

Antarctic Visit Report

Introduction

- 1.1 In September 2012, the Minister for Sustainability, Environment, Water, Population and Communities, the Hon Tony Burke MP, invited members of the Joint Standing Committee on the National Capital and External Territories to take part in a visit to Wilkins base in the Australian Antarctic Territory.¹ The visit consisted of a kit-out, tour of inspection and briefing at the Australian Antarctic Division (AAD) Headquarters at Kingston, Tasmania, on 12 December, followed by a return flight to Wilkins on 13 December. While at Wilkins the Committee inspected the base facilities and a field camp.
- 1.2 During the visit, the Committee was able to hold discussions with a range of AAD personnel and learn something of the scientific work being undertaken in Antarctica. The Committee was also given the chance to experience at first hand the challenges and rewards facing those working in the Australian Antarctic Territory, especially the incredible logistical effort involved.
- 1.3 The Committee thanks the Minister for the opportunity to travel to the Antarctic, and thanks the staff of the AAD for their efforts and support in making the visit a rewarding experience for those involved.

Day 1—AAD Kingston

- 1.4 The day at AAD Headquarters, Kingston, involved a kit-out, inspections and briefings. The Committee was also able to hold informal discussions

¹ The visit was also attended by the Senate Standing Committee on Environment and Communications (SSCEC).

with AAD staff during the day, getting a picture of the current opportunities and challenges facing the AAD.

- 1.5 The kit-out involved the issue of a complete set of survival clothing as well as instructions upon how to pack it, how to wear it and when to put it on. It was emphasised that the survival gear was vital to our welfare, was to be worn at all times on the ice, and that no substitution with non-issue gear was allowed.
- 1.6 The Committee conducted inspections of the set-up and preparations of the Aurora Basin Deep Field Glaciology Camp, the AAD mechanical workshop, the krill laboratory, as well as receiving a briefing on the manufacture and use of whale tags.
- 1.7 The Aurora Basin Deep Field Glaciology Camp will generate climate data from ice cores. The Committee was shown around camp facilities set up at Kingston for demonstration and testing, as well as being shown ice core drills and testing equipment. As part of the inspection, the committee was briefed on the climate data already being produced from Antarctic ice cores, particularly at Law Dome in the Australian Antarctic Territory. Four hundred metres of ice core can give 4000 years of temperature data. The presence of various elements in the core can give indications of solar activity, volcanic activity and winds at different times. Concentrations of atmospheric gases can also be measured over time. So too can the extent to which Antarctica is soaking up water or releasing it to the ocean.

Figure 1.1 JSCNCET Members inspecting ice coring equipment, AAD Kingston.



Source JSCNCET 12 December 2012

- 1.8 The findings presented to the Committee indicate that a slight decrease in land ice has occurred in Antarctica, but that losses of sea ice in some areas have been compensated by increases in other areas, reflecting variations in ocean circulation. The records indicate an exponential increase in the presence in the atmosphere of greenhouse gases such as methane, carbon-dioxide and nitrous oxide since the year 1800. Carbon Dioxide is at its highest concentration for 15 million years.

Figure 1.2 JSCNCET Members discussing climate data with Dr Tas van Ommen, AAD.



Source JSCNCET 12 December 2012

- 1.9 The krill laboratory looks at the lifecycle of krill and the phytoplankton that feeds it. Phytoplankton plays a significant role in carbon dioxide sequestration. Understanding the relationship between the Southern Ocean, its inhabitants and the atmosphere is vital to understanding the process of oceanic carbon sequestration.
- 1.10 Antarctic krill is the dominant herbivore biomass in the Southern Ocean. It is essential for much higher animal life and also plays a part in the human food chain. Information on the life cycle of krill provided by the laboratory informs catch limits in the krill fishery.
- 1.11 AAD is playing a leading role in the tagging and monitoring of whales. The Committee was given a demonstration of types of whale tags and the development of tagging technology. The technology has been used to produce maps illustrating the migratory patterns of humpback whales

and will be employed in future to allow scientists to monitor the movements of blue whales as part of the Antarctic Blue Whale Project.

- 1.12 The Committee was also shown around the mechanical workshop where vehicles and equipment are maintained and reconditioned for return to Antarctica. The Committee inspected two Hägglunds over-snow vehicles which provide the main motorised transport for AAD personnel in Antarctica. The two vehicles had been in service for some thirty years.

Figure 1.3 JSCNCET Members inspecting the Mechanical Workshop, AAD Kingston.



Source JSCNCET 12 December 2012

Day2—In-flight briefing—the work of the AAD

- 1.13 The in-flight briefing included an overview of Australia's Antarctic operations.
- 1.14 The Australian Antarctic Division was established in 1948, and moved from Melbourne to Kingston in 1981. It employs around 300 staff in Tasmania and between 70 and 200 staff in the Antarctic stations at any one time.
- 1.15 The four permanent stations are:
- Macquarie Island

- ⇒ Established 1948
 - ⇒ Accommodation for around 30 people
 - ⇒ 4 days from Hobart by sea
 - Mawson
 - ⇒ Established 1954
 - ⇒ Accommodation for around 40 people
 - ⇒ 15 days from Hobart by sea
 - Davis
 - ⇒ Established 1957
 - ⇒ Accommodation for around 100 people
 - ⇒ 12 days from Hobart by sea
 - Casey
 - ⇒ Established 1969 (replacing Wilkes)
 - ⇒ Accommodation for around 100 people
 - ⇒ 8 days from Hobart by sea;
 - ⇒ 65km from Wilkins runway (4½ hours by air from Hobart).
- 1.16 The three Antarctic mainland bases are crewed 365 days a year and are regarded as high maintenance, requiring a year-round presence to ensure they remain serviceable. Many of the design features are now considered out of date. They are also energy intensive, a major drawback when all fuel supplies must be shipped in and securely stored, at considerable cost.
- 1.17 Transport of equipment, stores and (until recently) personnel is chiefly by sea. The *Aurora Australis*, launched in 1969 and operated by P&O, is the platform for maritime transport and marine research for the AAD. It is the sole Australian vessel supporting Australia's Antarctic presence and is due for a major refurbishment in 4 years.
- 1.18 The air link is principally for the movement of personnel and light stores. The air link is via Wilkins runway, using an Airbus A319 operated by Skytraders Pty Ltd. The Wilkins runway has had a chequered history since becoming operational in January 2008 – with as few as two flights per season being completed – the operation of the runway being dependent on weather, aircraft serviceability and, most importantly, the integrity of the runway surface. Unusually warm temperatures in recent years have regularly rendered the runway unusable. Three of the five seasons at Wilkins have been considered failures, and other options for inter-continental transport are being explored.
- 1.19 Intra-continental air transport is by Basler T-67 and Twin Otter aircraft operated by Kenn Borek Pty Ltd (Canada). The Baslers are converted DC-3

aircraft and, while very effective, do not offer a long term transport solution. Other options are being explored.

- 1.20 Helicopters also provide short-range and ship-to-shore transport.
- 1.21 Over 10 000 tonnes of cargo are carried to Australia's four stations each year. In 2011-12, over 444 passengers completed round trips by sea and/or air, while another 100 travelled by sea alone. There were 51 520 occupied bed nights at the four stations. 6.4 million litres of fuel were consumed for electricity generation, shipping, aviation and vehicles. Transportation is regarded as the single biggest cost of Australia's Antarctic operations.
- 1.22 The AAD plays a significant role in the Tasmanian economy, with direct spending of some \$70 million per annum. AAD procures \$15-20 million per annum of goods and services from around 100 Tasmanian businesses. The Tasmanian Antarctic sector employs around 900 people and is worth up to \$200 million per annum.
- 1.23 The in-flight briefing also focused on the changes to Antarctica and the world revealed by 100 years of scientific endeavour. Committee members received a small bottle of air extracted from ice-cores dating to 1912, the year of Mawson's Antarctic expedition. Antarctic science has revealed changes in the atmosphere, changes in climate, and changes in the world's oceans in the last 100 years. It has allowed us to hind-cast the world's climate over tens of thousands of years. It has revealed changes in ocean circulation and convection which have a major influence on climate.
- 1.24 Science has also identified a collapse in fish stocks and the pelagic whale population in the Southern Ocean in the last hundred years. Australian Antarctic science has been at the forefront of supporting policy on sustainable management of the Southern Ocean through research on the krill fishery, reducing bird by-catch and non-lethal whale research.
- 1.25 Australian Antarctic science has also led the way in environmental management through remediation efforts and biosecurity management.
- 1.26 There is a ten year strategic plan in place to provide direction to Australian Antarctic science, with four basic themes:
 - Climate Processes and Change
 - Terrestrial and Nearshore Ecosystems: Environmental Change and Conservation
 - Southern Ocean Ecosystems: Environmental Change and Conservation
 - Frontier Science.
- 1.27 The focus of the strategy is on highly applied and effective science with an emphasis on the link between science, policy and operations, with all

projects being selected on a competitive basis to fulfil these requirements. There is also a high level of emphasis on international co-operation, which is seen as essential to the future of Antarctic science.

1.28 Current projects being run from Casey Station include:

- **Aurora Basin North ice coring.** This project will recover an ice core from a new site in the interior of East Antarctica, providing data covering 2000 years and filling a gap in the current array of Antarctic climate records.
- **Law Dome Summit Snow–Climate Observatory.** This will update the high resolution Law Dome ice core data, allowing calibration with meteorological data.
- **High resolution studies of cosmogenic beryllium isotopes at Law Dome.** Study of naturally occurring radioactive beryllium isotopes provide a means of reconstructing solar output, and thereby the impact of the solar cycle and changes in the Sun’s impact on climate over time.
- **Remediation of petroleum contaminants in the Antarctic and sub-Antarctic.** A long term program looking at implementation, risk assessment and monitoring of full-scale remediation operations of fuel contamination in the Antarctic and sub-Antarctic.
- **Development of contaminant metal removal systems suitable for implementation in cold regions.** This project will develop materials and methods for the stabilization and removal of metal contaminants from contamination sites in cold regions.
- **Development of environmental risk assessment and remediation guidelines for Antarctic and sub-Antarctic marine and terrestrial environments.** This project will build on limited ecotoxicological data currently available for Antarctic biota to develop Environmental Risk Assessment procedures and to derive soil and water quality guidelines and remediation targets.
- **Residual toxicity and risk assessment of petroleum hydrocarbons in Antarctic and sub-Antarctic soils.** This study will evaluate the toxicity of fuels as they degrade. The project will identify safe levels of contamination where no environmental risk remains and provide targets for cleaning up contaminated sites.
- **Modelling spatial patterns and identifying environmental drivers for temporal change in Antarctic moss communities.** The project will use existing and new data to model spatial and temporal variation of mosses and lichens, identify the environmental drivers that determine their current locations, and predict the species that are most at threat from station activities and future climate scenarios.

- **ICECAP (Investigating Cryospheric Evolution through Collaborative Aerogeophysical Profiling in the Australian Antarctic Territory).** This project explores ice sheet structure, Antarctic bedrock and changing ice volume to answer key questions about Antarctica and current and future sea-level rise. ICECAP has already revealed a great deal about the geography of the East Antarctic Ice Sheet.
- **Monitoring the status and trends of Antarctic seabirds to improve fisheries management and detect climate change impacts in east Antarctica.** This project aims to develop and apply cost-effective monitoring approaches to determine population status and trends of a range of seabirds across the AAT.
- **Greenhouse gases in the southern hemisphere.** Part of CSIRO's background air monitoring network, the Antarctic region is well located to measure global background changes in greenhouse gases.

Day 2—Wilkins

1.29 The Committee departed from Hobart at 5am for the 4½ hour flight to Wilkins runway. Survival gear was donned during the flight. Upon arrival, the Committee was briefed on ground conditions (-8 degrees C, winds 25–30 knots, and cloudy).

Figure 1.4 Wilkins Aerodrome, AAT.



Source JSCNCET 13 December 2012

- 1.30 The Committee inspected a demonstration field camp for an ice-coring site, complete with one-person accommodation tent, ablutions tent, and ice core equipment. The field-camp gave the Committee a brief taste of the conditions faced by researchers and support staff working in the field. Transportation to and from the field camp was on the snow bus 'Priscilla'.

Figure 1.5 Members of the JSCNCET, SSCEC and AAD staff inspecting field camp.



Source JSCNCET 13 December 2012

- 1.31 The Committee was then shown around the base facilities at the Wilkins runway, including the main runway building and the accommodation block, with its basic and confined but otherwise comfortable facilities, and the various machines required to maintain the runway.
- 1.32 After approximately two hours on the ice, the Committee boarded the plane for the return flight to Hobart.

Figure 1.6 The Airbus A319 on Wilkins Runway.



Source JSCNCET 13 December 2012

Committee conclusions

- 1.33 The Committee is grateful for the opportunity to have seen the work of Australia's Antarctic scientists and support staff at first hand. The visit to the Australian Antarctic Division's facilities at Kingston and flight to Antarctica was an informative and rewarding experience for all those who attended.
- 1.34 Perhaps the most important point to come out of the visit from the Committee's point of view is the great work of the men and women of the AAD. The Committee was impressed by the dedication, enthusiasm and professionalism of everyone they met. The AAD and Australia's Antarctic and marine scientists are responsible for world-leading and ground-breaking research. It is a record of achievement of which the nation can be justifiably proud.
- 1.35 Nonetheless, there are challenges facing Australia if it wishes to remain one of the leading scientific influences in Antarctica.
- 1.36 First is the issue of logistics. The Committee got first-hand experience of the sheer logistical effort required to do anything in Antarctica, let alone conduct world-class scientific research. The challenges presented by ageing equipment and facilities, the regular failure of the Wilkins runway, and the need for more diverse transport options, must be met if Australia is to compete with existing and emerging Antarctic nations. Australia

must modernise the transport and infrastructure supporting Australia's Antarctic presence – including new ship(s), new air transport options, modern base facilities, and better access to the Antarctic inland. Moreover, the planning and funding for this new generation of bases and equipment must begin now.

- 1.37 Second is the need to maintain Australia's Antarctic and Southern Ocean research effort. Australia is a leader in environmental and climate science in Antarctica because of a sustained bi-partisan commitment to Antarctic science. This commitment must be maintained and funding continued, at the very least, at current levels in real terms, so that Australia can maintain pre-eminence in these fields. The Committee believes that the significance of Australia's Antarctic science cannot be overstated.
- 1.38 This is not merely a matter of research and logistics but of strategic necessity. Australia's continued claim to the Australian Antarctic Territory is hollow without a strong and enduring scientific and logistical presence on the Antarctic continent. Effectively, Australia must use the AAT or lose it.
- 1.39 This in no way suggests that Australia should seek to exclude other nations from the AAT or reduce the emphasis on international collaboration in research. Rather, it is to acknowledge that Australia's Antarctic claim rests upon its leadership, and continued leadership requires investment in cutting-edge science and logistics.
- 1.40 To this end, the Committee welcomes statements by Minister Burke supporting the scientific research effort and acknowledging the importance of logistics, including marine and air transport capabilities.²
- 1.41 The Committee also acknowledges Australia's leading role in research on waste management and pollution remediation. Protecting the near pristine Antarctic environment and minimising the impact of human activities should be a priority for all activities in the Antarctic. Finding ways to reduce the human footprint through better technology, more careful management, and effective remediation, is vital.
- 1.42 Finally, the Committee wishes to restate its ongoing interest in the work of the AAD and the future of the AAT. The Committee has a strong interest in the Antarctic Treaty System (ATS), its implications for Australia, and its role in the management and protection of Antarctica and the Southern Ocean. The ATS is vital to Australia's interests, especially with the growing presence of new Antarctic nations within and outside the AAT. The Committee is conscious of the scientific research effort, of the need to

2 <http://www.abc.net.au/news/2012-12-18/burke-backs-support-to-antarctic-program/4434620>.

maintain Australia's leadership in fields such as climate science and environmental management, and the opportunities to explore new fields, such as Antarctic astronomy. The Committee is also conscious of the logistic systems underpinning Australia's scientific effort, and the need for new and ongoing investment in transport and infrastructure if the scientific effort is to be maintained. Waste management is a significant and ongoing issue; as is the future of Antarctic tourism with its potential impacts on the Antarctic environment. These are all areas the Committee expects to investigate further in the not-too-distant future.

Senator Louise Pratt

Chair

13 March 2013