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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC
WORKS

(Subcommittee)

**Reference: Australian SKA Pathfinder Radio Telescope in Geraldton-Greenough
and in Murchison Shire, Western Australia**

WEDNESDAY, 1 OCTOBER 2008

GERALDTON

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**PARLIAMENTARY STANDING
COMMITTEE ON PUBLIC WORKS**

Wednesday, 1 October 2008

Members: Mr Butler (*Chair*), Senator Troeth (*Deputy Chair*), Senators Mark Bishop and Forshaw and Mr Champion, Mr Forrest, Mr Lindsay, Mr Price and Mr Slipper

Members in attendance: Senator Troeth, Mr Lindsay and Mr Slipper

Terms of reference for the inquiry:

To inquire into and report on:

Australian SKA Pathfinder Radio Telescope in Geraldton-Greenough and in Murchison Shire, Western Australia

WITNESSES

BOYLE, Dr Brian, Business Unit Leader, Australia Telescope National Facility, CSIRO..... 2

DeBOER, Dr David, Research Scientist, Australia Telescope National Facility, CSIRO 2

FRANZ, Ms Jo-Anne Frances, Director, Native Title Management, Office of Native Title 20

MIKULIC, Mr Antony, Manager, Capital Works and Sustainable Environment, Property Services, CSIRO 2

ROBINS, Mr Bruce, Team Leader, Radio Astronomy, Department of Industry and Resources, Western Australia 20

STAVELEY-SMITH, Professor Lister, Representative, Astronomy Australia Ltd..... 27

STEVENS, Mr Ross, Manager, Property Resources, Property Services, CSIRO 2

STOREY, Dr Michelle, Policy Strategist, Australia Telescope National Facility, CSIRO..... 2

ZELINSKY, Dr Alex, Group Executive, Information and Communication Sciences and Technology, CSIRO 2

Subcommittee met at 9.57 am

ACTING CHAIR (Senator Troeth)—I would like to call a representative of the local people who I understand is going to welcome us to country.

Clarence Cameron—For those who do not know me, I am Clarrie Cameron. I am a descendant of the Naaguja people from Champion Bay. My grandmother was a Champion Bay blackfella and I am here to give you welcome to country, and I just wish you all success. Thank you very much for coming and I hope you'll be looked after.

ACTING CHAIR—Before we start official proceedings I acknowledge the traditional owners of the land on which we are having the hearing, the Yamatji and the Naaguja people. Thank you very much, Clarrie, for that welcome.

[9.58 am]

BOYLE, Dr Brian, Business Unit Leader, Australia Telescope National Facility, CSIRO

DeBOER, Dr David, Research Scientist, Australia Telescope National Facility, CSIRO

MIKULIC, Mr Antony, Manager, Capital Works and Sustainable Environment, Property Services, CSIRO

STEVENS, Mr Ross, Manager, Property Resources, Property Services, CSIRO

STOREY, Dr Michelle, Policy Strategist, Australia Telescope National Facility, CSIRO

ZELINSKY, Dr Alex, Group Executive, Information and Communication Sciences and Technology, CSIRO

ACTING CHAIR—Welcome. I declare open this public hearing of the Parliamentary Standing Committee on Public Works. The committee is inquiring into the proposed development of the Australian SKA Pathfinder Radio Telescope. Although the committee does not require you to give evidence under oath, I advise you that these hearings are formal proceedings of the parliament. Consequently, they warrant the same respect as proceedings of the parliament itself. I remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as contempt of parliament. Would you care to make some introductory remarks.

Dr Zelinsky—There are some amendments to the statement of evidence that I would like to table.

ACTING CHAIR—Could you outline briefly those amendments.

Dr Zelinsky—There are four amendments to paragraphs 23, 93, 120 and 213. There are some deletions and some insertions. I could read them in if you like, or should I just table them?

ACTING CHAIR—You can table them. You have given an indication of the paragraphs, so that will be sufficient.

Dr Zelinsky—They are relatively minor.

ACTING CHAIR—Please proceed with your opening statement.

Dr Zelinsky—The proposal that CSIRO is presenting to the Parliamentary Standing Committee on Public Works is for the Australian SKA Pathfinder Radio Telescope in Western Australia. ASKAP will be a radiotelescope array of up to 36 parabolic dishes. It will be the fastest survey radio telescope in the world and will be world leading in many radioastronomy applications.

Radioastronomy is important to CSIRO and Australia. It provides both tangible and intangible benefits, as it increases our knowledge of the universe, inspires students and the general public and generates new technologies with broad application. It is proposed that the dishes for ASKAP be constructed in the midwest of Western Australia at the Murchison Radio-astronomy Observatory, or MRO. MRO is within the Boolardy Station pastoral lease about 315 kilometres north-east of Geraldton. The MRO is Australia's candidate site for the international Square Kilometre Array radio telescope. The SKA is a major international science project currently under development by scientists from 50 institutions across 19 countries with a projected budget in excess of €2 billion. Establishment of ASKAP on the MRO site will significantly strengthen Australia's bid to host the SKA in Australia.

A central compound to house infrastructure for ASKAP will be constructed on the MRO. For example, a control building has been designed to provide staff with working accommodation that is appropriate for the remote site of the MRO. Also, renewable power options are being proposed to supply energy for the telescope. Accommodation and recreational facilities for MRO staff and visitors will be provided in the Boolardy Station homestead area, some 40 kilometres from the MRO. These facilities will also provide for remote monitoring of ASKAP. It is proposed that the MRO will be connected via fibre optic cable to a support facility at the Geraldton Universities Centre in Geraldton. The MRO support facility will contain a supercomputer room and workshops as well as office space and education outreach facilities. The ASKAP facility in Western Australia will be connected to CSIRO's radio telescopes in New South Wales to enable new experiments spanning the continent.

The estimated outturn cost of ASKAP including GST is \$111 million at 30 June 2008 prices. This estimate includes locality allowance, escalation costs, contingencies and all professional fees and authority charges. The ASKAP telescope project is funded by the National Collaborative Research Infrastructure Strategy, a new policy announcement in the 2007-08 Australian government budget and CSIRO funds. In addition, the Western Australian government has allocated \$4 million to support infrastructure for radioastronomy projects in Western Australia. Construction of ASKAP needs to commence in mid-2009 in order to most effectively influence technology and site selection decisions for the SKA project. Operational costs for ASKAP will be sourced from within CSIRO's existing budget for radioastronomy operations through reprioritisation of current operations.

In developing this proposal CSIRO has worked with the relevant stakeholder groups over a number of years. Strong support for the proposal is evident in the letters received by the Public Works Committee on the project. For example, CSIRO has been working with the traditional owners of the MRO, the Wajarri Yamatji people, over several years. An Indigenous land use agreement is currently being negotiated with the Wajarri Yamatji Native Title Claim Group for the use of the land. All environmental management issues are being evaluated and addressed. ASKAP only uses a fraction of the land of the MRO and the antenna placement can be adjusted to minimise the environmental impact.

In conclusion, the CSIRO is satisfied that the submission for the construction of the proposed Australian Square Kilometre Array Pathfinder (ASKAP) radio telescope in Western Australia will: (1) secure the continued high international profile of Australian astronomy and Australian science; (2) provide a demonstration that Australia is the best location for the international SKA; (3) encourage the adoption of Australian advanced technologies developed for ASKAP both by

industry and by the SKA; (4) forge international collaborations in research and development; and (5) provide a mechanism for Australian industry to participate in SKA related research and development. CSIRO therefore submits the proposal to the committee for examination and seeks its endorsement.

ACTING CHAIR—Thank you. Could you give the committee an idea of the number of staff who will be employed at the centre when it is fully operational?

Dr Zelinsky—I think the best person to answer this is my colleague Brian Boyle.

Dr Boyle—The number of people we estimate being employed at the Geraldton University support facility is of the order of 10 to 15 people.

ACTING CHAIR—You also spoke about the renewable power options that would be used at the centre. Could you give us some idea of what they are?

Dr Zelinsky—They are currently being investigated, and the best person to answer this question would be Dr David DeBoer.

Dr DeBoer—In the submission we have about 20 per cent as a solar photovoltaic power system, and we are investigating mechanisms to provide more of the power using other solar technologies. CSIRO is involved in energy technologies as well, and we are working with the Division of Energy Technology to further that.

ACTING CHAIR—What is the date of completion?

Dr DeBoer—The program and the funding go through to 30 June 2011, but the final antennas will go in slightly after that time.

ACTING CHAIR—You also mentioned the environmental impact that the building of this facility will have. Could you give us some idea of how that has been estimated and what it will amount to?

Mr Mikulic—The impact that at the MRO will be minimised. We have undertaken environmental study reports as far as we can at this current stage. The antennas will be sited to minimise the local impact or trenching, and all other infrastructure will be located in consideration of the environmental impact report.

ACTING CHAIR—I can see the plan on the bottom left-hand diagram over there. Is that area within that black and white diagram the area that the plant will encompass?

Mr Mikulic—That is Boolardy Station.

ACTING CHAIR—Is that where staff will be housed?

Mr Mikulic—They will be housed in additional accommodation at the homestead.

ACTING CHAIR—And the plant itself is separate to that?

Mr Mikulic—The plant itself is located at the MRO, which is located in the middle top part of the plan. That is the MRO site, which will be located approximately 40 kilometres north of Boolardy Station. Currently there are no facilities out there. They will be constructed in accordance with a detailed environmental study.

ACTING CHAIR—I gather you are going to be giving us some idea of that with a slide show?

Dr Zelinsky—We are. Dr Boyle will present it.

ACTING CHAIR—Would it be possible to do that now?

Dr Zelinsky—I think that would be a good idea. It will give you a good background.

Dr Boyle—The intention is to give a background with slides of the big picture and then we can talk about the details.

Slides were then shown—

Dr Boyle—First, I would like to acknowledge the Wajarri Yamatji people of Australia as the native title claimants of the proposed observatory site and to thank the Wajarri Yamatji people for allowing the early scientific activity on the site.

Radioastronomy provides us with a unique view of the universe. It provides us with a view of a universe of gas, which comprises the bulk of normal material in the universe; a universe of extreme physics; and a universe of cosmic magnetism. Australia has been a world leader in radioastronomy for over 50 years through the construction and ongoing operation of world-class facilities like the Parkes Radio Telescope, which today still has the highest citations per paper of any radio telescope anywhere in the world, through to the Australian Telescope Compact Array, which is the second highest productive radio telescope anywhere in the world in total number of papers. So, from this very solid platform, Australia has an opportunity to build in order to play a leading role in the next generation of radioastronomy facilities, the Square Kilometre Array, so-called because it will have a total collecting area of one square kilometre distributed over a continent in scale. This gives you an idea of how the distribution of the antennas would work on the continent of Australia. Essentially, the one square kilometre of collecting area is composed of up to 4,000 antennas, 12 metres each in diameter or of that order, distributed across a number of antenna stations across the continent in this spiral pattern, with most of the antennas, 50 per cent, being located in this diagram at the proposed core Australian site for the SKA—that is, the Murchison Radio-astronomy Observatory.

The public value of radioastronomy is through the science benefits of doing the world-class science. Although Australia only invests in two per cent of the world's astronomy, it produces four per cent of the world's astronomy papers. It punches well above its weight. It provides significant international linkages not only by providing these international facilities on Australian soil that enable Australian scientists to work with the world's best and leverage the world's intellectual property in these domains but by providing a valuable seat at the global table. It drives innovation and builds capacity through our involvement in super computing and broadband networking. The SKA will be a true information communications technology

telescope as we move away from concrete and steel towards the technologies of super computing and broadband networks in modern radioastronomy telescopes.

It brings economic benefit through the provision of highly skilled jobs and long-term return on investment. You will see up at the top right-hand corner 802.11 wireless technology, which had its origins in radioastronomy. Indeed, one of the inventors of wireless technology has come back to work for CSIRO on the ASKAP project because he believes the ASKAP project provides the best opportunity for innovation in this space.

It has societal benefits through the education opportunities and the ability to foster a science aware society. You will see at the bottom right-hand corner one of the many educational programs that we have been conducting throughout in Australia—in this case, particularly in the mid-west of Western Australia—to inspire children in science and technology.

As part of maximising Australia's benefits from the SKA program, I am privileged to work as a member of Team Australia. Team Australia has been developed through a memorandum of understanding between the Australian government, the Department of Innovation, Industry, Science and Research and the Western Australian government in order to deliver AuSKA. Part of Australia's strategy for the SKA is to deliver the ASKAP radio telescope project and to deliver the Murchison Radio-astronomy Observatory.

CSIRO is the main technical deliverer on the ASKAP telescope, and I am delighted to have the very strong support of the WA state government and the Commonwealth government of Australia to deliver the observatory. What is ASKAP? ASKAP is essentially a bridge to the SKA. As Alex has told you, it comprises of up to 36 antennas located at the core site of the Square Kilometre Array. It will deliver the world's leading survey telescope. In six hours of normal operation, ASKAP will deliver more information than radioastronomy has delivered in its entire history. It will be able to answer important new questions about the evolution of the universe and about the nature of the magnetic field in our own galaxy and nearby galaxies and probe into a new discovery space of transient objects, things that go bump in the night.

It will be designed to influence key SKA decisions that are due to be made on the same time scale that ASKAT will be completed in 2011-12—the key technology decisions and of course the key siting decisions. It is designed to build Australia's capability not just in the astronomy space but also in industry and education and to allow through our engagement with industry to prepare industry to reap the maximum benefit from engagement in the SKA program should Australia decide to proceed with that in the longer term.

For the next three hours I am going to go through the system diagram in some detail! This is how you build a radio telescope. You have an antenna at the front end that collects the radio waves from the sky. You have a detector which essentially collects those radio waves. Next to that detector you can actually see John O'Sullivan, who is one of the co-inventors of 802.11 wireless technology, with his baby, and very proud of it he is too. You have an amplifier which amplifies these very faint signals from the cosmos by a factor of a billion. The total amount of energy collected from radioastronomical sources is less than the energy of a snowflake hitting the ground, over the entire history of radioastronomy. So we have to involve very sensitive and very leading-edge systems in order to be able to detect these radio signals.

Next these signals are turned into ones and zeros by a processor and from each of these antennas—we connect them all by fibre-optics and essentially bring all these signals together and process them using a state-of-the-art supercomputer. It is interesting to note that again this is an area where we have worked very closely with industry. IBM have a weekly meeting of their global scientists to talk about the SKA and the developments in the SKA. It is an important sign that SKA is held in very high regard by our industry colleagues. Finally, one has to power the whole system. Specifically in the longer term we are looking towards, as you have identified, the renewable energy sources.

A core element of the innovation around the Australian SKA pathfinder is the phased array feed, a new radio camera. This radio camera was delivered a day ahead of schedule. It was a very challenging piece of research and development but immediately putting it on our test bed antenna it performed two times better than the world's best performance of anything previous to that. Essentially this radio camera provides ASKAP with a unique field of view. This is the area of sky that radio telescopes were able to look at before. With ASKAP's new technology, this is now the area of sky. This is the impact that ASKAP will have on our information gathering abilities in the universe.

The specific ASKAP benefits are clearly that it is a world leading survey telescope. We do have strong international demand: the science case has been developed with colleagues internationally. With industry we have established the SKA-industry consortium so that we have good communication pathways with industry. We have just released the industry opportunities register here, which identifies the upcoming contracts, tenders et cetera—opportunities for industry to play a major role in the development of ASKAP. Important regional benefits include as diversifying the economic base in this area of Western Australia. Indeed, it is very much aligned with and will anchor the 'smart mid west' Mid West Development Corporation's plan.

Societally, again we are focusing on education programs and the opportunity to provide time for school students to utilise ASKAP in the longer term in a similar way that we already do with the Parkes radio telescopes and to provide for Indigenous engagement. In the CSIRO we have our own Indigenous engagement strategy being developed called 'Seeing through both eyes'.

The project itself has a very strong focus on best practice project management disciplines, on brief, on budget, on time. To date all are technical milestones in the R&D area have been delivered on that basis. We have a strong focus on system engineering methodology; that is, we use the science requirements, operational requirements and environmental requirements to essentially drive the system design. That system design is broken up down into six integrated product teams, each with its own work breakdown schedule, budget and risk assessment.

We also have robust review mechanisms, both internal and external technical reviews at various stages of each technical development—conceptual, preliminary, final and production ready designs. We have a bimonthly review of the whole program with the Australian SKA coordination committee, four-monthly whole of project divisional reviews within the Australia Telescope National Facility Division of CSIRO and annual CSIRO science investment process in which the ASKAP theme as a whole is evaluated against other science priorities within CSIRO. As part of this we have international engagement through memoranda of understanding with our Canadian, Netherlands and US colleagues, which collaborate on technology development, and also with the European Union's FP7 program.

Here we have the Murchison Radioastronomy Observatory, MRO. The MRO is a 127-kilometre square area in the centre of Boolardy Station. You can see the indicative fibre optic route connecting up to 36 antennas with the proposed support facility here at the Geraldton University campus, and you can see a number of circles indicated there. They reflect the areas at which we are seeking to provide a radio quiet coordination zone and other forms of legislative instruments in order to protect, in the long term, this unique site for radioastronomy, not just for ASKAP but for the SKA. Those radio quiet zones I have indicated there are those being developed with the Australian Communications and Media Authority, but we are also working with both the state and the Commonwealth government on a variety of instruments.

Just to give you an idea of the centre of the site, the centre of the site is located here. That is a caravan, to give you some idea of scale. The breakaway, the little lump in the middle, is 30 metres high and the ASKAP site is to the lower part of that area. That is where the 36 antennas will be. This is a truly unique site on the planet for radioastronomy. One of the important things about this site is its freedom from radiofrequency interference, and that is really driven by the population density. Population density is quite remarkable: three ‘nanohumans’ per square metre or three-billionths of a person per square metre. The shire of Murchison has a population of between 100 and 150 in an area essentially the size of the Benelux countries in Europe—for my European colleagues. I also say that it is the size of Vancouver Island when I am giving a presentation to Boeing representatives. This is a truly remarkable site in the world, and we have a truly remarkable project. Thank you for your patience and your indulgence. I will leave you with a vision of ASKAP.

ACTING CHAIR—Thank you, Dr Boyle; that was very informative.

Mr LINDSAY—I am going to go through the statement of evidence in the order that it appears. It might seem a bit out of order but it is in the order of what is written here, so you can follow me through. First of all, could you explain to me: is this part of a CSIRO flagship program? If not, why not? Where does it sit in CSIRO?

Dr Zelinsky—CSIRO has basically been repositioned as a national science agency to work on national challenges. We have a specific program around that, which is the flagship program. There are nine flagships. The ASKAP project is not considered to be a flagship; however, it is considered to be a program of significance within the organisation—

Mr SLIPPER—Not a flagship, a frigate.

Dr Zelinsky—Yes. It is a significant program but in terms of the oversight and the way it is managed it has the same sort of implications as a flagship. Flagships generally have a much broader implication across the organisation. Generally they draw on many more divisions of the organisation. We have 16 business units, and generally a flagship may draw up to seven or eight business units. However, the ASKAP project does draw on a number of capabilities. It uses the ATNF capabilities, the ICT centre capabilities, our mathematical and statistical science capabilities, and our Energy Technology Division.

Mr LINDSAY—How much money in round numbers do you think you have already spent developing this project?

Dr Zelinsky—There is an answer to that, and I am going to refer to Brian.

Dr Boyle—As specifically identified as ASKAP R&D about \$5 million.

Mr LINDSAY—To this point in time?

Dr Boyle—Correct.

Mr LINDSAY—In your presentation, Dr Boyle, you put up a map of Australia which had dots all over it. I did not quite understand that. Were the dots supposed to be dishes?

Dr Boyle—I am sorry that I did not make that clear. The dots for the SKA would be antenna stations. Each of those antenna stations would be comprised of up to 100 antennas in the full realisation of the SKA.

Mr LINDSAY—Is that the \$1.8 billion project proposed, if Australia wins it?

Dr Boyle—Yes.

Mr LINDSAY—Have all those sites been identified as having the same radiofrequency security?

Dr Boyle—That is a very good question. They do not need the same level of radiofrequency security. The further away you get from the core, the greater your ability to discriminate between incidental emission and emission from the heavens. You need the good security around the bulk of your antennas—that is, the core site—but not at the external sites. I should also add that many of those external sites—for example, in New South Wales—are at existing radioastronomy locations, which minimises the infrastructure rollout. So the ones in New South Wales are at existing radio telescopes at Narrabri and at Parkes.

Mr SLIPPER—If I can interrupt on the same issue, this brings me to the question of land acquisition for the other dishes. Is that going to be a problem? Obviously in New South Wales the sites are already being utilised, but what about elsewhere? When I looked at the dots all over the country, it would seem to be quite a large job.

Dr Boyle—I would not underestimate the significance of that job, but until we can come to the negotiating table with the Commonwealth government's position on the full realisation of the SKA we have not sought to investigate detailed permission about acquiring the land over Australia.

Mr SLIPPER—How much flexibility is there in locating those particular sites?

Dr Boyle—There is very significant flexibility—the further away you get from the core, the greater your tolerance in being able to position those sites. By the time you get to the east coast of Australia, the flexibility is over 500 kilometres.

Mr SLIPPER—Therefore, with the economic capacity and the political will to do this, you would not have difficulty in acquiring the land necessary?

Dr Boyle—Indeed.

Mr LINDSAY—In your presentation you talked about the 36 receivers. You did not make it clear, although it was suggested, whether the output of each of those dishes would come down to here. Is it combined up where the dishes are and a single something sent down to Geraldton?

Dr Boyle—We will form an image using each of the telescopes. So at the site we will actually form what we call beams from each antenna but each of those antenna beams will then be sent down and correlated to produce the final image here at Geraldton.

Mr LINDSAY—We had a conversation in the corridor outside, and I would like to get that on the public record. On the plane coming up here I was thinking about other collaborations, and I raised with you collaborations with Defence. Could you put on the public record for me the opportunities that Defence and Geraldton have for collaborations with your project? I think you know what I am talking about.

Dr Zelinsky—Yes. I guess the implications are around industry opportunities, of which Defence could be one of the subsets. Brian, could you talk about the opportunities that could flow to Australian industry?

Dr Boyle—We are engaged with our industry colleagues who also supply contracts for Defence in those areas. We have not spoken directly with the Department of Defence around this, of course, but the Department of Defence are aware of the SKA development project. I guess I would like a little bit more understanding—

Mr LINDSAY—We need to put on the public record that Defence have a facility here in Geraldton and there are opportunities for collaboration between the two. What are the opportunities you see?

Dr Zelinsky—I misinterpreted that question, Mr Lindsay. I interpreted it as an opportunity for technology development spin-offs from this project. At this stage we do not anticipate collaborations between that facility and this radioastronomy facility.

Mr LINDSAY—You may not want to comment on this—and, if you do not, I understand the sensitivity of it—but what about the use of staff between the two facilities? Do you want to put something on the public record about that?

Dr DeBoer—Clearly, we have two significant facilities that will draw upon many of the same capabilities, so we certainly want to collaborate and make sure we are not competing for resources. There might be some interesting collaborations given that there is a period of time upfront where they have to get security clearances, so maybe they could participate with us then. We have had some very informal discussions on how to use those capabilities most effectively in the Geraldton area.

Mr LINDSAY—Moving along, will you put on the public record why expenditure on the development of this proposed project will still be justified even if Australia does not get the international SKA project.

Dr Boyle—This project, as I outlined in my presentation, will provide a world-class telescope in its own right, supporting an acknowledged world-class scientific capability that Australia has.

Dr Zelinsky—In fact it will be the world's best radio telescope to date.

Mr LINDSAY—Why do you say Australia is one of the last places left on Earth that is free from the harmful effects of radiointerference? You say that in your statement of evidence.

Dr Zelinsky—It is a fact of the geographic isolation of the area. There is one other site that has been identified in southern Africa.

Mr LINDSAY—South Africa?

Dr Zelinsky—Southern Africa.

Mr LINDSAY—I need some detail on this, and I will tell you why—how do you intend to protect the uniqueness of this site in relation to the effects of radiofrequency interference? How can you assure the committee that, if we approve this money, in 10 years time, 20 years time and so on the site will remain protected from radiofrequency interference? I need to know specifically how you can guarantee that.

Dr Zelinsky—I will ask Dr Storey to answer. She has been responsible for that part of the work.

Dr Storey—There are a number of mechanisms that we have in place and that we are investigating now to protect the radio quietness of the site. The location of the site was partly selected on the basis of a study that the Western Australian government conducted in 2000, which led to them declaring a section 19 reserve, under the Western Australian Mining Act, over a large area. This site is an area where the prospect of there being valuable minerals is low and where the government have now put in an exclusion so that no mineral exploration or mining can take place. In addition, the Western Australian government have introduced a mineral resource management area under their Mining Act to protect the site up to a radius of 80 kilometres. The Australian Communications and Media Authority have introduced a radiocommunications licensing instruction to further protect the site from licensed ground based transmitters, and we are working with the ACMA on other mechanisms, regulations and legislation to protect the radio quietness. We do not need complete radio silence, so it is important to note that it is possible for the radioastronomy to coexist with the land users that are currently in the area. But the important thing is that we now have mechanisms in place that mean we can consult and ensure that any increase in radiofrequency emission is controlled.

Mr LINDSAY—You worried me when you said you were 'investigating now', which would mean you have not yet settled this particular issue. Is that right?

Dr Storey—There are some aspects of it that we are still investigating with the Australian Communications and Media Authority.

Mr LINDSAY—So is that a risk for this project?

Dr Storey—I think the site is already radio quiet and the protection we have is the best in the world already and we are looking at further mechanisms now.

Dr Zelinsky—Dr Boyle might just add a little bit more to that answer.

Dr Boyle—Specifically pursuant to the ASKAP project and the protection required for ASKAP, which is not as stringent as the full SKA, WA are in negotiations to purchase back the Boolardy pastoral lease. If that happens the CSIRO would be given the lease in order to ensure that the activities around the Boolardy lease are compatible with radioastronomy.

Mr LINDSAY—So keeping people out is your best protection.

Dr Boyle—Not keeping people out. We wish to work with our stakeholders better than that. But we would seek to make sure that the management of the site is compatible with radioastronomy.

Mr LINDSAY—How certain are you that you will be able to control that pastoral lease—

Dr Boyle—I would be very certain.

Mr LINDSAY—which has not yet been agreed to?

Dr Boyle—At the Australian SKA Coordination Committee, the way forward in terms of the purchase of the pastoral lease by the Western Australian state government and its transfer of ownership to CSIRO has been agreed to. It is just that the final negotiations and details around that have not yet been finalised.

ACTING CHAIR—Mr Lindsay, you can have a couple more questions and then I will go to Mr Slipper.

Mr LINDSAY—I still have a lot of questions.

ACTING CHAIR—I understand that. Do you wish to start another section of questioning now? If so, I will give Mr Slipper a go.

Mr LINDSAY—Let him have a go.

Mr SLIPPER—I will try and be brief to give Mr Lindsay the opportunity of asking as many of his questions as possible. Often scientists embark on projects of self-indulgence in the interests of so-called pure research or in the interests of knowledge, which is all very important. If people had not done that over the years, as a society we would not be where we are. But I always like to, when supporting a project like this, have some firm, tangible evidence that, in addition to our contribution towards knowledge, we are gaining firm, definite economic benefits that actually stack up. Could you give me details of the benefits, firstly, to the nation, secondly, to Western Australia and, thirdly, to the local region, in addition to the employment of 10 to 15 people, which will flow from this particular project?

Dr Zelinsky—There is a detailed answer to that. I might draw on a slightly longer time frame and give you an example of something which we did some years ago when we built the radio telescope in Parkes in the sixties. That required new technologies to be done, very similar to what we have done here. New signal-processing algorithms and computer chips had to be developed. As result of that technology, we were able to make wireless LAN technology. That led to the spin-off of a company called Radiata, which to date has been one of the largest IP transactions for Australia. That company was acquired by Cisco for in excess of A\$500 million. CSIRO still has the patent and is licensing it commercially to a number of leading providers around the world as well as enforcing it. That is a multimillion-dollar benefit that we can trace back to radioastronomy research.

Mr SLIPPER—But when you look at the cost of that research versus the income you are getting, how would it stack up?

Dr Zelinsky—It is a multifold result.

Mr SLIPPER—The return would be multifold.

Dr Zelinsky—Yes.

Mr SLIPPER—That is reassuring.

Dr Zelinsky—That is a very tangible example. We can draw on a practical example of what has happened in the past, and in regard to this project we have a list of benefits we believe will flow, which I will ask Brian to come in with now.

Dr Boyle—I would also cite another example: Connell Wagner, who built the antennas for the Australia Telescope Compact Array. The development of that capability in Connell Wagner allowed them to move into a South-East Asian market of building antennas for communications networks in South-East Asia. Connell Wagner estimated the return on investment from that was two to one. ACIL Tasman conducted a study of the tangible cost-benefit return of Australia's investment in the SKA program. They found the tangible return was of the order of two to one when comparing across a number of different outcomes.

Mr SLIPPER—And now focusing on this project in 2008?

Dr Boyle—Sorry?

Mr SLIPPER—You have given us all the history, which is all very nice.

Dr Boyle—The ACIL Tasman study was focused on the likely return on investment to Australia from engagement in the SKA program.

Mr SLIPPER—So what sort of return are we likely to see on this particular project? For every dollar we outlay as a nation are we going to get three or four back, or is this an altruistic exercise by us in the interests of the increase of knowledge in this area?

Dr Boyle—I am very aware that I am on the public record, so it is very difficult for me to make definitive statements.

Mr SLIPPER—Although you are not under oath, you are certainly a witness before a hearing.

Dr Boyle—CERN have demonstrated that there is a robust figure in terms of return on investment somewhere between three to one and four to one for industry associated with the development of megascience projects like ASKAP.

Mr SLIPPER—There has been some mention of Indigenous employment. While I am always in favour of assisting Indigenous people to improve their situation, can you give us some sort of assessment of the likelihood of Indigenous employment and also an assurance that you will be employing on merit?

Dr Storey—We have been working with the Wajarri Yamatji people for a number of years to identify opportunities. There will be opportunities for employment at the Murchison Radio-astronomy Observatory both for operation of the antennas themselves and for support of accommodation at the Boolardy homestead. We do employ on merit, but the geographic isolation of the MRO has an influence on what employment opportunities people would be able to take up.

Mr SLIPPER—I think Argyle Diamonds have an excellent program to assist with the involvement of Indigenous people in their work. It might well serve you to have a look at what they do.

Dr Storey—Thank you very much. I will follow that up.

Mr LINDSAY—In relation to the question of dark matter and dark energy, you evidence says:

With ASKAP, CSIRO can forge a pathway towards the resolution of these issues which can ultimately only be answered by the full SKA.

Is it a problem that you cannot answer these questions without going to the full SKA? What is the prospect, anyway, of answering the questions with the full SKA?

Dr Boyle—That is true: you cannot answer the full question of dark energy with ASKAP alone. It would require megascience facilities like the SKA and, indeed, other next-generation telescopes to be able to answer those questions fully. What is the likelihood that we will eventually be able to answer these questions? I think our experience has shown that whenever we ask a question it is not so much the answer that we get; it is the other questions that it throws up. I know of no major national facility that was developed that actually answered the questions it was necessarily supposed to do, but they threw up entirely new knowledge about our cosmos.

Mr LINDSAY—You said that the great strength of the ATCA, which is in New South Wales, is its frequency coverage of one to 100 gigahertz, yet this project is only going to run 800 megahertz to 1.7 gigahertz. Is that a limiting factor?

Dr DeBoer—As Brian said, there are different strengths in existing telescopes—in the field of view that they see, in the little patch of sky that they are sensitive to. ASKAP is set to largely expand that. The technology typically limits the frequency range in which you can do that. The whole point in radioastronomy and in astronomy is that it is really about census taking. You go out into the cosmos and take a population census, so you want to be able to do very fast and accurate surveys. ASKAP is focused solely on conducting those surveys over that frequency range, which in fact maps well over 90 per cent of the matter in the universe.

Mr LINDSAY—So your evidence is that this is not really limiting the effectiveness of this proposed telescope?

Dr DeBoer—No.

Mr LINDSAY—What happens if Australia does not remain competitive in international radioastronomy?

Dr Boyle—Clearly, if Australia does not remain competitive in radioastronomy, it removes one of the two pillars of Australian astronomy as a whole. Whether Australian astronomy is sustainable in the longer term on the basis of optical astronomy alone is matter for speculation. It may be that Australia chooses in the end not to focus on astronomy and not to maintain what has previously been a very high-performing discipline. I would venture to suggest that that would lose important international connections and, of course, it would lose our important ability to link with industry in innovative ICT domains, as Alex has suggested.

Mr LINDSAY—Under the heading ‘Timescales/Urgency’, your evidence says:

... CSIRO must be able to issue the large-scale construction contracts for antennas and optical-fibre cable by late 2008, and construction should start on site by mid 2009.

You are not going to make that deadline, are you. Is that a risk to the project?

Dr Zelinsky—I believe that the project is on time, on brief.

Dr Boyle—In response to your question around making these timescales, it is clear that negotiations around access to the site are very important. They are driving the milestones in this area. We have very strong commitments from both the Commonwealth government of Australia and the state government of Western Australia that those timescales are still being worked towards and they will be able to deliver—

Mr LINDSAY—But you are not going to be able to issue the large-scale construction contracts by the end of this year, as you put in your brief of evidence, are you? Just say no; that is all right.

Dr Boyle—I am not sure on what you are basing that.

Mr LINDSAY—I am basing it on point 81 of your brief of evidence under Timescales/Urgency.

Dr Boyle—We will be making an announcement around the antenna contract within the next six weeks, around the move towards the design to build—

Mr LINDSAY—Will you be issuing large-scale construction contracts before the end of this year?

Dr Boyle—Yes.

Mr LINDSAY—That is all you need to say. You obviously have the contracts prepared anyway—is that right?

Dr Zelinsky—Yes.

Dr Boyle—Yes.

Mr LINDSAY—Okay; don't make this hard, guys. Under Project Scope you say that each antenna site will have 'lightning protection in the form of an earth mat'. I do not think that is true, is it? Is the earth mat just part of the lightning protection?

Dr DeBoer—You would need to couple very strongly to the earth to couple the energy down. There is an earth mat, basically the connecting wires between antennas and so on, which is part of the lightning protection.

Mr LINDSAY—Then why, when you deal with lightning protection in here, not mention the earth mat? It is so significant.

Dr DeBoer—It is mentioned in the full report.

Mr LINDSAY—It is not mentioned in this brief of evidence under Earthing and lightning protection.

Dr Zelinsky—We will take that on board.

Mr LINDSAY—You talk about astronomically useful data rates coming from out there to here. What kind of data rates—this is just for my own interest?

Dr DeBoer—For ASKAP, we are looking at about five gigabytes per second—

Mr LINDSAY—That is all I need to know. On the heritage considerations, why are we getting involved in heritage issues?

Dr DeBoer—As a future act, that is a necessary part of it.

Mr LINDSAY—No, we are talking about expenditure of money here. This is Commonwealth expenditure of money on heritage issues out on the site. Why is that our responsibility?

Dr Zelinsky—This is the actual site, the actual station?

Mr LINDSAY—Yes.

Mr Stevens—The last station has buildings which are registered under the Western Australian Heritage Act, and, if we take over control of the property, we have obligations to ensure they are maintained. So we will need to spend some money—

Mr LINDSAY—Now I understand. A risk to the project that I want to explore is in relation to the land. Your submission says:

The land is WA Crown Land, held under a pastoral lease, with the next pastoral lease renewal period being 2015. The WA Pastoral Lands Board has indicated that it plans to extend leases in the area.

I saw Defence do a \$50 million project. They had a lease for only five years but it was a 50-year project. What I am asking you guys is: can you be certain, can you assure us, that you will have the necessary lease in place for the life of the project and not have a risk of someone saying, 'We'll cancel the lease.'

Dr Storey—We are working with the Western Australian government and the Australian government, and the Western Australian government has indicated that the site will be provided. The intention is to excise the MRO land from the pastoral lease and to lease that MRO land to CSIRO. So it will be excised from the Crown reserve held by the Western Australian government and then leased separately to the CSIRO.

Mr LINDSAY—Okay. Your submission is that there is an intention to do this but you cannot assure the committee that in fact that will happen, so it is a risk.

Dr Zelinsky—That is correct.

Mr LINDSAY—In relation to the EPBC Act—and you have to pass those milestones and it may be a controlled action—

Dr DeBoer—Right.

Mr LINDSAY—It is not likely but it could be. Will that delay construction? You have not been through that process yet, have you?

Dr Storey—No. At this stage we have draft environmental referrals. We have been working with Parsons Brinckerhoff, who have a lot of experience in this area, on the referral documents. We have had informal exchange with the Department of the Environment, Water, Heritage and the Arts on that. It is part of a number of processes of approvals which we are working through in parallel with each other at the moment.

Mr LINDSAY—You are doing well so far, guys. In your submission, under the heading 'Antenna Array and Correlator', you say:

Each antenna may be fenced in order to keep cattle away ...

Why do you say 'may'? Why don't you say 'will'?

Dr DeBoer—We may or may not, in fact. It does not necessarily require it.

Mr LINDSAY—'It does not necessarily require it.' What sort of an answer is that?

Dr DeBoer—The main issue for keeping space is that the antennas move under automatic control and we do not want people to be able to go right up to the antenna because it may move. We will have some sort of indication that they should not go up to the antenna.

Mr LINDSAY—Looking over here at the top right-hand diagram, there is a dotted line and I assume the dishes are inside that. Is that right?

Dr DeBoer—Yes.

Mr LINDSAY—I just assumed, as a non-technical person, that they would all be neatly lined up in a square or something like that. Why is there no apparent correlation?

Dr DeBoer—It is actually a very carefully contrived set of random positions to produce what we call the best point spread function. It gives us the best beam on the skies.

Dr Zelinsky—Optimisation.

Dr DeBoer—It is an optimisation algorithm.

Mr LINDSAY—So what you are telling me is that you know what you are doing.

Dr DeBoer—Yes.

Mr LINDSAY—How robust has your risk assessment process been, including the development of options, particularly the fallback option in New South Wales?

Dr Zelinsky—We do have a full register. There are a number of aspects to that question.

Dr Boyle—We have developed a comprehensive risk register that goes across stakeholder, operational and managerial issues. The second part of your question was about how confident we are about the fallback option into New South Wales. At the moment that is still very much a fallback option. The best site for radioastronomy is the one in Western Australia. While we receive assurances from the Commonwealth and the state government that we are working to the time scale to secure this site, we are working on that basis. Should we run into an issue where the acquisition of the site puts the project on the critical path then we will have to review that and go to our fallback option. But discussions around the site are not on the critical path at this stage.

Mr LINDSAY—Finally, can you assure the committee that the provisions of the Lands Acquisition Act 1989 have been fully complied with in regard to this project?

Mr Stevens—They will be. We are in dialogue with the Department of Finance and Deregulation and working with them and the Australian Government Solicitor to make sure that we do comply with the act.

Mr LINDSAY—Thank you for your evidence.

ACTING CHAIR—We will now proceed to hear evidence in camera.

Evidence was then taken in camera but later resumed in public—

[11.24 am]

ROBINS, Mr Bruce, Team Leader, Radio Astronomy, Department of Industry and Resources, Western Australia

FRANZ, Ms Jo-Anne Frances, Director, Native Title Management, Office of Native Title

ACTING CHAIR—Welcome. Did you hear my words before about not appearing under oath but these being formal proceedings of the parliament?

Mr Robins—Yes.

ACTING CHAIR—So I can take it that you have heard that.

Mr Robins—Yes, and understood them.

ACTING CHAIR—Would you care to make some introductory remarks.

Mr Robins—At this point in time I sit here as a representative of the Department of Industry and Resources of Western Australia and not specifically as a representative of the Western Australian government. As you are aware, there was an election recently in Western Australia. The public service was in caretaker mode until Tuesday of last week, when a new government was sworn in. Officially we are no longer in caretaker mode, but at this point in time my department has not received any new instruction or direction from the incoming government as to the positions it wishes to take in the future with respect to this project, although neither has my department received any direction or advice that there is going to be any change of approach. Let me make it clear that any statement I make today is on behalf of the department. I may well make statements that are statements of fact regarding what the previous government and governments were involved in regarding this project. But in terms of specific positions I can only speak for my department at this point in time.

I will not go through the department's submission again, as you have it before you. My main aim in requesting permission to speak today was to update the committee about any activities or events which may have occurred since the written submission was submitted. In terms of the temporary uncertainty as to the state's position, I believe it is worth reminding the committee that the state government is a signatory to the memorandum of understanding that was signed in 2007 by the Commonwealth and state governments regarding the joint collaborative effort to establish the ASKAP project and Australia's strategy to win the SKA project. The state government through the Department of Industry and Resources and other departments also acts as a co-chair of the Australian SKA Coordination Committee.

The state government and our department have been involved in and have actively resourced the development of Australia's SKA bid and the establishment of the ASKAP project for something like the last 10 years. The cumulative total of resources that has been either expended or committed by previous state governments in supporting this project would now be in excess of approximately \$30 million. I say these things as a sign of, at least, the previous level of

commitment and support that the state government showed for the ASKAP and SKA projects. The department's submission contains many examples of the state's involvement and activities in support of the project from paragraph 17 onwards. I will not go through them at this point in time, as I am simply making the point that there has been a significant level of state support for the project over the last 10 years.

As I said, my main aim in addressing the committee is to give you as much of a progress report as I can regarding events that have occurred since the written submission was provided. That report largely relates to a series of activities that are required to have been completed—subject to this committee's approval of the overall project, of course—in a certain order and by a certain time for the project to maintain its critical path and, as was referred to earlier, to roll out construction projects and achieve construction and operational deadlines that have been aimed at for some time now.

Our submission mentions that one of the agreed requirements was that the CSIRO should purchase Boolardy Station, and the state has been involved in the negotiation of the price. I am happy to say that the negotiation is complete and the price has been agreed. All that remains in that process is for final state government approval of that price. The collaboration agreement that is being drawn up between the state government and CSIRO that defines the commitments of each party to the other around the funding of the purchase of Boolardy Station is in its final draft form as we speak and is expected to be ready for execution in the next few weeks.

The lease of the Murchison Radio-Astronomy Observatory to the CSIRO, as a document, is in discussion draft at this stage and is moving forwards towards a final version in the reasonably near future. The Indigenous land use agreement that is contemplated between the Commonwealth, CSIRO, the state government and the Wajarri Yamatji native title claimant group is progressing well, albeit on a very tight time frame. There are others present who could report to you on that, if that is required.

The final progress report I would like to make—again perhaps as a significant indicator of the degree of collaboration between the state and the Commonwealth parties around this project and also in terms of perhaps providing some additional response to Mr Slipper's earlier question about economic impact—is that the ASKAP Industry Opportunities Register document was completed and launched last week. That is a document which describes the various economic opportunities that arise from the implementation of the project. That was launched by Senator Carr, of the Australian government, last week, but is an example of the collaborative effort that goes between the governments. The manpower, if you like, that was involved in producing that document was significantly provided by the state in conjunction with the Commonwealth. We were all very pleased to see that document completed last week. Again, it is a sign of our collaboration. At this point in time, that is all I wish to say as a progress report to you.

ACTING CHAIR—Thank you for that. In paragraph 21, on page 7 of your submission, you have detailed the proposed tenure, access and management arrangements set out for land lease and so on. Will there be additional ongoing costs to the Commonwealth as part of those arrangements?

Mr Robins—Sorry, could you repeat the question now that I have it in front of me?

ACTING CHAIR—Yes. You have detailed in that paragraph the proposed tenure, access and management arrangements for the acquisition of the land under the lease arrangement, and I would like to know if there will be additional ongoing costs to the Commonwealth as part of that arrangement.

Mr Robins—There are a number of elements to the various land access and tenure arrangements. In terms of the procurement of the Boolardy Station pastoral lease, the acquisition cost is a state government cost. The ongoing operational costs of running a pastoral station will be CSIRO costs. There are some cost-sharing arrangements contemplated in terms of investment by CSIRO in the station as time goes by being counted as an investment, if you like, by CSIRO in conjunction with state investment. To briefly answer your question, yes, there will be operational costs from running the pastoral lease that will be incurred by CSIRO, and I cannot speak as to the source of the funds that they will be required to expend.

In terms of the lease of the Murchison Radio-Astronomy Observatory to the CSIRO, there will be an annual rent, but it is what you would loosely term a peppercorn rent. The Indigenous land use agreement will involve costs both in negotiation and in terms of a benefits package, and those costs are agreed to be shared fifty-fifty between the state and the Commonwealth. I think that covers the question.

ACTING CHAIR—You have also said in paragraph 16:

The Western Australian Government has identified a range of outcomes beneficial to the State ...

Can you identify those in more detail for the committee?

Mr Robins—Yes. Without taking all day, we commonly talk about the four dot points in a Premier's letter that was written between the Premier and the Minister for Innovation, Industry, Science and Research in the Commonwealth. They identified four major outcomes that the state wished to generate. They are an enhancement of scientific and research capability in Western Australia; the generation of science education outcomes—that is, using the project to attract more students into science and develop more scientists in Western Australia; industry development outcomes—that is, economic outcomes; and also regional development outcomes, particularly for the mid-west of Western Australia. In a nutshell, it is those four particular types of outcome that the state is looking to generate.

ACTING CHAIR—Do you know how many secondary schools there are in Geraldton?

Mr Robins—No, I do not know.

ACTING CHAIR—I am sorry; I realised as I was asking that it is probably a very unfair question, but I was wondering about the level of students locally who will be able to benefit from that.

Member of the audience interjecting—

ACTING CHAIR—We have had five stated. Thank you very much. So now you know and I know too, which is very good. Thanks for that.

Mr LINDSAY—Earlier in your evidence you talked about the price of the station. You had negotiated something or other which you did not mention and I am not asking you to tell me. In CSIRO's confidential cost estimates there was an indicative amount of money—where would CSIRO's cost, or the price of the station, be in their budget? How do we resolve that? I think there is an answer and it is zero. But, if it is zero, you gave evidence that the price had been resolved. Did you resolve it as zero?

Mr Robins—No, definitely not.

Mr LINDSAY—Well, that was a long way around, wasn't it.

Member of the audience interjecting—

Mr LINDSAY—Dr Zelinsky informs me that to the CSIRO it is zero because the state government is providing the site. I see. Whatever the price is, you are bearing that cost—that is what you are telling us.

Mr Robins—To be clear, the site is not what we are providing funding for. We are providing funding for CSIRO to purchase Boolardy Station, which is much bigger than the MRO, which might be what you meant by 'the site'. The state is funding the purchase of Boolardy Station—that is the intention.

Mr LINDSAY—Right, okay.

Mr Robins—Perhaps I could elucidate a little further. Subsequent to CSIRO owning the pastoral lease it will relinquish, or surrender, back to the state that portion of it which is the MRO, whereupon the state will then lease it back to the CSIRO for a peppercorn rent for radioastronomy purposes.**Mr LINDSAY**—Earlier I asked the CSIRO about the risk of that lease, sometime in the future, not being renewed. Can you give the committee some evidence that would indicate that it is the intention of the WA government, while this telescope is in place, to continue to renew the lease?

Mr Robins—No, I cannot, particularly because I cannot speak for the state government at this point in time in terms of the current government, the new government, and what its views or intentions might be. If I were talking about a status quo situation as we had with the previous government I probably could not make such a commitment in any case. I can confirm that the proposed lease of the MRO is for the life of the project in general terms. That is what is being discussed at this stage.

Mr LINDSAY—When will the proposed lease be agreed upon?

Mr Robins—The particular time line is that it be agreed, completed and signed by April or June next year. It has to be done in conjunction with the completion of the Indigenous land use agreement arrangements as well—they work in parallel. We are talking early to mid next year as the date by which that lease would need to be signed, or sooner if possible. The lease period for the MRO is contemplated to be 30 years with an extension of 20 years, which covers the life of the ASKAP project and potentially the SKA project if it were to be hosted in the midwest of Western Australia.

Mr LINDSAY—So we can report to our parliament that the proposal is for a 30-year-plus-20-year lease and that that lease has not yet been agreed to but your evidence would be that it would be unlikely to be another outcome—or can't you say that?

Mr Robins—I can say with the best of intentions that the previous state government would have been happy to commit to a lease of the MRO for 30 years plus 20. To make sure I am answering your question entirely correctly, we were also talking about the lease of Boolardy Station, which is a separate issue. The Boolardy Station lease, whoever owns it, is due to expire in 2015, and that is a matter of fact. Those leases and the lengths of those leases are controlled by the Pastoral Lands Board. We understand that the Pastoral Lands Board would have had every intention of rolling that lease over, whoever owned it, in 2015.

Mr LINDSAY—In relation to an ILUA, at law isn't an ILUA necessary? Is it lawful not to have an ILUA?

Mr Robins—I am certainly not an expert in the Native Title Act and there are perhaps others in this room who could answer more legally correctly, but I will venture an answer for you. My understanding is the nature of the activities contemplated on the MRO would constitute a future act. It is a change of land tenure from pastoralism to radioastronomy, and that is a future act which invokes the Native Title Act and requires some form of native title adjustment.

Mr LINDSAY—I think that is a good answer. Current negotiations with the native title holders are confidential, but limited information can be placed on the public record. Will that remain confidential when the ILUA is concluded, or will it all be on the public record?

Mr Robins—I cannot answer, as I do not know. I do not know what the protocols would be. As a layperson, I imagine that the details of an Indigenous land use agreement are ultimately public, but I cannot say that is the case.

ACTING CHAIR—Ms Franz, would you be able to answer Mr Lindsay's question?

Ms Franz—Yes. Basically an Indigenous land use agreement is held on a register with the National Native Title Tribunal. It is up to the parties to decide what part of the content of that agreement is placed on the register. The register is then obviously a public register that people can access. So it could be that all of the terms of the ILUA are public or it could be that the parties agree to keep part of them off the register and confidential.

Mr SLIPPER—What would be the determining factors which would determine whether the details of the agreement are public or not public? It would seem to me to be in the community interest for them to be public.

Ms Franz—Usually it is a commercial reason. In an ILUA like this, between governments and the Wajarri Yamatji, there probably would not be any part of it that would not be public in the interests of the public. But in commercial deals often parts of them are kept off the register.

Mr SLIPPER—Is there a body that determines whether keeping part of them off the register is appropriate?

Mr Robins—No. It is an agreement between the parties.

Mr SLIPPER—Can they be FOied?

Ms Franz—That is not a question I can give you an answer to, as I am not sure.

Mr SLIPPER—Thanks.

Mr LINDSAY—Our committee is always very suspicious about government keeping things confidential; we had an issue with Immigration recently. Mr Robins, in their evidence CSIRO said there was a contribution of about \$4 million from the WA government. But your evidence says that you have a financial commitment to the project of close to \$30 million. How do you resolve that?

Mr Robins—The \$4.08 million that is referred to in the CSIRO submission is a matter of record and state government contribution as a historical fact. That is a sum of funds which was allocated a number of years ago and has ended up in my team and my department's budget for use for particular purposes, notably around the provision of infrastructure—I think that was the original terminology used. Since that initial funding—and I probably should not even say that, rather it was the initial large sum allocated by the state for a particular purpose around this—the state government has, as I indicated, been funding the project in a number of different ways via the resourcing of salaries of staff and things like that for up to 10 years. The \$30 million figure is a summation of specific amounts which have been allocated directly to projects such as that \$4.08 million and a number of other allocations for associated activities, such as the establishment of a centre of excellence at Curtin University of Technology; the funding of the proposed International Radio Astronomy Research Centre, or IRARC, as it is loosely known, in Western Australia for \$20 million; the funding of the Premier's Research Fellowship program; et cetera. Those sorts of particular program allocations over the last few years add up to about \$30 million.

Mr LINDSAY—Is the WA government accepting responsibility, for example, for the state of the roads out to this facility? Will you be doing any upgrades to the roads?

Mr Robins—In general terms, there is a public, gazetted road which runs right to the border of the MRO. As such, it will remain the responsibility of the current local shire to maintain that road in gazetted form, as with all gazetted roads that the shire is responsible for. Once the road crosses the border of the MRO and goes onto what will be the CSIRO's leased property, the road will be CSIRO's responsibility.

Mr LINDSAY—So you are not aware of any proposal to upgrade the road because there is going to be a lot of construction stuff going on.

Mr Robins—I am aware in general terms that shires talk about these things. In terms of it being a requirement of the project you certainly should ask the CSIRO ASKAP project team if they have a budget allocation or an intention to expend funds in that regard, but the state has not enunciated any specific intention to do that.

ACTING CHAIR—Thank you very much for appearing before us today, Mr Robins, and thank you, Ms Franz, for helping.

[11.47 am]

STAVELEY-SMITH, Professor Lister, Representative, Astronomy Australia Ltd

ACTING CHAIR—I think you have heard my previous remarks to witnesses.

Prof. Staveley-Smith—Yes.

ACTING CHAIR—Would you care to make some introductory remarks.

Prof. Staveley-Smith—Firstly, thank you for the opportunity to address the committee. I will give a small bit of background about Astronomy Australia first. Astronomy Australia Ltd is a not-for-profit company. The members of the company include the vast majority of Australian universities and research organisations engaged in astronomical research, and that includes the CSIRO. It is funded by its members and by the Australian government, principally through the National Collaborative Research Infrastructure Strategy but also through other organisations such as the ARC. Its aim is to provide astronomers with access to national optical astronomy and radioastronomy facilities and to play a coordinating role for future astronomy infrastructure in Australia.

The AAL has interests in two projects to be located at the MRO. The first is CSIRO's ASKAP facility, which we are discussing now, and the second is the joint Australian-US-Indian Murchison Widefield Array project. Altogether, AAL intends to provide funding of up to \$19.2 million for assistance in the development of these projects. In the longer term, AAL is committed to the Square Kilometre Array project and is assisting CSIRO and the Australian government to establish a good case for siting the SKA in Western Australia and Australia in general. Examples of AAL's involvement recently have been its sponsorship of an international SKA pathfinder meeting in Perth in April this year and also a proposal to set up an Australian national radioastronomy committee jointly with CSIRO to provide advice on matters of interest relating to radioastronomy and radioastronomy facilities.

With specific regard to ASKAP, AAL would like to note that ASKAP will be the world's leading survey radio telescope, at a frequency of about one gigahertz. This will provide Australia's astronomers with a scientific advantage over other facilities worldwide for many years. For example, it will provide surveys of millions of galaxies. These galaxies will be used by astronomers to measure the structure of the universe and the evolution of galaxies in our universe. ASKAP will provide a map of unprecedented detail of the magnetic field of our own galaxy and will allow us to find out how the magnetic fields in other galaxies similar to the Milky Way evolve with time. It will also allow us to see vast numbers of new variable and transient radio sources, and this will be a very new capability for radioastronomy worldwide.

There are many implications of having ASKAP, including improving Australia's international research ranking, fostering collaborations with overseas institutes, attracting young people into science and helping Australia's SKA bid. I recently attended a scientific workshop in Melbourne—at the end of last week—and I was very impressed to hear of the keen interest of overseas scientists who are currently designing surveys with major ground based and space

based facilities such as the German XMM satellite and ESA's future Herschel mission, to be launched next year. These scientists were very keen to know when the first ASKAP data will flow and what particular parts of the sky the ASKAP deep field will be pointing to.

To conclude, I would also like to say that AAL has just completed a review of its strategic options in optical astronomy over the next three years. It has engaged a team of three leading international astronomers to provide a list of recommendations as to the use of future funds. Although it was not asked to provide comment on radioastronomy, the committee was particularly impressed by the radioastronomy road map in Australia; in fact, it prefaced many of its recommendations with remarks about possible synergies with the ASKAP project. In doing so it tied the future of Australian optical astronomy very much to the development of future radio telescopes. In summary, the AAL would like to see the ASKAP project proceed without delay.

ACTING CHAIR—Thank you for that. It has been put to the committee that ASKAP will reverse the trend of brain drain. Would you agree with that comment?

Prof. Staveley-Smith—I think we have already seen overseas people being attracted back into Australia even before the construction of ASKAP, so I would have to agree with that statement.

Mr SLIPPER—What sort of numbers are we looking at, though? We have been losing them for years. We have lost them in a drain; are we getting them back in a trickle?

Prof. Staveley-Smith—In terms of high-profile scientists, we are not talking large numbers, but these high-profile scientists are the nuclei of groups of young people. They are very important in attracting postdocs and students, and I think they are very important for future student training. I would find it difficult to give you an absolute number.

Mr SLIPPER—Do we pay them enough? My view is that we do not pay top people enough. We are too mean.

Prof. Staveley-Smith—I think that view would be supported by people in the scientific community!

Mr SLIPPER—I thought I should redeem myself following my earlier question! When in so many areas young people, particularly, and also older, more experienced people are being offered big dollars with fine research facilities elsewhere, it does seem to me that even if we cannot always compete with the research facilities—although I can see that you are trying to do it here—we ought to at least offer reasonable remuneration, in which case there is a greater chance of holding them.

Prof. Staveley-Smith—I think the previous federal government, through the Federation Fellowships scheme, and the current government, through the Laureate Fellowships and the Future Fellowships, have seen this and tried to address some of those issues.

Mr SLIPPER—I do think the former government had better vision.

ACTING CHAIR—We will allow that on the record!

Mr SLIPPER—We will all agree with this!

Mr LINDSAY—Do we currently have any federation fellows in astronomy in Australia?

Prof. Staveley-Smith—Yes, we have at least two, although the exact number might—

Mr LINDSAY—Does this project have the potential to bring more to our country?

Prof. Staveley-Smith—Absolutely.

Mr LINDSAY—It is of that importance?

Prof. Staveley-Smith—Yes.

Mr LINDSAY—You call this project a world-leading research telescope at one gigahertz. I have asked the CSIRO about that band. Rather than being one gigahertz through to 100 gigahertz, what is your evidence to the committee—should this project be capable of being more frequency agile or is it fine the way it is?

Prof. Staveley-Smith—Astronomy goes from DC to daylight, as we sometimes say. It covers a very large number of orders of magnitude and frequency range. Radioastronomy typically goes from 100 megahertz to 100 gigahertz. No one radio telescope has ever covered the total frequency range, so it is quite all right to have an instrument which covers a smaller frequency range. With the type of technology that is being used for ASKAP, the frequency range is perhaps slightly smaller than usual and that is partly connected with the very innovative technology it is using. But I think that for most of the community in Australia—it is difficult to give you a percentage, but 60 or 70 per cent—given the scientific interests of the community, that is justified.

Mr LINDSAY—I do not understand these things, but the interest of radioastronomers largely centres on the frequency that this instrument will work at; is that is right?

Prof. Staveley-Smith—A large part of the interest, yes—not the only interest but a large part of that interest.

Mr LINDSAY—And whoever is running the wider project, the SKA, are happy with this frequency band?

Prof. Staveley-Smith—Yes, even the SKA itself has a frequency band that does not cover all of radioastronomy. There are other facilities in the world, such as the upcoming ALMA facility in Chile, which does operate at high frequencies, above 40 gigahertz. It requires different site characteristics to those for a low-frequency radio telescope. It requires a high and dry site, whereas for low frequency we need to get rid of radio frequency interference from cell phones et cetera. The WA site is much more ideal.

Mr LINDSAY—You still require a dry site though, because microwave energy is absorbed by moisture in the atmosphere; is that right?

Prof. Staveley-Smith—Not particularly at low frequency, no.

Mr LINDSAY—Now you have thrown me off—I did not expect that answer! I had better stop there.

ACTING CHAIR—Perhaps that is wise, Mr Lindsay! Mr Slipper, do you have any more questions?

Mr SLIPPER—Yes; I have one, which has not been asked. Given the remoteness of Geraldton, do you think it is going to be difficult to get leading people to come here to live permanently, or do you expect them to fly in and fly out?

Prof. Staveley-Smith—I am not qualified to answer the operational aspect of that; but from the scientific part it is not intended that ASKAP will be operated locally. Most scientists will be sitting at their home institutions and using it something like an internet telescope, but even then most scientists will just be interacting with the data in much the same way as they do currently with space projects. They get the data downloaded at some stage shortly after the observations are done.

Mr LINDSAY—If we do attract the SKA to Australia, will the \$1.8 billion cost largely be spent in Australia?

Prof. Staveley-Smith—I believe that a fraction of that will be spent within Australia through industry contracts et cetera, but probably the most important flow-through will be the operational costs, which typically for large astronomy facilities run at five to 10 per cent of the capital costs and much of that \$100 million to \$200 million would flow back to Australia. That is my understanding.

Mr LINDSAY—Is there any component of the SKA that is located outside Australia, or is it just the research people that are located outside Australia?

Prof. Staveley-Smith—The SKA has not been funded yet and does not exist; it is not yet planned to exist within Australia. The Australian proposal has most of the telescopes within the continent and there has been talk—indeed, our Prime Minister has talked to the Prime Minister of New Zealand to discuss the possibility of a New Zealand station being part of SKA.

Mr LINDSAY—Could New Zealand still see the same part of the sky that Australia would see?

Prof. Staveley-Smith—With some restrictions, but basically the same part of the sky, except sources as they are rising and setting. Once the sources are set in one part of the country they may still be visible in another part of the country.

Mr LINDSAY—Thanks.

Resolved (on motion by **Mr Slipper**):

That this committee authorises publication of the transcript of the evidence given before it at public hearing this day.

Evidence was then taken in camera—

Subcommittee adjourned at 1.15 pm