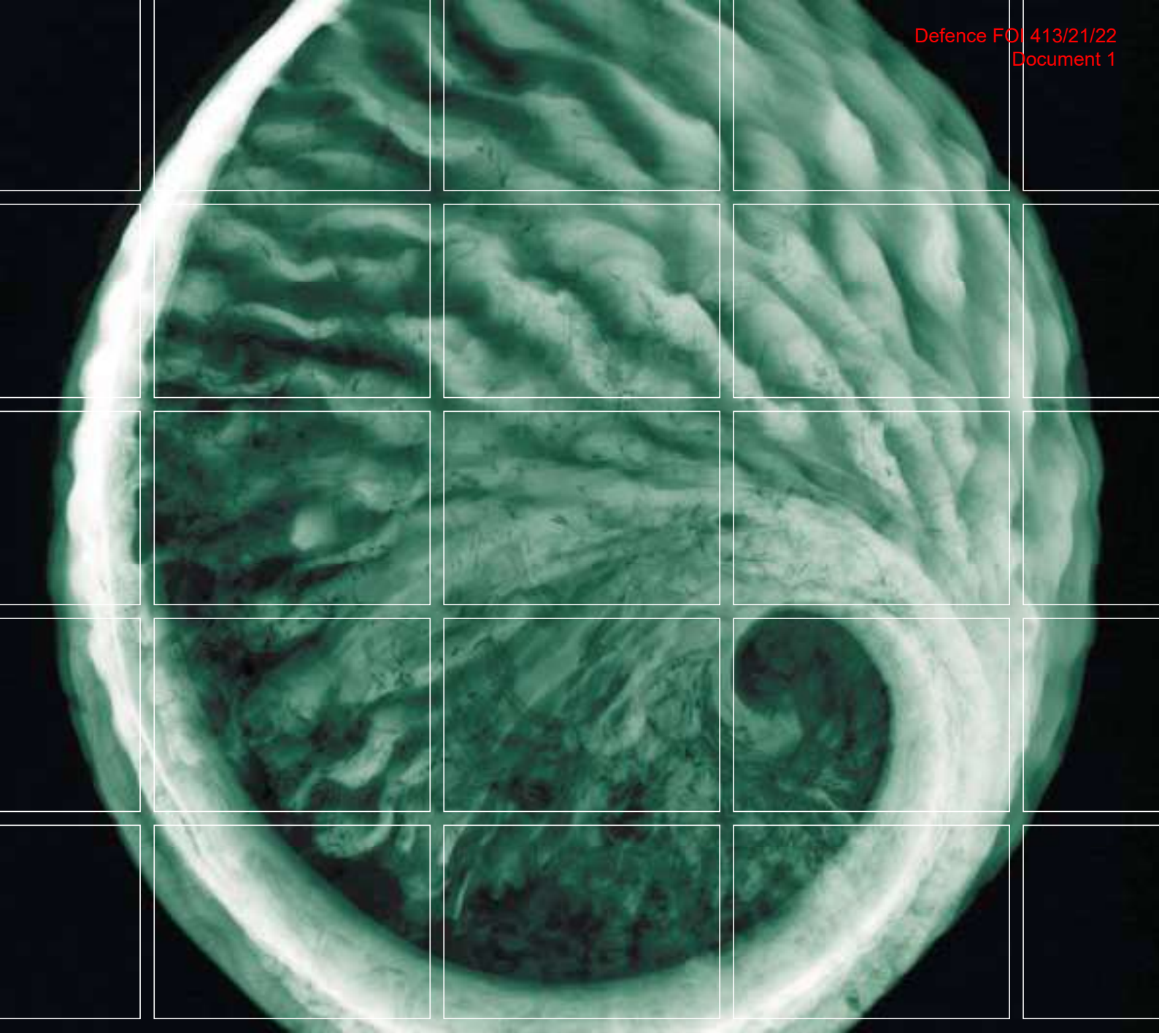

Statement of Heritage Impact: Belconnen Naval Transmitting Station Decommissioning

Advisory

Department of Defence

March 2005

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ERM

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FINAL REPORT

Department of Defence

Statement of Heritage Impact: Belconnen Naval Transmitting Station Decommissioning

Advisory

March 2005

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 OVERVIEW

Environmental Resources Management Australia Pty Ltd (ERM) were commissioned by Defence Corporate Services and Infrastructure (Defence) to undertake a Heritage Impact Assessment for the decommissioning of the Belconnen Naval Transmitting Station (BNTS) in ACT.

BNTS is an active transmitting station and has been since its construction in the 1930s. The site is currently wholly owned by Defence and managed by the navy. The site is to be decommissioned and its management handed to Corporate Services and Infrastructure Group. The decommissioning of the site is planned to involve the removal of equipment and antennae. The site is then to be managed as an inactive site with a view to its potential disposal in the future.

BNTS is currently listed on the Commonwealth Heritage List (CHL) and therefore is protected under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is listed for:

- History and equipment;
- Ecological species

The CHL citations are provided in Annex A of this report.

1.1.1 *Context Of This Report*

This report assesses the potential impacts to the Commonwealth heritage values of the site resulting from the decommissioning process.

As noted above, the site may be divested in the future. At the time of planning the decommissioning, it is unknown when and if this disposal would occur.

This decommissioning process is planned to occur whether the site is disposed or not, and is required to occur in the short term. As such, the decommissioning has been managed as a separate action but with a clear link to the potential disposal in the future. This allows for appropriate short term management measures to be protective of the historic and natural heritage values to be implemented, while allowing DEH to view the project in the context of future actions.

1.1.2 *Purpose Of This Report*

This report documents the findings of a Heritage Impact Assessment for the Decommissioning of the BNTS.

It provides an updated Statement of Significance based on the CHL criteria and provides guidance as to management recommendations for the ongoing protection of the heritage values of the site in specific relation to the decommissioning, with a view to potential future uses.

1.1.3 *Methodology*

This report was undertaken by Ruth Kelly of ERM and ERM's sub-consultant, Pip Giovanelli, Heritage and Conservation Consultant.

The project was undertaken with initial deskbased research, followed by a site visit in the company of Defence representatives.

A key tool in the preparation of this report has been a heritage assessment undertaken by the Cultural Heritage Research Centre (September 2001). Relevant sections of that report have been reproduced here. Other desk based sources are provided in the Reference Section at the end of this report.

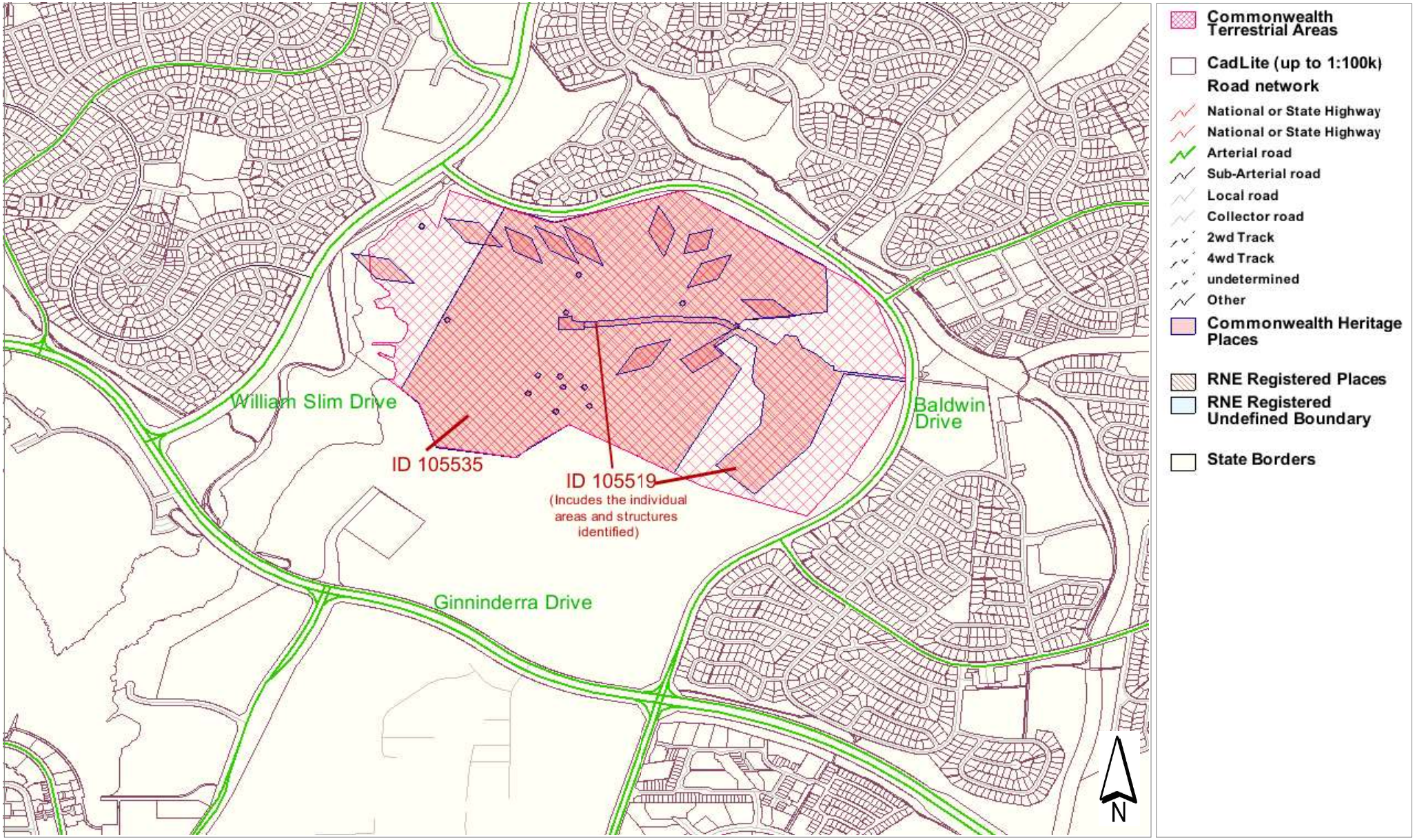
1.2 *CURRENT LEGAL STATUS*

As noted above, the BNTS site is currently listed on the Commonwealth Heritage List (CHL) for both historic and natural heritage reasons. The extent of the listings are provided in Figure 1.1 below.

This means that the site is formally protected under the provisions of s.341ZC&D of the EPBC Act.

Commonwealth Heritage List

Australian Government
Department of the Environment and Heritage



Scale 1:20000

Comment: ID 105519 − RAN Transmitting Station; ID 105535 Synemon Plana Moth Habitat

NOTE. Heritage Division officers should seek appropriate clearance prior to distribution of any maps that contain the location of CONFIDENTIAL sites.

printed by: LWALL
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1.3 WORK UNDERTAKEN TO DATE

As noted previously, much work has been undertaken to date at the site. This includes:

- Cultural Heritage Research Centre Natural, Cultural and Military Heritage Assessment – Belconnen Naval Transmitter Station and ACT Government Land, Lawson (2001) (identified in this document as the UCAN report);
- Review of Grassland Significance, Belconnen Naval Transmitter Station Lawson ACT (2001); and
- Threatened Species and Kangaroo Management at Belconnen Naval Transmitter Station, ACT (2004).

1.4 BACKGROUND TO THE DECOMMISSIONING PROCESS

1.4.1 *Modernised High Frequency Communication System*

As part of continually improving Defence capability, the ADF identified that communications facilities required upgrading to meet the current capability demands.

Modern combat forces require timely, accurate information in the form of secure voice, data and image transfer which the current Defence HF systems can not fully support. As a result the High Frequency Modernisation Project was signed on the 31st of December 1997 with the prime contractor Boeing Australia.

The new HF communications system provided by Boeing will meet all the ADF requirements as well as provide significant improvements in the area of Frequency Management, Radio Equipment, automation, connectivity and greater data throughput.

The Modernised High Frequency Communications System (MHFCS) will enhance command and control of the ADF by linking command centres with deployed aircraft, ship and land forces. The coverage of the system is all of continental Australia and for 3000 kilometres out to sea.

The upgrade to the Defence communications system will take advantage of some existing communication facilities by refurbishment, supplemented with the building of new facilities. As a result some Defence HF communications facilities will become redundant and need to be decommissioned and managed according to Commonwealth legislative requirements.

The decommissioning of BNTS is being undertaken within this context. This is an operationally driven action and Defence has no other operational use for the site.

1.4.2 Current Site Management

The site is currently managed by Navy with Boeing as the primary contractor for operations. The decommissioning process is being managed by Defence Materiel Organisation (DMO). Corporate Services and Infrastructure Group (CSIG) currently have management responsibility for environmental issues on the site.

When the site is decommissioned, the Navy will leave the site with the assistance of DMO and the management of the site will fall into the hands of CSIG. At this point, the site will be empty and non-operational.

Since there is no alternative function for the site, CSIG will be tasked with management of the site until such time as the site is disposed, or an alternate use is found for the site.

1.4.3 Future Management And Maintenance Requirements

In planning for the decommissioning of the site and the management hand-over to CSI-G, DMO commissioned a Masts Inspection Report to assess the condition of the three VLF masts at BNTS. The aim of the report was to ascertain what works would be required to *"have the masts brought to a structurally sound and presentable condition to allow masts to remain in-situ as a non operational exhibit."* (LeBlanc Communications Australia, December 2004).

The report found that a series of immediate remedial works would be required to make the masts structurally safe as non-operational items, including (but not limited to):

- Installation of anti-climb components;
- Removing the existing paintwork in accordance with AS4361.1-1995 Guide to Lead Paint Management and re-painting;
- Rust treatment, remedial works to the ladders and platform bolts, upgrades to the earthing; and
- Installation of other safety systems and applications to increase life of the masts and their component parts.

The document also reported on the ongoing maintenance requirements of the three masts, assuming a maintenance program of 25 years.

The report found that the immediate remedial works would incur a cost of $1.46 million. The ongoing maintenance costs over 25 years would be an additional estimated $5.46 million.

The LeBLANC report only assessed the three VLF masts. There are over 40 other masts and antenna at the site which would also require remedial, safety and maintenance works if left in situ.

LeBLANC also provided costs for the ongoing maintenance costs over a period of 25 years for all other towers and aerials. The costs for carrying out maintenance checks and minor maintenance work is approximately $1.5 million. This does not include any remedial work required to be carried out to make the towers and aerials safe to remain in situ as a non-operational exhibit.

Table 1.1 ***Summary of Remedial and Maitnenance Costs***

Task	Cost
Remedial work on the 3 x 600 ft towers	$1.46 million
25 year maintenance costs for 3 x 600 ft towers	$5.46 million
Remedial work for other towers and aerials	TBC
25 year maintenance costs for other towers and aerials	$1.51 million
Approximate total (not including costs of remedial work for other towers and aerials)	***$8.43 million***

1.5 BNTS DECOMMISSIONING PROCESS

This report is concerned only with the decommissioning process. While it is recognised that the site may be disposed in the future, at the time of undertaking this project, the disposal future of the site is unknown.

The decommissioning process (and the action which has been assessed for impacts as part of this report) includes:

Removal of all equipment required at other sites by Defence. This will include:

- the removal of all workshop equipment directly associated with antenna maintenance; the equipment will be used elsewhere in Defence.
- 12 of 25 ATS10 Txers plus all spares and associated test equipment.
- All serviceable test equipment will be returned for reuse elsewhere in Defence.

Decommissioning and de-construction of antennae. This will include:

- Dismantling of all VLF antenna structures guy/cables and removal from site as scrap all components not required to remain as potential future static display; and
- Dismantling of all HF antenna structures guy/cables and removal from site as scrap all components not required to remain as potential future static display.

Decommissioning of other plant and equipment including generators and transmitters etc. This will include the removal of the 450kVA emergency generator for reuse at the HFMOD Bohle River Transmit Site.

Once the relevant equipment has been removed and the towers dismantled, the site will effectively be non-operational and vacant and its management will be passed to the Corporate Services and Infrastructure Group of Defence. CSIG will manage the site in "stasis" until plans for the site's future use are more developed.

2 OVERVIEW OF THE SITE HISTORY AND SIGNIFICANCE

2.1 HISTORIC CONTEXT

Construction work began at the BNTS in 1938 with the first naval officers stationed there, and the first transmissions made in 1939. The first transmissions were made using the Rhombic aerials, with the long wave aerial array (ie the 3 x 600 ft towers) being completed in 1941.

The transmitting and receiving stations remained operational ever since, with additional works undertaken on the low frequency transmitter and infrastructure from 1959-61. Ratings Quarters and Messes were added in 1960 and a standby generator building erected in 1973 . The 1960s also saw upgrades to the Rhombic Aerials and the construction of the Omni Vector Aerials.

More detailed histories of the site can be found in the UCAN report and the CHL citation (provided in Annex A of this report for reference).

2.1.1 *Overview Of The Commonwealth Heritage List Assessment Of Significance*

The BNTS was entered in the Register of the National Estate (RNE) in 2002 and is currently "Listed" in the Commonwealth Heritage List as an "historic" place. (see Annex A).

The Assessment of Significance and Summary Statement of Significance for both the RNE and CHL are effectively the same, with the CHL including additional information on those *attributes* of the place that illustrate significance.

The CHL assessed BNTS against standard heritage criteria and concluded that effectively the whole of the place has cultural heritage value. The CHL citation notes that of the approximately 50 aerials (of six differing types) the three 600 ft masts and those rhombic aerials associated with the original rhombic aerial array are individually significant within the aerial farm. (Criteria A Processes).

The CHL citation assessed the three masts as important components of the site's significance. The masts illustrate and express the design and technical achievement of the low frequency transmitter, they demonstrate an important east-west alignment that enabled transmissions to the Indian and Pacific oceans, and the length between the masts is a graphic illustration of the long wave but low frequency nature of the transmission (Criteria B Rarity, D Characteristic Values, F Technical Achievement and G Social Value).

2.1.2 *Review Of Significance*

Based on assessment undertaken as part of this report, a review of the significance is provided below, along with a Statement of Significance under the CHL criteria as outlined in the EPBC Act Regulations provided in Section 2.4.

The historic heritage values of BNTS relate to its historic associations with WWII, the technical values of the LF transmitter (given its date of construction), the integrity of the LF transmitter (but not including the aerial array) and the diversity of transmitters and aerial types contained within the one station. Features that reinforce the above items contribute to significance, such as the purpose built Helix room, stylistic elements of the buildings that reflect the initial period of construction, and the subsequent evolving built form that responded to the increasing amount of equipment housed and used on the site.

The site has continued in use over the length of its development as a transmission facility and both the technical equipment and the architecture that housed it have been maintained in good utilitarian condition.

The facility has a high degree of interest for several personnel in the service and in the community who have previously operated and maintained the equipment.

It is important to recognise that the more significant aspects of the site relate to its historical associations (particularly in the lead up to and during World War II) and the technical achievement of producing an extremely powerful low frequency transmitter. The masts were only a part of the technical achievement, albeit the largest and most visually apparent component. They were large for their time (but not the largest) and could be considered "inert" structures that merely supported the massive (and "active") aerial array that was linked back to the transmitter. After reviewing the available documentation and undertaking the site inspection, it appears that the masts are important more for their contribution to the site's significance, rather than as highly significant items in their own right.

The removal of the aerial array (in 1995/6) that was strung between the masts has reduced the towers' significance by removing their physical and functional link back to the transmitter. The masts now tend to read as three separate vertical elements. The cables that linked the transmitter to the aerial at the base of the central mast have also been removed.

2.2 ECOLOGICAL CONTEXT

The BNTS site is currently listed on the CHL for natural heritage reasons. That is, the site is listed for its Synemon Moth habitat. The CHL citation for this is also provided in Annex A.

This species of moth makes up one of three species at the site which is listed under the EPBC Act:

- Golden Sun Moth (*Synemon plana*);
- Ginninderra Peppercress (*Lepidium ginninderrense*); and
- Natural Temperate Grasslands.

2.3 ARCHAEOLOGICAL CONTEXT

Some Indigenous items have been identified at the site including a possible scarred tree and some isolated artefacts (identified in the UCAN report).

These items are not considered to meet the threshold of significance under the CHL criteria. The artefacts are neither rare nor technically significant. In addition, these items are not within an area that may be affected by the decommissioning. However, since there are previously known isolated finds at the site, this is a matter that may be adequately managed through on-site practices during the decommissioning process.

2.4 UPDATED STATEMENT OF SIGNIFICANCE

Criterion a: The place has significant heritage value because of the place's importance in the course or pattern of Australia's Cultural history

The overall history of the site and its construction in response to political and military needs in the 1930s is of significance. The building additions (1941 extensions, 1951 Transmitter Hall and 1951 two storey entry) have significance for illustrating historical evolution of the site.

The diversity of transmitters and associated equipment including ADS 10, Marconi, Linear Amplifiers, Antennae exchange etc, richness of assemblages, and historical importance of facility to Naval communication, and by extension national defence and military associations with Great Britain at the time. The significance is embodied in the fabric, the number or quantity/diversity of items and the direction or array of the particular aerials.

Aerial feeder systems are of historic and technical interest, however they are significant only in association with transmitters and aerials. The individual wires are not significant. It is the combination of parts that demonstrate the system.

The observation posts are significant for associating the facility with WWII. The significance is embodied in the fabric, form and location.

Criterion b: The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspect of Australia's cultural history

The 1938 LF transmitter and all associated equipment inside the building have significance because of their uncommon nature. The 3x 600 ft towers are rare in their height, type of construction, layout and form but not unique.

The direct linear and functional relationship between transmitter, helix room and central mast is rare but the aerial and cable link has already been lost. The coherence of the various elements has been compromised by the removal of the aerial from the towers. This has impacted the significance of the item under this criterion.

The diversity of transmitters and associated equipment including ADS 10, Marconi, Linear Amplifiers, Antennae exchange is rare as well as the diversity of aerials including Rhombic, Bi-conical Monopole, Rotatable Log Periodic, Log Spiral, Omni Vector, Fixed Vertical Log Periodic sites with this diversity are rare.

Criterion d: The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of ; a class of Australia's cultural places or a class of Australia's cultural environments

The 3x 600 ft towers have significance as they demonstrate the remaining infrastructure of the long-wave aerial. The aerial itself was removed in the 1990s, the remaining towers representing the support structures. They do illustrate however the scale, form and layout supporting the original aerial. In addition, the location and arrangement of the masts are a component part of the layout of the site overall which demonstrates the characteristics of BNTS as a functioning transmission station of its period.

The direct linear and functional relationship between transmitter, helix room and central mast demonstrates technological process of the time although the aerial and cable links have already been lost.

The architectural features on the 1938 building have significance in demonstrating Federal Capital architecture and establishes the building and the commencement of the facility in time. The features of particular note include cornices, light fittings, door glazing, wall vents, soffit brackets etc.

The Helix room demonstrates technical process of generating high-powered low-frequency transmissions as well as the diverse range of transmitters and aerials.

The HMAS Harman emblem illustrates facility's association with HMAS Harman and the Guard house clearly shows the controlled nature of facility, both of which contribute to the demonstration of this type of Naval facility.

Criterion e: The place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group

It should be noted here that the equivalent of this criterion was not included in the original RNE/CHL assessment. It has been included here however as it is believed that some features of BNTS exhibit particular aesthetic characteristics as noted below:

The 3 x 600 ft towers exhibit particular aesthetic characteristics based on their original use. These towers are the most visually prominent and iconic element of the site. Their iconic status as features of a cultural landscape is perhaps the most significant element associated with the towers.

Criterion f: The place has significant heritage value because of the place's importance in demonstrating a high degree of relative or technical achievement at a particular period.

The 1938 LF transmitter and all associated equipment inside the building have significance in demonstrating a high degree of technical achievement.

The 3x 600 ft towers as part of the LF transmitter have significance, primarily under Criterion e. The towers are the support structures to the original aerial and so do not represent technical achievement in themselves. As noted above, the removal of the aerial array (in 1995/6) that was strung between the masts has reduced the towers' significance by removing their physical and functional link back to the transmitter. The masts now tend to read as three separate vertical elements. As three separate masts, they do not represent high significance under this criterion. The towers themselves are not representative of a new or unique type of construction. As a group of three however, they still retain significance in their form and axis arrangement and are still the most visually iconic representation of the technical achievements of the time.

The layout of the towers along an east-west axis demonstrates the technical achievements of the time. However, this is represented in the arrangement of the masts and the spatial relationship to the transmitter, rather than in the towers themselves.

The underground copper mat has high technical significance as an essential part of the LF transmitter. The Helix room and the diversity of transmitters and aerials is also of high technical significance.

Criterion g: The place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social cultural or spiritual reasons

The place has strong social value for groups with a high level of interest in the site's ability to demonstrate the cultural, historic and technical achievements demonstrated in the place.

3 IMPACTS TO HERITAGE VALUES

3.1 OVERVIEW

Based on the heritage values identified, the section below summarises the potential identified impacts resulting from the decommissioning process.

Table 3.1 Summary of Effects on Heritage Values of the Decommissioning Process

Component identified in the Updated Statement of Significance	Potential Impacts Resulting from the Decommissioning
Criteria (a) Historic associations with WWII Quantity/diversity of aerials Diversity of transmitters	Chain of historic associations broken through end to continuity of use. Historic associations still held within the site however partially through physical interpretive means of the site's form and context and partially through recorded histories of the place. Loss of some interpretable associations through loss of some fabric.
Aerial feeder systems	Minor impacts predicted via removal of these systems in conjunction with removal of aerials and towers.
Observation posts	No impacts predicted directly to the building and its features as the building is to remain in situ. Potential for secondary impacts through vandalism and neglect.
Criteria (b) 1938 LF transmitter and all associated equipment inside building	Minor impacts – The LF transmitter is to remain with much of the equipment that is not to be re-used at other Defence operational sites. Recycling of operational equipment is not deemed to be an adverse impact as this will retain continuity of use of movable items. In addition, multiples of movable equipment are to be retained on site for future use.
Diversity of transmitters and associated equipment including ADS 10, Marconi, Linear Amplifiers, Antennae exchange etc, Plus The diversity of aerials including Rhombic, Bi-conical Monopole, Rotatable Log Periodic, Log Spiral, Omni Vector, Fixed Vertical Log Periodic	Loss of fabric, the number or quantity of items and the direction or array of the particular aerials.
Listed ecological species	No impacts predicted if rigorous management is adhered to during the decommissioning process.
Criteria (d, e and f) 3x 600 ft towers	Loss of most visually iconic element of the site.
The direct linear and functional relationship between transmitter, helix room and central mast	Loss of external link to base of tower due to proposed demolition of tower. Aerial and cable link has already been lost however so this relationship is already compromised
Underground copper mat	No impacts predicted. This is to remain in situ
Architectural features on 1938 building. Cornices, light fittings, door glazing, wall vents, soffit brackets etc	No impacts predicted directly to the building and its features as the building is to remain in situ. Potential for secondary impacts through vandalism and neglect.
Helix room	No impacts predicted. This is to remain in situ
Subsequent building additions	No impacts predicted directly to the building and its

Component identified in the Updated Statement of Significance	Potential Impacts Resulting from the Decommissioning
(1941 extensions, 1951 Transmitter Hall and 1951 two storey entry).	features as the building is to remain in situ. Potential for secondary impacts through vandalism and neglect.
HMAS Harman emblem	Loss of associative and interpretive heritage values predicted if removed.
Guard house	No impacts predicted directly to the building and its features as the building is to remain in situ. Potential for secondary impacts through vandalism and neglect.

The key potential impacts are discussed in more detail below with specific mitigation and management measures to provide a framework for the reduction of potential or secondary impacts. This also provides a framework for the ongoing management of the site while in "caretaker" period, prior to the future of the site becoming known.

3.2 *PREDICTED IMPACTS*

The predicted impacts outlined in more detailed discussion below include:

- Loss of understanding through discontinued use;
- Loss of Physical fabric; and
- Potential impacts to ecological species.

These relate to effects noted in the table above which require further discussion in relation to the extent of effects that may be managed into the immediate future. Where no impacts have been identified as resulting from the decommissioning, these issues have not been considered further in this report.

3.2.1 *Continuity Of Use*

Much emphasis has been placed previously on the loss of understanding of the site through discontinuity of use. The loss of functionality can be seen as a "break" in the historic chain or pattern of use of the site.

Understanding of the use of the site comes through interpretation. It is not directly inherent in the presence or use of the place. The loss of understanding remains essentially with the loss of key elements that would assist interpretation. Therefore, while the loss of functionality secondarily may result in impacts via the removal of antenna and equipment, the transition of the site from operational to non-operational is not deemed to be an impact in and of itself.

3.2.2 *Physical Fabric*

The Masts

The retention costs identified by the LeBlanc report illustrates that there is no alternative to full removal of the towers and aerials. The remedial and maintenance costs as well as the OH&S and public liability issues make their retention in an upright position unviable.

The proposed removal of the three 600 ft masts follows the earlier removal of the LF feeder cable and aerial array. The masts are original fabric associated with the highly significant LF Transmitter and while their significance has been reduced through change over time, they still represent the most visually iconic demonstration of the site within a cultural landscape.

Aside from the visually iconic value, the demonstration of other values have either already been compromised by change over time (such as the direct functional relationships between the aerial and the transmitter) or are still able to be interpreted when the towers are dismantled (such as the spatial layout and arrangement). While this does not detract from the core effect of loss of visually iconic material, there are opportunities to manage the site into the future that allows the ongoing interpretation of the history and use of the site and its values. This is discussed further in Chapter 4.

The Transmission Station and Other Buildings on the Site and Associated Equipment and Infrastructure

Decommissioning has the potential to impact on the buildings through;

- Rapid deterioration of building fabric due to termination of maintenance,
- Rapid deterioration of building fabric due to increased exposure to vandalism,
- Internal damage to building fabric resulting from unsympathetic removal of equipment,
- External damage to building resulting from unsympathetic removal of feeder cables,
- Fire resulting from poor grounds maintenance.

These are primarily secondary effects which are manageable in the longer term. This is also discussed further in Chapter 4.

3.2.3 *Management Of Ecological Species*

HLA provided Defence with a report on the potential impacts to the threatened species and ecological communities (2004) which included issues directly related to the potential decommissioning:

Their impact assessment and mitigation measures were designed to be protective of the ecological species present at the site, with particular emphasis on the Natural Temperate Grasslands and the Ginninderra Peppercress. Their recommendations have formed the basis of the discussion and recommendations below, with some additions where there are additional (historic and Indigenous) heritage issues to be managed in conjunction.

Potential impacts identified by HLA included:

- Potential impacts to Natural Temperate Grasslands and Ginninderra Peppercress if smaller antennae removal undertaken in an unplanned manner;
- Significant soil disturbance around the 3 x 600 ft towers if allowed to free-fall;
- Soil disturbance from cut guy wires dragging along the ground as antennae fall;
- Accidental damage to kangaroos and other fauna from free-fall of towers;
- Potential impacts to rehabilitation areas; and
- Spread of weed species.

All these issues are manageable during the decommissioning process and Chapter 4 outlines a suite of means by which this can be achieved.

4 MANAGEMENT OPTIONS

4.1 OPTIONS FRAMEWORK

This Chapter outlines a suite of management options for the consideration of Defence in their management of the decommissioning process.

The management options have been designed within a framework with the intent of:

- Managing the decommissioning in a manner that would not negate the use of buildings, equipment and infrastructure for future uses;
- Managing the decommissioning in a manner that is protective of the site's heritage values;
- Managing the decommissioning in a manner that is protective of the identified listed ecological features of the site.

4.1.1 *Enabling The Future Use Of The Site*

In looking at potential future uses of the site, a museum has been identified as one possible function. It is recognised that any form of future use in this (or similar) manner would require a significant financial outlay. A museum site would however enable the initiation of continued interpretation of the site and its history.

It is unknown at this time if this will eventuate. However, should this, or another viable use be found for the site, the decommissioning aims to retain as much physical fabric and equipment as prudently and feasibly possible in order to enable such future uses if they should arise.

The decision making process for the future use of the site rests with Defence The planning and communications strategy for that future use also rests with Defence. With specific respect to the decommissioning process however, outlined below are a series of management options that would enable the future use of the site, whether that be a museum function or other identified use.

Management Options

Identify future user group /groups. Consultation with the interested parties and potential future landowners/users would help to develop an appropriate and practical future use management plan. It is assumed however that this would be undertaken as part of a Defence planning and disposal strategy.

Building fabric to be made good where equipment is removed. To allow for the ongoing management of the non-operational site, as well as any potential future uses outside of Defence ownership.

Removal of equipment should not be done in a way that disables associated functioning equipment. This is a change-management policy which would allow for the re-use of some items of equipment should this be required for operational reasons in the future, or for operational displays should a museum be a future use option.

Wherever possible and or practicable, equipment and infrastructure is to remain on site and in-situ in anticipation of future use/interpretation and to demonstrate the extent of the facility. This includes feeder cables and their support stirrups in the field. Again, as a change management policy, it is unknown what the future use of the site will be. In leaving items and features in situ where they are not required by other operational sites will allow for their future use and preservation if required. This also would be undertaken in the context of Defence requirements. That is, where equipment and materials have an ongoing function at other operational sites. This is an important factor of these items since their "recycling" at other operational sites will maintain their appropriate use. The approach of Department of Defence is to re-use equipment and infrastructure where it will serve a practical purpose at other operational sites. Where there is no Defence operational use, the equipment may remain on site for potential future uses/interpretation.

Maintain an inventory/catalogue of all fixed and movable items that are to be retained with the site in stasis. This would greatly assist the management of the transition phase and the eventual future use when this has been determined.

Consult with interested parties for opportunities to house movable heritage items off-site in a secure location. Since the site will be unoccupied, it may be prudent to consult with interested parties to establish opportunities for storage of some movable items off-site. This would protect and maintain the items and remove them from the possible threat of vandalism.

4.1.2 Protecting The Site's Heritage Values

This issue primarily relates to the management of the decommissioning of the towers and aerials. While it is noted that there is a loss of some fabric and their visually iconic status, there are a suite of management options outlined below which Defence may consider within the context of protecting the site's heritage values and their ability to be interpreted and understood in the future.

Management Options

Retention of Tower Material On-Site. The retention of tower material on site provides the opportunity to illustrate the scale and nature of the aerial support towers, should this be a needed for a static display in the future.

The most significant of the masts is the central one (44B) as it provides the (historically) direct link to the transmitter. The central mast could be laid along the axis of the aerial - ie. East-west to emphasise the importance of the orientation. The two outer masts could then be demolished and removed from the site.

Possible Retention of a Lower Portion of the Tower in situ. Retention of a lower section of the tower (up to 20 m) in-situ is also an option to provide an illustration of the scale and nature of the tower in an upright position. However retention of the lower portion will still require some on-going management. To retain future options with respect to this, it would be appropriate as part of this option to retain the three lower guy wires with connecting mechanism and tensioning equipment that would enable full reinstatement of the lower section of the central aerial.

Management of Tower Dismantling. If either or both of the above two management options are viable and safe, endeavours could be made to dismantle the towers in a manner that enables the interpretation of the full mast if laid down, or the re-erection of the lower portion of the tower.

Retention of Tower Infrastructure. To identify the east-west orientation of the array and its length, the two external towers' footings and bearings should be left in-situ. Guy wire anchor blocks for the central mast should remain in situ and samples of the wire and tensioning attachment bolts retained on site.

Retention of other aerials and masts. Consideration should be given to the significance of individual aerial types in making the decision of which types could remain on site for future static display and interpretive purposes. If safe, available material should be reviewed with respect to which aerials would be the most appropriate to retain on site. Given that retaining the aerials in an upright position is unviable in view of the immediate caretaker period until the future use is known, the aerials should be carefully disassembled or lowered, including all wires, guys, insulators etc. Anchor blocks and other infrastructure should remain in place.

Preparation of interpretation plaques or panels describing the types of aerial, their history and purpose. The plaques should be installed in a permanent manner in proximity to the aerials, towers or infrastructure to which it relates.

It is worthy of note here that the core coherence of the site has already been affected through the removal of the LF aerial in the 1990s. The diversity of the aerials and towers and the functional link of the LF aerial with the transmitters and other infrastructure could best be understood through interpretive means, such as images of the tower and aerial array in operational position and describing the importance of the size and orientation of the aerial.

The retention of the anchor points and other extant infrastructure will provide a good "reference" point for interpretive materials describing the style, format and functional characteristics of the site.

Record fabric that is to be removed. All fabric to be removed, particularly elements of significant fabric as noted in this report, should be recorded to appropriate archival standards in order that future use and interpretation might be accessed by the public and interested parties.

Develop a "caretaker maintenance program" to be protective of the site and its buildings and their condition. This should be designed to avoid rapid deterioration and would enable future users to use or adaptively re-use the buildings without an undue re-commissioning burden. This should also include regular inspections by Defence staff to ensure that the buildings remain in a good condition and free of vandalism.

4.1.3 Protecting The Site's Ecological Values

The potential impacts to the ecology of the site was identified as being manageable as part of the decommissioning process. The management options outlined below are provided to be protective of both flora and fauna while remaining consistent with the intent of the management options for the management of the historic heritage.

Management Options

Ensure that decommissioning works are undertaken in accordance with on-site management measures. The HLA report should be used as a basis for the ecological management and should include:

- Use cranes to lower antennae rather than allowing them to free-fall;
- Mark locations of Ginninderra Peppercress in the field so plant operators may avoid them;
- Reduce impacts to NTG lowering antennae towards nearest formed track
- Restrict, where possible, the movement of cranes to formed tracks. Where this is not possible, vehicle movements should be kept to a minimum and the shortest route to the antennae and guy wire supports utilised;

- Restrict vehicle movements to periods when soils do not have elevated moisture levels.

- Where practicable, cut antennae to be removed entirely from site into short lengths in order that they may be removed from site in light vehicles

- Remove wire support structures in a similar manner to the antennae, with wire support structures to be lowered along overhead wire route

Ensure dismantling that is protective of both ecological species and historic heritage values. While the dismantling of the towers should be undertaken in a safe and practicable manner, consideration should be given to their potential re-use for interpretive purposes in the future.

Manage kangaroo presence during the decommissioning process. This could take the form of monitoring the kangaroo presence and movement in the area of tower dismantling to avoid any accidental collision. Care should also be taken to time works so as not to coincide with feeding activities (ie dawn and dusk).

Undertake rehabilitation post-decommissioning. The rehabilitation should use native species seed from BNTS and monitored for exotic species. Rehabilitation areas should also be fenced from kangaroos to be preventative of any disturbance from foraging. Any disturbed areas near the Ginninderra Peppercress should be monitored for up to three years.

Undertake weed management as part of the Antennae Decommissioning Plan. There are several invasive species that have the potential to spread via vehicles traversing the site. The UCAN report identified some species, including African Lovegrass (Eragrostis curvula), Serrated Tussock (*Nasella trichotoma*) and Chilean Needle-Grass (Nasella neesiana (syn. Stipa neesiana))]. Vehicles entering the site as part of the decommissioning process should be washed down.

Undertake fire prevention as part of the Antennae Decommissioning Plan. The use of equipment for the dismantling of the antennae and unprotected exhaust systems could represent sources of ignition. Fire prevention planning should be included in the planning for the antennae dismantling on the site.

Undertake site induction training and tool box talks for decommissioning personnel in order that the values and locations of ecological species are known and that measures for the weed spread and fire prevention are understood.

Undertake Cultural Awareness training for decommissioning personnel in order that the values of the site are known and that measures for the management of potential sub-surface discoveries are understood. Should any items of potential archaeological interest be noted during ground disturbance works, the SEA or REO should be contacted immediately with respect to the appropriate course of action.

5 CONCLUSION

The decommissioning process has been planned to work within:

- operational parameters of current needs (ie items that have a continuing use at other operational sites);
- maintenance, OH&S and potential liability limitations (ie the financial burden of remediating and maintaining the site in a fashion that is no longer operational and is safe to humans and the environment);
- environmental needs and the requirement to be protective of the identified ecological species at the site.

But most importantly:

- Where prudent and feasible, to preserve and maintain the heritage values for the overall site, and as they are manifested in the physical fabric of the site including buildings, equipment and infrastructure etc; and
- To retain on-site where possible in order that potential future uses are supported through the retention of any antennae, towers, facilities and equipment that is non-essential for removal as part of the decommissioning process.

It is recognised that the removal of the antennae and towers will adversely affect some of the heritage values of the site, particularly the visually iconic status of the three 600 ft towers. However, given the weight of the remedial needs and maintenance requirements ($1.46 million and $5.46 million for the 3 x 600 ft towers and $1.51 million for the other aerials respectively), there is no prudent or feasible alternative to their removal.

In appreciation of this, the decommissioning is planned to retain as much material as prudent and feasible. This may not be items in situ (ie the planned retention of towers but laid down rather than maintained upright and in situ). However, this would retain material that may still be used and re-instated or maintained on site for interpretation purposes, until the future of the site is known and the opportunities are fully understood.

It is considered that while the visually iconic physical fabric will be lost from their functional context, the suite of options offered in this report allows some opportunities for the management of heritage values and their interpretation in the future.

It is further considered that the management options provided for the management of identified ecological features of the site will be fully protective of their significance.

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Annex A

CHL Citations For BNTS

Royal Australian Naval Transmitting Station, Baldwin Dr, Lawson, ACT

Photographs: None
List: Commonwealth Heritage List
Class: Historic
Legal Status: Listed place
Place ID: 105519
Place File No: 8/01/000/0490

Summary Statement of Significance:

The Royal Australian Naval Transmitting Station at Belconnen, comprising the three main aerial masts, elements of the Rhombic and Omni Vector aerial arrays, transmitting hall, guardpost and guard house, the cricket pitch and the village site, including the tree plantings, shelter belt radiata plantations, subdivision and tennis courts and road system, is important for its association with the development of Australian Naval Communications in Australia from 1938 in the lead up to the Second World War 1939-45. Completed in 1939 the Transmitting Station was the most powerful naval wireless station in the British Empire and the largest naval or commercial station in the southern hemisphere.

The extant fabric of the transmitting station and the relict village site are important in illustrating the significant role the base played in naval communication both during and after World War Two. The area developed for the village is important in demonstrating the functioning of the station in its relatively remote setting. (Criterion A.4)

The Transmitting Station is important as a rare example of the technical development of Australian Naval Communication during the inter-War years. This is illustrated by the design and technical achievement expressed in the three 600 foot aerial masts, assembled on site and aligned east-west to maximise transmissions to the Pacific and Indian Oceans and the intact 44,000hz, purpose built, low frequency transmitter complex, which, in conjunction with Rugby in England, made it possible to communicate with British Merchant or Fleet shipping anywhere in the world (Criterion B.2 and Criterion F.1).

The Transmitter Building, 600ft aerial masts, Guard House and guardpost and the access road and associated village site, including the subdivision and landscape elements, are important in demonstrating the design, layout and functioning of high powered, low frequency, transmitting stations developed by the Commonwealth for long distance radio communication prior to and during World War Two (Criterion D.2).

The place is highly valued for its social and symbolic associations by members of the local community including former Naval personnel in particular the WRAN, for whom the establishment of the transmitting and receiving stations in Canberra resulted in the training of women as telegraphists under Mrs Florence McKenzie, founder of the WRAN service, and in the development of Canberra. (Criterion G.1)

(Historic Themes: 7.7 Defending Australia).

Official Values:

Criteria Values

A Processes The Royal Australian Naval Transmitting Station at Belconnen, comprising the three main aerial masts, elements of the Rhombic and Omni Vector aerial arrays, transmitting hall, guardpost and guard house, the cricket pitch and the village site, including the tree plantings, shelter belt radiata plantations, subdivision and tennis courts and road system, is important for its association with the development of Australian Naval Communications in Australia from 1938 in the lead up to the Second World War 1939-45. Completed in 1939 the Transmitting Station was the most powerful naval wireless station in the British Empire and the largest naval or commercial station in the southern hemisphere.

The extant fabric of the transmitting station and the relict village site are important in illustrating the significant role the base played in naval communication both during and after World War Two. The area developed for the village is important in demonstrating the functioning of the station in its relatively remote setting.

Attributes The whole of the transmitting station including the various elements articulated above.

B Rarity The Transmitting Station is important as a rare example of the technical development of Australian Naval Communication during the inter-War years. This is illustrated by the design and technical achievement expressed in the three 600 foot aerial masts, assembled on site and aligned east-west to maximise transmissions to the Pacific and Indian Oceans and the intact 44,000hz, purpose built, low frequency transmitter complex, which, in conjunction with Rugby in England, made it possible to communicate with British Merchant or Fleet shipping anywhere in the world.

Attributes The three 600 foot aerial masts and their east west alignment, plus the low frequency transmitter complex.

D Characteristic values The Transmitter Building, 600ft aerial masts, Guard House and guardpost and the access road and associated village site, including the subdivision and landscape elements, are important in demonstrating the design, layout and functioning of high powered, low frequency, transmitting stations developed by the Commonwealth for long distance radio communication prior to and during World War Two.

Attributes The Transmitter Building, 600ft aerial masts, Guard House and guardpost and the access road and associated village site, including the subdivision and landscape elements.

F Technical achievement The design and technical achievement of the transmitting station is expressed in the three 600 foot aerial masts, assembled on site and aligned east-west to maximise transmissions to the Pacific and Indian Oceans and the intact 44,000hz, purpose built, low frequency transmitter complex, which, in conjunction with Rugby in England, made it possible to communicate with British Merchant or Fleet shipping anywhere in the world.

Attributes The three 600 foot aerial masts and their east west alignment, plus the low frequency transmitter complex.

G Social value The place is highly valued for its social and symbolic associations by members of the local community including former Naval personnel in particular the WRAN, for whom the establishment of the transmitting and receiving stations in Canberra resulted in the training of women as telegraphists under Mrs Florence McKenzie, founder of the WRAN service, and in the development of Canberra.

Attributes The whole facility including the three main aerial masts, elements of the Rhombic and Omni Vector aerial arrays, transmitting hall, guardpost and guard house, the cricket pitch and the village site, including the tree plantings, shelter belt radiata plantations, subdivision and tennis courts and road system.

Description:

HISTORY:

With the development of wireless radio communications at the beginning of the twentieth century, it became possible for naval ships to exchange operational, logistic and administrative information with shore authorities. The Royal Australian Navy (RAN) initially established shore based radio facilities at the Flinders Naval Depot near Melbourne, later transferring to sites in Canberra and Darwin. An extended communications facility was considered necessary in the 1930s, prior to the perceived onset of World War Two, in order to cover certain areas in low frequency (long wavelength) transmissions, missed at the time by the Royal Naval Communications station at Rugby in the United Kingdom. In 1925 the Australian

Commonwealth Naval Board had recommended the construction of strategic wireless stations at Canberra and Darwin. These stations marked the advent of modern RAN communications. The stations were expected to make possible communication with British Merchant Navy or fleet shipping in any part of the world. In 1935 the Commonwealth Government decided to erect radio receiving and transmitting stations in Canberra. Canberra was located 75 miles inland and so was considered safe from sea attack and thought to be less vulnerable to invasion by the Japanese than other British Empire wireless stations in the Pacific region. In 1937 the Commonwealth Government decided to commence the erection of receiving and transmitting stations in Canberra; these were to be located on the territory border near Queanbeyan and at Belconnen respectively. The separation was necessary to reduce interference between the receiving and transmitting facilities. Plans were approved in September 1938, following early site planning in April 1938. November 1938 saw the commencement of work at Belconnen by Standard Telephones Ltd, with the aid of the Department of the Interior, on the transmitting station. Technical construction of the HMAS Harman receiving facility near Queanbeyan was begun in early 1939, with the transmitter room at Belconnen required by 15 January 1939. Due to the lack of facilities on the selected sites accommodation was to be provided for naval personnel. The layout of the base was influenced by technical requirements, wih the married quarters sited behind a hill to reduce absoption (of radiation), and by existing features including a stock route and fenced lane. A fenced lane defined the boundary between the operational areas of the transmitter and the site designated for staff quarters, behind a low ridge. Site planning drawings of April 1938 indicate that the present access road, in part a stock route, linked the new base to Canberra. Provision was made for both a cricket pitch and football field near Ginninderra Creek.

Approval was given in February 1939 for the erection of 2 Chief Petty Officers Quarters on blocks 3 and 4, with 7 married quarters for Ratings to be erected on blocks 12-14 and 18-20, in an area dedicated to accommodation at the entrance to the site. The entrance road was run from the then Queanbeyan-Yass Road across an existing stock route before entering the site. The layout of the housing blocks at Harman and Belconnen characteristically included formal, semicircular subdivisions and planning expressing the social structure of the prevailing naval culture including the provision of tennis courts. Water was supplied to the Station and to the newly erected National Broadcasting Station, at Gunghalin, from a new concrete reservoir completed by September 1938.

The Belconnen site was originally far enough away from the capital city to avoid interference with commercial stations. The facility was also sufficiently far to instil feelings of isolation in staff and families living at the transmitting station. The first batch of thirty naval officers and ratings arrived in March 1939 to operate and guard the stations. This group was to form the advance guard of the 200 men who were to occupy the two naval villages being established on either side of Canberra: '...the base was the most powerful short wave naval wireless station in the British Empire and the largest naval or commercial station in the southern hemisphere' (The Canberra Times 12 April 1939). The first transmission was made on 22 December 1939. These first transmissions appear to have been made using a series of Rhombic aerial arrays, located outside the area of the long wave aerial array completed in 1941. The Rhombic aerials were directional and named after the bases to which they transmitted.

The Belconnen Transmitting Station, known throughout the Australian Fleet as Bels, principally contained the very powerful 200 kilowatts transmitter operating at the quite low frequency (long wave) of 44,000hz. This was designed to be able to break through the static noise usually encountered over long distances and to be received by submerged submarines. This necessitated the erection of three 600ft high aerial masts set a quarter of a mile apart to support the massive radiating aerial sited east-west to maximise transmissions into the Pacific and Indian Oceans. In conjunction with Rugby in England the facility at Canberra would make it possible to communicate with British Merchant or Fleet shipping anywhere in the world. This role could be fulfilled even, and fortuitously, in the event that stations at Singapore or Hong Kong became inoperable. In January 1941 the three 600ft masts were completed, followed in February and April by tennis courts, recreation hall and garages for those living on site. A cricket pitch and football field were located on the banks of Ginninderra Creek. During the war years the base at Belconnen was camouflaged to look like an operational farm. Small farm buildings were dotted about the landscape which also included three camouflaged Observation Stations and a small arms range. In the post war years the grasslands were grazed under lease by local pastoralists including members of the local Southwell family. As high frequency (short wave) radio gained in reliability and efficiency more equipment was acquired occupying

many hectares of open country . The HMAS Harman Receiving Station was only commissioned in 1943 and had a range of aerial types to ensure continuing reception. High frequency aerials were often rhombic in shape and directionally aligned to maximise power output towards the UK, Ceylon, New Guinea and Pearl Harbour in Hawaii. From 1942 to the end of World War Two the receiving station was manned by communications personnel from the RAN Shore Wireless Service, RANR, RANVR, WRANS and even the US Navy. During the war years the WRAN, after 1942, was the largest group at HMAS Harman. The establishment of the receiving and transmitting facility in Canberra is important in the history of the WRAN which began to train women as telegraphists in April 1941 under the influence of Mrs Florence McKenzie the founder of the Women's RAN service. With the increase in wartime activities an Auxiliary Receiving Station was established at Fyshwick and named Molonglo. In the early 1950s a new receiving station was erected at Bonshaw next to HMAS Harman. This new station played an important role in receiving the results of the 1956 Olympics and passing them to Belconnen for transmission to the world. Changes at Belconnen included in 1951 additions to the transmission hall and the erection of a new Aerial Switch Room. The village at the entrance to the Belconnen complex was progressively landscaped under the influence of married staff and the Officer in Charge, with the ridgeline defined by groups of pine trees and some formal plantings along the approach driveway. The transmitting and receiving stations remained operational being manned 24 hours a day. From 1959-61 the low frequency transmitter at Belconnen was overhauled, the water cooled valves changed to air cooled types and power output increased to 250kw. In 1960 Ratings Quarters and Messes were constructed at Belconnen and a standby generator building erected in 1973 . Also during the 1960s the Rhombic aerials, located in the aerial farm, were overhauled, the timberpoles being replaced with metal structures. In some cases the new support structures utilised the original bases maintaining the original aerial configuration and orientation. A range of Omni Vector aerials were also erected in the 1960s.

By 1980 only six of the twenty-six cottages in the naval village at Belconnen were still occupied, the area falling into neglect. In 1982 TS (Training Ship) Canberra was installed in Cottage 17 at Belconnen with the modernisation and extension of six of the cottages. The housing area has now been cleared of structures with the exception of the single men's mess and quarters opposite the guardhouse, although the tennis courts remain. In 1986 five high frequency transmitters were installed at the Belconnen transmitting facility, surplus from OTC. From 1988-90 retention of operational potential was carried out on all transmitters and general equipment. The low frequency transmitter was boxed in (screened) to reduce radiation risks. In 1995 the low frequency (LF) transmitter, Bels44, was ceremonially decommissioned. The Belconnen station is still operational, providing the RAN with the high frequency radio transmission facilities required to send information to HMAS Fleet at sea. The functions of the Belconnen facility are expected to be transferred to Albury by 2001.

The transmitting facility was being considered in 1999, by the Institution of Engineers Australia Heritage Panel, for an Historic Engineering Marker.

PHYSICAL DESCRIPTION:

The Royal Australian Naval Transmitting Station at Belconnen is the transmission facility of the Naval Communications Station (NAVCOMSTA) Canberra. The Communications Station also includes a receive facility at the Naval Receiving Station, Bonshaw and a control facility at HMAS Harman. There is an 11 mile dispersion distance between the receiving and transmitting sites, HMAS Harman and Belconnen respectively, necessary to ensure that the powerful transmitting site did not drown out the sensitive receiving site at Harman. The Royal Australian Naval Transmitting Station at Belconnen consists of the transmitter hall, aerial farm, guardhouse, sailors messing accommodation and remnant landscape of the former married quarters settlement, linked by the access and internal road system. For convenience the description is in two parts.

1. Transmitter Hall and Aerial Farm

The transmitter hall and aerial farm are located on 136.8ha of land in Belconnen, North Canberra. The three 600ft towers and the subordinate transmitter hall are dominant elements in a landscape defined by the technical requirements of low frequency transmission. Although replaced by high frequency transmission

expressed in the multiplicity of smaller aerials the landscape and aerial farm, remains subordinate to the 600ft low frequency transmission towers. The area defined by the operation of the Transmitting Station, including the aerial array, transmitting halls and guard post, at Belconnen are located within an area of Danthonia grassland in good condition listed separately in the Register of the National Estate (see RR 018878). Significant features include the following.

- Aerial Farm

There is a very large earth mat buried beneath the ground consisting of a series of copper wires radiating out from the central mast site of the low frequency transmitter. The aerial farm consists of six different types of aerials including Omni-Vector, Rhombic, bi-conical monopole, vertical log periodic, rotatable log periodic, log spiral and vertical folded dipoles. There are approximately fifty aerials on the site. The three, 600ft, low frequency transmitter aerial masts and those Rhombic aerials associated with the original Rhombic aerial array are individually significant within the aerial farm. The seven Omni-Vector aerials are the rarest types found on the site with no other examples identified in Australia. Associated with the three low frequency transmitter aerial masts are a range of structures which include the foundations of camouflage buildings and at least one intact Observation or Guard Post from the 1939-45 war years. Scattered eucalypts are reminders of the former pastoral landscapes which underlie the site.

- Transmitter Building and Transmitting Equipment.

The Transmitter Building has been erected in a number of linked phases. The main building was erected from 1938-39 and in the early 1940s and includes the No 1 transmitter hall and helix room and the 44khz low frequency transmitter and No 2 transmitter hall and a range of attached structures including switch and amenities rooms, TX plant room, classroom, aerial workshop and stores. Extensions in the 1950s and 1960s include the regulating office, maintenance rooms and aerial exchange room on the western front of the transmitter hall. The associated emergency diesel generator building erected in 1973 is not included. The Transmitter Building is characterised by its brick, gabled domestic form with Marseilles tiled roofs and simple fenestration expressing the industrial nature of the buildings. Construction in red brick is typical of Commonwealth construction in the inter-war and World War Two years. With the exception of details the external brickwork is painted white. The two transmitter halls feature similar construction but have corrugated asbestos cement roofing and lower roof profiles than the associated more domestic structures housing ancillary functions. The 1950s two storey administration and aerial exchange extension on the western side of Transmitter Hall No 1 features an externally expressed frame with minimal pitch gabled roof. The 1950s extension is the main entrance to the building. The transmitting equipment is housed within buildings designed for functions specific to the operations of a high powered transmitting station. Features include blast proofing of the low frequency transmitter, the use of wooden fittings in place of iron within the Helix Room and electrical screening in the walls of the station. The low frequency transmitter and its components is one of the only remaining pieces of equipment remaining from the 1940s. The low frequency transmitter was designed and installed for the RAN by Standard Telephones and Cables Pty Ltd to operate in the frequency range 40khz to 150khz with a 200kw input in the final stage. The transmitter was updated in 1959-61 to allow for frequency shift operation. The original operation used Morse code and this modification allowed the transmitter to send information in telegraphic format. The original water cooling system was replaced by an air cooling system and the power input was increased to 250kw. In the period 1988-90 the mercury arc rectifiers were replaced with semi-conductor rectifiers. The (radio) valves were replaced with more readily available types. The transmitter was also completely boxed in due to concerns regarding radiation. The three original high frequency transmitters have been replaced with more modern equipment. Three different models of high frequency transmitters remain from the late 1950-60s, the 1970s and the 1990s. The station is the only low frequency radio site in the southern hemisphere. The station is also the most powerful Naval communications centre in the southern hemisphere with the oldest surviving communications technology in Australia. At the time of construction, the station was the most advanced communications station in Australia. The custom built 250kw low frequency transmitter was made specifically for Naval use and is unique in this respect.

Those elements of the facility associated with the transmitting function, namely the transmitter buildings, 600 foot aerial masts, Rhombic and Omni Vector aerials, the guardpost, camouflage building foundations

and the western part of the access road are located within an area of DANTHONIA grassland which represents the largest such area in good condition in the ACT. The grassland area acts as the habitat for an endangered species, the day flying moth, SYNEMON PLANA. This area is separately listed in the RNE at 8/01/000/0423.

2. Village settlement, entrance road, Guard House and landscaping.

The transmitting facility was entered from the east, from the direction of HMAS Harman. In December 2000 the access road to the site is from Baldwin Drive. The houses in the small village which developed west of the access road at the entrance to the site have been removed with the exception of the 1960s ratings quarters and mess adjacent to the guardhouse. Associated with the Guardhouse is a small ceremonial area defined by a group of cypress trees. Evidence of the village remains in the form of landscaping, roads and introduced planting which define and screen the former village subdivision and access road which accurately follows the line of the original stock route. HMAS Harman, associated with the receiving component of the facilty, has undergone considerable modification compared to the Belconnen settlement.

The village subdivision implemented in 1939 incorporates planning characteristic of the formality effected during the Inter-War years. Features include social zoning reflected in a semi-circular central feature, opposite the site of the Officer in Command, from which a short road below the ridge provides access to the 1960s single storey Ratings Quarters. This siting clearly reflects the influence of the technical requirements which dictated that the married quarters be sited below a hill to reduce absorption.

The entrance to the site is identified by white painted brick walls and piers located close to the edges of the access road adjacent to the former village area. Plantings include three major elements; a shelter belt, or plantation, of PINUS RADIATA to the west and north of the village area below the crest of the adjacent ridge along the line of the pre 1938 stock route and the entrance road; a shelter belt of pin oaks, (QUERCUS PALUSTRIS), east of the village site aligned with the white painted entrance walls and piers; and a double row of EUCALYPTUS BICOSTATA on the north side of the access road. The line of the former laneway is reflected in the western windbreak of pine trees. The areas between the shelter belts retain landscaping elements associated with the village. Species include various types of cupressus, eucalypts and native and introduced shrubs planted characteristic of the post war period. The ratings quarters comprise single storey domestic scale buildings with low pitched roofs characteristic of cellular accommodation of the period.

The Guard House defines the boundary between the village site and the operational areas of the transmitting station. The former Guard House of 1939-41 is strategically sited at the entrance to the transmitter, aerial array and technical areas and illustrates in its location the strict security arrangements associated with the facility. The building typically features brick construction with tiled gabled roof and simple fenestration of the inter-war years. A single brick chimney articulates one gable. The entrance side features a flat roofed porch on brick piers. The brickwork is painted white externally.

The concrete cricket pitch remains in place adjacent to Ginninderra Creek within the area of the aerial farm.

History: Not Available

Condition and Integrity:

Integrity:

The NTS Belconnen is still operational and the buildings and aerials are maintained to working standard. The 250k watt low frequency transmitter is intact and in situ although the aerial conductors have been removed from the 600 foot towers. The houses have been removed from the village site. (March 1998)

Condition:

All elements are generally maintained in good order.

Elements that are starting to deteriorate include the ceilings in the Transmitter exchange room and the protective insulating ceiling in the Helix Room. Some cracking has started to occur in the concrete flooring near the low frequency transmitter and paint is peeling off the door to the Buffer Amplifier of the transmitter. The site has been contaminated in some areas through the dumping of PCBs (polychlorinated biphenyl) which is a toxic liquid used as liquid insulation for some of the transmitting equipment. The RAN has been conducting surveys of the land since the late 1980s and is carrying out a comprehensive site clean up program. (March 1998)

Location:

About 15ha, off Baldwin Drive, Lawson, comprising the Transmitter Building and its access road; the three 600ft aerial masts 44A, 44B and 44C; the seven Omni Vector aerials; Rhombic aerials numbers 18, 30, 32 to 35, and 37 to 40; the cricket pitch; the guardhouse located 50 metres to the north of the Ratings Quarters; the guardpost located 200 metres to the north of the Transmitter Building; the 1938 subdivision village site and its access road from Baldwin Drive; plantings that include a belt of pines to the west and north of the village area and extending to the west of the Ratings Quarters; a shelter belt of pin oaks east of the village site; and a double row of eucalypts on the north side of the access road. The Ratings Quarters are not included.

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Synemon Plana Moth Habitat, Baldwin Dr, Lawson, ACT

Photographs: None
List: Commonwealth Heritage List
Class: Natural
Legal Status: Listed place
Place ID: 105535
Place File No: 8/01/000/0423

Summary Statement of Significance:

The Belconnen Naval Station has one of the largest remnants in the ACT of DANTHONIA grassland in good condition and this ecological community is recognised as having high conservation value. DANTHONIA grassland formerly had a much wider distribution in the ACT. This remnant grassland community is representative of original vegetation characteristic of the Limestone Plains of the Canberra area. Natural temperate grassland such as occurs in this place is nationally endangered and endangered in the ACT.

Danthonia sp. grassland is essential habitat for the day-flying, golden sun moth, SYNEMON PLANA which is endangered in the ACT. The golden sun moth has a restricted distribution and is presently only known from 32 sites; five in Victoria, 11 in NSW immediately north of the ACT, and 16 in the ACT. This place has one of the most extensive populations of the golden sun moth. Because of its relatively large size of approximately 100ha and good condition, the place is important for the long term conservation of the golden sun moth.

The place is important as a research site for the endangered grassland community and for research about the golden sun moth and a number of other as yet undescribed insect species that inhabit the grassland.

Official Values:

Criteria Values

A Processes The remnant Danthonia sp. grassland in the place is representative of once widespread vegetation characteristic of the Limestone plains of the Canberra area (Edwards 1990).

The golden sun moth, Synemon plana occurs in the grassland habitat in the place. Castniidae, the family of Synemon moths, has species occurring in Central and South America and South East Asia as well as Australia. Indications are that it is a family that has Gondwanan origins.

A Processes The native grassland ecological community at Belconnen Naval Station has high conservation value. Danthonia sp. grassland is essential habitat for the day-flying, golden sun moth, Synemon plana. This place is considered to be one of the best for the conservation of S. plana because the Danthonia sp. grassland is in good condition and it is a relatively large area of approximately 100ha. The site is one of the largest of 16 sites where the species is known to occur in the ACT (Edwards 1990, S. Sharp pers. comm., Environment ACT 1998).

B Rarity Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory is listed as a nationally endangered ecological community under the Environment Protection and Biodiversity Conservation Act 1999 and is endangered in the ACT.

Synemon plana is endangered in the ACT. The golden sun moth has a limited distribution, and currently it is only known from 32 sites, five in Victoria, 11 in NSW immediately north of the ACT, and 16 in the ACT, with an extensive population occurring at this place (Environment ACT 1998).

C Research The site represents an opportunity for further research on an endangered ecological community that was originally widespread. The lifecycle of the golden sun moth is yet to be elucidated, as are the lifecycles of other invertebrate species known to occur in the grasslands (Edwards pers. comm.).

Description:

The place consists of DANTHONIA grassland which was formerly widespread in the region. Dominant grasses of this grassland community are short wallaby grass (DANTHONIA CARPHOIDES) and DANTHONIA AURICULATA, with herbs and prostrate low bushes scattered throughout the site. Other species present include the common everlasting (CHRYSOCEPHALUM APICULATUM), blue devil (ERYNGIUM ROSTRATUM), pink bindweed (CONVOVULUS ERUBESCENS), LOMANDRA sp, GOODENIA sp, and WAHLENBURGIA sp. The presence of DANTHONIA, CHRYSOCEPHALUM and ERYNGIUM indicate the site is relatively undisturbed. The site is predominantly flat, averaging 600m in altitude. Soils are shallow, skeletal and have developed on a shale base.

The Belconnen Naval Radio Station became operational in 1939. It is surrounded by a cleared strip and a security fence. There is a network of communication aerials through the area. Management of the vegetation on the site includes light grazing by a small resident flock of sheep and the occasional high mechanical slashing. This minimal disturbance has discouraged the invasion of weeds.

The place provides suitable habitat for the endangered, day-flying, golden sun moth SYNEMON PLANA. The golden sun moth is about 3.5cm across, with clubbed antennae and wings that are brown, orange and black dorsally, with the ventral surface white. Females have bright orange hind wings (male hind wings are bronze brown) and long ovipositors for inserting eggs into DANTHONIA grass tussocks. Neither females nor males have mouthparts and live only one to two days. Females are poor fliers and are sought out by the stronger flying males soon after emergence. Females attract males by exposing the bright hind wings. After copulation the female begins depositing eggs. Eggs are mature at the time of emergence in November or December. The larval stage is thought to be twenty-one to twenty-two months, during which time the larvae feed on the underground parts of short wallaby grass. The complete life history is unknown. The moth is seen in large numbers during the period of emergence, but approximate figures are difficult to assess and a minimum viable habitat area has not been postulated. Within the family CASTNIIDAE the S PLANA female is unique in having wings smaller than usually required to support the body size. Another unique feature is the different coloration and size of the sexes. The poor flight of the female moth implies past access to an extensive and continuous habitat without the need to colonise disjunct areas.

CASTNIIDAE, the family of SYNEMON moths, has species occurring in Central and South America and South East Asia as well as Australia. Indications are that it is a family of Gondwanan origins. In Australia, these moths and their habitats were widespread 200 years ago, based on reliable records from throughout south east Australia.

History: Not Available

Condition and Integrity:

The condition of the site is very good in comparison with other grasslands in the ACT. The number of exotic plant species is low and those that do occur are in low numbers. As well, native plant species richness is high compared with other grasslands.

Persistence of the golden sun moth and various plants such as native grasses, everlastings and blue devils indicates that there has been insignificant modification of the grassland habitat during the fifty years of its use for military communications purposes. DANTHONIA grassland, although encouraged by light grazing, is susceptible to pasture improvement such as has occurred throughout south east Australia since the 1950s. Current major threats include gradual encroachment by colonising vegetation and total loss or major changes due to changes in land use. The smaller grasslands in the ACT are susceptible to inappropriate

management, such as short mowing, which could easily destroy the habitat, along with the moth. (June 1992)

Location:

About 100ha, at Belconnen, comprising the area bounded by straight lines joining the following AMG points consecutively: 89800064, 89459994, 89529990, 89579973, 89819968, 89979980, 90309962, 90520000, 90440008, 90540018, 90800020, 90800037, 90350068, 89940057 and the commencement point, excluding all man made structures.

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HLA

Survey for *Lepidium ginninderrense* Belconnen Naval Transmitting Station Lawson ACT

22 April 2005

Prepared for:
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Building 17 Facilities Office
HMAS Harman, Canberra Avenue, ACT

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HLA Ref: D1023601_FinalRPT_22Apr05

DISTRIBUTION

Survey for *Lepidium ginninderrense*
Belconnen Naval Transmitting Station
Lawson ACT
22 April 2005

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s22

Neil McElhinney
Ecologist

Peer Review: **Date:**

s22

Peter Wright
Principal Environmental Services

CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

1.1 Background

The Belconnen Naval Transmitting Station (BNTS), located in the suburb of Lawson in the Australian Capital Territory (ACT), was established prior to the Second World War as a naval communications facility. **Figure 1** shows the location of the BNTS. Advances in technology and the transfer of communications capability have resulted in the Department of Defence deeming the BNTS excess to Defence requirements and it is planned to decommission the facility. Decommissioning of the site may include the removal of all Defence related infrastructure or may include the retention of some items, including buildings, underground cables and transmission antennae. A review of ecologically significant matters by HLA-Envirosciences Pty Ltd (HLA) identified the presence of the Nationally threatened Ginninderra Peppercress (*Lepidium ginninderrense*) occurring in close proximity to several aerials and associated guy wires (HLA-Envirosciences & Cumberland Ecology, 2004). Existing knowledge of the species distribution was determined to be inadequate and as a result HLA has been commissioned by Resolve FM (Resolve) to undertake a survey for *Lepidium ginninderrense* and to map the species distribution within the BNTS.

1.2 Scope

The scope of this report is to:

- Survey the distribution and abundance of the species;
- Identify potential threats to the species during decommissioning of the facility and provide appropriate management recommendations; and
- Identify exclusion zones during decommissioning.

2 REVIEW OF *LEPIDIUM GINNINDERRENSE*

2.1 Identification

The Ginninderra Peppercress (*Lepidium ginninderrense*) belongs to the *Brassicaceae* family, within the class *Magnoliopsida* (*Magnoliidae*), flowering dicotyledons. The plant is described as a perennial herb, with up to six stems to around 20 cm high. The moderately papillose stems are striate. The thick leaves are fleshy, glabrous and shiny on the upper surface. The widely spaced rosette leaves are 15 mm to 55 mm long and 1.5 mm to 2 mm wide. The flowers are 2 mm wide and 1.5 mm long, without petals, having green sepals that are less than 1 mm long and 0.5 mm wide with scarious margins, borne on elongating racemes to 15 cm (Scarlett, 2001).

2.2 Conservation

The species is listed as Endangered and is a Special Protection Status (SPS) species under the ACT *Nature Conservation Act 1980*. Only activities related to the conservation of SPS species or those serving a special purpose are permitted to affect the species. An Action Plan has been prepared by the ACT Conservator of Flora and Fauna (ACT Government, 2003).

The species is presently under consideration for listing as an Endangered species under the provisions of the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Northwest corner of the Belconnen Naval Transmitter Station, ACT was added to the Register of Critical Habitat, effective 28 February 2005. The area is described as:

'About 20 ha, at Lawson, being an area bounded by a line commencing at the intersection of the northern boundary of Block 2 Section 6 Lawson with the eastern shoreline of Lake Ginninderra (approximate ACT Map Grid point 206670mE 610910mN), then southerly via the eastern shoreline to its intersection with the southern boundary of Block 2 Section 6 Lawson (approximate ACT Map Grid point 206560mE 610260mN), then easterly via the southern boundary of Block 2 Section 6 Lawson to a point where the boundary changes direction at approximate ACT Map Grid point 206710mE 610000mN, then north easterly via a straight line to a point on the northern boundary of Block 2 Section 6 Lawson where it changes direction at approximate ACT Map Grid point 207080mE 610860mN, then westerly via the northern boundary of Block 2 Section 6 Lawson to the point of commencement.

The relevant portion of the property consists of the flood plain of Ginninderra Creek, where natural temperate grassland is dominated by *Austrodanthonia* spp. and *Bothriochloa macra*. Associated herbaceous species include *Plantago gaudichaudii*, *Juncus filicaulis*, *Triptilodiscus pygmaeus*, *Parentucellia latifolia* and *Calocephalus citreus*.'

The listed area is considerably larger than the known past and present distribution for the species. It is an offence, under the EPBC Act, for a person to take an action that the person knows will significantly damage the Critical Habitat of a listed threatened species if the Critical Habitat is in a Commonwealth area. The decommissioning of infrastructure within the mapped area of Critical Habitat BNTS must not therefore involve significant damage to the mapped area. Damaging Critical Habitat in a Commonwealth area is punishable by a fine or imprisonment, or both. Additionally, the future disposal of the land must ensure that the sale contract includes a covenant to protect the Critical Habitat.

A recovery plan is presently being prepared for the species (DEH 2005).

The species does not occur in a known conservation reserve. Presently, *Lepidium ginninderrense* is known only to occur within a 90 m x 30 m area in the north west of the BNTS. The species is likely to have a Rare or Threatened Australian Species (ROTAP) code of 1E, based on code descriptions of Briggs and Leigh (1995). The code of 1 is given to species known from one collection only, and is used rather than a code of 2 that indicates a wider distribution, as all other historical locations are presumed extinct (ACT Government, 2003). The species was previously known to occur at Reid, however the species has not been recently located there despite targeted survey (ACT Government, 2003).

The Action Plan prepared for the species identified post decommissioning urban infill as a major threat and recommended that:

- the population be protected within a reserve,
- a low profile be maintained for the presence of the species, and
- construction of tracks and facilities be avoided (ACT Government, 2003).

Additionally the Action Plan has an objective of maintaining natural ecological processes.

2.3 Ecology

Lepidium ginninderrense grows in grassland in the north west of the BNTS. The area is low and subject to periodic inundation from the flooding of Ginninderra Creek. Observations by Avis (2000) concluded that the species occurred in various grass covers; however, the species generally grew in areas that have a sparse cover of leaf litter except where the grass growth habitat was low, where competition for space and light was low. It was also found to grow well in areas where there was some level of disturbance. Plants were also found to grow in depressions that filled with rainwater. Green leaves were present throughout the period between April and November, with basal leaves growing from September onwards. Inflorescences were green until May. Seed formation was observed from May with the majority of seed dispersed during August.

2.4 Historical Population

Two areas where the species was known to occur were fenced in 1993 to avoid disturbance. BNTS was grazed with sheep prior to 1997 and a mowing regime was implemented upon their removal. The population within the fenced area was estimated to be less than 50 plants in 1997. In 1999 there were approximately 80 specimens, 40 of which occurred outside of the fenced area. A systematic survey was undertaken by Avis (2000) between the middle of April and early May, 2000. The known population of *Lepidium ginninderrense* in autumn 2000 was 2,243 (Avis, 2000).

3 SURVEY METHODOLOGY

The current survey by HLA took place from 16 February to 18 February 2005 inclusive, between the hours of 0800 and 1600 each day. A series of grids was established using a portion of the north-south property boundary fence as a reference. A 50 m fibreglass tape measure was used to define the western boundary. The northern and southern boundaries of the grid were defined by laying two fibreglass tape measures to the east, perpendicular to the fence line. Trigonometry was used to ensure the grid was rectangular. Another tape measure was then placed 1 m from the western boundary. The resulting 1 m wide transect was walked slowly and occurrences of *Lepidium ginninderrense* recorded within each metre square. Once the transect was completed, the western most tape was moved 2 m to the east and the process repeated until habitat within the grid was traversed. The grid was then moved by using the north-south fence line as a reference and aligning the new grid with the old grid boundary markers. The relatively flat nature of the area, low grass height and clear sightlines ensured the error of grid placement was significantly less than 0.5 m. The grids were moved and transects walked until all habitat had been traversed. The approximate location of the area intensively surveyed is shown in **Figure 1**, with the flood plain area to the south also assessed, however this was done less intensively, based on preliminary work (HLA-Envirosciences & Cumberland Ecology, 2004). Wire with pink plastic 4"x 5" flags was used to identify patches of *Lepidium ginninderrense*, particularly where the species occurred near aerials, guy anchors or tracks. Yellow flags were used to define exclusion zones. The locations of the corners of the exclusion zones were recorded using a hand held GPS with an accuracy of ±5 m.

4 SURVEY RESULTS

There were 875 occurrences of *Lepidium ginninderrense* within 340 m^2. The majority of 1 m^2 cells, 168, had only an individual *Lepidium ginninderrense* within them. The distribution and density of observed *Lepidium ginninderrense* within the BNTS is shown in **Figure 2**. Many of the *Lepidium ginninderrense* are located near aerials or their supporting guys and are at risk of damage during decommissioning. Exclusion zones are shown in **Figure 3**. Differences in the location of mapped *Lepidium ginninderrense* and the exclusion zones in **Figure 3** are a result of GPS error. The recommended direction for the lowering of the aerials is shown in **Figure 3**. The direction is based on the likely direction of aerial fall given the severing of guys on the opposite side and the location of the majority of the *Lepidium ginninderrense* present in the vicinity of the aerials and guy wires.

5 DISCUSSION

The present survey identified 875 individuals, approximately 39 per cent of individuals recorded during the April – May 2000 survey. It is unlikely the smaller population is a result of observer error if the observations of obvious mature racemes were typical of the population at the survey timing. While there were few small specimens of *Lepidium ginninderrense* observed in areas with sparse cover, the seedlings may have benefited from increased cover where grass was denser during the recent drought. This however contradicts the commonly held belief that the species is excluded from areas where ground cover is dense.

The previous survey in 1999 (Avis, 2000) did not show the distribution of *Lepidium ginninderrense*, however the broad area of survey was mapped. The majority of *Lepidium ginninderrense* recorded were within Area C (Avis, 2000). Area C is located the north and west of the junction of the track that crosses Ginninderra Creek and the north-south track that is located to the east of the flood plain. A total of 1686 *Lepidium ginninderrense* were observed in

Area C (Avis, 2000), compared with 284 specimens observed during the present survey. The species was restricted to the western part of the area, while the eastern part where no *Lepidium ginninderrense* were observed had a dense cover of Redleg (*Bothriochloa macra*). The present survey recorded 589 specimens of *Lepidium ginninderrense* within the remainder of the site, compared to 545 recorded during 1999 (Avis, 2000). There was a slight increase in the distribution of the species to the south compared to the 1999 survey.

None of the remaining marked locations of specimens marked in 1999 (Avis, 2000) had live specimens at the time of the present survey, indicating the longevity of the species is less than five years. Of the 875 specimens observed during the present survey, 43 were of senescent individuals, indicating dead specimens do not persist for several years. Many other specimens had shed seed, mature inflorescences with seed and also new flowers forming at the raceme tips. This is evidence that the species flowers over at least two years.

The decline in the population is likely to be the result of either or a combination of the prolonged drought that had impacted the region since the previous survey or an increase in grass and forb cover resulting from the removal of sheep. Sheep were removed from the site prior to 1997 (Avis, 2000). While a combination of the two is probable, it was observed that *Lepidium ginninderrense* has been excluded in the former fenced areas where Lemon Beautyheads (*Calocephalus citreus*) dominates the ground cover.

Given the apparent large number of seed observed on most racemes, it would be expected that the species will recover quickly if below average rainfall experienced during the recent drought was the cause of the decline. If the population does not increase, then management of the creek floodplain must be considered in order to address competition with other species, both native and exotic.

Exotic species include many invasive species, particularly species that form dense infestations such as St John's Wort (*Hypericum perforatum*) and those which have rosettes that are likely to exclude *Lepidium ginninderrense*, for example Spear Thistle (*Cirsium vulgare*), Saffron Thistle (*Carthamus lanatus*), Chicory (*Cichorium intybus*) and Paterson's Curse (*Echium plantagineum*), all are within the area which *Lepidium ginninderrense* occur. These species may take advantage of disturbance that results from the decommissioning. It is recommended that these species are controlled prior to decommissioning and monitored to ensure seed stored in the soil does not germinate and result in infestations. Additionally, Paspalum (*Paspalum dilatatum*) is present in moister areas of the floodplain and has the potential to invade *Lepidium ginninderrense* habitat.

There was no evidence of a significant impact from grazing or seed predation by Eastern Grey-kangaroos, Galahs or Purple Swamp Hens, all observed feeding in areas containing flowering *Lepidium ginninderrense*, and fencing to exclude these species is not necessary

The apparent decline is of concern given the potential for decommissioning related activities to impact *Lepidium ginninderrense*. Possible impacts from decommissioning activities include crushing of specimens from falling aerials and from vehicular movement. The latter has greater potential to impact the population, especially through unrestricted movement between aerials associated with array 41. The listing of *Lepidium ginninderrense* as a SPS species requires the decommissioning either not impact the species or be related to the conservation of the species (ACT Government, 2003). Seven exclusion zones, including a buffer of 2 m – 5 m, have been marked in the field to avoid significant impacts to specimens of *Lepidium ginninderrense* and to protect the immediate habitat and seed stored in soil, during the decommissioning of transmitting arrays. The location of the exclusion zones is shown in **Figure 3**.

The majority of specimens are located within the zones and there is not expected to be a significant impact to the population if the zones are avoided. The exclusion zones are identified

by 4" x 5" fluorescent yellow flags attached to wire driven into the soil. Fluorescent pink flags have been used to identify individuals or groups of *Lepidium ginninderrense* where these occurred outside of the exclusion zones or where vehicular movement presently occurs within the exclusion zones.

Flags are used as they allow mowing operations to continue. Continued mowing is recommended as the build up of grass litter and increase in grass cover is thought to be a reason of the decline of the species within the formerly fenced exclusion zones. Avis (2000) recommended mown biomass be cleared from the habitat to reduce the potential for a thatch to form. It is recommended that a mower with a catcher be used in the *Lepidium ginninderrense* habitat, with the clipping disposed of outside of the habitat. Using a catcher is less likely to damage specimens and requires only a single pass, reducing impacts from vehicular movement. It is recommended mowing operations in the flood plain and Area C (Avis, 2000) take place after the majority of seed is shed in July and prior to late spring when the species begins to flower.

Figure 3 also shows the preferred direction for the lowering of the aerials. Lowering the aerials in the directions indicated will avoid impacting the exclusion zones. The exclusion zones are unlikely to impact the cutting of the appropriate guy wires to allow for the lowering of the aerials in the preferred direction. With regard to the removal of transmitting wires between poles where the species is present, it is recommended they be cut at an aerial and dragged to a collection point, rather than vehicles driving along the fallen wire.

The species decline may be the result of natural fluctuations in population size as a result of variation in seasonal rainfall over several years impacting soil moisture. To ensure the species potential to recolonise apparently suitable habitat, a pilot study involving the spread of seed or planting of seedlings should be considered. Apparently suitable habitat exists to the south west of the present population. Whilst the seed dispersal mechanism is unknown, it is unlikely the shed seed is dispersed over a wide area. A reason the species may not be able to successfully colonise habitat to the south west may the seed being shed in winter when the prevailing winds are from the south east, blowing any seed to the north east. If the species can be successfully established to the south east, suitable habitat between the creek and existing population may eventually be recolonised aided by wind dispersal.

6 CONCLUSIONS

A total of 875 specimens of *Lepidium ginninderrense* were observed within the BNTS. It is not expected that there are additional specimens outside of the surveyed area based on the dense grassy ground cover associated with other areas of the Ginninderra Creek floodplain. The number observed represents a population decline of 61 per cent over five years. The majority of *Lepidium ginninderrense* observed within the BNTS have been included within exclusion zones, and if these zones are avoided there is not expected to be a significant impact from decommissioning related activities. Specimens located outside of the exclusion zones have been flagged to enable their protection.

7 RECOMMENDATIONS

Based on the findings of the survey, it is recommended that:

- The decommissioning activities not be permitted to impact the marked exclusion zones and specimens outside of the zones, where practicable.
- Future management of the population should include weed management as a high priority, particularly of rosette forming species such as Paterson's Curse.
- Mown biomass be collected and disposed of away from the immediate *Lepidium ginninderrense* habitat.
- The present *Lepidium ginninderrense* habitat, or at least permanent quadrats, be monitored annually.
- A pilot study of establishing the species closer to Ginninderra Creek in areas of low grass and forb cover be undertaken and monitored.

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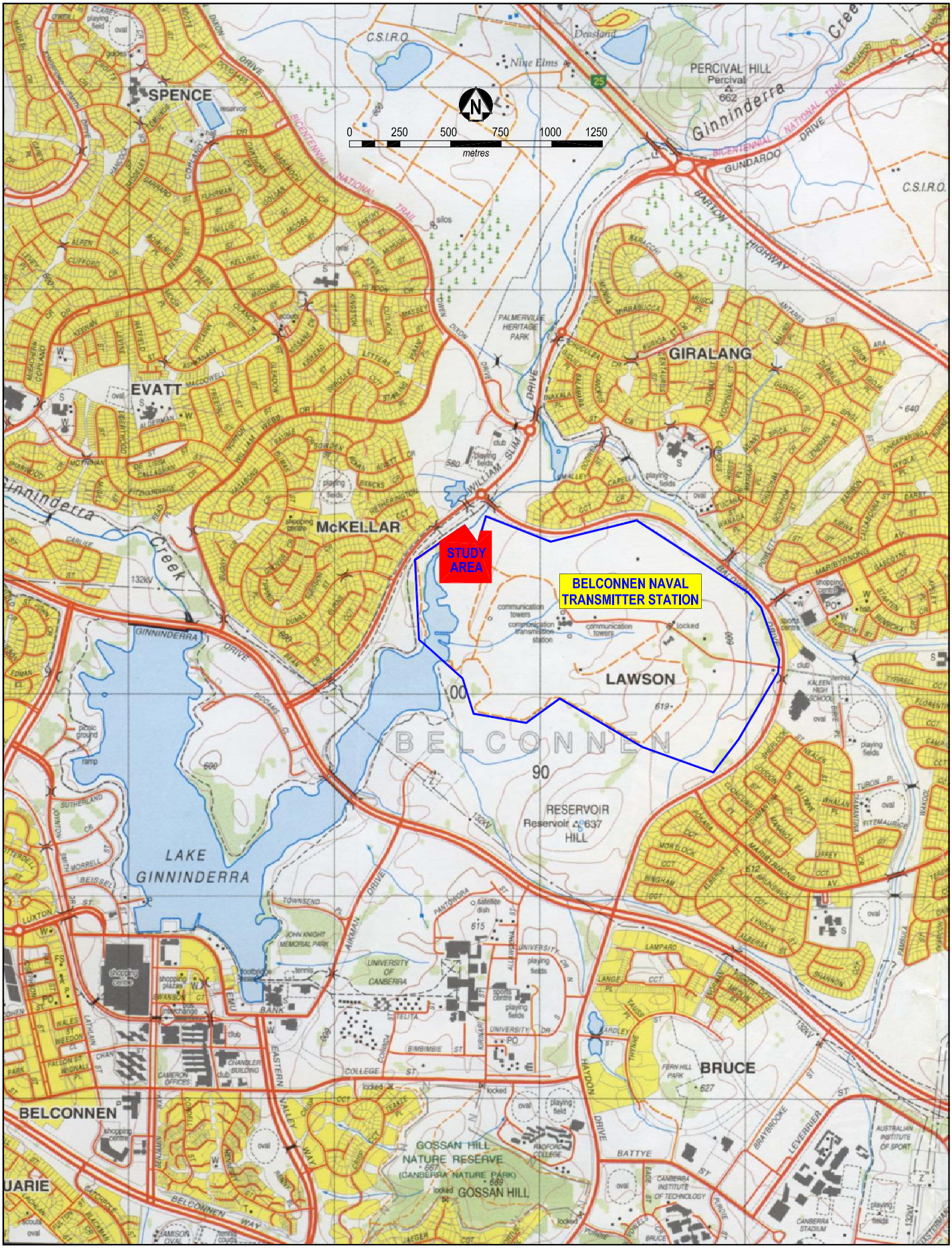
Figures

A4



HLA

LOCATION OF BECONNEN TRANSMITTER STATION
RESOLVE FM
Lepidium ginninderrense survey
Lawson, Canberra ACT

FIGURE
1

PROJECT-FILE NAME **D1023601** DATE **February 2005** DRAWN **amt** APPROVED

PROJECT FILE NAME D1023601
DATE 25 February 2005
DRAWN ST
APPROVED

LEGEND

- Aerial
- SiteBoundary

Density Class

- 1
- 2
- 3
- 4
- 5
- 6 - 10
- 11 - 15
- 16 - 19

20 10 0 20
Meters

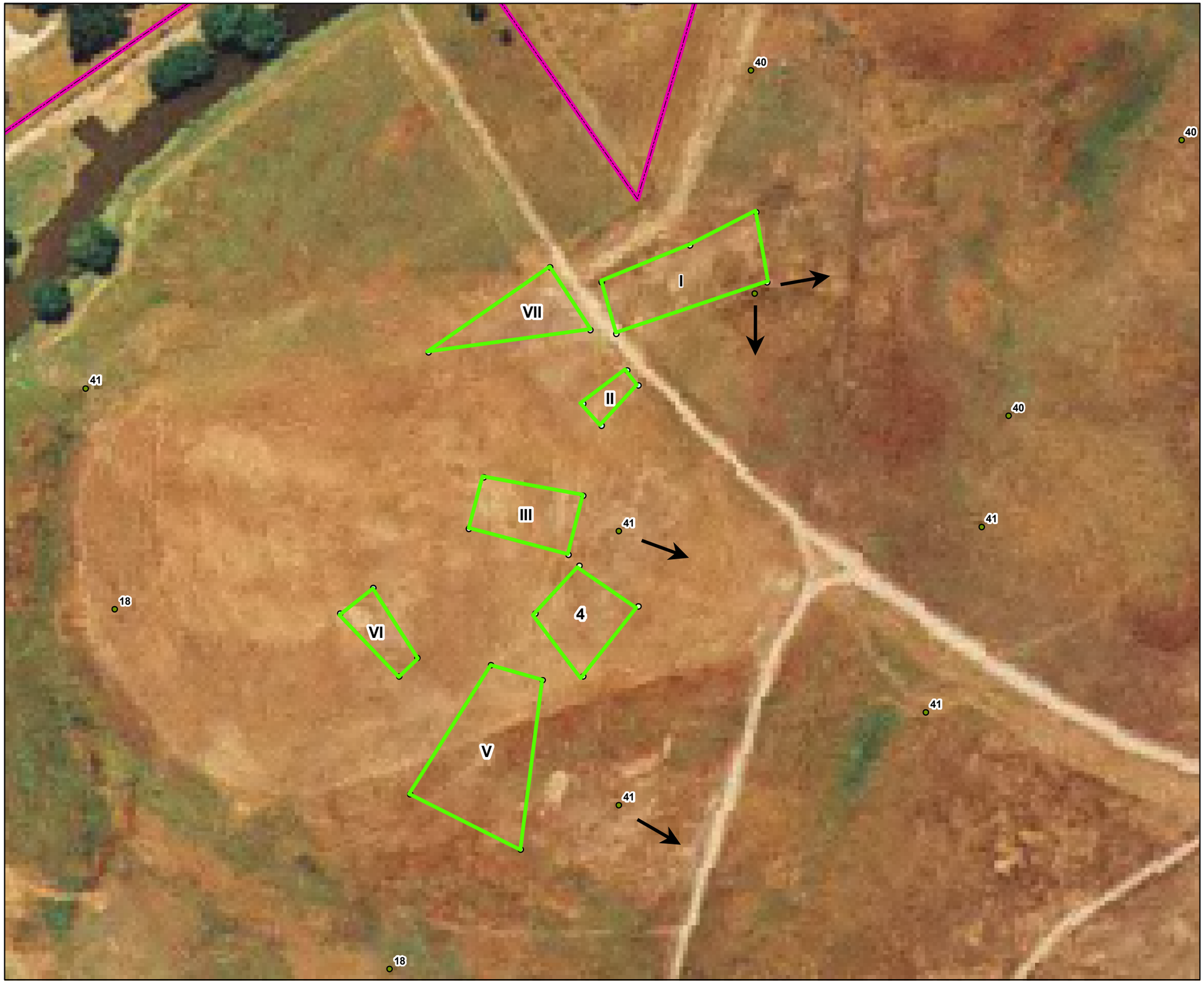
Datum: AGD66
Projection: AMG Zone 55

Note:
The spatial accuracy of the data presented on this map is not known.

Distribution of *Lepidium ginninderrense*.
Department of Defence
Aerial Farm Decommissioning
Belconnen NTS

HLA

Figure
2



PROJECT FILE NAME D1023601
DATE 25 February 2005
DRAWN ST
APPROVED

LEGEND

- Aerial
- Site Boundary
- Exclusion Zone
- Recommended Direction For Lowering Aerial

20 10 0 20 Meters

Datum: AGD66
Projection: AMG Zone 55

Note:
The spatial accuracy of the data presented on this map is not known.

Recommended Exclusion Zones
Department of Defence
Aerial Farm Decommissioning
Belconnen NTS

HLA

Figure
3

Appendices

Appendix 1: Metadata for February 2005 Lepidium Ginninderrense Survey

File Name	lepidium_distribution
Description of data	Locations of *Lepidium ginninderrense* with Belconnen Naval Transmitter Station.
Data linage	Locations are based on a grid of 1 m x 1 m cells established across population. Grid physically created using tape measures using part of a north – south fence as a reference. Data transcribed onto data sheet in field, transcribed to Excel, imported into ARCGIS, converted from UTM to Decimal Degrees.
Field collection	s47F Senior Ecologist
Date of field collection	16 –18 February 2005
Field data contact	Telephone: (02) 4968 0044 Facsimile: (02) 4968 0005 e-mail: s47F HLA-Envirosciences PO Box 73 Hunter Regional Mail Centre (“HRMC”) NSW 2310
GIS processing	s47F GIS Officer
Date of GIS processing	February 2005
GIS processing contact	s47F Telephone: s47F Facsimile: e-mail: s47F HLA-Envirosciences 46 Clarendon Street South Melbourne VIC 3205
GIS data completeness	Complete
Datum	AGD_1966
Spheroid	AGD_1966
Units	Degrees
Accuracy of data	>± 0.5 metres
Projection	Geographic Decimal Degrees
File Type	ArcView Shape File
Feature Type	Point
Attribute: ID	Unique point identifier
Attribute: Easting	East Coordinate, in metres, UTM, zone 55
Attribute: Northing	North Coordinate, in metres, UTM, zone 55
Attribute: Species	Targeted species, *Lepidium ginninderrense*
Attribute: Number	Number of *Lepidium ginninderrense* observed
Attribute: Old	Number of *Lepidium ginninderrense* without green leaves present

File Name	Exclusion_Zone
Description of data	Recommended Exclusion Zones at Belconnen Naval Transmitter Station.
Data linage	Locations are based on coordinates obtained using a handheld GPS. Data transcribed onto data sheet in field, transcribed to Excel, imported into ARCGIS, converted from UTM to Decimal Degrees.
Field collection	s47F Senior Ecologist
Date of field collection	18 February 2005
Field data contact	Telephone: (02) 4968 0044 Facsimile: (02) 4968 0005 e-mail: s47F HLA-Envirosciences PO Box 73 Hunter Regional Mail Centre (“HRMC”) NSW 2310
GIS processing	s47F GIS Officer
Date of GIS processing	February 2005
GIS processing contact	s47F Telephone: s47F Facsimile: e-mail: s47F HLA-Envirosciences 46 Clarendon Street South Melbourne VIC 3205
GIS data completeness	Complete
Datum	AGD_1966
Spheroid	AGD_1966
Units	Degrees
Accuracy of data	± 4 metres
Projection	Geographic Decimal Degrees
File Type	ArcView Shape File
Feature Type	Polygon
Attribute: ID	Unique point identifier
Attribute: Area	Exclusion Zone Number

File Name	**D1023601_aerial**
Description of data	Location of transmitting aerials at Belconnen Naval Transmitter Station.
Data linage	Locations are based on 'Royal Australian Navy HMAS Harman Transmitting Station Belconnen Aerial Farm' (NG 36080, sheet 3 of 4) A4 photocopy obtained from Mike Parker (formerly of Boeing), scanned, imported into ARCGIS, property boundary matched to ACT cadastre (Decimal Degrees).
Field collection	Australian Telecommunications Commission
Date of field collection	10-05-1978
Field data contact	- Holder of photocopy - s47F Telephone: (02) 4968 0044 Facsimile: (02) 4968 0005 e-mail: s47F HLA-Envirosciences PO Box 73 Hunter Regional Mail Centre ("HRMC") NSW 2310
GIS processing	s47F GIS Officer
Date of GIS processing	February 2005
GIS processing contact	s47F Telephone: s47F Facsimile: e-mail: s47F HLA-Envirosciences 46 Clarendon Street South Melbourne VIC 3205
GIS data completeness	Complete
Datum	AGD_1966
Spheroid	AGD_1966
Units	Degrees
Accuracy of data	± 10 metres
Projection	Geographic Decimal Degrees
File Type	ArcView Shape File
Feature Type	Point
Attribute: Feature_ID	Unique point identifier
Attribute: DropZone_R	Radius of aerial drop zone (= height of aerial)
Attribute: Gwire_R	Radius of aerial ground wire plane
Attribute: ID_Aerial	Aerial array number