be relocated from existing CSIRO accommodation at Floreat Park and leased accommodation at Nedlands. This transfer will allow CSIRO to continue with the ongoing program of rationalisation of accommodation in WA by vacating leased premises at Nedlands. It will also provide opportunities for the further consolidation and expansion of CSIRO agricultural research activities at Floreat Park.

46. CSIRO expects that the Centre will further increase in size as industry endorses the relevance of the research activities and recognises the value of its effort to the petroleum and mineral industries.

### **Benefits of co-location**

47. CSIRO advised the Committee that the proposal to locate CSIRO Petroleum and CSIRO Exploration and Mining at one location represents a coordinated approach to maximise the Organisation's research effort in support of both oil and mining industry sectors. Establishment of the Centre would facilitate research collaboration between the two divisions in areas such as:

- exploration concept modelling;
- geophysical data processing and visualisation;
- isotope studies; and
- drilling technologies.

48. CSIRO believes integration of the two divisions will deliver significant cost savings in research support costs by avoiding unnecessary duplication of effort. This integration, CSIRO advised, has the potential to save \$750,000 annually in research support costs.

### **Curtin University of Technology**

49. The Committee was advised by the Deputy Vice Chancellor of Curtin University that a long and strong collaboration has been established with the CSIRO. Relationships encompass CRCs as well as individual research project arrangements. The driving forces behind this successful interaction are the need

to achieve a world competitive capability in minerals and exploration research which the University would not be able to achieve by itself.

50. CSIRO and Curtin University of Technology are establishing heads of agreement to collocate the University's Department of Exploration Geophysics with the new CSIRO complex.

51. The purpose of this close association is to strengthen joint participation in research. CSIRO believes that the Department of Exploration Geophysics has acknowledged skills which are complementary to those in the CSIRO Divisions.

52. CSIRO envisages that close collaboration will be facilitated by having integrated research facilities and laboratories, offices, library, auditorium and meeting rooms. The day-to-day interaction between CSIRO staff, university staff, postgraduate students and visiting researchers has a proven record of generating ideas and creative solutions.

53. CSIRO advised the Committee that there will be opportunities for collaborative research projects involving both CSIRO divisions and Curtin University of Technology in the area of geophysical interpretation and representation. This research effort will be considerably enhanced by the sharing of specialised computing equipment and the establishment of a High Performance Computing and Communications (HPCC) facility in close proximity to the site proposed for the Centre at Technology Park, Bentley. A proposal is currently before the Western Australian Government to secure the additional financial support required for the HPCC facility. The Committee was advised that the State has already committed \$1 million towards the establishment of the facility.

54. Curtin University of Technology will provide the capital funding necessary to effect the relocation of its Department of Exploration Geophysics to the Centre.

## **State Government**

55. The WA Government advised the Committee that the Centre will provide significant benefits to the State by research and development directly related to the petroleum and minerals industries. These industries, which now underpin the WA economy, are expected to achieve gains in productivity resulting from new technology developed through the Centre. These productivity gains, in turn, are expected by the WA Government to result in an increased level of resource development as well as stimulating growth in other areas such as the manufacturing sector.

## **Support from DEETYA**

56. The then Commonwealth Department of Employment, Education and Youth Affairs (DEETYA) advised the Committee of strong support for the proposed Centre which will have a number of positive elements in relation to national objectives. These are:

- collaboration: one of DEETYA's key policy objectives is the improvement of linkages between universities, industries and other research organisations to produce industry-relevant research and research training opportunities. DEETYA believes the Centre will promote this objective;
- development of industries: DEETYA believes the Centre will provide the opportunity to bring together world class scientific and engineering groups to work closely with the petroleum and minerals industries;
- economies of scale: the Centre will provide opportunities for the use of research infrastructure; and
- research training: the type of industry relevant and collaborative research training environment which is envisaged was recommended by the Minerals Council of Australia in 1998.

## **Consultations**

57. A list of authorities and departments which were consulted or contacted about the Centre is at APPENDIX B.



## **Committee's Conclusions**

**58. CSIRO, or its predecessor organisations, has had a presence in Western Australia spanning more than 80 years and employs more than 400 staff at six locations.**

**59. The mining, oil and gas industries are the mainstay of the Western Australian economy.**

**60. Both the CSIRO Division of Exploration and Mining and the Division of Petroleum Research have established research teams and formed alliances with other research and development partners to undertake projects associated with mining, oil and gas industries in Western Australia and nationally.**

**61. CSIRO and the Western Australian Government have identified the need to increase substantially the State's research capability to support the sustained development of resource industries in an era of heightened international competitiveness.**

**62. CSIRO and the Western Australian Government entered into an agreement in 1997 to establish a National Centre for Petroleum and Mineral Resources Research in Perth.**

**63. Independent economic and financial analysis has demonstrated that returns to the community and resource companies from investment in research and technology transfer can be significant and are highly influential in the creation of new investment and employment.**

**64. Collocation of the Division of Exploration and Mining and the Division of Petroleum Resources will deliver cost savings and will maximise research effort in support of both oil and mining industry sectors.**

## **THE PROPOSAL**

### **Overview**

**65. The new complex of approximately of 14,700 square metres gross floor area will comprise a number of connected wings with distinct generic functions. A connecting gallery will provide access to the various functional facilities as well as giving a display and an insight into the activities of CSIRO to the visiting public.**

**66. All areas of the complex will be capable of future expansion.**

67. The road system will separate the various movements of visitor, staff and heavy service vehicles, and provide safe movement throughout the site for vehicles and pedestrians.

### **Design and construction standards**

68. Design of the facilities will be consistent with the general design philosophy for all CSIRO research accommodation, namely:

- long term flexibility—multiple use of space;
- adaptability—easy conversion of layout and simple reservicing; and
- simplicity of maintenance—with easily accessible services.

69. All buildings, services and external infrastructure will comply with relevant town planning, Commonwealth and State building, health and safety regulations, the Building Code of Australia and all relevant Australian Standards.

### **Design**

70. The generic functional entities have been formed into three elements:

- research facilities and laboratories—6,500 square metres;
- process bays, support facilities and stores—5,200 square metres; and
- public facilities—3,000 square metres, incorporating the foyer and reception area, auditorium, library, canteen, administration and management.

### **Research facilities and laboratories**

71. The research facilities will comprise computer oriented work areas of an office nature for research scientists and technicians. The laboratory facilities will be of two distinct types:

- wet chemistry laboratories and support rooms requiring some fume extraction cupboards and reticulated services for use by research scientists and technicians; and
- dry laboratories for precision microscopy work requiring vibration and natural light control such as the electronic, X-ray and electron beam facilities.

72. Where these are functionally dependent they will be grouped together in one wing flanking a central staff access area.

73. These facilities will be located on the northern portion of the site with secured key-card access.

74. The central staff access area will be a linear open space extending over three levels with open balcony walkways, bridge links and large overhead glazing, creating both a functional and efficient building envelope and an open interactive working environment.

75. Both the research facilities and laboratories can be easily expanded to the west with minimal disruption.

### **Process bays, support facilities and stores**

76. The process bays will be industrial-type buildings which will vary in height and include technical equipment and drilling test bays. The support facilities, closely associated with the process bays, will be accommodated in industrial-type structures containing laboratories, offices, workshops and sample preparation areas.

77. Stores will also be of an industrial nature and located adjacent to the process bays and support facilities.

78. Due to the steepness of the site, the process bays, support facilities and stores and the associated vehicle hardstand area will be located on the southern portion of the site for ease of access, at approximately 4.5 metres below the entry foyer.

79. This difference in level will enable the stores and some support facilities, plant rooms, and service access corridors to be located directly below the entry foyer. This will allow more room and greater efficiency on the site for expansion of the process bays to the west.

### **Public facilities**

80. The feature that will connect and integrate the Centre's generic functional groups into a systematic and cohesive working environment will be a connecting gallery. It will extend from the south east corner of the site (fronting

Kent Street and accessed by the public and staff from Perry Drive) to the north east corner of the site (fronting Kent Street and accessed by staff from the northern carpark).

81. The connecting gallery will be the heart of the Centre from where movement and access to all areas will be generated. Movement through the gallery will foster a high degree of interaction with staff and between various user groups.

82. The gallery space will be one of varying levels and outlook, with natural reflected light provided from overhead glazing. The central gallery will heighten awareness of the functional areas. CSIRO believes the need for interaction amongst all staff is reflected into the design.

83. A combination of stairs, ramps and lifts will provide vertical access to upper and lower areas of the Centre, linking the research facilities and laboratories, administration and management areas on the upper levels and process bays, stores and support facilities on the lower levels.

84. All public oriented facilities such as the foyer, reception, auditorium, library, canteen, administration and management will be directly accessible from the connecting gallery. The auditorium will be suspended above ground. This feature was prompted by architectural considerations as well as the need to have internally stepped seating. CSIRO acknowledged that this feature would attract cost penalties which would not be applicable in a more conventional design.

85. The gallery space will also have the potential to display high profile research equipment and projects for public and commercial interests.

### **Materials and finishes**

86. The research facilities, laboratories, offices, administration and management areas will be reinforced concrete and steel framed construction with reinforced concrete floors.

87. Roof decking will be Colorbond metal and external walls will comprise clear glass and rendered concrete. Floor finishes will be vinyl to laboratories and carpet to offices.

88. The process bays and support facilities will be conventional portal steel framed structures with Colorbond metal deck roofs and walls. Floors to the process bays will generally be monolithic concrete finish with vinyl floor finishes to the support areas.

### **Child-care provisions**

89. A child care centre is located in the existing Technology Park Precinct. This Centre has been set up privately to provide child-care services to Park residents and has a current capacity of 38 places. It is expected that this will be

expanded to 64 places in the near future. These facilities will be available to CSIRO staff.

### **Disabled access**

90. Initial advice from CSIRO was that access for disabled persons will meet the requirements of the Building Code of Australia and relevant Australian Standards. Disabled access will be provided via lifts and ramps strategically located within the Centre.

### **WA Disability Services Commission**

91. Following an examination of the CSIRO submission to the Committee, the WA Disability Services Commission (DSC) recommended that access should be provided to ensure staff and visitors, with or without disabilities, are able to participate in all aspects of the Centre's functions. The DSC supported the technical requirements of the BCA and associated Standards, which are regarded as minimum requirements and are limited to a basic level of access. For these reasons, the DSC would prefer the CSIRO to use recommended standards which provide an enhanced level of access.

92. In response, CSIRO reiterated design principles to be adopted to comply with the *Commonwealth Disability Discrimination Act 1992* (the Act). Accordingly, all aspects of Code requirements, including the design of lifts, ramps and disabled toilet facilities will be addressed. CSIRO also advised that the BCA is currently under review by the Australian Building Code Board to ensure alignment with the Act.

93. Project consultants discussed access matters with ACROD and the Independent Living Centre. In addition, the consultants reviewed various relevant documents and advisory notes. CSIRO will also engage a specialist disability access consultant to review the design and provide expert advice of additional requirements.

## **Occupational health and safety**

94. CSIRO already pursues an active occupational health and safety policy within the workplace and this will be extended to include the new Centre. Strict compliance with the requirements of the Workplace Health and Safety Act will be adhered to in all construction work.

## **Local impact**

95. The proposed complex will have a positive effect on the local economy as follows:

- during the construction period, construction and associated industries will benefit with up to 200 persons working on the project at any one time;
- post construction benefits will result from the research and development opportunities generated; and
- the completed facility will employ an additional 90 persons.

## **Construction details**

96. Further construction details are at APPENDIX B.

## **Committee's Conclusion**

**97. The extent of the proposed work can be justified as providing modern facilities designed to enable CSIRO Divisions and alliance partners to undertake research into minerals and petroleum research at increased levels and will overcome current unsatisfactory conditions.**

## **SITE**

### **Perth location**

98. CSIRO advised the Committee that Perth is the most suitable locality for the Centre because it is at the centre of activities in minerals exploration and mining in Australia. Perth has the largest concentration of activities associated with petroleum exploration and development. CSIRO recognised these factors and undertook an examination of possible sites in Perth at which to locate petroleum and minerals research. This examination included a study into the suitability of Floreat park which revealed that there is little room for expansion to provide for the scope of facilities envisaged for the Centre. In the end,

therefore, CSIRO believed that the location of the Centre on a suitable site at Bentley offered a superior outcome based on the scope for close collaboration and contact with high technology research and development groups already in existence there.

99. The Centre complex will be located in the new western precinct of Technology Park in Bentley approximately 6 kilometres from the centre of Perth. The Technology Park includes a number of high technology research and development companies in industry sectors of relevance to the Centre. The WA Government advised the Committee that Technology Park is expected to continue to expand, with expressions of interest for development sites expected from international and national technology companies.

### **Description**

100. The site, which is irregular in shape, is bounded by a major arterial road, Kent Street, and by December 1998 will be served by new public roads to the north and south which form a part of separate development works funded by the State to extend Technology Park.

101. The site is bounded by future Technology Park occupancies, the adjacent Western Australian Bush Fires Board and the State Government Departments of Agriculture (Agriculture WA) and Conservation and Land Management (CALM) respectively to the north and south.

102. The site occupies approximately 4.3 hectares and falls approximately 18 metres from north to south. The site and the surrounding areas were part of a former pine plantation and consequently there are numerous mature pine trees scattered throughout the site.

103. The Western Australian Police Department advised the CSIRO that the site was used before the Second World War as a military and civilian rifle range. There is no information to suggest that the site might be polluted with unexploded ordnance.

### **Geotechnical**

104. CSIRO advised the Committee that a geotechnical investigation confirmed the geological information previously obtained from survey maps of Perth. The soil profile comprises sand with moderate to high bearing capacity, high permeability and low shrink/swell potential. Site investigation test results also indicated that the sub-surface material is consistent throughout the site.

105. Ground water was not encountered in any of the test probes nor in test pits. Geological survey data suggests that the water table occurs approximately 15 metres below the lowest surface level of the site. Conventional pad and strip footings are considered to be a suitable type of foundation for the buildings proposed for the Centre.

### **Site planning**

106. A number of alternative site planning studies were carried out to develop a Master Plan for development on the site. These studies included the following issues:

- generic functional and performance groups;
- orientation and environmental conditions;
- site slope and height restrictions;
- access for the public, staff and for service vehicles;
- future expansion;
- carparking;
- landscaping; and
- presence, identity and imagery.

107. A preferred site development option, developed through value management workshops and review, resulted in a Master Plan which CSIRO believes would provide a basis for all future expansion and development on the site.

### **Development constraints overcome**

108. CSIRO advised that some development constraints imposed by the City of South Perth will be overcome by the location of various elements of the proposed complex. The maximum building height of Relative Level 30.5 metres is determined at the highest point on the site. However, the taller buildings, the process and technical bays can be accommodated on the lower parts of the site without exceeding building height limitations.



## **Master Plan**

109. CSIRO advised that the key features of the Master Plan include:

- location of buildings on the site to enable easy future expansion to the west;
- visual prominence of the main entry from Kent Street;
- public and community orientated facilities (auditorium, reception facilities) at the lower, southern site frontage;
- exposure to Kent Street and outlook over Technology Park;
- secure research facilities and laboratories located on the northern portion of the site;
- process bays, support facilities and stores located on the southern portion of the site surrounding a large hardstand/turnaround area, accessible at grade for loading/unloading by large vehicles;
- two major carparks on the site—one on the south frontage for visitors, staff and those using the auditorium, the other to the north, providing direct access for staff to the research facilities and laboratories;
- separation of heavy vehicle movement from staff/visitor vehicles;
- desirable orientation of the majority of buildings such that the major longitudinal axes run east to west;
- management of the natural site slope to provide easy access for the disabled and for heavy vehicles; and
- satisfaction of local authority constraints of building height, setbacks, landscaping and provision of carparking.

110. The current proposal for the Centre is consistent with the Master Plan.

## **Expansion**

111. The current proposal forms the first stage of development of the site. CSIRO has continued to expand its research effort in petroleum since agreement was reached with the Western Australian Government to establish the Centre. CSIRO anticipates, therefore, that significant levels of additional resources will

be provided in the future to expand the planned research focus at the Centre. Staff levels may increase by as much 100 per cent, necessitating the construction of additional accommodation.

112. CSIRO assured the Committee that the Master Plan allows for expansion of all the research facilities and laboratories by 115 per cent, process bays, and stores by 25 per cent and support facilities by 30 per cent.

### **Committee's Conclusions**

**113. The proposed site, adjacent to Curtin University of Technology and within Technology Park, Bentley will provide the capability to foster collaborative research between the university and private sector research and development organisations.**

**114. A Master Plan for the site makes provision for further expansion of facilities and staff.**

## **ENVIRONMENT AND HERITAGE**

### **State authorities**

115. CSIRO advised the Committee that formal consultations with the WA Department of Environmental Protection (DEP) were held. Following advertisements for public submissions, DEP determined that the proposal not be subject to a formal environmental impact assessment given that there are already controls available under other approval processes which include licencing of discharge to sewers, groundwater discharges and noise and dust emissions during construction.

### **Commonwealth assessment authorities**

116. The Committee was advised by Environment Australia that a number of issues required clarification by CSIRO. There was a need to:

- determine if there are any Native Title claims relative to the site;
- liaise with the WA Aboriginal Affairs Department; and
- investigate the absence or likely presence of threatened species on the site.

117. Environment Australia also noted that the proposed location was used as a military and civilian rifle range before the Second World War. The land in question has not been nominated or entered in the Register of the National

Estate. The Australian Heritage Commission accordingly considered that the proposal is unlikely to have an adverse effect on the National Estate.

### **Native Title claims and liaison with State authorities**

118. CSIRO advised the Committee that the 4.3 hectare site will be leased from the State Government which, through the WA Department of Commerce and Trade, advised the CSIRO that there are no Native Title claims for the site.

119. CSIRO also advised the Committee that following a request by CSIRO and its consultants, the WA Aboriginal Affairs Department conducted a search of its register and advised that there are no listed Aboriginal sites known to the Department within the area of land. The WA Aboriginal Affairs Department also recommended to CSIRO that suitably qualified consultants be engaged prior to any proposed development activity to conduct ethnographic and archaeological surveys of the area. It is believed, by the Department, that this course of action will ensure that all Aboriginal interests are consulted so that any sites on the land are avoided or identified. CSIRO advised the Committee that it will pursue this matter further.

### **Threatened species**

120. CSIRO advised the Committee that the identification and extent of native species or threatened fauna on the site was investigated in the context of the entire proposed western precinct of Technology Park of which the proposed CSIRO Centre forms part. Findings from a report prepared by consultants engaged by the WA Department of Commerce and Trade indicated that:

*there are no unusual vegetation associations present and the habitat, having a very high level of disturbance and long history of pine cultivation on the site, suggests that the likelihood of significant species being present is low.*<sup>3</sup>

121. In addition, the WA Department of Conservation and Land Management (CALM) was also consulted by CSIRO. CALM advised the CSIRO that a search of threatened fauna databases was undertaken in respect of the site. This revealed that Carnabys Cockatoo, which is a 'rare or likely to become extinct' species, occurs on the site between December to March each year. CALM advised that this cockatoo does not breed in the area, but feeds on pine cones. The pine trees at the site provide a significant food source although CALM noted that the trees are not the only source of food in the immediate area. CSIRO responded by confirming a commitment to retain the pine trees as far as

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<sup>3</sup> *Ibid*, p. 87

is practicable. Landscaping principles will aim to plant new pine trees to replace some of those removed.

122. CALM also conducted a search of the Declared Rare Flora database which indicated that there are no declared rare flora on the site.

### **WA Heritage Council—pine plantation**

123. The WA Heritage Council advised the Committee that contact with the City of South Perth led to the identification of remnants of the Collier Pine Plantation, dating from 1928. The Heritage Council recommended that CSIRO liaise with the Council about retention of the trees.

124. CSIRO advised the Committee, in response, that the WA Heritage Council was consulted by the design team in the early stages of planning of the Centre. Advice received by CSIRO from the Council indicated that there is no Heritage Agreement in place and no Conservation Order had been issued for the site. In addition, CSIRO was advised by the Heritage Council, the property is not included in the Register of Heritage Places and is not listed with the National Trust or with the Australian Heritage Commission.

125. CSIRO also advised the Committee of its understanding that the Council of the City of South Perth does not have a formal policy relating to the retention of pine trees for the site. However, based on discussions with the Council, CSIRO expects that the Council would encourage the retention of as many trees as possible and the planting of new trees of the same species as part of any landscaping.

126. Again, the CSIRO reiterated the stance to be adopted to retain as many existing trees as practicable and to replace some of those removed.

### **Unexploded Ordnance**

127. CSIRO advised the Committee that design consultants for the Centre received advice from the WA Police that its Unexploded Ordnance (UXO) Unit, which holds all State records relating to such matters, ‘has no information which would even remotely suggest that the area concerned might be polluted with unexploded ordnance.’ The WA Police further advised that:

*...whilst it is known that elements of Australia’s Defence Forces have, in past eras, used such range facilities to undertake training using weapons systems which have the inherent capacity to produce unexploded ordnance, the State holds no records of such having been the case at the site in question. In such circumstances, it is possible, however, that*

*unexpended rifle rounds (i.e. bullets) may have been abandoned on the site during its use as a rifle range. It is generally accepted that individual bullets in such circumstances are not considered to be unexploded ordnance. However, if bulk ammunition of this type has been cached and buried, the situation becomes different. It is not envisaged that this latter situation will be identified on the site in question.*<sup>4</sup>

128. As a precaution, nevertheless, CSIRO advised the Committee that contract documents for the Centre will specify procedures, recommended by the WA Police, which should be followed should the remote possibility of UXO being discovered during construction.

### **Construction and operational impacts**

129. A separate environmental review by the State for the new Technology Park Western Precinct which encompasses the CSIRO site, confirmed that the major issues relating to construction of the Centre are capable of being addressed as follows:

- Site development issues
  - community impacts: site works will take into account the proximity of premises to ensure noise and dust emissions are maintained within acceptable levels;
  - dust: off-site dust emissions will be managed through such actions as minimising clearing, mulching and use of water sprays;
  - soil management: suitable site topsoil will be reclaimed, stockpiled and, following construction, used in rehabilitation;
  - flora and fauna: the development will retain as many pine trees as is practicable and recover any suitable native plants on the site for rehabilitation; and
  - dieback: WA Conservation and Land Management “dieback” disease procedures will be applied. Soils imported to the site will be obtained from a “dieback” disease free source.

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<sup>4</sup> *Ibid*, p. 86

- Ongoing operations
  - gaseous emissions: installation of fume cupboards will minimise any unacceptable gaseous emissions;
  - laboratory liquid and soil wastes: liquid wastes will be diluted, further treated as necessary prior to discharge to sewer, all to the requirements of the Water Corporation of Western Australia. Solids, grease and oils will be collected in interceptor traps and periodically removed by a licensed contractor to an approved disposal site; and
  - external water management: waste wash-down water will be discharged to settling pits and then to the sewerage system, all to the requirements of the WAWC. Stormwater from roofs, pavements and uncovered areas will be discharged into soakwells.
  
- Noise
  - environmental noise emission from the site for both the construction period and occupancy of the building will be controlled to meet the requirements of the Western Australian Environmental Protection (Noise) Regulations 1997.
  
- Hazardous chemicals and materials management
  - the supplier of chemicals will make application for the purchase of any Schedule 6 and 7 chemicals;
  - storage of dangerous goods, chemicals and gases will be in accordance with the respective Codes for each; and
  - where required by the Controlling Authority, the appropriate licence will be obtained for their storage.

## **Adjacent landholders**

130. CSIRO advised that consultations had taken place with CALM to ensure that safe access is maintained to their site. The WA Bushfire Board, also adjacent to the site, will not be affected by construction activity.

## **COST AND TIMETABLE**

### **Cost**

131. The estimate for this proposal is \$31.8 million at May 1998 prices, inclusive of escalation costs, contingencies, all professional fees and authority charges. The estimate does not include the cost of relocating staff and equipment from other existing CSIRO sites or the cost of facilities for any collocation for the Curtin University of Technology Department of Exploration Geophysics.

132. The WA Government has agreed to provide \$34.864 million to the CSIRO to assist in the establishment of the Centre. In addition, the State will provide funding for associated site works as part of an overall land expansion program for Technology Park.

### **Implications of cost reduction**

133. The Committee questioned CSIRO about the extent to which operation of the Centre would be compromised if the construction costs were, for example, reduced to \$25 million. CSIRO advised that if the cost estimate were reduced, it would not be possible to construct the extent of the facilities required. The extent of the proposed work encompasses a complex of 14,700 square metres. The cost estimate was developed on the basis of requirements. A reduction in the budget would therefore reduce the scope of the complex and consequently reduce the extent of research activities carried out.

### **Confidence of cost estimate**

134. CSIRO advised that all CSIRO buildings are designed to achieve maximum efficiency and value for money. CSIRO believes that the cost estimate will provide the complex as designed. Cost estimates were benchmarked against other comparable facilities and this exercise revealed a favourable comparison.

### **Project delivery**

135. The project will be delivered by a traditional lump sum contract. CSIRO will be seeking competitive tenders and is committed to ensure that the main contract will, at the very least, be a company which operates in WA. With the work being carried out in Perth, CSIRO believes it would not be attractive for

subcontractors from other States to tender for the work. Therefore, it is believed that local subcontractors will be used for all trades work on the project, unless specialist skills, not available locally, are required.

### **Timetable**

136. It is expected that construction will be over a 16 month period. Subject to a favourable report from the Public Works Committee and Parliamentary Approval, it is planned to commenced construction in April 1999 with completion and occupancy in late 2000.

### **Committee's Recommendation**

**137. The Committee recommends the construction of the proposed CSIRO National Centre for Petroleum and Mineral Research, Bentley, WA, at an estimated out turn cost of \$31.8 million.**

## **CONCLUSIONS AND RECOMMENDATIONS**

138. The Committee's conclusions and recommendations and the paragraphs in the report in which they occur are set out below.

- 1. CSIRO, or its predecessor organisations, has had a presence in Western Australia spanning more than 80 years and employs more than 400 staff at six locations. (Paragraph 58)**
- 2. The mining, oil and gas industries are the mainstay of the Western Australian economy. (Paragraph 59)**
- 3. Both the CSIRO Division of Exploration and Mining and the Division of Petroleum Research have established research teams and formed alliances with other research and development partners to undertake projects associated with mining, oil and gas industries in Western Australia and nationally. (Paragraph 60)**
- 4. CSIRO and the Western Australian Government have identified the need to increase substantially the State's research capability to support the sustained development of resource industries in an era of heightened international competitiveness. (Paragraph 61)**
- 5. CSIRO and the Western Australian Government entered into an agreement in 1997 to establish a National Centre for Petroleum and Mineral Resources Research in Perth. (Paragraph 62)**
- 6. Independent economic and financial analysis has demonstrated that returns to the community and resource companies from investment in**



research and technology transfer can be significant and are highly influential in the creation of new investment and employment. (Paragraph 63)

7. Collocation of the Division of Exploration and Mining and the Division of Petroleum Resources will deliver cost savings and will maximise research effort in support of both oil and mining industry sectors. (Paragraph 64)

8. The extent of the proposed work can be justified as providing modern facilities designed to enable CSIRO Divisions and alliance partners to undertake research into minerals and petroleum research at increased levels and will overcome current unsatisfactory conditions. (Paragraph 97)

9. The proposed site, adjacent to Curtin University of Technology and within Technology Park, Bentley will provide the capability to foster collaborative research between the university and private sector research and development organisations. (Paragraph 113)

10. A Master Plan for the site makes provision for further expansion of facilities and staff. (Paragraph 114)

11. The Committee recommends the construction of the proposed CSIRO National Centre for Petroleum and Mineral Research, Bentley, WA, at an estimated out turn cost of \$31.8 million. (Paragraph 137)

Judi Moylan MP

Chair

11 February 1999

## APPENDIX A

### WITNESSES

**BOSCI**, Mr Peter John, Business Manager, CSIRO Division of Petroleum Resources, Riverside Corporate Park, Delhi Road, North Ryde, NSW

**CHRISTOU**, Mr Peter Nicholas, Director, Christou Casella and Jee Architects Pty Ltd, 610 Murray Street, West Perth, WA

**HAMILTON**, Dr Patrick Joseph, Deputy Chief of Division, CSIRO Division of Petroleum Resources, Petroleum House, 3 Broadie Hall Drive, Technology Park, Bentley, WA

**HARVEY**, Dr Stephen, General Manager, Division of Exploration and Mining, CSIRO, Underwood Avenue, Floreat, WA

**HOBBS**, Dr Bruce Edward, Chief of Division, Division of Exploration and Mining, CSIRO, Underwood Avenue, Floreat, W

**MALE**, Mr Robert, Principal Development Engineer, Woodside Energy Ltd, 1 Adelaide Terrace, Perth, WA

**MARSHALL**, Mr Ross Edward, Executive Director, Infrastructure, Department of Commerce and Trade, 170 St George's Terrace, Perth, WA

**MOODY**, Mr Trevor Laurence, Assistant General Manager, CSIRO Corporate Property, PO Box 225, Dickson, ACT

**ROSSITER**, Professor Paul Lawrence, Deputy Vice-Chancellor, Research and Development, Curtin University of Technology, Kent Street, Bentley, WA

**BUILDING SYSTEMS AND SERVICES**

**MECHANICAL**

**Scope**

1. The mechanical services will comprise:

- airconditioning to research facilities and laboratories, offices, canteen, boardroom, administration and management, auditorium, specialist areas and general circulation space;
- mechanical ventilation systems for general plant, sanitary compartments, food preparation and other specialist areas;
- fume exhaust hoods and associated ducting and fan systems;
- bottled gas storage and reticulation of special gases;
- liquid nitrogen storage and reticulation of gaseous nitrogen;
- compressed air plant and reticulation;
- chilled process cooling water;
- refrigeration systems for constant temperature rooms, coolers and freezers; and
- vacuum plant and reticulation.

**Airconditioning**

2. The following criteria were addressed in assessing options for airconditioning systems:

- capital cost;
- operating cost;
- maintenance cost;
- system reliability;
- access for maintenance;

- noise generation;
- aesthetics;
- building works provisions; and
- facility for expansion.

3. The Centre will be serviced by the lowest life cycle cost systems to meet reliability, flexibility, environmental criteria and provision for expansion comprising the following:

- centralised air cooled chilled water system for cooling;
- gas fired boilers for heating systems;
- variable air volume air handling for the majority of areas; and
- independent plant for constant temperature facilities.

### **Air handling**

4. In order to minimise any opportunity for noxious discharges entering the airconditioning system air intakes, all major air handling unit systems will be located at low level. The majority of discharges will be released at roof level.

5. A variable volume system will be provided in the Laboratories with adjustable relief air to provide adequate make up when specialist exhausts or laboratory fume cupboards are operated. This will provide flexibility.

6. Variable supply systems will be provided for the research offices with sufficient outside air being provided to prevent infiltration of odours or air flows from adjacent laboratory areas.

7. All controls to airconditioning plants will allow individual after hours usage with metering for cost recovery and energy management purposes.

### **Ventilation**

8. Exhaust systems will serve toilets, kitchens, fume hoods and cupboards in laboratories and process bays.

### **Chilled and heating water distribution**

9. A centralised chilled and heating water plant will be provided for process cooling/heating and for the various airconditioning systems. Chilled and heating

water will be piped underground from the external central plant facility and reticulated within the building via service corridors.

### **Compressed air and vacuum systems**

10. Remote compressed air and vacuum plant will be provided to suit the diversified capacity of the development. Both will be piped and distributed in a similar manner to chilled and heating water.

### **Gas storage and distribution**

11. Bottle banks will be provided external to the laboratory wings and gases reticulated through the internal service corridors to nominated laboratories.

12. Back-up gas bottles will be stored on site in an isolated storage building.

13. A liquid nitrogen tank will be installed on site in accordance with relevant standards and gaseous nitrogen reticulated to nominated outlets.

## **ELECTRICAL**

### **Scope**

14. The electrical services will comprise:

- High Voltage power supply switchgear meter cubicle;
- 11kV reticulation to High Voltage substations;
- auxiliary power supply—generator backup and UPS;
- earthing;
- low voltage switchboards and distribution boards;
- light and power sub-circuit wiring;
- luminaires, including floodlighting;
- emergency and exit lighting;
- general purpose outlets;
- telecommunication block cabling;
- electronic and access control system;

- emergency warning intercommunication system with public address facility;
- voice and data wiring; and
- Building Management System (BMS).

## **Supply**

15. Power supply to the site will be 11kV from a Western Power zone substation.

16. Two High Voltage substations will be established on site. They will be located adjacent to major load centres. One substation will have a capacity of 2 MVA capacity and the other will have a 1 MVA capacity.

17. Master planning of the electrical distribution services from the substations will permit development of the site to its ultimate capacity.

## **Distribution**

18. Distribution from substations will be of low voltage to main switchboards located in each building. Power will be reticulated in each building from main switchboards to local distribution boards.

19. Radiation levels from electrical switchboards and cables will be minimised through selection of switchboard types and the location of cable routes. Shielding will be provided where required.

## **Auxiliary standby power**

20. An UPS will be provided to service areas or items of equipment requiring a no-break power supply.

21. An emergency generator set will be installed to power the UPS and service other essential equipment.

## **Lighting**

22. Lighting will be provided to building interiors in accordance with relevant Australian Standards.

23. In offices and research areas the lighting will be energy efficient, low brightness, fluorescent type. Control systems will be provided to minimise energy consumption. Technical and process bay lighting will comprise high bay luminaires. Use of natural lighting will be optimised for all areas. External lighting will be provided for both security and for after hours use.

24. Emergency lighting will be installed in accordance with Australian Standards and the Building Code of Australia (BCA).

### **Reticulation**

25. Power reticulation will be installed in accordance with Australian Standards.

26. Residual Current Detection devices will protect all general and special outlets in the technical and process bays and laboratory areas. Surge protectors and filters will be installed where necessary.

27. Electromagnetic shielding to achieve appropriate levels of shielding will be installed to specific areas as required.

### **Voice/data**

28. An integrated voice/data structured cabling system, with a main distribution frame, a PABX and communications rack will be provided.

29. Cabling systems will be provided in accordance with CSIRO and Australian Standards. Fibre optic data backbone cabling will form part of the structured cable system.

A micro wave link will be established between the complex and the Perth CBD.

### **Public address**

30. A public address system will be integrated with the building emergency warning and intercommunication system.

### **Security**

31. Nominated entrances will be provided with electronic access and with intruder detectors as required.

32. Intercoms will be provided to aid visitors contacting staff in secure areas after hours.

## **Building Management System**

33. A BMS will control and monitor the various engineering services systems and to optimise maintenance and energy costs. The BMS will have the capability to manage the following systems:

- internal and external lighting;
- airconditioning;
- compressed air/vacuum plant;
- gas bottle storage;
- tanks/pumps associated with hydraulic services;
- electrical load shedding;
- emergency generator set; and
- UPS.

## **HYDRAULIC**

### **Scope**

34. The hydraulic services will comprise:

- water supply and reticulation;
- sanitary plumbing and drainage;
- chemical and industrial waste plumbing and drainage;
- internal cold and hot water services;
- deionised water;
- natural gas services; and
- fire hydrant and hose reel services.



## **Standards and Regulations**

35. The hydraulic services will be designed and constructed in accordance with the following standards and regulations:

- BCA;
- National Plumbing Code;
- Australian Standards;
- Local authority regulations; and
- WCWA By-Laws and regulations.

## **Water supply**

36. The local water supply has sufficient pressure and capacity to adequately serve the new internal domestic and fire service ring mains. These will be sized and installed to provide for the current and anticipated future demand.

## **Sanitary plumbing and drainage**

37. Sanitary plumbing will be designed and installed to facilitate future modification and extension. Sewage will be collected into an integrated gravity sewerage system and discharged into the external WCWA main sewerage system.

## **Chemical wastes**

38. Chemical waste discharge will be collected into a separate integrated gravity system, discharging through appropriate dilution/neutralising treatment facilities prior to discharge to the sewer.

## **Industrial wastes**

39. All industrial waste will be collected through appropriately sized silt interceptor traps for settlement prior to the waste being discharged to sewer. The silt will be collected and disposed of by CSIRO.

## **Internal cold and hot water services**

40. Water supply branches to laboratories and dark rooms will be fitted with backflow prevention devices to prevent potential cross contamination of water supplies. Hot water will be generated by gas and electric storage units.

## **Deionised water**

41. Allowance has been made to generate, store and reticulate deionised water on the site. An investigation and analysis will be carried out to determine the feasibility of utilising a reliable bulk manufacturer and supplier rather than installing an on-site generation plant.

## **Gas services**

42. The local town gas supply has sufficient pressure and capacity to adequately serve the new internal ring main which will be sized and installed to provide for the current and anticipated demand on the site.

## **FIRE SERVICES**

### **Scope**

43. The fire services will comprise:

- fire hydrants, hose reels and extinguishers;
- wet pipe fire protection systems;
- a fire detection system;
- an emergency warning and intercommunication system;
- special gas protection to selected areas; and
- smoke control systems.

### **Fire protection**

44. An automatic wet pipe sprinkler system throughout all buildings will provide fire protection for the complex.

45. The complex will also be serviced with an external fire hydrant and internal fire hose reel system in accordance with the BCA. Portable fire extinguishers will also be provided at required locations.

### **Fire detection**

46. Alarms from detectors, sprinklers, break-glass alarms and smoke control systems in each of the buildings will be housed in the main fire indicator panel.

## **Smoke control**

47. Smoke detectors will be installed in the buildings to provide smoke control systems to air handling plant and to provide early warning to other sensitive equipment areas.

## **Emergency warning and intercommunication**

48. Evacuation speakers and sounders will be installed to warn occupants in the event of a fire alarm.

## **LIFTS**

49. Three lifts will be provided serving all building levels. The lifts will be hydraulic type with a 17 passenger/1156kg rating.

50. All lifts will be capable of evacuating stretcher borne personnel with the lift in the laboratory/research block fitted with a ceiling boot to accommodate long items.

51. The lifts will comply with the requirements of the lift code and the disabled persons code.

## **CIVIL ENGINEERING, SITEWORKS AND LANDSCAPING**

### **Internal service road**

52. The internal service road will be designed for access by semi-trailer vehicles with maximum gradient of 11 per cent in the northern, steeper portion of the site and near-flat gradients to serve loading and unloading areas.

### **Hard standing area**

53. The concrete hard standing area adjacent to the process bays, support facilities and stores will accommodate a full 180 degree turn by semi-trailers and will also permit semi-trailers to reverse into the facilities if required.

### **Carparking**

54. There will be two major carparks located on the southern and northern sides of the site. The 117 bay southern carpark will include 18 spaces for visitors with direct access to the public entry and auditorium.

55. In the northern carpark, the 136 bays will be directly accessible from the research wing by a covered walkway which will lead to a prominent staff entry on the northern end of the connecting gallery.

56. Disabled parking bays will be provided in both carparking areas.

### **Stormwater Drainage**

57. Stormwater from roofed and paved areas will be disposed on site via soakwells and interconnected sub-soil drains.

58. Overland flow routes will be provided along the internal service road to cater for the major event (100 year ARI) without inundation of the buildings.

### **Landscaping**

59. All external and unpaved areas will be landscaped in accordance with the requirements of the local authority and the Technology Park management.

60. The existing pine trees will be retained as far as is practicable.

## **ENERGY CONSERVATION AND MANAGEMENT**

### **Active and passive measures**

61. Passive energy conservation measures will be incorporated into the buildings and landscape design. Active measures will be incorporated in the design of mechanical, electrical and hydraulic services to reduce the usage of energy from conventional fossil fuels.

### **Conservation and management**

62. Energy conservation and management measures will include:

- building orientation on an east/west axis to maximise opportunity for solar control in summer and passive solar energy in winter;
- north facing windows screened to provide control of summer sun penetration;
- shading to the east/west windows of the connecting gallery to control solar heat gains;
- thermal insulation to reduce heating and cooling loads;
- significant daylight being incorporated into the design to minimise use of artificial lighting;
- BMS to operate, control and monitor engineering services;

- provision of economy cycles on all air handling plant;
- interconnection of exhaust and associated airconditioning systems to ensure outside air introduction is reduced when exhaust systems are not operating;
- variable volume air handling technology to allow total shut off of supply air to designated areas when not occupied;
- variable speed drives for all variable air volume air handling plant and secondary chilled water and heating water pumps;
- use of long life, low energy light fittings;
- adoption of measures to reduce water consumption. This will include water flow control tapware, dual flush cisterns and programmable boiling water units; and
- use of bore water for landscaped areas.

63. These initiatives and measures are consistent with a continuing commitment by CSIRO to reducing energy use through the adoption of better and more efficient energy management practices.

## **ACOUSTIC AND VIBRATION**

64. The design of the facility will ensure that the following conditions will be achieved:

- background noise levels within the various areas and areas requiring speech privacy will be designed to meet the requirements of Australian Standards;
- particular attention will be given to the control of noise and vibration in the process bays;
- maximising distance between vibration sources and vibration sensitive laboratories; and
- vibration control will be implemented at both source and receiver locations.

## CONSULTATIONS

65. The following authorities and Departments were contacted and/or consulted by CSIRO and its associates:

- Commonwealth Government:
  - Department of Industry, Science and Tourism
  - Department of Finance and Administrative Services
  - Department of Primary Industries and Energy
  - Department of the Environment
  - Department of the Prime Minister and Cabinet
  - Department of the Treasury
  - Attorney-General's Department
  - Department of Transport and Regional Development
  - Department of Workplace Relations and Small Business
  - Department of Employment, Education, Training and Youth Affairs
  - Department of Communication and the Arts
  - Department of Immigration and Multicultural Affairs
  - Department of Veterans' Affairs
  - Commonwealth Fire Board
- State and Local Government
  - Water and Rivers Commission
  - Fire and Rescue Service of WA
  - Water Corporation of Western Australia
  - Western Power
  - Department of Environmental Protection
  - Department of Commerce and Trade

- Department of Conservation and Land Management
- Heritage Council of Western Australia
- Agriculture Western Australia
- Department of Minerals and Energy
- Health Department of Western Australia
- Western Australian Police Unexploded Ordnance Unit
- Town of Victoria Park
- City of South Perth
- Federal, State and Local Members
  - The Hon Mr Phillip Pendell, MP
  - The Hon Dr Geoff Gallop, MLA
  - The Hon Mr Don Randall, MLA
- Union
  - CSIRO Division of Community Public Sector Union (CPSU)
- Other Authorities and Organisations
  - Telstra
  - Alinta Gas
  - WA Technology and Industry Advisory Council
  - Advanced Energy Systems
  - Swan Cottage Homes
  - Park Management, Technology Park, Bentley
  - South East Metropolitan College of TAFE
  - Curtin University of Technology

**APPENDIX C**

**PROJECT PLANS**

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