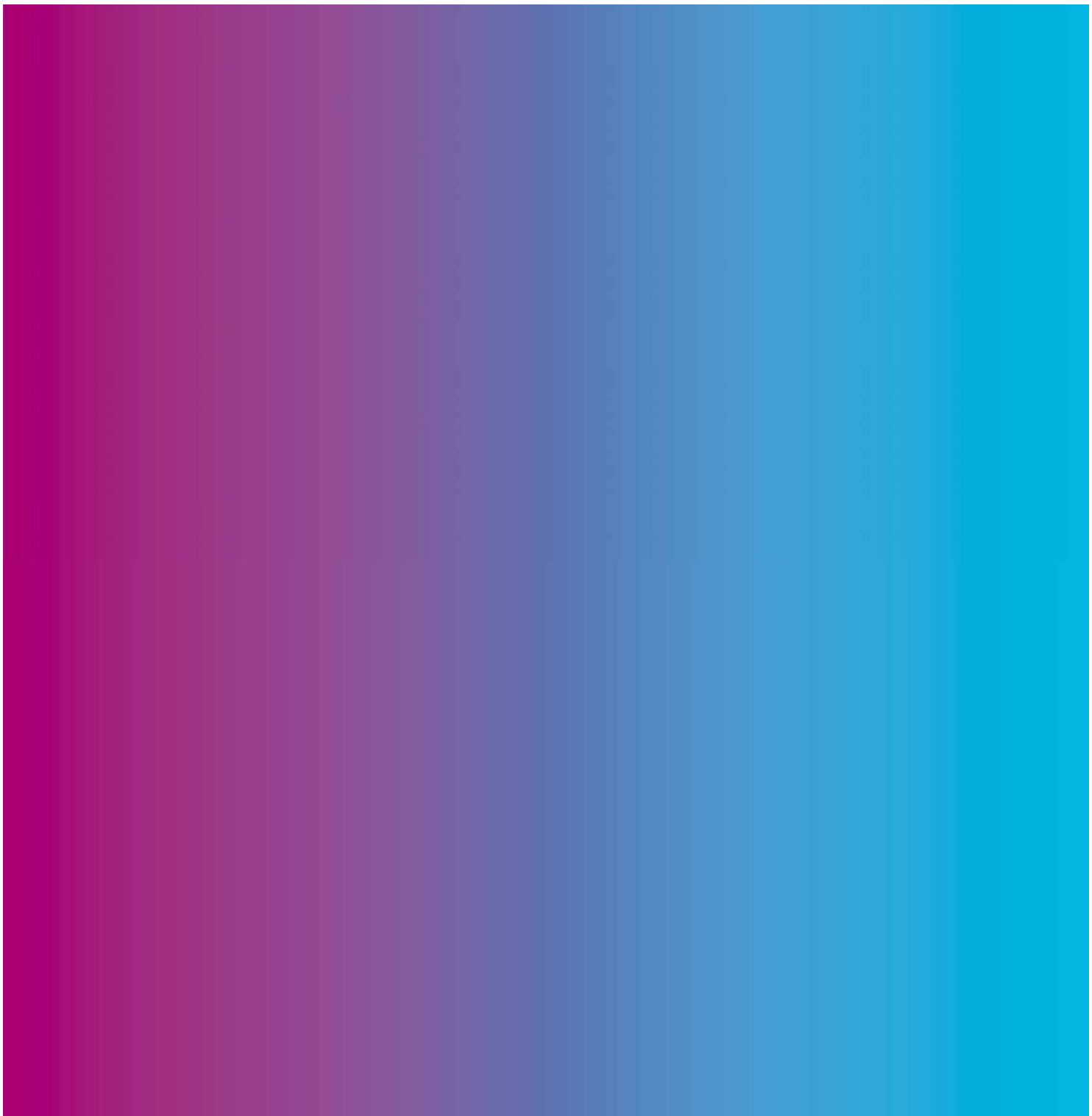
Enhanced Land Force Stage 2C
Department of Defence
22 March 2011

Environmental Impact Assessment for ELF 2C at Greenbank Training Area

Supporting Information for EPBC Act Referral



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Supporting Information for EPBC Act Referral

Prepared for

Department of Defence

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List of Acronyms

Acronym	Definition
25/49 RQR	25th/49th Battalion of the Royal Queensland Regiment
3 RAR	3rd Battalion of the Royal Australian Regiment
7 BDE	7th Brigade
8/9 RAR	8th/9th Battalion of the Royal Australian Regiment
ABS	Australian Bureau of Statistics
ADF	Australian Defence Force
ARMP	Approved Risk Management Plan
ASLAV	Australian Light Armoured Vehicle
ASRIS	Australian Soil Resource Information System
BC	Blunder Creek
BCC	Brisbane City Council
BSC	Beaudesert Shire Council
BSR	Battle Shooting Range
CEMP	Construction Environmental Management Plan
CHL	Commonwealth Heritage List
CMU	Catchment Management Unit
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management
DFSW	Direct Fire Support Weapons
ECTA	Enoggera Close Training Area
EIA	Environmental Impact Assessment
ELF	Enhanced Land Force
ELF 2C	Enhanced Land Force Stage 2C Training Areas and Ranges
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPT	*Ephemeroptera*, *Plecoptera* and *Trichoptera*
ESCP	Erosion and Sediment Control Plan
GBSS	Greenbank State School
GBTA	Greenbank Training Area
GMU	Groundwater Management Unit
HNA	Hardened and Networked Army
HVR	High Value Regrowth
ICC	Ipswich City Council
Koala SPP	*State Planning Policy 2/10 South East Queensland Koala Preservation* (Qld)
LCC	Logan City Council
MNES	Matter of National Environmental Significance

Acronym	Definition
MTR-B	Marksmanship Training Range Type B
NC Act	*Nature Conservation Act 1992* (Qld)
OC	Oxley Creek
OC WQO	Oxley Creek Water Quality Objectives
PFC	Project Foliage Cover
PMV	Protected Mobility Vehicles
RE	Regional Ecosystem
RIFA	Red Imported Fire Ant
SDTA	Safe Driver Training Area
SEQ	South East Queensland
SEQ Koala SPRP	*The South East Queensland Koala State Planning Regulatory Provisions* (Qld)
SEQ NRMP	*South East Queensland Natural Resources Management Plan 2009-2031*
SEQRP	*South East Queensland Regional Plan 2009-2031*
SEWPAC	Department of Sustainability, the Environment, Water, Population and Communities
SGA	Springfield-Greenbank Arterial
SP Act	*Sustainable Planning Act 2009* (Qld)
SQ	South Queensland
STP	Sewage Treatment Plant
SWBTA	Shoalwater Bay Training Area
SWL	Standing Water Level
TA	Training Area
UXO	Unexploded Ordnance
VM Act	*Vegetation Management Act 1999* (Qld)
VM Code	*Regional Vegetation Management Code for South East Queensland Bioregion-Version 2*
WONS	Weeds of National Significance

Executive Summary

The Department of Defence (Defence) has developed the Enhanced Land Force (ELF) initiative to increase the capability of the Australian Army. ELF Stage 2C (ELF 2C) includes the introduction of new training and camp facilities at Greenbank Training Area (GBTA) to increase the capacity for military training. Facilities proposed at GBTA include:

- An upgrade and extension of the existing Battle Shooting Range to a Marksmanship Training Range Type B (MTR-B)
- A new Safe Driver Training Area (SDTA) in a previously cleared area
- A new access point from Goodna Road on the southern side of GBTA
- A new Range Control compound near the new entry
- A new 320 Person Camp (Camp) at Accommodation Area L
- New working accommodation for 25th/49th Battalion, Royal Queensland Regiment (25/49 RQR) near the new Camp.

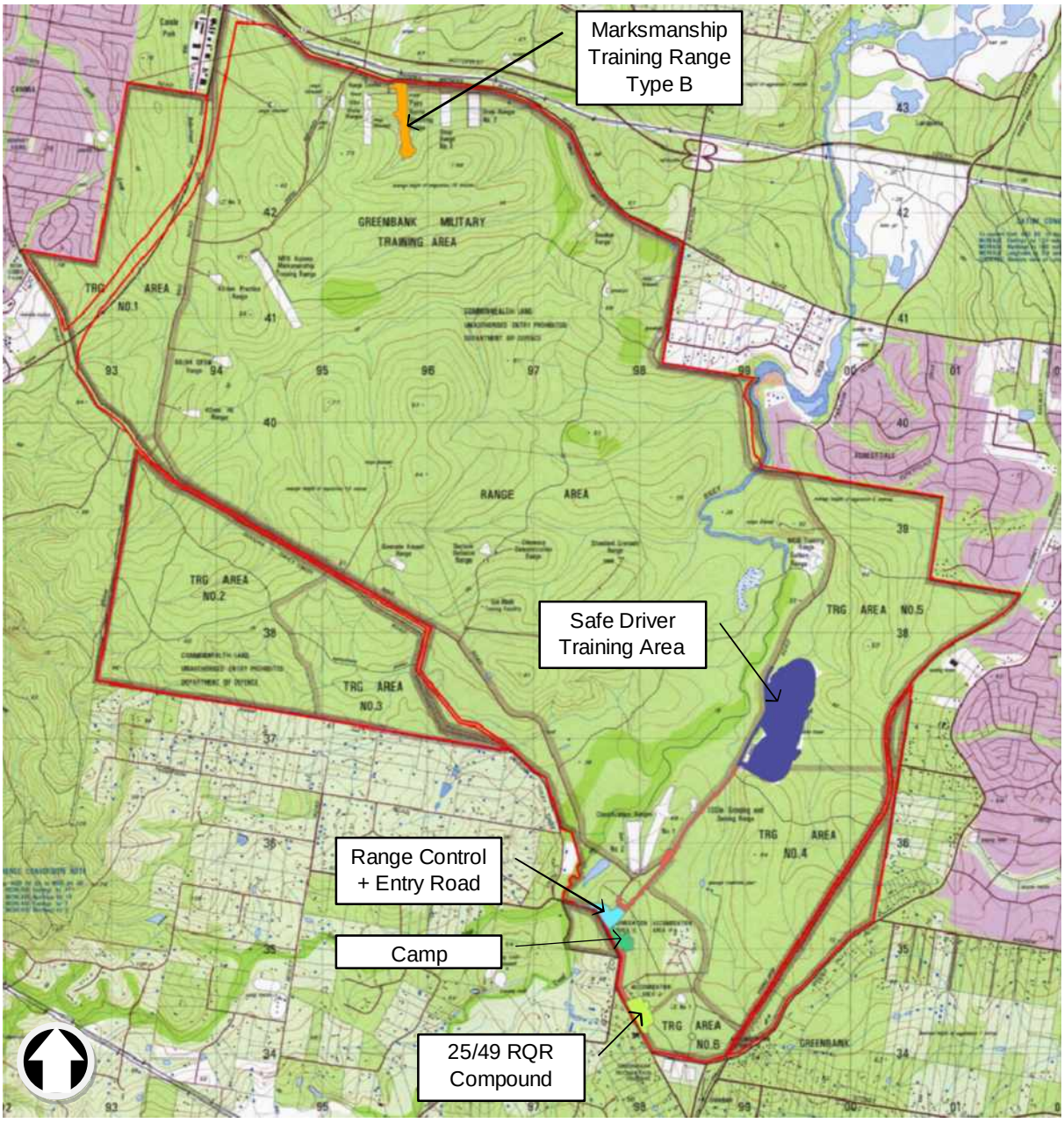
The locations of the proposed facilities are shown in Figure 1 and Map 1 in Appendix A. Detailed descriptions of the facilities are provided in Section 2.0.

Existing Environment

GBTA is an important area of remnant vegetation in the greater Brisbane region. Environmental values of importance for GBTA are listed below:

- GBTA has extensive natural heritage values, which are demonstrated by its Commonwealth Heritage Listing (CHL) (Section 3.12). It has been listed for two key reasons:
  - *Processes*—GBTA is important for the conservation of old growth forest and Koala habitat in South East Queensland (SEQ).
  - *Rarity*—GBTA contains Endangered and Of Concern Regional Ecosystems (RE). It is also important for species that are threatened, uncommon, or restricted in the Brisbane area.
- GBTA provides suitable habitat for a number of threatened plant species, including *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed species. Although none of these have been recorded at GBTA in previous surveys a number have been recorded within 10 km of GBTA (Section 3.9).
- GBTA provides suitable habitat for a number of threatened animal species, including EPBC Act listed species. Squatter Pigeons were observed in October 2009 and a number of other species have been observed within 10 km of GBTA (Section 3.10).
- GBTA is entered into the Directory of Important Wetlands, Australia (Section 3.9), indicating it is a nationally important wetland.
- GBTA provides habitat for a number of Endangered and Of Concern RE, which are protected under Queensland's *Vegetation Management Act 1999*. More than 50 % of two of the Endangered RE occurs within GBTA (Section 3.9).
- Areas of Essential Habitat for the Koala and Wallum Froglet are mapped as occurring within GBTA. Koala Essential Habitat occurs within the proposed locations of the SDTA and MTR-B (Section 3.10.3).
- Remnant vegetation is in good to excellent condition with limited weed infestation and other disturbance (Section 3.9) and provides good to excellent quality fauna habitat (Section 3.10.4).
- GBTA is an important element of the Flinders Peak to Greenbank/Karawatha Fauna Corridor (Section 3.3.2).
- The MTR-B and SDTA sites have low to moderate potential for items of Aboriginal heritage significance to occur (Section 3.13).
- The Greenbank State School is located opposite the proposed Camp and 25/49 RQR facilities and south of the proposed new entry and Range Control (Section 3.15).

Figure 1 Proposed ELF 2C facilities



Mitigation Measures

Mitigation measures were developed to address the potential environmental impacts of the proposed ELF 2C works, these are described below:

- Design:
  - Minimising clearing by locating facilities in previously disturbed areas where possible. The new Range Control, was located to avoid potential traffic safety issues, and consequently is in remnant vegetation.
  - Developing a bullet-catcher in the MTR-B design to minimise the extent of potential contamination from training with live rounds.
  - Developing erosion and sediment control infrastructure in the design of the MTR-B and SDTA to prevent the migration of sediment from the facilities to the downstream environment.
  - Developing a new Sewage Treatment Plant (STP) for sewage from the Range Control, Camp and 25/49 RQR compound and replace the existing system (which currently discharges to a tributary of Oxley Creek). The new STP will treat water to be reused in toilets and for irrigation at the training area.
  - Developing a new vehicle wash bay to reduce the risk of spreading weeds within GBTA.
- Construction:
  - The Contractor will be required to prepare and implement a Construction Environmental Management Plan (CEMP), which will be approved by Defence. The CEMP will include measures to manage:
    - Erosion and sediment control through the implementation of an Erosion and Sediment Control Plan developed in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008)
    - Red Imported Fire Ants through the implementation of an Approved Risk Management Plan and compliance with Queensland legislation
    - Traffic issues through the implementation of a Traffic Management Plan developed in accordance with Department of Transport and Main Roads requirements
    - Noise and dust
    - Items of Aboriginal heritage through the implementation of construction measures to detect potential items of significance during excavations
    - Fauna through the implementation of pre-clearing surveys by a qualified fauna spotter/catcher to ensure animals are not harmed by clearing activities, and
    - Spills and leaks through the implementation of a Materials Handling Plan, which is to include spill cleanup and response.
  - Archival recording to document historic values of the Signals and Communications Facility, P1 Huts and tent pads that are to be demolished.
- Operation:
  - Implementing a Range Management Plan for the MTR-B, to be developed in accordance with the guidance provided in *Best Management Practices for Lead at Outdoor Shooting Ranges* (USEPA, 2005) and *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges* (NSSF, 1997).
  - Regularly maintaining sediment control infrastructure at the MTR-B and SDTA.
  - Controlling weeds around the SDTA, particularly in drainage lines, where weed infestation is most likely to occur.
  - Updating and implementing the Bushfire Management Plan to include the new facilities.
  - Environmental monitoring, including:
    - Continuing the annual water quality monitoring
    - Inspecting erosion and sediment control infrastructure, and
    - Inspecting and controlling weeds.

In addition, Defence propose implementing an environmental compensation strategy, which includes:

- The existing STP would be decommissioned, removed, remediated and revegetated.
- A culvert crossing would be installed over Oxley Creek to prevent erosion of the creek bank.
- Nest boxes would be installed to replace hollows in cleared trees at a ratio of 2:1.

Further details of the proposed mitigation and compensatory measures are provided in Section 4.0.

Potential Impacts

Potential Impacts on MNES

Threatened and migratory species listed under the EPBC Act have the potential to occur at GBTA. However, no populations of these species have been recorded at GBTA, despite previous searches (Driscoll, 1992; HLA , 2007). Therefore, it is unlikely that a population of a listed species exists in GBTA, and also unliekly that the proposed removal of 0.84 % of potentially suitable habitat in remnant vegetation would cause a significant impact on these species. Detailed assessments are provided in Section 5.0.

Potential Impacts on Commonwealth Heritage Values

GBTA's CHL values for Processes are as follows:

- GBTA is important for the conservation of old growth forest in southeast Queensland.
- GBTA provides an area of high quality habitat for Koalas (*Phascolarctos cinereus*).

The proposed development of the ELF 2C facilities would require the removal of 36.79 ha, or 0.84 %, of remnant vegetation from GBTA. This is unlikely to be a significant proportion of the existing remnant vegetation.

RE mapping indicates 1,746.6 ha of remnant vegetation at GBTA is Essential Habitat for the Koala. The proposed ELF 2C development would require the removal of 13.35 ha (0.76 %) of this Essential Habitat. This is unlikely to be a significant proportion of the available Essential Habitat for the Koala at GBTA.

The proposed development of the ELF 2C facilities would require the removal of 36.79 ha (0.84 %) of Koala Bushland Habitat (Medium and Low Value). This is unlikely to be a significant proportion of the existing Koala Bushland Habitat.

GBTA's CHL values for Rarity are as follows:

- GBTA contains Endangered and Of Concern RE, as listed in the Queensland *Vegetation Management Act 1999.*
- It is important for species that are threatened, uncommon, or restricted in the Brisbane area.

Less than 1 % of Endangered and Of Concern RE would be removed under the proposal, which is unlikely to be a significant reduction in area.

No threatened species were identified in targeted threatened flora surveys in 2007 (HLA , 2007) and none were identified within the proposed development sites during site inspections. Furthermore, less than 1 % of available potential habitat would be removed under the proposal. Consequently, the proposed ELF 2C works are not likely to have a significant impact on threatened species or their habitat.

Overall, the proposed ELF 2C works, which require the removal of 36.79 ha of remnant vegetation (including 27.14 ha of Endangered and Of Concern RE) and 67 ha of suitable habitat for the Koala:

- Is unlikely to cause the CHL values of *Processes* or *Rarity* to be lost
- May degrade the CHL values of *Processes* and *Rarity*, and
- Is unlikely to cause the notable alteration, modification, obscuration or diminishment of the CHL values *Processes* or *Rarity*.

Potential Impacts on the Commonwealth Environment

Regional Values	The removal of 1.5 % of remnant and regrowth vegetation from GBTA and works on minor drainage lines of Blunder and Oxley Creeks are unlikely to have a significant impact on GBTA's regional values (refer Section 7.2.1).
Surface Water and Hydrology	The proposed works may have a minor impact on local hydrology of tributaries of Blunder and Oxley Creeks, associated with the development of the MTR-B and SDTA (refer Section 7.2.2); however, this is unlikely to be significant. The development of the new STP is expected to have a positive impact on water quality in Oxley Creek within GBTA (refer Section 7.2.2).
Soils and Geology	The proposed works are unlikely to cause significant levels of erosion or soil contamination. During construction, the Contractor will be required to implement an Erosion and Sediment Control Plan in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008). The MTR-B will have a stop-butt, which will be regularly de-leaded to prevent migration of potentially contaminated sediment into the surrounding environment (refer Section 7.2.3).
Flora	The proposed ELF 2C works require the removal of approximately 1.5 % of native vegetation at GBTA, including 16.45 ha of Endangered RE (0.78 %). This is unlikely to be a significant impact (refer Section 7.2.4). The proposed works are unlikely to affect any threatened flora species (refer Section 7.2.4).
Fauna	The removal of approximately 1.5 % of potentially suitable habitat for threatened fauna is unlikely to have a significant impact on any threatened fauna species (refer Section 7.2.5). Nor is it likely to have a significant impact on fauna movement through GBTA.
Aboriginal Heritage	Items of Aboriginal heritage may be discovered during excavation for the proposed works; however, potential impacts will be managed through the Contractor's CEMP. Consequently, the works are unlikely to have a significant impact on the Aboriginal heritage values of GBTA (refer Section 7.2.6).
Historic Heritage	Signals and Communications Facility, P1 Huts and tent pads will be demolished to accommodate the proposed ELF 2C facilities. Archival recording will be undertaken to document the historic values of these places. Consequently, the proposed works are unlikely to have a significant impact on the historic heritage values of GBTA (refer Section 7.2.7).
Social and Economic Environment	Construction of the proposed works may cause a noise nuisance to nearby receptors, although this is not likely to be significant given the separation of works from sensitive receptors. Nevertheless, potential noise disturbance will be managed through the Contractor's CEMP (refer Section 7.2.8) and is unlikely to be significant. Construction of the new entry may cause short-term, temporary interruptions to traffic along Goodna Road (refer Section 7.2.8). The Contractor will be required to obtain relevant permits from the Queensland Department of Transport of Main Roads and develop a Traffic Management Plan as part of the CEMP. Consequently, there are unlikely to be significant interruption to traffic. The proposed works are unlikely to affect surrounding land uses.

An assessment of the proposal under EPBC Act Policy Statement 1.2 indicates the proposed ELF 2C development may have a significant impact on the Commonwealth environment through:

- Medium scale clearing of remnant and HVR vegetation, and
- Impacts to the heritage values of GBTA through the removal of 36.79 ha of remnant vegetation and 67 ha of habitat suitable for the Koala.

Formal assessments of impact significance pursuant to the EPBC Act indicate the proposal is unlikely to have a significant impact on Matters on National Environmental Significance. The proposal has the potential to have a significant impact on the Commonwealth Heritage Values of GBTA. Furthermore, the removal of 67 ha of remnant and HVR vegetation could be considered medium scale clearing under EPBC Act Policy Statement 1.2.

1.0 Introduction

1.1 Background

1.1.1 Enhanced Land Force Stage 2C: Training Areas and Ranges

Recent experiences of the Australian Defence Force (ADF) suggest that a high operational tempo is likely to be maintained for the foreseeable future, and that the battlefield is becoming a more complex and lethal environment (Lt Col Ryan, 2006). The Hardened and Networked Army (HNA) is a response to the above observations, and requirements of the Defence 2000 White Paper, which recognises that the ADF requires sufficient firepower, protection, and mobility for operations in the defence of Australia and its interests. Strategic guidance recommends the ADF maintain the ability to sustain a brigade size group of operations for extended periods while retaining the ability to deploy a battalion size group for other contingencies. In December 2005, the Commonwealth Government endorsed the HNA initiative as part of the launch of the Strategic Update 2005.

HNA was to have funded the establishment of a mechanised battle group in Adelaide by converting the parachute enabled 3rd Battalion, Royal Australian Regiment (3 RAR) to a mechanised infantry battalion (Joint Standing Committee on Foreign Affairs, Defence and Trade, 2008). However, the conversion of 3 RAR through HNA has been superseded by the introduction of the Enhanced Land Force (ELF) initiative, which includes converting 3 RAR to a light infantry battalion and relocating it to Townsville (Hon MP Fitzgibbon, 2008).

The ELF initiative was announced in August 2006 to expand the capacity of the ADF, and the Army in particular, to support regional stabilisation operations as well as Australia's other interests. ELF raises two additional infantry battalions with their essential battle group and joint and Defence enabling capabilities (Joint Standing Committee on Foreign Affairs, Defence and Trade, 2008). The major elements of ELF include:

- Raising a second mechanised battalion, 7 Battalion, Royal Australian Regiment, to be located in Adelaide (and funded under HNA)
- Relocating 3 RAR to Townsville, and
- Re-raising 8th/9th Battalion, Royal Australian Regiment (8/9 RAR) in South East Queensland (SEQ).

Re-raising 8/9 RAR will fulfil an important role in increasing the capability and capacity of the Australian Army to conduct operations in the defence of Australia and its interests. It forms part of a wider initiative, as outlined above. The facilities proposed under the ELF Stage 2C-1 Training Area and Ranges (ELF 2C) are required as a direct consequence of re-raising 8/9 RAR and will support the battalion and its supporting elements to fulfil their operational roles. ELF 2C aims to provide facilities for the combat training of 8/9 RAR and other Defence personnel.

Facilities proposed for Greenbank Training Area (GBTA) under ELF 2C include:

- An upgrade and extension of the existing Battle Shooting Range (BSR) to a Marksmanship Training Range Type B (MTR-B)
- A new Safe Driver Training Area (SDTA) in a previously cleared area
- A new access point from Goodna Road on the southern boundary of GBTA
- A new Range Control compound near the new entry
- A new 320 Person Camp (Camp) at Accommodation Area L, and
- New 25th/49th Battalion, Royal Queensland Regiment (25/49 RQR) working accommodation near the new Range Control.

1.1.2 Defence Training Model

The Defence Training Model includes three tiers of activity, described below.

Tier 1 encompasses individual and small team (up to platoon/troop) activities, including those associated with meeting Army Individual Readiness Notice requirements and maintaining weapon proficiency. Tier 1 activities are part of normal unit daily routine and the supporting facilities. Tier 1 ranges and training areas should be located at the unit's main operating base, or within one hour's travelling time. Tier 1 training areas in south Queensland include Enoggera Cantonment, Enoggera Close Training Area (ECTA), GBTA, Canungra Military Area, and Purga Rifle Range. Canungra and Purga are more than the desired one hour travelling time from Gallipoli Barracks.

Tier 2 focuses on sub-unit/combat troop level activities, including pre-deployment training, live firing of explosive natures of ammunition, the conduct of static, and mobility range practices, tactical manoeuvre by day and night and mobility/counter mobility activities, including obstacle breaching and demolition. Tier 2 activities are conducted at least annually by each sub-unit in a brigade. The enabling facilities, ranges, and training areas should be located within two hours of the unit's location. Tier 2 training areas in south Queensland (SQ) include GBTA, WBTA, and Shoalwater Bay Training Area (SWBTA). WBTA and SWBTA are more than the desired two hour travelling time from Gallipoli Barracks.

Tier 3 covers unit/battle group level activities, including pre-deployment training for operations. Tier 3 activities involve the concurrent manoeuvre of several combat troops in a battle group setting, live firing in a tactical context and support from Divisional, Army and Joint assets. Tier 3 activities are planned and conducted annually by each unit, with battle group activities under Brigade Headquarter control taking place at least every two years. The facilities, ranges, and training areas for Tier 3 activities should be accessible within four hours travel. Tier 3 training areas in SQ include SWBTA, which is more than the desired four hour travelling time from Gallipoli Barracks.

This training model drives the planning and development of training facilities. The ELF 2C training and support facilities at GBTA have been proposed to meet the Tier 1 and Tier 2 training needs of 7th Brigade (7 BDE) and other supporting units as a result of re-raising 8/9 RAR under HNA.

1.2 Scope of this Study

1.2.1 Purpose

Defence has developed an internal process to ensure compliance with environmental legislation and to achieve their vision of being a leader in sustainable environmental management in the support of the ADF's capability. The process also identifies impacts that may trigger a referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), which allows Defence to either plan to mitigate impacts or refer the proposal to the Department of Sustainability, the Environment, Water, Populations and Communities (SEWPAC) for assessment.

This Environmental Impact Assessment (EIA) has been developed, as a consequence of the findings of previous studies, to support the referral of the proposed ELF 2C works at GBTA under the EPBC Act.

It investigates the potential environmental and heritage risks associated with the proposed ELF 2C works at GBTA. The objectives of the study are listed below:

- It assesses the potential environmental and heritage impacts of the construction and operation of the ELF 2C facilities, based on the sensitivity of the existing environment and the types of activities proposed.
- It assesses the potential environmental and heritage impacts of the anticipated increased intensity of use of the training area as a whole as a consequence of the improved facilities and increase training tempo.
- It determines whether the proposal has the potential to have a significant impact under the EPBC Act.
- It identifies and recommends measures to avoid, minimise, mitigate, and/or offset any potential environmental and heritage impacts likely to eventuate from the proposed construction and operation of ELF 2C facilities.

1.2.2 Scope of Work

The ELF 2C scope of works at GBTA is described in Section 1.1.1. Both construction and operation of these facilities are considered within the EIA.

The EIA for GBTA considers the potential impacts on GBTA and the surrounding external natural, heritage, and social environments. In particular, the EIA considers potential impacts on:

- Soils and land systems
- Surface water and groundwater
- Native and introduced flora and fauna
- Natural, European and Indigenous heritage values, and
- Land use and social values.

The EIA was completed through a combination of reviewing existing information and conducting field investigations. A Public Works Committee hearing was held for ELF 2C on 5 November 2009. To inform their submission, Defence required preliminary advice based on field investigations on 23 October 2009. This deadline was a key determinant in the development of the scope of field investigations undertaken.

Existing information reviewed for the EIA included documentation held by Defence, State and Commonwealth databases and other information from reputable sources available in the public domain.

Field investigations were limited to a two-week period from 12 October 2009 to 23 October 2009 to meet the project timeframes. Survey methodologies were developed in consideration of the short timeframe available and Defence's operational constraints (such as unexploded ordnance risks) while gaining as much information about each site as possible. This generally involved targeting sites considered to have a higher risk because of existing environmental conditions or the proposed activities. Details of the survey methodologies are provided in the relevant technical section.

1.3 Relevant Legislation

The primary legislation relevant to the proposed ELF 2C development is the EPBC Act, which is described below. Nevertheless, while Defence is not bound by Queensland legislation, their Good Neighbour Policy requires that Defence comply with State legislation except where there is a conflict with Commonwealth legislation. Relevant Commonwealth and Queensland legislation relating to environmental protection and safety management is outlined in Appendix B.

The EPBC Act is the Australian Commonwealth Government's key piece of environmental legislation, which commenced 16 July 2000. The EPBC Act enables the Commonwealth Government to join with the States and Territories to provide a national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act focuses Commonwealth Government interests on the protection of Matters of National Environmental Significance, with the States and Territories having responsibility for matters of state and local significance. SEWPAC administers the EPBC Act.

The objectives of the EPBC Act are to:

- Provide for the protection of the environment, especially Matters of National Environmental Significance (MNES)
- Conserve Australian biodiversity
- Provide a streamlined national environmental assessment and approvals process
- Enhance the protection and management of important natural and cultural places
- Control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife, and
- Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources.

The eight MNES are:

- World Heritage properties
- National Heritage places
- Wetlands of international importance
- Great Barrier Reef Marine Park
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas, and
- Nuclear actions.

1.3.1 Actions Requiring Approval

Under the Act, some actions require approval from the Commonwealth Government Minister for SEWPAC (the Minister). If it is proposed to take an action that could have a significant impact on the environment, the proponent needs to refer the proposed action to SEWPAC. A referral is required if:

- The proposed action is likely to have a significant impact on an MNES, or
- The proposed action is likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

Under the Act, a "significant impact" is an impact that is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude, and geographic extent of the impacts. All of these factors should be considered when determining whether an action is likely to have a significant impact on the environment.

SEWPAC have published a number of Policy Statements to provide guidance on the practical application of the EPBC Act. Two Policy Statements have been prepared to assist proponents determine whether an action is likely to have a significant impact under the Act:

- *Policy Statement 1.1 Significant impact guidelines—Matters of National Environmental Significance*, and
- *Policy Statement 1.2 Significant impact guidelines—Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies*.

1.3.2 Protection of Commonwealth Heritage Places

The EPBC Act also provides for the protection of places on the Commonwealth Heritage List (CHL). The CHL comprises natural, Indigenous and historic heritage places on Commonwealth lands and waters or under Commonwealth Government control. Once a heritage place is listed under the EPBC Act, special requirements come into force to ensure that the values of the place will be protected and conserved for future generations. The EPBC Act provides for the preparation of management plans that set out the significant heritage aspects of the place and how the values of the site will be managed.

Under the EPBC Act, Australian Government agencies that own or lease heritage places must:

- Develop a management plan to manage Commonwealth Heritage places consistent with the Commonwealth Heritage management principles prescribed in regulations to the Act, and
- Ask the Minister for advice about taking an action, if the action has, or will have, or is likely to have, a significant impact on a Commonwealth Heritage place.

An action is likely to have a significant impact on the heritage values if there is a real chance or possibility that it will cause:

- One or more of the heritage values to be lost
- One or more of the heritage values to be degraded or damaged, or
- One or more of the heritage values to be notably altered, modified, obscured, or diminished.

Heritage management principles provide a guiding framework for managing properties in a manner to protect heritage values for future generations. These principles should be used when preparing and implementing management plans and programs. In the absence of a management plan, they should guide the management of heritage values of a property. The Commonwealth heritage management principles are listed below:

- The objective in managing Commonwealth Heritage places is to identify, protect, conserve, present and transmit, to all generations, their Commonwealth Heritage values.
- The management of Commonwealth Heritage places should use the best available knowledge, skills and standards for those places, and include ongoing technical and community input to decisions and actions that may have a significant impact on Commonwealth Heritage values.
- The management of Commonwealth Heritage places should respect all heritage values of the place and seek to integrate, where appropriate, any Commonwealth, State and Territory and local government responsibilities for those places.
- The management of Commonwealth Heritage places should ensure that their use and presentation is consistent with the conservation of their Commonwealth Heritage values.
- The management of Commonwealth Heritage places should make timely and appropriate provision for community involvement, especially by people who:
    - Have a particular interest in, or association with, the place, and
    - May be affected by the management of the place.
- Indigenous people are the primary source of information on the value of their heritage and the active participation of Indigenous people in identification, assessment and management is integral to the effective protection of Indigenous heritage values.

"Australia's Commonwealth Heritage: Working Together: Managing Commonwealth Heritage Places" provides information for Commonwealth agencies on managing Commonwealth Heritage places and actions that may affect those places (DEWHA, 2008e).

1.4 Defence Environmental Management

Defence's Environmental Vision is to be a leader in sustainable environmental management to support the Australian Defence Force's capability to defend Australia and its national interests.
The Defence Environmental Policy consists of six objectives:

1) To implement innovative best practice approaches to environmental management that achieve Defence and stakeholder requirements
2) To integrate sustainable environmental management into Defence activities, business processes and decisions
3) To establish clear lines of accountability for environmental outcomes
4) To raise the environmental awareness of Defence personnel through education, training and ready access to necessary information
5) To measure and report environmental performance as a part of a process of continual improvement, and
6) To create a climate of transparency and establish strategic partnerships with key environmental stakeholders.

Defence seeks to achieve their Environmental Policy through the implementation of a variety of management plans described in Appendix B.

2.0 Description of the Proposal

2.1 Summary Description

Defence proposes to increase the capacity for training at GBTA through the introduction of new training and camp facilities. Facilities proposed at GBTA include:

- An upgrade and extension of the existing BSR to an MTR-B
- A new SDTA, partly in a previously cleared area
- A new access point from Goodna Road on the southern side of GBTA
- A new Range Control compound near the new entry
- A new Camp at Accommodation Area L, and
- New 25/49 RQR working accommodation near the new Range Control.

The locations of the proposed facilities are shown in Map 1, Appendix A.

2.2 Location of the Study Area

GBTA is located at Greenbank, approximately 20 km south-southwest of Brisbane and 17 km east of Ipswich. GBTA's location is shown in Figure 2.

GBTA is surrounded by urban development, including:

- Residential areas on all sides, including Forest Lake, Springfield, Springfield Lakes, Forestdale, Boronia Heights, and Greenbank
- Greenbank State School (GBSS) on the west, near the proposed new entry point
- Industrial areas, including Larapinta sand mining operations, to the north, east and north-west, and
- On a broader scale, GBTA forms an environmental corridor with Flinders Peak and Karawatha Park.

GBTA and its immediate surrounds are shown in Figure 3.

GBTA covers an area of approximately 4,665 ha consisting of large areas of eucalypt forest and woodland with patches of closed vine forest. It is important for maintaining a range of old growth forest types in southeast Queensland. GBTA represents a large area of intact lowland open forest in the greater Brisbane region.

Figure 2 Location of GBTA

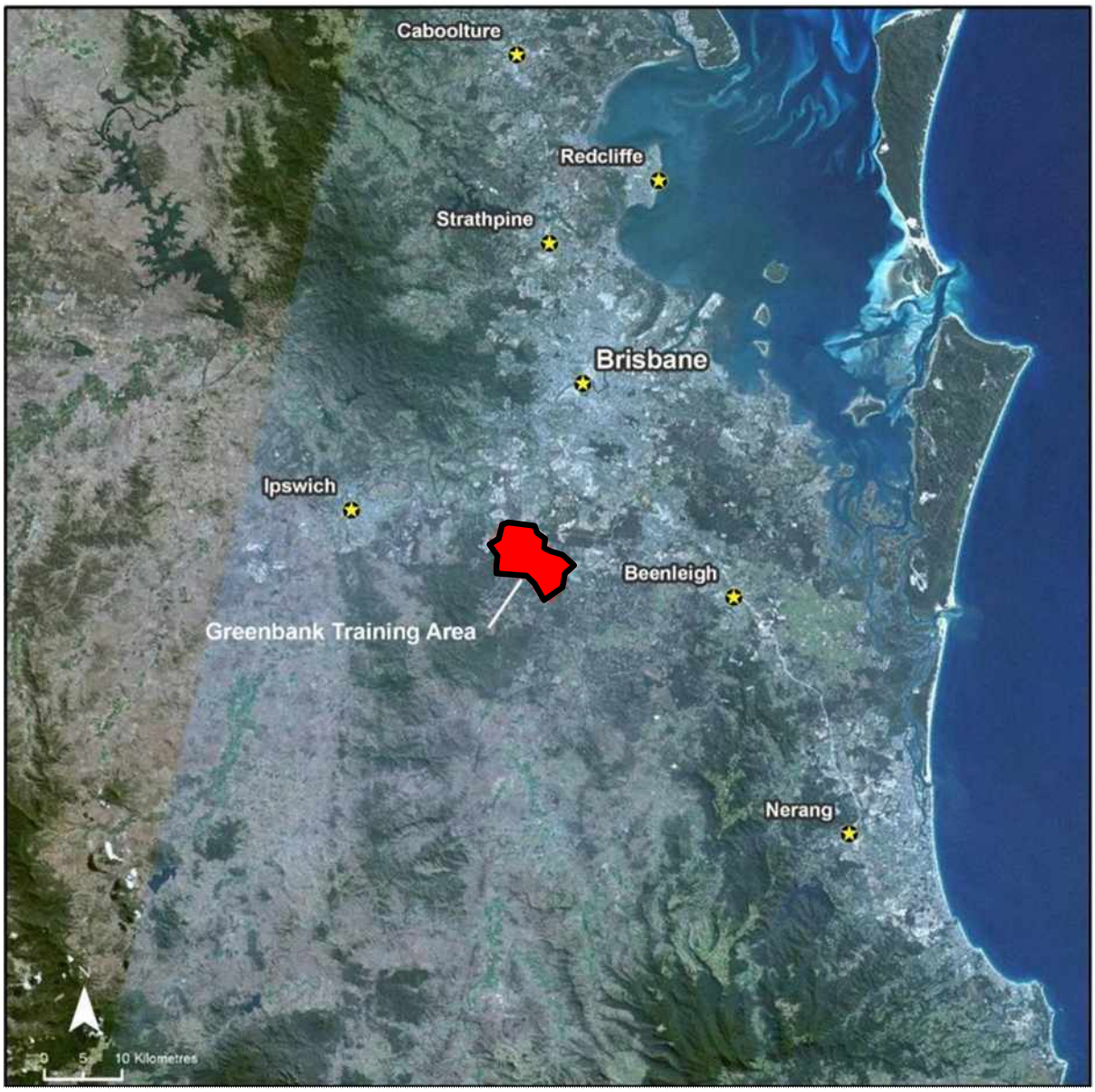
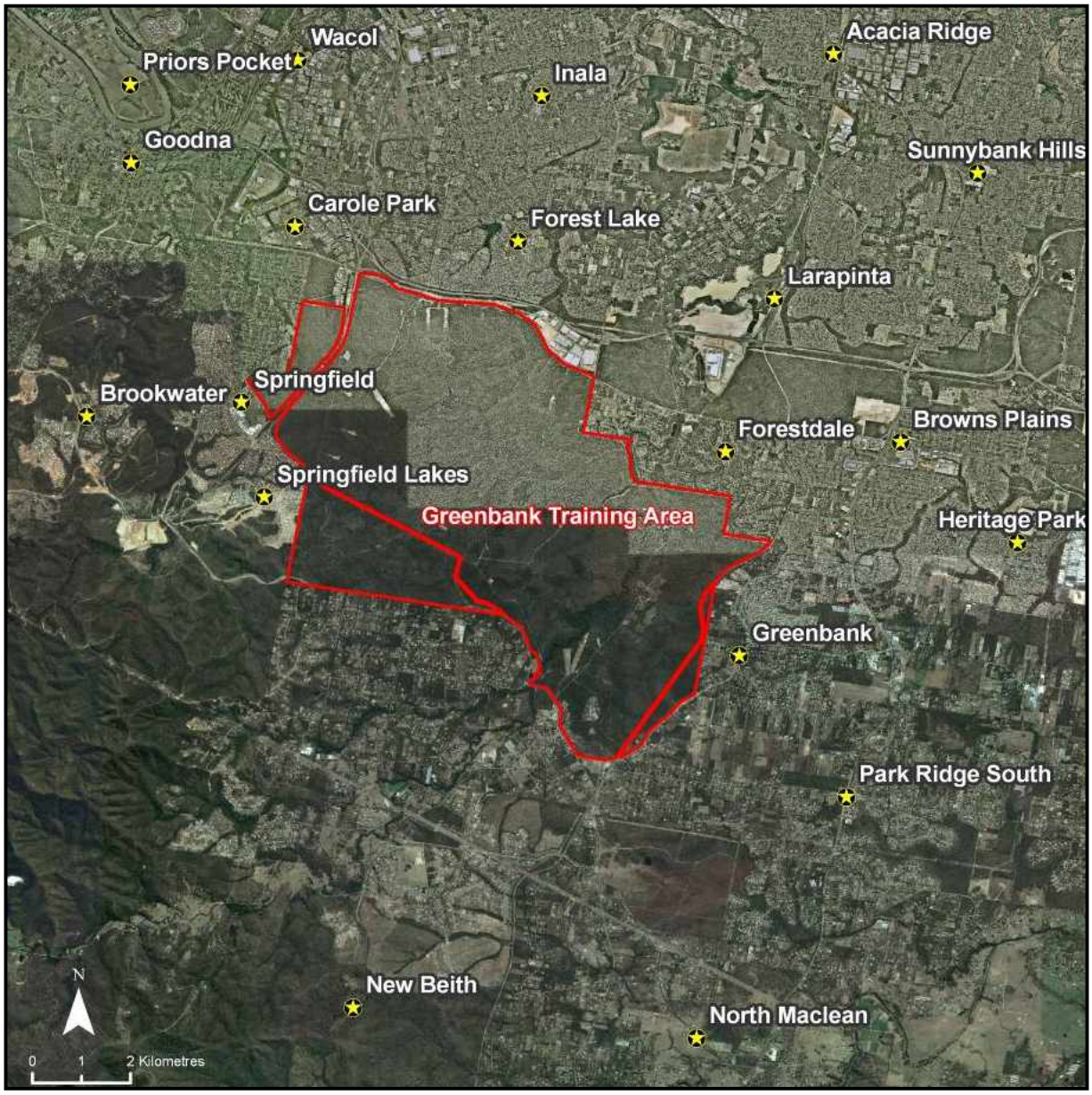


Figure 3 GBTA boundary and surrounding features



2.3 Timeframe

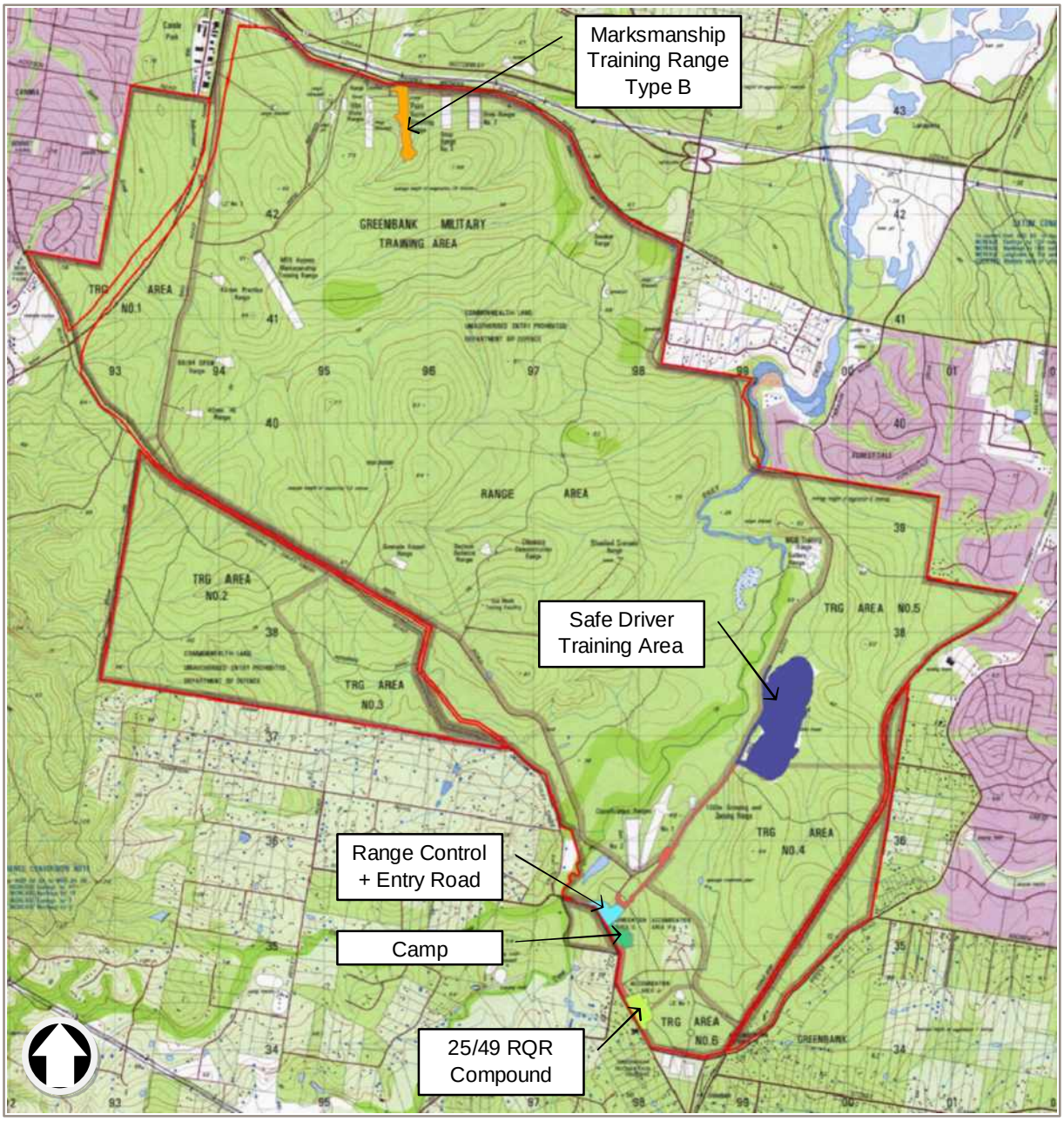
Construction of the proposed ELF 2C facilities is expected to occur over a 24–28 month period commencing in May 2011. It is envisaged that the construction will be sequenced to ensure that adequate existing facilities are available for training during construction; however, the details of this have not been established and will be subject to the procurement process adopted by Defence to engage construction contractors.

The commissioning, defects and liability, and handover period is typically 12 months, but it is anticipated this will be negotiated between Defence and the construction contractors. The facilities will be fully operational during the defects and liability period.

2.4 Detailed Description of the Proposal and Related Activities

Under ELF 2C it is proposed to upgrade the training and support capabilities of GBTA through the upgrade and development of new ranges, driver training, Range Control, working accommodation and camp accommodation. The locations of the proposed facilities are shown in Figure 4.

Figure 4 Proposed ELF 2C facilities



2.4.1 Marksmanship Training Range-Type B

It is proposed to develop the MTR-B on the existing BSR. It is intended for the MTR-B to have 10 lanes out to 600 m. The MTR-B will have a fixed target point, with soldiers shooting from 100 m intervals from the 600 m point. The MTR-B will be larger than the existing range, and subsequently requires the removal of 6.77 ha of existing vegetation. Supporting infrastructure includes waiting sheds, toilet block, store area, parking for 10 Protected Mobility Vehicles (PMV) and an access road to the target area.

Plate 1 and Plate 2 show the existing BSR and surrounding vegetation.

Plate 1 Existing Battle Shooting Range

Plate 2 Existing vegetation at the end of the BSR, which will be removed to accommodate the MTR-B

2.4.2 Safe Driver Training Area

The SDTA is used to train personnel to drive military vehicles in a safe environment; driving skills include defensive driving and off-road driving. The proposed location for the SDTA covers a previously cleared area and surrounding remnant vegetation. Parts of the previously cleared area have begun to revegetate naturally. The SDTA will require the removal of 23.35 ha of regrowth vegetation and 23.53 ha of remnant vegetation adjacent to the previously cleared areas. The Signals and Communications Buildings currently located at the site will also be removed.

The SDTA design vehicles will be PMV, Australian Light Armoured Vehicle (ASLAV) and the new B-Fleet vehicles, which include vehicles to the size of a semi-trailer.

Plate 3 shows the proposed SDTA location; Figure 5 shows the proposed site plan for the SDTA.

Plate 3 Landing Zone, within proposed SDTA footprint, showing regrowth vegetation

Figure 5 SDTA Precinct Site Plan (GHD, 2009)

1 Urban Training Area
2 Obstacle Course
3 Obstacle Course
4 Improvised Explosive Device Lane
5 Main Access, High Speed (Semi-Trailer Access)
6 General Training, Classrooms, Skid Pan, Recovery Area, Fault Finding
7 Off Road/Class 4

2.4.3 Range Control

A new southern entry point and Range Control facility will be developed off Goodna Road to provide safe all weather access. Range Control will include administration facilities, convoy and visitor parking, target compound, and maintenance area.

A new vehicle wash point will be developed so that units can remove weeds, seeds and mud from vehicles before departing the training area. Full vehicle cleaning is conducted at the unit's barracks.

The new wash point will consist of a concrete hardstand sized to accommodate up to six vehicles or Defence plant equipment to be washed down. It is anticipated the facility will use bore or recycled water, with dirty wash water draining into separator pits for minor treatment and recycling.

Figure 6 shows a site perspective of the proposed Range Control compound.

Figure 6 New Range Control facility site perspectives (GHD, 2009)

2.4.4 Camp

The Camp will be a rudimentary permanent set of facilities established for occupation by multiple users at differing times on training exercises. The Camp will be located in Accommodation Area L and will require the removal of existing structures and some mature trees and 1.68 ha of surrounding remnant vegetation and 1.32 ha of regrowth vegetation. The Camp at GBTA will include:

- Ten accommodation blocks
- Two Q-Store buildings
- One kitchen
- One dining area, and
- Ablutions blocks.

All facilities proposed for the Camp are expected to comply with the Defence Green Buildings requirements. The proposed camp will replace the existing Accommodation Area L.

It is also proposed to develop a new Sewage Treatment Plant (STP) to treat wastewater from the Camp, 25/49 RQR, Range Control and existing camps. Treated water from the STP will be recycled and used for toilet flushing, with the remainder to be used for irrigation at GBTA.

Figure 7 Camp perspective (GHD, 2009)

1 New Accommodation Blocks
2 New Amenities
3 New Kitchen/Mess
4 New Q Store

Plate 4 Proposed location of the Camp and 25/49 RQR: representative environment

Plate 5 Proposed location of the Camp and 25/49 RQR: representative environment

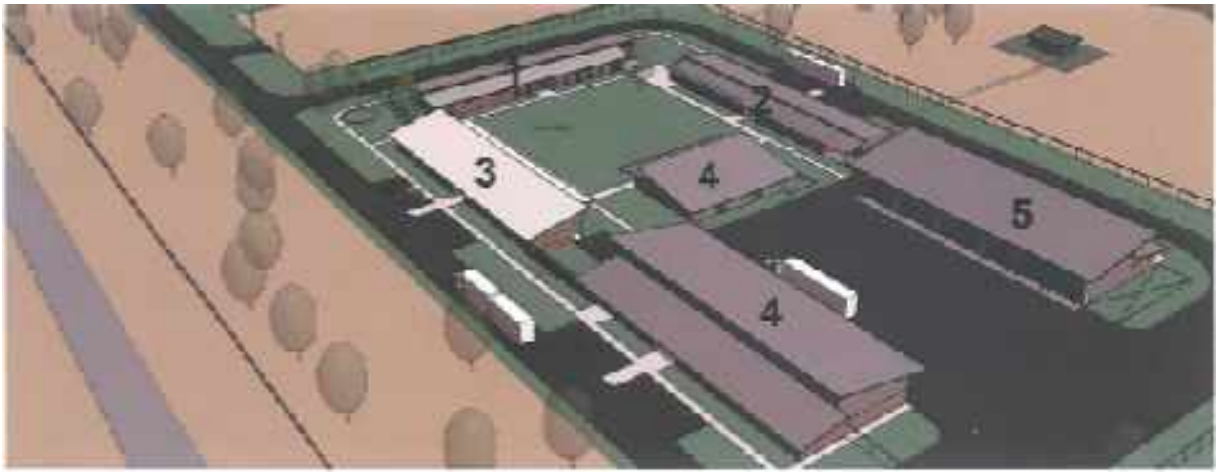
2.4.5 25/49 RQR

It is proposed to establish working accommodation for 25/49 RQR at GBTA. Proposed facilities for the unit include Headquarter buildings, Q-store, and a battalion workshop. It is understood that 25/49 RQR will conduct basic training, such as navigation exercises within Training Area 6 and use the other training facilities at GBTA.

Development of the proposed 25/49 RQR compound requires the removal of 2.7 ha of remnant and 2.45 ha of regrowth vegetation.

Plate 4 and Plate 5 show the representative environment of the proposed compound. Figure 8 shows a perspective view of the proposed compound.

Figure 8 25/49 RQR perspective (GHD, 2009)



1 New Battalion Headquarters
2 New Rifle Company Headquarters
3 New Administration Company Headquarters
4 New Q Store
5 New Battalion Workshop

2.4.6 Equipment

The weapons systems able to be used at GBTA are limited by the Range Area size and the proximity of residential areas that may be affected by noise. Small arms (up to 15 mm) will be used at the MTR-B.

The SDTA will be used to train drivers in PMV, ASLAV, and the new B-Fleet vehicles, which include vehicles to the size of a semi-trailer.

2.4.7 Planned Defence Activities

Training activities for 7 BDE generally occur on a sustained annual training rhythm for SQ training areas, as outlined in Figure 9. In addition to this, a three phase training intensity revolves around unit deployment. Preparedness training in the lead-up to deployment lasts for eight to twelve months; it involves an intense training period that requires many training and personnel resources. During operations (deployment), the unit is involved with intense activity and requires many resources; however, these are not located in SQ. On return from operations, the units undergo sustaining training, which includes individual, Tier 1, and Tier 2 training activities.

It is expected that this training regime, with peak intensity in autumn and spring and Cadet training in September, will continue with the establishment of the ELF 2C facilities.

Figure 9 Example annual training regime for 7 BDE

January–February	Individual training and integration period after the reduced activity period. Units and sub-units conduct mandatory training, individual readiness qualification and trade testing. This training is typically conducted in the ECTA using unit and area instructional facilities.
March–April	Basic and small team skills work-up training (Tier 1 and Tier 2) with mounted live fire at WBTA and dismounted live fire training at GBTA. Individual training serials are completed at Gallipoli Barracks using the ECTA unit and area instructional facilities. Training during this time may culminate with up to sub-unit combined arms, live fire, manoeuvre training.
May	In this time, training focuses on sub-unit and unit level assisted gunnery training, including working up to combined arms live fire at WBTA and SWBTA (Tier 2).
June–July	The mid year period sees a focus on combined arms unit level manoeuvre and live fire training, including unit collective training competitions at either WBTA or SWBTA (Tier
August–October	7 BDE and higher level directed activity.
October–December	The fourth quarter of the year is a courses period and preparation for reduced activity. The main effort is enabling courses to provide maximum qualified personnel for the commencement of training the following year.

Potentially, the introduction of the SDTA could have a considerable effect on the level of use of GBTA. This facility will be unique in SQ, and subsequently will attract many Defence units, including 7 BDE, the Reserve brigades, and Airfield Defence Wing. The SDTA will be heavily used by units undergoing conversion training to the new B-Fleet vehicles being introduced under Land 121.

2.5 Proposal Context

2.5.1 Defence Planning Context

The Defence White Paper is a strategic planning tool developed by the Commonwealth Government for long-term planning of Australia's military. The current White Paper 2009 sets the strategic policy for Australia's Defence Force until 2030. The previous White Paper set policy from 2000 to 2010.

Under the 2000 White Paper, the Government planned to structure the Army to ensure that Defence is able to sustain a brigade deployed on operations for extended periods, and at the same time maintain at least a battalion group available for deployment elsewhere. To achieve this, the Government planned to expand the number of infantry battalions at high readiness from four to six. Under this plan, six battalion groups, each of around 1,000 personnel, would be held at no more than 90 days notice to move, and most at 30 days or less.

These forces are organised into three brigades (1st, 3rd, and 7th) and the Special Operations Group. The brigades, each of around 3,000 personnel, include, in addition to the infantry battalions, a range of specialised combat units such as armour, artillery, aviation, combat engineers, logistics, and support units.

7 BDE provides a motorised formation comprised of both full-time and Reserve units. It provides depth to the other two brigades by providing a range of highly mobile forces. Task forces for particular contingencies would be assembled from these ready forces to meet the specific needs of each operation.

In December 2005, the Commonwealth Government endorsed the HNA initiative as part of the launch of the Strategic Update 2005. The ELF initiative was announced in August 2006 and expands the capacity of the ADF, and the Army in particular, to support regional stabilisation operations as well as Australia's other interests. ELF raises two additional infantry battalions with their essential battle group and joint and Defence enabling capabilities. The HNA and ELF initiatives provide increased combat weight through a redistribution of combat vehicles, greater organisational depth, and a greater focus on combined arms battle groups. The 2009 White Paper provides for the growth of the two battalions established under ELF (7 RAR and 8/9 RAR).

ELF 2 includes the development of facilities to support re-raising 8/9 RAR. It includes permanent working accommodation at Gallipoli Barracks, Enoggera (ELF 2B), and training facilities in SQ and other areas (ELF 2C). The facilities proposed under ELF 2C are required as a direct consequence of re-raising 8/9 RAR and will support the battalion and its supporting elements to fulfil their operational roles.

Defence is undergoing a review and development of Zone Plans for Bases and Training Areas in Australia, which further facilitates future capability planning at a property scale. Currently, there is no Zone Plan for GBTA.

2.5.2 Internal Zoning (Sectors)

The introduction of the SDTA is likely to have a measurable effect on the level of use of GBTA.

With the introduction of new B Fleet vehicles under Land 121, it is understood that driver training will be conducted on an ongoing basis throughout the year, particularly during the conversion-training phase.

SQ units, not associated with Land 121, may take advantage of the collocation of the SDTA with other training facilities to conduct multiple training activities when they visit GBTA. Based on the current usage rates, the Classification Ranges and Marksmanship Training Ranges are likely to be most popular.

Overnight visits may increase with improved accommodation facilities. The new accommodation facilities may also reduce the frequency of use of the existing Accommodation Area H facilities.

Range booking information indicates that Training Areas (TA) TA2, TA3, TA4, and TA5 are regularly used for field training activities. The development of the SDTA could reduce the field training capability of TA4 and TA5; however, this is expected to be to a small impact, given the large unaffected area.

The new Range Control and entry point on Goodna Road will cause a marked increase in activity in that area, which is related to:

- Relocating the Range Control office
- Likely increased Defence activity with the introduction of the SDTA
- Relocation of 25/49 RQR, and
- Improved support facilities such as the vehicle wash point.

2.5.3 Local Planning Context

The majority of GBTA is within Logan City Council (LCC), except for part of TA1 west of the Centenary Highway, which is in Ipswich City Council (ICC). In March 2008, the Queensland Government undertook a Local Government Reform, which altered the Local Government Area boundaries. Before March 2008, GBTA was within LCC, except for TA2 and TA3, which were in Beaudesert Shire Council (BSC). The Planning Schemes for the former Local Government Areas apply until LCC and ICC develop updated plans for the new shire boundaries.

Under the former LCC Logan Planning Scheme, GBTA is zoned "Conservation" sub area "CZ13". TA2 and TA3, within the former BSC area, are zoned "Mt Lindesay Corridor Community Facilities: Defence". Specific Outcomes for these zones are described in Appendix B. The Broad Zone Map for the area is shown in Map 2, Appendix A. While Defence is not bound by these Outcomes, it is important to understand the broader community's expectations of activities that will be undertaken within the Defence estate to inform consultation with stakeholders, including Local Governments.

2.5.4 Surrounding Land Zoning and Activities

GBTA is within LCC and ICC. It is bounded to the north by Brisbane City Council (BCC). Surrounding land zones are predominantly Residential. However, there are some areas of Public Open Space associated with Oxley Creek, and an Investigation Area east of Middle Road and south of Andrew Road. GBTA is surrounded by established growing residential communities, including Springfield Lakes, Springfield, Springfield Central, and Camira.

As previously mentioned, before the Local Government Reform in March 2008, the Local Government boundaries were different. However, those former planning schemes apply until new planning schemes are developed for the new Local Government Area boundaries.

To the east, GBTA is bounded by the former LCC.

To the south and southwest, GBTA is bounded by the former BSC. Surrounding land zones are predominantly Residential. However, the GBSS is zoned Community Facility, and there are two Recreation zones nearby: north of Ison Road and east of Bombala Road; and the sports fields south of Middle Road.

To the west, GBTA is bounded by ICC. Surrounding land zones include Residential, Recreation, and Local Business and Industry. Map 2, Appendix A, shows the broad zoning under the Planning Schemes. Note that for the purposes of mapping, zones with different names but similar planning intent were grouped together (e.g. “Housing” was mapped as “Residential”).

3.0 Description of the Study Area

3.1 Methodology

The existing environment was described predominantly from a review of existing references, with some field investigations to support the desktop review. References included reports held by Defence, government databases, and information from reliable sources in the public domain.

Specific information on the methodology adopted to describe the current conditions of environmental aspects is detailed below.

3.1.1 Climate

A desktop review of Bureau of Meteorology information was undertaken to describe the existing climate.

3.1.2 Surface Water and Hydrology

Existing surface water conditions were described based on existing information, including existing water quality monitoring undertaken by Defence and the Queensland government. In addition, the environmental values of waterways at GBTA were described from the legislated Environmental Values and Water Quality Objectives.

The existing site hydrology was assessed based on existing topographical information.

3.1.3 Soils and Geology

A desktop review and field survey of sites proposed to be cleared was undertaken to identify the existing characteristics of the geology and soils potentially affected by the proposal.

A field survey was conducted for the proposed SDTA to gain a greater understanding of soil properties at the site.

A preliminary geomorphic assessment was conducted to determine the major landforms present. Soil transects were then traversed across the site to best capture soil-landform relationships. Observations were conducted approximately every 50 m within the project footprint.

Soil Characterisation

At the SDTA, two soil pits were excavated to investigate A horizon and upper B horizon morphology. At other observation points, these profiles and all other soils were characterised by auger observations to 1 m depth or upon contact with an impermeable layer, whichever was first. For each soil horizon, the following were described:

- Thickness
- Texture, indicating relative contribution of sand, silt and clay, based on visual observation and the behaviour of the moist bolus (Hopkins, Isbell, McDonald, Speight, & Walker, 1990)
- Structure, indicating degree of pedological organisation (this reflects organic matter and clay content, contribution of carbonates, and degree of weathering)
- Munsell colour (which provides an indication of organic matter content, degree of weathering and drainage conditions (Munsell, 2000))
- Inclusions (e.g. gravels).

The morphology of surveyed soils was compared to the mapped Australian Soil Classification Order (Isbell, 2002).

Water Erosion Risk

Water erosion risk, adapted from a land capability assessment (Wells, 2001), was assessed to determine the potential for water erosion at the SDTA. The assessment addresses soil properties alone, and therefore provides a measure of soil erosion risk after assumed vegetation clearance. For the water erosion risk assessment, the following properties were characterised:

- Slope class: Steeper slopes are in general more susceptible to erosion
- Soil erodibility, which is consists of two factors
    - Soil resistance to detachment: Soils with weakly developed structure and/or dispersive clays are in general more susceptible to erosion and
    - Rainfall acceptance: Soils with near-surface impermeable layers are in general more susceptible to erosion.

Each property was assigned a score, which was then used to provide an overall measure of soil water erosion risk. The higher the score, the higher is the risk. The detailed assessment methodology is presented in Appendix C.

The occurrence of erosion features such as gullying, tunnelling, rilling or sheet erosion near survey sites was also noted.

3.1.4 Groundwater

A description of the existing groundwater conditions was derived from a desktop review of existing groundwater information available in contaminated land reports and the Australian Natural Resources Atlas (NLWRA, 2000).

3.1.5 Flora and Fauna

The study comprised a desktop assessment supplemented with a 3 day site inspection of the flora and fauna potentially affected by the proposal. The study was conducted to:

- Assess the ecological condition of terrestrial and aquatic habitats within GBTA
- Assess the potential impacts to terrestrial and aquatic flora and fauna
- Develop mitigation measures.

The desktop review included searches and reviews for relevant information from the following databases and sources:

- *EPBC Act Protected Matters Database* (DEWHA, 2009) using the coordinates of the GBTA boundary
- *Wildlife Online Database* (DERM, 2009) within a 10 km radius from the central coordinate -27.6640 S, 152.9692 E
- *Biodiversity Planning Assessment and Mapping (BAMM) Assessment* (EPA, 2002)
- *Regional Ecosystem (RE) Map (Version 6)* (DERM, 2009) and *Regional Ecosystem Description Database (REDD Version 6)* (Queensland Herbarium, 2009)
- *Regrowth Vegetation Map (Version 2.0)* (DERM, 2009)
- *Essential Habitat Mapping* (DERM, 2009)
- *HERBRECS Database* (Queensland Herbarium, 2009) for the coordinates -27.6227 to -27.7202 S and 152.9177 to 153.0183 E
- *Defence Threatened Species Database* (ENSR, 2008)
- *Threatened Flora Species and Vegetation Communities Survey Report: Greenbank Training Area* (HLA, 2007)

- *The Terrestrial Vertebrate Fauna of the Greenbank Training Area* (Driscoll, 1992)
- *The status and conservation of the Spotted-tailed Quoll (Dasyurus maculatus) in the Flinders Peak to Greenbank/Karawatha Corridor* (Lloyd & Robbins, 2009)
- *Enhanced Land Force Stage 2C Initial Environmental and Operational Review Volume 2.4: ELF 2C-1 Greenbank Training Area* (AECOM, 2009)
- *Field Guide to the Freshwater Fishes of Australia* (Allen, Allen, & Midgley, 2002)
- *Freshwater Fishes of North-Eastern Australia* (Arthington, Kennard, & Pusey, 2004).

A site inspection was conducted by two ecologists over 3 days from 14 to 16 October 2009. The purpose of the site inspection was to verify the information obtained from desktop analyses, focussing specifically on the areas where works were nominated to occur.

The field surveys were undertaken in two areas where works were proposed:

- Camp and 25/49 RQR
- SDTA.

To develop the MTR-B, it is proposed to extend the BSR into the Range Area. At the time of inspections, access was not permitted beyond the established BSR infrastructure.

Flora Assessment

Seven survey points were established, at which the following information was collected:

- Slope, aspect, topography
- Soil
- Disturbance
- Vegetation structure
- Dominant canopy species
- Weed cover
- Vegetation condition, and
- Regional Ecosystem.

Fauna Assessment

An assessment of the value of the habitat for native fauna was based on the habitat requirements for threatened fauna species previously recorded in the region. The assessment was conducted using a standardised habitat data sheet, which includes habitat factors for the species such as structural and floristic characteristics and the presence or likely presence of hollows, water bodies, rocky outcrops, litter, and fallen debris. Site disturbance history information, such as the presence of weeds and past fire events, was also noted. These factors were then used to comment on the overall condition of the site.

A targeted search was conducted for the presence of *Dasyurus maculatus maculatus* (Spotted-tailed Quoll (southern subspecies)) as it was understood there was particular concern about the possible presence of this species within the property boundary. Twenty quoll-size traps (265 mm wide x 325 mm high x 805 mm long) were laid perpendicular to the ring road in two areas on the western side of GBTA. These areas were considered to provide the best available habitat for the species. The traps were set in a grid configuration over a period of 2 nights baited with fresh chicken cut into strips. While the Queensland Department of Environment and Resource Management (DERM) recommends a minimum of 20 traps per night over four successive nights (EPA, 1999), given the time constraints, only two nights' trapping was completed.

Considering the likely low density of the animals if the Spotted-tailed Quoll is present within the study area, the large home range sizes of individuals (Claridge, et al., 2005) and the short survey period, the absence of the species cannot be confirmed.

Aquatic Ecology

In accordance with AUSRivas protocols for Queensland streams, the fishes and aquatic macroinvertebrate communities were surveyed and the condition of aquatic habitats was assessed to provide an indication of the status of the waterways (AECOM, 2009).

To address variations in habitat preferences for aquatic organisms and to obtain an accurate assessment through the whole water column at each site, samples were taken from two distinct aquatic habitats – the benthos (bed) and the littoral fringe (edge).

Sampling was undertaken during spring 2009 at GBTA on 15 to16 October by AUSRivas-certified ecologists (AECOM, 2009). Macroinvertebrate sampling was undertaken in both bed and edge habitats at four sites (Map 3, Appendix A) as follows:

- GB1: Oxley Creek where it leaves the ring road (-27.6689, 152.9905).
- GB2: Oxley Creek where it enters the ring road (-27.7005, 152.9749).
- GB3: Blunder Creek where it leaves the ring road (-27.6368, 152.9689).
- GB4: Blunder Creek where it enters the ring road (-27.6688, 152.9357).

For each sampling site, the following was undertaken:

- AUSRIVAS aquatic habitat assessment
- Macroinvertebrate sampling, identification and analysis
- *Ephemeroptera*, *Plecoptera* and *Trichoptera* (EPT) richness, which is a measure of taxa richness based on the taxonomic orders *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies) and *Trichoptera* (caddis flies), and
- Fish survey using electrofishing and seine netting.

Limitations

Fieldwork was scaled to provide adequate information to achieve the required assessments in the required timeframe. It should be noted that within these limitations it is necessary to draw upon past field assessments and reports as part of this process, and therefore assessments of significance are based on the accumulation of that information.

Field work was restricted to characterisation and assessment of the vegetation communities potentially affected by the proposed works. Targeted searches for all threatened flora species potentially occurring in the area were not feasible within the available time.

The presence or otherwise of a particular flora or fauna species within the study area can only be confirmed by detailed targeted field surveys. Given the time constraints, no active trapping of fauna species was conducted, except for that carried out for the Spotted-tailed Quoll (*Dasyurus maculatus maculatus*). Targeted field surveys were conducted for fish species; however, this was limited to only four sites within GBTA.

To meet the requirements of the project within the required timeframe, habitat assessments were undertaken within the development footprints. Habitat suitable for threatened species previously recorded in the region was targeted and incidental observations of native and introduced fauna species were recorded. Where field sampling effort was not adequate to detect a particular threatened flora or fauna species, it was assumed that the presence of suitable habitat indicates the potential presence of the species (AECOM, 2009).

3.1.6 Invasive Species

The potential for invasive species to occur at GBTA was determined from a combination of desktop review and observations during site inspections.

3.1.7 Natural Heritage

GBTA is Commonwealth Heritage Listed for natural heritage values. These values were identified from the Australian Heritage Database entry for the site. Site visits to confirm natural heritage values at GBTA were carried out on 14 and 15 October 2010.

3.1.8 Aboriginal Heritage

An Aboriginal impact assessment was undertaken in accordance with the requirements of the EPBC Act and the Queensland *Aboriginal Cultural Heritage Act 2003* and its associated *Duty of Care Guidelines*.

Searches of the *Aboriginal and Torres Strait Islander Register and Database* (DERM, 2009a) were undertaken on 9 October 2009 to identify any previously recorded places of Aboriginal heritage at each site, and to identify Aboriginal parties for the area.

A process of landscape characterisation and assessment of site distribution was used to infer locations most frequently visited. Predictive modelling was undertaken to determine zones with archaeological potential associated with the proposed development sites.

A field inspection was undertaken at GBTA on 14 and 15 October 2009 to identify Aboriginal sites and confirm the level of archaeological potential across the study area. During site inspections, the sites were inspected for surface artefacts and environmental features that might attract pre-European Aboriginals to the area. Features of note include water, flora and fauna resources, and suitable raw materials for the manufacture of stone tools and other items.

3.1.9 Historic Heritage

The historic heritage impact assessments were undertaken in accordance with the requirements of the EPBC Act, and have been guided by the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter, which provides guidance for the management and conservation of places of cultural significance in Australia.

A desktop review of the historical background of GBTA and the development of the subject site was initially undertaken. State and National Heritage Registers were reviewed to determine any listings for the site's historic heritage values.

A field inspection was undertaken at GBTA on 14 and 15 October 2009, during which built infrastructure was inspected to determine its residual historic values.

3.1.10 Social and Economic Environment

The assessment of the socio-economic conditions in the area surrounding GBTA involved:

- Collection and review of socio-economic data predominantly sourced from the Australian Bureau of Statistics (ABS) to define the existing socio-economic environment
- Identification of social infrastructure and other social characteristics of the Study area
- Review of relevant planning instruments to identify existing and future land uses surrounding GBTA; such planning instruments include the Logan, Beaudesert, Ipswich and Brisbane Planning Schemes
- Identification and analysis of potential positive and adverse impacts associated with construction and operation of the proposed ELF 2C works on the socio-economic environment, and
- Identification of potential strategies that may enhance the positive impacts and mitigate any adverse impacts.

3.2 Existing Development and Training Activities

3.2.1 Facilities and Features

Existing facilities at GBTA are shown in Figure 10. Fifteen permanent ranges have been established at GBTA, including:

- Classification Range Number One
- Classification Range Number Two
- Open Range No 1
- Open Range No 2
- Open Range No 3
- Marksmanship Training Range (MTR)
- Section Defence Range
- Standard Grenade Range
- Assault Grenade Range
- Direct Fire Support Weapon Range (DFSW)
- Individual Sneaker Range
- Battle Shooting Range and Field Miniature Range
- Gallery Range
- Claymore Range, and
- Gas Mask Testing Facility.

GBTA is divided into seven internal Training Areas, which are used to manage training bookings and activities. A description of each training area and their associated facilities and activities is provided in Table 1.

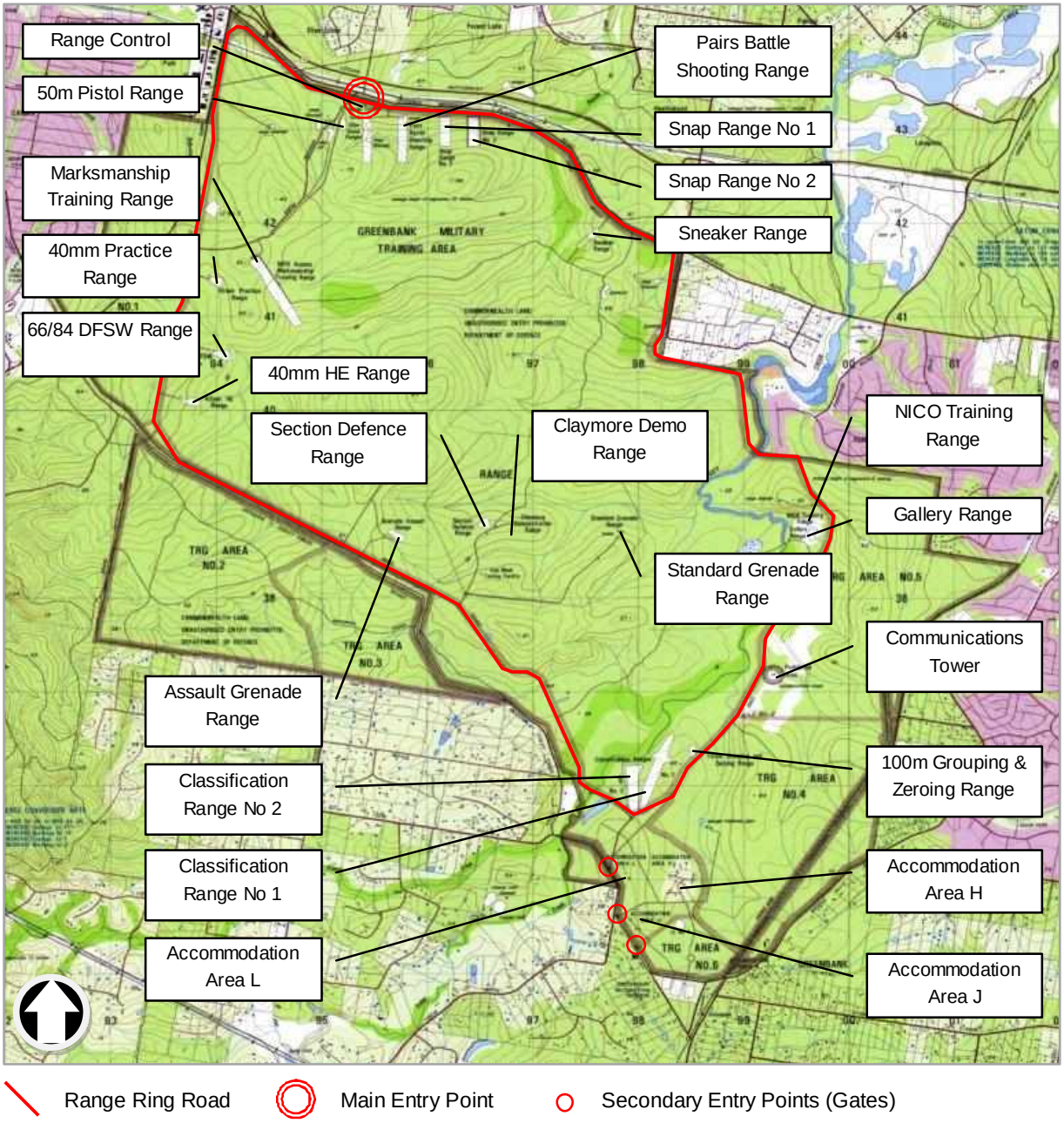
Table 1 GBTA internal Training Areas, Accommodation Areas and Range Area

Training Area	Features	Facilities/ Activities
TA1	TA1 is located on the northwest portion of GBTA and is split by the Centenary Highway and the internal ring road section leading to Range Control. TA1 is 1 km wide and 3.4 km long.	- No established infrastructure
TA2	TA2 is located on the southwest portion of GBTA and is bordered by the Goodna/Oxley Creek Road to the north and a track to the east, which separates this TA from TA3. TA2 is 2 km wide by 2 km long.	- Unsealed tracks - Infantry Minor Tactics (IMT) related activities
TA3	TA3 is located on the southwest portion of GBTA and is bordered by the Goodna/Oxley Creek Road to the north and a track to the west, which separates this TA from TA2. TA3 is 1.2 km wide by 1.2 km long.	- Unsealed tracks - Infantry Minor Tactics (IMT) related activities
TA4	TA4 is located on the southern portion of GBTA and is bordered by Greenbank Road to the south and Moody Road to the east. The Sydney to Brisbane Railway passes through the southeast corner of this TA. TA4 is 1.7 km wide by 2.3 km long. Located within TA4 is the STP.	- STP - Unsealed tracks

Training Area	Features	Facilities/ Activities
TA5	TA5 is located on the eastern portion of GBTA and is bordered by Moody Road to the east and the suburb of Forestdale to the north. The Sydney to Brisbane Railway passes through the southeast corner of this TA. This TA is 1.4 km wide by 2.3 km long. Located within TA5 is a disused Signals Station. The Aviation Safety Authority has a communications building within the compound and is out of bounds to all personnel. Also located within TA5 are three cleared areas of approx 300 m by 500 m in size, which are being allowed to revegetate naturally. A circular area 100 m in diameter will remain cleared for the use as a helipad.	- Signals Station - Unsealed tracks
TA6	TA6 is located with the accommodation area situated in the southern portion of the range. This TA is unsuitable for any form of tactical patrolling or field craft; however, it is suitable for vehicle deployments in dry weather, open area patrolling or for tents as part of additional accommodation.	- Unsealed tracks
TA7	TA7 is located on the eastern side of the Sydney to Brisbane railway line. This TA is unsuitable for any form of tactical patrolling or field craft.	- No established infrastructure
Accommodation Area	The accommodation area is divided into three smaller accommodation areas. Accommodation available varies in the facilities provided and the size of unit that can be accommodated in the applicable area. The accommodation areas include: - Accommodation Area H is the largest accommodation area within GBTA able to accommodate more than 600 personnel. This area is divided into six sections, which can be booked individually or as a whole to suit large groups. The facilities at Area H include 16 buildings, 30 concrete tent slabs, showers and latrines blocks (SAL blocks), 13 wet weather shelters, servicing ramp, fenced compound, and kitchen facility. - Accommodation Area J, which is the smallest of the accommodation areas and is capable of supporting 100 personnel. This area consists of three wooden buildings and a SAL block. - Accommodation Area L, which is capable of supporting 100 personnel. This area includes three SAL blocks, a basic kitchen and nine wooden buildings, two of which can be used as a Q Stores.	- Accommodation
Range Area	The Range Area is generally the area within the Ring Road and provides the administrative boundary for Range Danger Areas. All of the established ranges are within the Range Area. Nevertheless, minimal disturbance has occurred to the environment across most of the Range Area, as can be seen in Figure 10.	- All ranges - Live firing - Blunder and Oxley Creeks flow through the Range Area

The Ring Road provides access to each of the training, range and accommodation areas. The main entry to GBTA is from Goodna-Browns Plains Road, with secondary access points on Goodna Road and Old Greenbank Road.

Figure 10 Existing infrastructure



3.2.2 Usage Rates

As identified in Section 1.1.2, GBTA is used for Tier 1 and Tier 2 training activities only.

Usage rates for GBTA vary considerably throughout the year. This relates to group size and duration of training visits. In 2008, peak usage occurred in September when 1,500–2,000 Army cadets stayed at GBTA for 8–10 days: this is a significant peak compared with the remainder of the year. Generally, cadet training occurs at a similar time each year to coincide with school holidays. Nevertheless, the majority of training is by small groups (less than 50 people) for a short duration (1 day).

Defence range booking information indicates that the MTR, which is used by a variety of units, is the most heavily used range.

The primary user of GBTA is 7 BDE, based at Gallipoli Barracks, and this expected to continue with the development of the proposed ELF 2C training facilities.

3.2.3 Equipment

The weapons systems able to be used at GBTA are limited by the Range Area size and the proximity of residential areas that may be affected by noise. Typically, training is restricted to small arms and hand grenades (on the grenade ranges). An overview of these weapons systems and the ranges they are used on is provided in Table 2.

Table 2 Weapons used by 7 BDE

Weapon System	Ammunition Types	Facility
Small Arms	- Up to 15 mm	- Classification Ranges - Open Ranges - MTR - Section Defence Range - Sneaker Range - Battle Shooting Range - Field Miniature Range - Gallery Range
F1 Fragmentation Hand Grenade	- HE grenade	- Standard Grenade Range - Assault Grenade Range
M18A1 Claymore Antipersonnel Mine	- C4 plastic explosive	- Claymore Range

3.2.4 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on the existing training regime include:

- Increased training tempo at GBTA, and
- Increase value of GBTA for Defence training owing to the introduction of the SDTA, a new training capability for GBTA.

3.3 Regional Context

GBTA is located in the SEQ bioregion within the Oxley Creek catchment, which forms part of the Brisbane River and Moreton Bay catchment.

SEQ has undergone rapid expansion in recent years with the population increasing from 2.5 million in 2001 to a forecast 4.5 million in 2030. This rapid population growth is associated with extensive residential development in the Brisbane, Ipswich and Logan local government areas. It has affected housing affordability, and there is increased pressure to develop greenfield land in urban areas of SEQ (DIP, —).

SEQ's population growth and related development are increasing the pressure on the natural environment (DIP, 2009). Continued clearing and fragmentation of natural areas and further degradation of natural environmental processes will adversely affect the region's environment (DIP, 2009). The SEQ Regional Plan (SEQRP) recognises that protection and management of the natural environment is fundamental to achieving a sustainable future for the region (DIP, 2009). Consequently, there is and will continue to be an increased significance of areas with high ecological value, such as GBTA.

3.3.1 Areas with Significant Biodiversity Values

The Queensland Government has developed policies to protect and enhance areas with significant biodiversity values and overall biodiversity values of the region to support regional sustainability (DIP, 2009). Areas with significant biodiversity values include areas of ecological significance and areas identified in local government planning schemes or master plans (DIP, 2009). GBTA is recognised as an area of high ecological value in the SEQRP, and within the Logan Planning Scheme as a Conservation Zone.

3.3.2 Biodiversity Networks and Corridors

A viable network of connecting corridors will be required to enable flora and fauna to disperse and adapt to changing conditions over time (DIP, 2009). The SEQRP promotes the protection of biodiversity networks and corridors at regional and local scales. Biodiversity networks include:

- Existing areas of significant biodiversity values
- Existing biodiversity corridors e.g. waterway corridors and biodiversity corridors including mosaic, contiguous or stepping stone corridors, and
- Future biodiversity corridors and habitat areas e.g. areas currently developed or cleared that can be rehabilitated to restore connectivity.

GBTA is an area of significant biodiversity values and forms part of the regionally significant Flinders Peak to Greenbank/Karawatha fauna corridor (refer Section 3.10.1).

3.3.3 Natural Resource Management

The *South East Queensland Natural Resource Management Plan 2009–2031* (SEQ NRMP) is a non-statutory plan that establishes a framework for regional natural resource management to achieve a range of targets, including improved biodiversity outcomes (DERM, 2009). The SEQ NRMP includes targets to:

- Maintain or increase the area and extent of regional vegetation cover, habitat for priority species and wetlands
- Ensure no net fragmentation of large tracts of vegetation over 5,000 ha
- Protect vulnerable RE, and
- Ensure no decline in the conservation status of native species.

A number of objectives for Nature Conservation have been developed in the SEQ NRMP:

- **Remnant and woody vegetation:** By 2031, the 2001 extent of regional vegetation cover, including both remnant vegetation (35 %) and additional non-remnant woody vegetation (22 %) will be maintained or increased.
- **Vegetation fragmentation and connectivity:** By 2031, there will be no net fragmentation of larger tracts (greater than 5,000ha), and 20 % of priority smaller tracts (less than 5,000ha) will be better connected than the 2003 baseline.
- **Wetlands:** By 2031, the 2008 extent and condition of SEQ wetlands will be maintained or increased.
- **Vulnerable ecosystems:** By 2031, at least 4 % of the original pre-clearing extents of vulnerable RE will be represented in protective measures.
- **Native species:** In 2031, the 2008 conservation status of native species will be maintained or improved.
- **Habitat for priority species:** By 2031, the 2001 extent and condition of habitat for priority taxa will be maintained or increased.

GBTA provides habitat for a significant area of native vegetation in the region, including threatened RE (refer Section 3.9.1); it is likely that it would be classified as a “priority smaller tract” under the SEQ NRMP. Essential Habitat for two threatened species is mapped as occurring within GBTA (refer Section 3.9.1). GBTA is also a nationally important wetland (refer Section 3.9.1). Consequently, the targets and objectives described in the SEQ NRMP are relevant to GBTA.

3.3.4 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on the regional values include:

- Reduced regional values (biodiversity, wildlife corridor and natural resource) from the removal of remnant and regrowth vegetation.

3.4 Climate

Greenbank is in a temperate region with warm summers and mild winters. In the summer, the average daily minimum and maximum temperatures are 19.5°C and 29.8°C respectively, with a record low of 11.2 and a record high of 43.3°C (BOM, 2009). In the winter, the average daily minimum and maximum temperatures are 8.6°C and 18.5°C respectively, with a record low of -2.5°C and a record high of 19.5°C. Climate averages are shown in Figure 11.

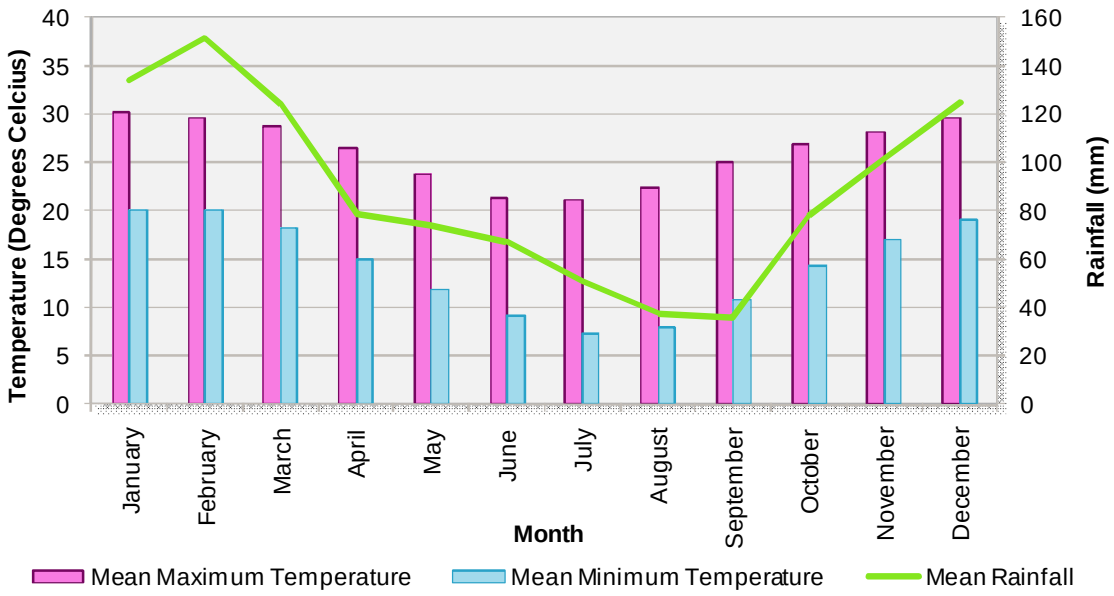
Precipitation is generally heavier in summer than winter. Highest rainfall historically falls in February with records of dry months typically occurring in July. Average annual rainfall is 1,057 mm, with a large amount of that falling between November and March.

Wind speed records for Archerfield airport show that morning wind speeds are typically lower than afternoon wind speeds. Wind speeds show some variation throughout the year, with spring wind speeds being up to 5 km/h greater than winter winds.

Monthly wind roses for Archerfield airport indicate the following:

- In summer, south-easterly winds are dominant in the morning, with north easterly winds dominant in the afternoon.
- In autumn, south-westerly winds are dominant in the morning, with some south easterlies in the afternoon.
- In winter, south-westerly winds are dominant in the morning, with west south-west winds dominant in the afternoon.
- In spring, south-easterly winds are dominant in the morning, with afternoon north-easterlies commonly greater than 20 km/h.

Figure 11 Average climate



3.4.1 Potential Impacts

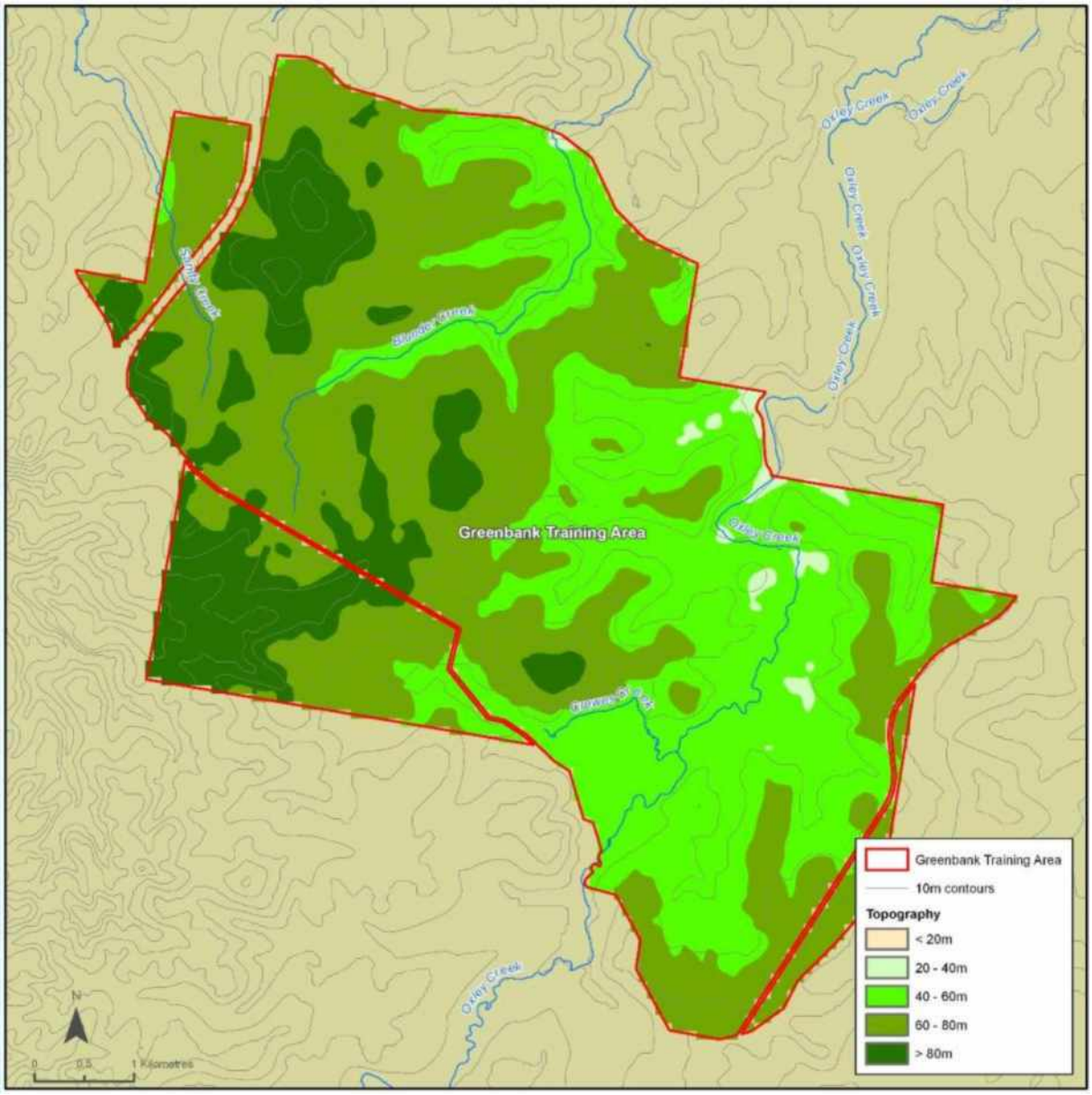
The proposed ELF 2C works are unlikely to have an impact on the local climate.

3.5 Land Forms and Relief

The northwest and eastern parts of the area consist of rolling to hilly terrain with gentle to moderate slopes. The remainder of the area is comprised of low hilly terrain on basalt and sedimentary rock. Based on a 25 m-resolution Digital Elevation Model of the area, elevation ranges from 35 m to 106 m above sea level, with a total relief of 71 m. Slopes range from 0° to 6°. Nearly the entire area (99.2 %) is comprised of slopes <5°, with the remainder (0.8 %) being 5–10°.

The topography and elevation of GBTA is shown in Figure 12.

Figure 12 Topography and elevation of GBTA



3.5.1 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on the regional values include:

- Localised changes to land form associated with earthworks to create level platforms for the development of infrastructure.

3.6 Surface Water and Hydrology

Oxley and Blunder Creeks flow through GBTA, as shown in Map 3, Appendix A. The headwaters of Blunder Creek are within GBTA, and it flows into Oxley Creek approximately 8.5 km downstream of the training area. Oxley Creek flows 70 km from near Flinders Peak, southwest of Brisbane, to join the Brisbane River at Tennyson. Sand dredging downstream of GBTA has influenced the hydrologic regime within GBTA (SKM, 1999).

Oxley Creek's water quality has been adversely affected by land use in the catchment, including industrial and residential development and effluent from sewage treatment plants (OCCA, 1999). Upstream of GBTA, water quality in Oxley Creek would predominantly be affected by residential land use. The Oxley Creek Catchment Management Plan (OCCA, 1999) documents the responsibilities of relevant parties in achieving the agreed environmental values for Oxley Creek.

Water quality in Oxley Creek is monitored as part of the Queensland Ecosystem Health Monitoring Program. The nearest monitoring location to GBTA is downstream near Johnson's Road (OXL-0005). In 2009, the freshwater areas of Oxley Creek received an 'F' rating, which means that most key ecosystem processes are not functional and most critical habitats are severely degraded (SEQ Healthy Waterways Partnership, 2009). Poor stream condition, high turbidity, and high nutrient concentrations contributed to the poor rating (SEQ Healthy Waterways Partnership, 2009). Nevertheless, water quality at OXL-0005 received relatively good scores for physical and chemical parameters (>0.8 out of 1) and nutrient cycling (1 out of 1); however, low scores were reported for aquatic macro-invertebrates (0.45–0.75) and fish (0.4–0.65) (SEQ Healthy Waterways Partnership, 2009).

An annual water quality monitoring program has been established for GBTA by Defence. There are fourteen surface water monitoring sites, as shown in Map 3, Appendix A. The sampling locations are described in Table 3.

Water quality results are compared with the Australia and New Zealand Guidelines for Fresh and Marine Water Quality 95 % Protection Levels for the appropriate ecosystem type, as shown in Table 5.

Table 3 Surface water monitoring locations at GBTA

Site ID	Location
SW1	SW1 is on a tributary of Bullockhead Creek catchment. It is adjacent to a high use road corridor.
SW2	SW2 is on Sandy Creek. It is downstream of the Centenary Highway and areas of TA1.
SW3	SW3 is on a tributary of Oxley Creek. It is located downstream of urban areas, TA2 and TA3. It is upstream of the Range Area.
SW4	SW4 is on Oxley Creek. It is located downstream of urban areas and upstream of Defence activities.
SW5	SW5 is at a dam. It is downstream of urban areas.
SW6	SW6 is on a tributary of Oxley Creek. It is located upstream of the STP, and downstream of field training areas in TA4.
SW7	SW7 is at the overflow of a man made pond area downstream of the STP.
SW8	SW8 is on a tributary of Oxley Creek. It is located downstream of the proposed SDTA and field training areas of TA4 and TA5.
SW9	SW9 is located on Oxley Creek. It is located downstream of the accommodation areas, the STP, and the classification ranges.
SW10	SW10 is on Oxley Creek at the downstream property boundary. It is located downstream of SW9, SW8 and SW7. The grenade ranges are located upstream of the monitoring point.
SW11	SW11 is on a tributary of Oxley Creek at the downstream property boundary. It is located downstream of the Range Area, but no specific ranges are within the catchment.
SW12	SW12 is located at a man made pond near the property boundary. The sampling location has a small catchment, which does not include any activities of note.
SW13	SW13 is on Blunder Creek near the downstream property boundary on the southern side of the Ring Road. It is downstream of a large part of the Range Area, including the BSR and adjacent ranges, the MTR, and the DFSW range.
SW14	SW14 is located downstream of SW13 on the northern side of the Ring Road.

It should be noted that water quality monitoring undertaken at the end of 2007 and start of 2008 was towards the end of a severe drought in SEQ. It is likely that the naturally reduced flows would have affected water quality in the area.

The onsite STP provides rudimentary treatment of sewage before it is discharged to the environment. It is almost certain that this system is contributing considerable amounts of nutrient and organic matter to the receiving waterway, a small unnamed drainage line that flows to Oxley Creek.

Under the Queensland *Environmental Protection (Water) Policy Water 2009*, quality objectives for GBTA are defined in the Oxley Creek Environmental Values and Water Quality Objectives (OC WQO) (EPA, 2007). Within Plan WQ1434 of the OC WQO, GBTA is identified as Area G1, which is high ecological value freshwaters. Waterways in GBTA are mapped as occurring in two stream types of lowland freshwaters as described in the OC WQO:

- Lowland streams:
    - Freshwater lowland streams are larger, slow flowing and meandering streams and rivers with a very slight gradient. The substrate is sometimes cobble and gravel but more often silt, sand, or mud.
- Coastal stream:
    - Coastal streams are a mixture of small and large slow-flowing lowland rivers and creeks between Caboolture and the NSW border that flow across the coastal plain. The substrate is often cobble despite a low gradient.

GBTA is also within Catchment Management Unit (CMU) 8 Logan Conservation and Urban, as described in the Oxley Creek Catchment Management Plan and referenced in the OC WQO.

Environmental values and water quality objectives have been set in the OC WQO. Environmental values for Blunder Creek and CMU 8 are outlined in Table 4. Water quality objectives for freshwater lowlands and those adopted for the Defence GBTA water quality monitoring program are shown in Table 5. The objective for Area G1 is to maintain the existing water quality (20th, 50^{th,} & 80th percentiles), habitat, biota, flow, and riparian areas.

Table 4 Environmental values for waters in GBTA

Environmental Values	Blunder Creek	Logan Conservation and Urban Catchment Management Unit
Aquatic Ecosystem	✓	✓
Secondary Recreation	✓	✓
Visual Recreation	✓	✓
Cultural Heritage	✓	

Table 5 Water quality objectives for GBTA

Water Quality Parameter	EPP (Water) OC WQO	Adopted WQO
Physicochemical Parameters		
Turbidity (NTU)	50	50
Suspended Solids (mg/L)	6	6
pH	6.5-8.0	6.5–8.0
Dissolved Oxygen (% saturation)	85-110	85–110
Nutrients		
Chlorophyll a (mg/L)	0.005	0.005
Total Nitrogen (mg/L)	0.5	0.5
Nitrate and Nitrite (mg/L)	0.06	0.04
Ammonia (mg/L)	0.02	0.02
Total Kjeldahl Nitrogen (mg/L)	0.42	0.5
Total Phosphorus (mg/L)	0.05	0.05
Filterable Reactive Phosphorus (mg/L)	0.02	0.02
Metals		
Arsenic (mg/L)	0.05	0.024
Cadmium (mg/L)	0.0002	0.0002
Chromium (Cr III) (mg/L)	—	—
Chromium (Cr VI) (mg/L)	0.01	0.001
Copper (mg/L)	0.002	0.0014

Water Quality Parameter	EPP (Water) OC WQO	Adopted WQO
Lead (mg/L)	0.001	0.0034
Nickel (mg/L)	0.015	0.011
Zinc (mg/L)	0.005	0.008

Monitoring undertaken to date (2005–2008) at GBTA indicates the following with respect to the adopted water quality objectives:

- Physicochemical parameters:
  - Dissolved oxygen is generally low, suggesting low flow conditions. These are expected as there was a severe drought in SEQ for 7 years from 2001.
  - pH is generally neutral, with some acidic results, particularly at SW5 and SW11.
  - Turbidity generally meets the objectives, except at SW1 near a main road, where the reported turbidity exceeded the objective on all monitoring occasions. SW12, SW13 and SW14 also were measured to exceed the objective for more than 50 % of monitoring events.
- Metals:
  - Arsenic concentrations met the objectives on all monitoring occasions at all locations.
  - Cadmium concentrations at SW9 and SW13 exceeded the objective for more than 20 % of monitoring events.
  - Chromium concentrations at SW11, SW13 and SW14 exceeded the objective for more than 20 % of monitoring events.
  - Copper concentrations at SW1, SW11, and SW13 exceeded the objective for more than 20 % of monitoring events.
  - Nickel concentrations at SW14 exceeded the objective for more than 20 % of monitoring events.
  - Lead concentrations at SW13 exceeded the objective for more than 20 % of monitoring events.
  - Zinc concentrations at SW1, SW11, SW13 and SW14 exceeded the objective for more than 50 % of monitoring events, and at SW4, SW9, and SW10 for more than 20 %.
- Nutrients:
  - Ammonia, organic nitrogen, and total nitrogen concentrations exceeded the objective at all locations for more than 50 % of monitoring events.
  - Oxidised nitrogen concentrations exceeded the objective at SW14 for more than 20 % of monitoring events.
  - Total phosphorus concentrations at SW5 and SW11 exceeded the objective for more than 50 % of monitoring events; at all other locations except SW3 and SW10, concentrations exceeded the objectives for more than 20 % of monitoring events.
  - Filterable reactive phosphorus concentrations met the objectives for more than 80 % of monitoring events at all locations.
  - Chlorophyll ‘a’ concentrations at SW4, SW10, and SW13 exceeded the objective for more than 20 % of monitoring events, at SW1, SW3, SW5, SW9, and SW14 for more than 80 % of monitoring events, and at all monitoring locations for more than 50 % of monitoring events. This is likely to indicate algal growth caused by low-flow conditions.

3.6.1 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on water quality and hydrology include:

- Improved water quality in Oxley Creek downstream of the existing STP, as it will be decommissioned and replaced by a new STP, and effluent will be recycled on site
- Reduced flows in Oxley Creek downstream of the existing STP
- Localised changes to hydrology where works impinge on minor tributaries of Blunder Creek (the MTR-B) and Oxley Creek (the SDTA)
- Increased suspended solids downstream of construction sites from disturbance of surface soils
- Increased suspended solids downstream of the SDTA from disturbance of surface soils, and
- Increased concentrations of metal contaminants downstream of the MTR-B from range produce.

3.7 Geology and Soils

The dominant geology of GBTA (2,202 ha, 47.1 %) is mixed sedimentary rocks and mafites (volcanic materials). Arenite, a sandstone (1,181 ha, 25.3 %) and an arenite-mudrock complex (23 ha, 0.5 %) are also present. Ferricrete comprises 504 ha (10.8 %), and alluvium from other rock types (763 ha, 16.3 %) fills gully floors.

GBTA is mapped at 1 km resolution under the Australian Soil Resource Information System (ASRIS) (CSIRO, 2009). The majority of the soils in the area (3,458 ha, 74 %) are classified as the Tenosol Order in the Australian Soil Classification, characterised by weak subsoil development with weakly expressed B horizons in terms of structure, texture and colour, and occur on alluvial soils and siliceous sands (Brown, Isbell, Jacquier, & McKenzie, 2004). The eastern margin of the area is mapped as Chromosols (266 ha, 5.7 %). The Chromosol Order is characterised by bright red and brown subsoils, reflecting their highly weathered and well-drained status. The south-western margin of the area is comprised of Rudosols (950 ha, 20.3 %), characterised by even weaker subsoil development than the Tenosols.

3.7.1 Safe Driver Training Area

Soil Classification and the Soil Landscape

The SDTA is mapped at 1 km resolution under ASRIS (CSIRO, 2009) as the Tenosol Australian Soil Classification Order. These soils are characterised by weak subsoil development with weakly expressed B horizons in terms of structure, texture, and colour, and occur on alluvial soils and siliceous sands (Brown, Isbell, Jacquier, & McKenzie, 2004). The underlying geology is mapped at 1:100,000 scale as the Jurassic Gatton unconsolidated sandstone and Holocene alluvium comprised of sand, silt and clay (DERM, 2009).

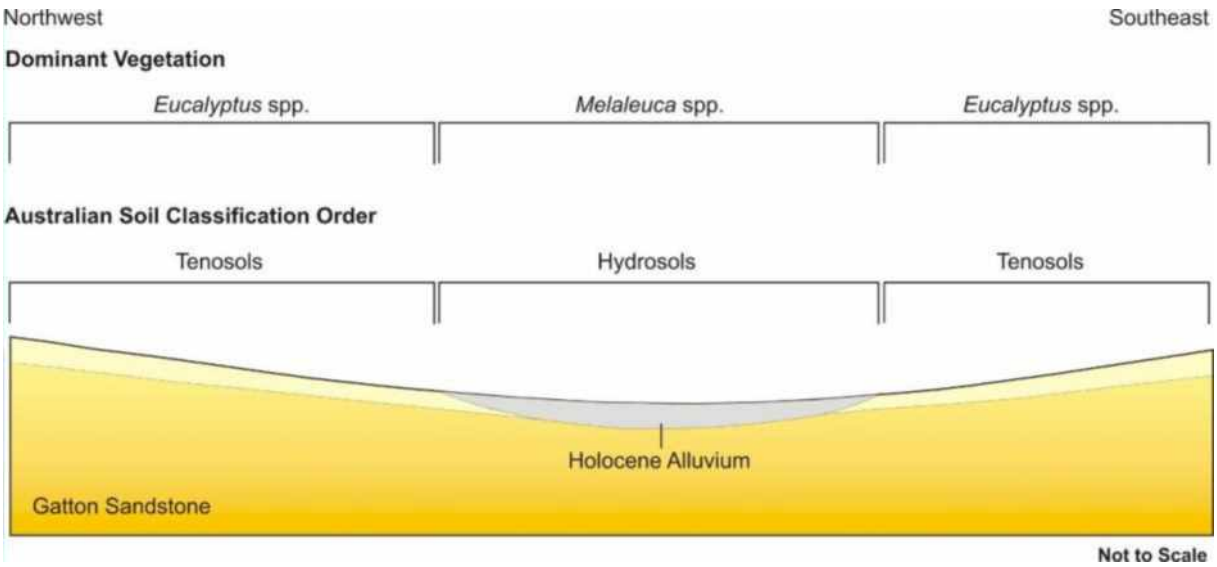
Observations confirm the presence of labile sandstones and sandy alluvium at the site, and the occurrence of well-drained Tenosols on ridges and slopes. Based on their dominant brownish colours, and being comprised of largely unconsolidated sands, these can be classified as Arenic Brown Orthic Tenosols (Isbell, 2002) (Figure 13). Along drainage line axes, soils are clay-rich with significant mottling, indicating prolonged saturated conditions. These low-lying positions receive and accumulate fines eroded from the surrounding landscape, and have poor drainage. They are characterised by the presence of *Melaleuca* spp and rush vegetation. The soil morphology, including mottling and blocky clay-rich subsoils, indicates that they are Dermosolic Oxyaquic Hydrosols (Brown, Isbell, Jacquier, & McKenzie, 2004)(Isbell, 2002) (Figure 14). A diagrammatic soil-landscape model of the SDTA is presented in Figure 15, with the associated soil map presented in Map 4, Appendix A. Tenosols and Hydrosols comprise approximately 90 % and 10 % of the area, respectively. Soil descriptions are presented in Appendix C.

No surface erosion features, either surface sheetwash, rilling or gullying, were observed.

Figure 13 (Left) A Horizon and upper B horizon of Arenic Brown Orthic Tenosol, SDTA. (Right) *Eucalypt* spp-dominated vegetation on Tenosols, SDTA.

Figure 14 (Left) A Horizon and upper B horizon of Dermosolic Oxyaquic Hydrosol, SDTA. (Right) Melaleuca spp and rush-dominated vegetation on Hydrosols, SDTA.

Figure 15 SDTA conceptual soil-landscape model



Erosion Risk

Based on the erosion assessment, the Arenic Brown Orthic Tenosols demonstrate low to moderate potential for erosion from water flows, with the latter occurring in the north of the site because of the presence of steeper slopes. Two of the three sites in the area of Dermosolic Oxyaquic Hydrosols had very low water erosion potential, and one had moderate erosion potential.

For the Tenosols, their dominantly sandy upper horizons indicate that incident rainfall would infiltrate readily, thereby reducing overland flow and attendant erosion. The relatively gentle slope on site would also contribute to low overland flow velocity. However, in some areas if there has been excavation and transfer of upper soil horizons, this may expose more clay-rich materials at depth. In general, the sandy nature of these soils indicates a low risk of significant erosion and minimal contribution of suspended solids to nearby waterways. Wind erosion risk is likely to be low.

For the Hydrosols, their essentially flat landform contributes to their dominantly low erosion risk. However, their high clay content means that a combination of disturbance and ephemeral water flow may in certain circumstance lead to dispersion, and down slope and/or downstream transport of suspended solids onsite, and potentially offsite in the absence of erosion mitigation measures. If disturbed soils are left exposed, wind erosion is a risk.

3.7.2 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on geology and soils include:

- Erosion at construction sites from the disturbance of surface soils
- Erosion at the SDTA from the disturbance of surface soils, particularly in off-road training areas, and
- Dust generation from off road training at the SDTA.

3.8 Groundwater

GBTA is located within the Clarence Moreton Unincorporated Area (UA) (NLWRA, 2000). The Clarence Moreton Groundwater Province extends from Yarraman in the north to the New South Wales border in the south. GBTA is also located near the administrative Logan/Albert Rivers Groundwater Management Unit (GMU) within the Clarence Moreton Groundwater Provence.

Groundwater in the Clarence Moreton UA is obtained from alluvium and fractured and sedimentary rocks (NLWRA, 2000). Much of the alluvial resource falls within the GMU areas in the Lockyer Valley, Logan and Albert Rivers, and the Condamine region. Groundwater is generally of good quality throughout the UA.

The Logan/Albert Rivers GMU is located approximately 20 km south of Brisbane and covers an area of approximately 1,325 km^2 (NLWRA, 2000). Groundwater in the GMU is present in deposits of unconsolidated Quaternary alluvium associated with the Logan and Albert River valleys. The average thickness of the fluvial deposits is approximately 25 m (NLWRA, 2000). These cut into Jurassic sandstone bedrock and are overlain by a confining/semi-confining layer of clay and silt.

Two registered bores are located within GBTA and thirteen registered bores are within 1 km of GBTA (GHD, 2006). Groundwater levels measured between 2002 and 2004 indicate the following concerning standing water levels (SWL) surrounding GBTA (GHD, 2006):

- To the north west, the SWL ranges from 20–28 m below ground level (BGL)
- To the south, the SWL ranges from 14–48 m BGL, and
- To the east, the SWL ranges from 16–30 m BGL.

Groundwater in the area is expected to be used for stock watering and irrigation only given the presence of a reticulated potable water supply (GHD, 2006).

In addition to the two registered bores at GBTA, there are a number of unregistered bores present. During previous site investigations, two bores were located and there is anecdotal evidence of other bores on site (GHD, 2006). Groundwater from GBTA might be used for the proposed Vehicle Wash Bay (Davis Langdon, 2008).

3.8.1 Potential Impacts

Groundwater might be used for the proposed Vehicle Wash Point; however, this is unlikely to have an impact on aquifer yield or groundwater quality at GBTA.

3.9 Native Flora and Vegetation Communities

GBTA is listed on the Commonwealth Heritage List and Register of the National Estate for Natural Values (DEWHA, 2004). It is a large area of eucalypt forest and woodland important for maintaining a range of old growth forest types in SEQ. This vegetation was once more widespread in SEQ but its extent has been severely reduced by clearing for agriculture, forest plantation and urbanisation of regions between the Gold Coast and Noosa (DEWHA, 2004).

GBTA represents a large area of intact lowland open forest surrounded by urban development and light industry in the greater Brisbane region (DEWHA, 2004).

3.9.1 Vegetation Communities

3.9.1.1 EPBC Act Threatened Ecological Communities

The EPBC Act Protected Matters Database indicates that the “White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland” community may occur in the area. From a review of previous studies, Wildlife Online Database, RE mapping and field inspections, it was identified that this threatened ecological community does not occur within the project areas.

3.9.1.2 Regional Ecosystems and High Value Regrowth

RE mapped as occurring within GBTA under the Queensland *Vegetation Management Act 1999* (VM Act) are listed in Table 6. RE mapping within GBTA was recently amended following a study of threatened flora and vegetation communities for Defence (HLA, 2007). These changes are incorporated into RE Map Version 6.0. RE mapping for GBTA is shown in Map 5 and Map 6, Appendix A.

High Value Regrowth (HVR) vegetation mapped as occurring at GBTA under the VM Act is shown in Maps 5 and 6 in Appendix A. HVR vegetation is mature vegetation that has not been cleared since 31 December 1989. The types of regrowth present at each proposed ELF 2C facility is outlined in Table 7.

Table 6 RE and HVR vegetation mapped within the GBTA boundary

Regional Ecosystem*	Short Description**	Area in GBTA (ha)
Endangered		
12.3.3 b	*Eucalyptus moluccana* open-forest to woodland. Other frequently occurring species include *Eucalyptus tereticornis*, *E. crebra*, *E. siderophloia,* and *Corymbia intermedia*. Occurs on margins of Quaternary alluvial plains.	56.8
12.5.3	*Eucalyptus tindaliae* and/or *E. racemosa* open forest on remnant Tertiary surfaces.	168.2
12.9-10.12	*Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks.	1,546.1
Endangered (Dominant)		
12.9-10.12/ 12.9-10.19a	*Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks. Open-forest of *Corymbia henryi* ± *Eucalyptus fibrosa* subsp. *fibrosa*, *Corymbia citriodora*, *E. siderophloia*, *E. crebra* and other coastal mesic variants of this RE. Occurs on Cainozoic and Mesozoic sediments.	238.8
Endangered (Sub-dominant)		
12.9-10.19a/ 12.9-10.12	Open-forest of *Corymbia henryi* ± *Eucalyptus fibrosa* subsp. *fibrosa*, *Corymbia citriodora*, *E. siderophloia*, *E. crebra* and other coastal mesic variants of this RE. Occurs on Cainozoic and Mesozoic sediments. *Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks.	106.6
Of Concern		
12.3.11	*Eucalyptus siderophloia*, *E. tereticornis*, *Corymbia intermedia* open forest on alluvial plains usually near coast.	223.8
12.3.8	Swamps with *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp.	3.3
12.9-10.3	*Eucalyptus moluccana* on sedimentary rocks.	4.8
12.9-10.7a	*Eucalyptus tereticornis*, *E. siderophloia* and/or *E. crebra*, *Corymbia intermedia* and *Lophostemon suaveolens* woodland. Occurs on Cainozoic and Mesozoic sediments.	10.6
Of Concern (Dominant)		
12.3.11/ 12.3.6	*Eucalyptus siderophloia*, *E. tereticornis*, *Corymbia intermedia* open forest on alluvial plains usually near coast. *Melaleuca quinquenervia*, *Eucalyptus tereticornis*, *Lophostemon suaveolens* woodland on coastal alluvial plains.	252.5
12.3.11/ 12.3.7	*Eucalyptus siderophloia*, *E. tereticornis*, *Corymbia intermedia* open forest on alluvial plains usually near coast. *Eucalyptus tereticornis*, *Melaleuca viminalis*, *Casuarina cunninghamiana* fringing forest.	52.3
Of Concern (Sub-dominant)		
12.3.7/ 12.3.11	*Eucalyptus tereticornis*, *Melaleuca viminalis*, *Casuarina cunninghamiana* fringing forest *Eucalyptus siderophloia, E. tereticornis*, *Corymbia intermedia* open forest on alluvial plains usually near coast	74.5
Not of Concern		
12.3.6	*Melaleuca quinquenervia*, *Eucalyptus tereticornis*, *Lophostemon suaveolens* woodland on coastal alluvial plains	114.2
12.5.1	Open forest complex with *Corymbia citriodora* on sub-coastal remnant Tertiary surfaces. Usually deep red soils	96.2
12.9-10.2	*Corymbia citriodora*, *Eucalyptus crebra* open forest on sedimentary rocks	80.5
12.9-10.4	*Eucalyptus racemosa* woodland on sedimentary rocks	861.1
12.9-10.19a	Open-forest of *Corymbia henryi* ± *Eucalyptus fibrosa* subsp. *fibrosa*, *Corymbia citriodora*, *E. siderophloia*, *E. crebra* and other coastal mesic variants of this RE. Occurs on Cainozoic and Mesozoic sediments	496.8
High Value Regrowth		
Endangered RE	Remnant Vegetation that contains endangered RE	46.3

Regional Ecosystem*	Short Description**	Area in GBTA (ha)
Of Concern RE	Remnant Vegetation that contains Of Concern RE	17.6
Least Concern RE	Remnant Vegetation that is a least concern RE	30.6
Non-Remnant* **		
Non- remnant	-	65.4
Plantation	-	53.3
Water	-	1.7
TOTAL	**-**	**4,602.0**

Notes:

* Status under the VM Act

** Sourced from DERM REDD Version 6

*** Area calculations of non-remnant vegetation were calculated by subtracting areas categorised as RE and HVR vegetation from the total area of GBTA

Table 7 HVR vegetation at proposed ELF 2C facilities

Proposed Facility	High Value Regrowth Area (ha)				Essential Regrowth Habitat	
	Endangered	Of Concern	Least Concern	Total	Area (ha)	Species
GBTA	46.30	17.60	30.60	94.50	Koala & Wallum Froglet	
MTR-B	—	0.26	2.79	3.05	3.05	Koala
SDTA	10.92	11.81	0.62	23.35	9.52	Koala
Range Control	—	—	—	—	—	—
Camp	1.32	0.12	0.01	12.37	—	—
25/49 RQR	0.12	—	2.33	2.45	—	—
Roads	0.01	0.01	0.02	0.04	—	—
ELF 2C TOTAL	**12.37**	**12.08**	**5.76**	**30.21**	**12.57**	

3.9.1.3 Wetlands

GBTA is described as an Important Wetland in *A Directory of Important Wetlands in Australia* (EPA, 2005); consequently, under Queensland legislation, GBTA may be considered a "natural significant wetland". GBTA's entry into the Directory is included in Appendix D. GBTA meets two criteria that make it nationally important:

1) It is a good example of a wetland type occurring within a biogeographic region in Australia.

2) The wetland supports native plant or animal taxa or communities that are considered endangered or vulnerable at the national level.

Two types of inland wetlands occur at GBTA as defined in the *Directory's* classification system:

1) Permanent rivers and streams.

2) Riverine floodplains (including river flats, flooded river basins, seasonally flooded grassland, savannah, and palm savannah).

In addition, DERM has developed wetland mapping based on RE mapping and satellite imagery (DERM, 2009). Within GBTA, two wetland types are mapped as occurring: Palustrine RE and RE 1–50 % wetland (mosaic units). This mapping indicates the presence of REs at GBTA that may contain wetlands. Palustrine RE may contain palustrine wetlands, which include all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. RE 1–50 % wetland (mosaic units) indicates a mixture of REs that may contain wetlands. At GBTA, the relevant habitat type is coastal/sub-coastal floodplain tree swamps dominated by *Melaleuca* and *Eucalyptus*. The MTR-B and SDTA contain RE 1–50 % wetland.

3.9.1.4 Summary of Vegetation Communities at ELF 2C Facilities

The RE, HVR vegetation, Wetland RE and Essential Habitat mapped under the VM Act as occurring at each proposed ELF 2C facility is outlined in Table 8.

Table 8 RE mapped as occurring at each ELF 2C facility

Facility	RE/Feature	Status/Description	Area (ha)[1]
MTR-B	12.5.3	Endangered	0.62
	12.3.11/12.3.6	Of Concern Dominant	1.06
	12.9-10.4	Least Concern	2.04
	Non-remnant	—	1.10
	HVR vegetation	All	3.05
	Waterways[2]	1st and 2nd order	—
	Essential Habitat[2]	Koala	3.72
SDTA	12.3.3b	Endangered	5.96
	12.9-10.12	Endangered	2.93
	12.3.11/12.3.7	Of Concern Dominant	9.12
	12.3.11	Of Concern	0.40
	12.9-10.2	Least Concern	5.12
	Non-remnant	—	1.02
	HVR vegetation	All	23.35
	Waterways	2nd order	—
	Essential Habitat	Koala	9.52
Range Control	12.9-10.12	Endangered	4.32
	12.3.11	Of Concern	0.02
	Essential Habitat	Koala	0.02
Camp	12.9-10.12	Endangered	1.68
	HVR vegetation	All	1.32
25/49 RQR	12.9-10.12	Endangered	0.36
	12.9-102	Least Concern	2.34
	HVR vegetation	All	2.45
Roads	12.9-10.12	Endangered	0.58
	12.3.11	Of Concern	0.09
	12.9-10.2	Least Concern	0.15
	Non-remnant	—	7.89
	HVR vegetation	All	0.04

Notes:

1. Areas may overlap (e.g. Essential Habitat may occur in Of Concern RE).
2. The presence of waterways and Essential Habitat influence clearing requirements, as discussed in Section 7.2.4.

3.9.2 Field Survey Results

The following sections describe the floristic characteristics of the areas that were surveyed; detailed site descriptions of the survey points are included in Appendix E. The area of the MTR-B proposed to be cleared was not surveyed, as access was restricted as outlined in Section 3.1.5. Table 24 in Section 7.2.4 detail the areas of vegetation removal within the surveyed facilities. Maps 5 and 6 in Appendix A illustrate the approximate locations of the facilities, the RE and HVR vegetation that occur within each facility.

3.9.2.1 SDTA

The 46.88 ha SDTA included 23.35 ha mapped as HVR vegetation. The remainder of the facility was mapped as remnant RE (23.53 ha) and non-remnant (1.02 ha), which was confirmed by field observations. The remnant RE is in a very good to excellent condition away from the cleared edges with mature trees present in the forest canopy and few to no weeds in the ground or shrub layers. The regrowth vegetation is quite varied in condition, but generally reflects the adjacent REs in terms of floristic composition but not in structure, as mature trees are sparse to absent. With some management input and the passage of time, the areas mapped as regrowth could be rehabilitated to remnant status.

The vegetation community within the SDTA comprised an open forest of *Angophora leiocarpa*, *Corymbia citriodora*, *C. intermedia*, *Eucalyptus moluccana*, *E. seeana*, *E. siderophloia/E. crebra*, *E. tereticornis,* and *Lophostemon suaveolens*. The canopy ranges from 20 m to 30 m in height and tree cover is generally between 30–70 % projected foliage cover. The mid storey is composed of *Acacia disparrima*, *Allocasuarina littoralis*, *Alphitonia excelsa*, *Melaleuca linariifolia* and young regrowth of the canopy species including *Corymbia intermedia*, *Eucalyptus tereticornis*, and *Lophostemon suaveolens*. Ground cover is composed of mainly native species with minimal weed cover, which is less than 5 % across the sites surveyed.

Past reports and observations in the field indicate a site disturbance history of grazing and logging. Logging is likely to be the cause of an absence of old growth trees, and in particular valued timber species such as *Corymbia citriodora*, *C. henryi*, *C. intermedia*, *Eucalyptus crebra*, *E. fibrosa*, *E. moluccana*, and *E. siderophloia*.

3.9.2.2 Camp and 25/49 RQR Facilities

The proposed facility locations included both regrowth and remnant vegetation. Most of the remnant vegetation comprised Least Concern RE 12.9-10.2, which field inspection revealed comprises only the canopy trees – *Corymbia citriodora*, *C. intermedia*, *Eucalyptus seeana,* and *E. tereticornis*. The shrub layer is mostly absent and the groundcover appears to be regularly slashed. The area mapped as regrowth is not entirely cleared and supports scattered mature trees, but at a much lower density than adjacent areas mapped as remnant.

The small area of Endangered RE 12.9-10.12 on the north eastern edge of this area is invaded by the Class 3 declared weed *Lantana camara* but is generally in good condition. It comprises an open forest of *Angophora leiocarpa*, *Corymbia citriodora*, *C. intermedia*, *C. tessellaris*, *Eucalyptus seeana*, *E. siderophloia*, *E. tereticornis*, and *Lophostemon suaveolens* in the canopy, ranging from 25 m to 35 m in height, tree cover is generally between 30–70 % projected foliage cover. The mid storey is composed of *Acacia* spp., *Allocasuarina littoralis*, *Alphitonia excelsa,* and young regrowth of the canopy species including *Angophora leiocarpa*, *Corymbia intermedia*, *Eucalyptus seeana*, *E. tereticornis* and *Lophostemon suaveolens*. Ground cover is composed of up to 20 % exotic species and *Lantana camara* is common in the shrub layer.

3.9.2.3 MTR-B

The proposed MTR-B is located within the Range Area of GBTA and so could not be accessed for field investigation. The area is well vegetated with previous disturbance likely to be limited to previous logging and minor impacts from military activity. Desktop information indicates it is comprised of a mix of Endangered, Of Concern and Least Concern RE, non-remnant (within the BSR) and regrowth vegetation.

3.9.2.4 Aquatic Environment

While desktop searches indicated the potential for three threatened aquatic plant species to occur at GBTA. None of these was identified during the field survey. However, 11 non-threatened aquatic flora species were observed in GBTA, as outlined in Table 9.

Table 9 Freshwater flora species observed during surveys

Name		Sites			
Scientific	Common	GB1	GB2	GB3	GB4
Juncus sp	Common Rush	✓	—	✓	✓
Eleocharis sp.	Spikerush	—	—	—	✓
Spirodela sp.	Duckweed	—	✓	—	—
Chara sp.	Stoneworts	—	✓	—	—
Cyperus sp	Sedge	—	✓	—	—
Typha sp	Cumbungi	—	✓	—	—
Persicaria sp.	Slender Knotweed	—	✓	—	—
Potamogeton sp.	Pondweeds	✓	—	—	—
Phragmites sp.	Common Reed	✓	—	—	—
*Eichhornia sp.**	Water Hyacinth*	—	✓	—	—
Salvinia molesta^	Salvinia^	—	✓	—	—

Notes:
Pest declarations, refer Section 3.11 for more information
* Introduced but not declared
^ Declared Class 2

3.9.3 Threatened Flora Species

A large number of species listed as threatened under the EPBC Act and Queensland *Nature Conservation Act 1992* (NC Act) have been identified as potentially occurring within GBTA. However, previous field studies have failed to locate any threatened flora species in GBTA (HLA, 2007). Table 10 identifies those species that have been identified in the EPBC Act Protected Matters, Wildlife Online, HERBRECS, and Defence Threatened Species databases as potentially occurring within GBTA. Species previously recorded within 10 km of GBTA (Wildlife Online and HERBRECS) are considered more likely to occur at GBTA than those predicted to occur regionally (i.e. those from the EPBC Act Protected Matters Database). These species are highlighted in Table 10.

Table 10 Threatened flora species potentially occurring within 10 km of GBTA

Scientific Name	Common Name	EPBC Act Status*	NC Act Status*	Source**
Alectryon ramiflorus	—	E	E	5
Arthraxon hispidus	Hairy-Joint Grass	V	V	5
Bosistoa transversa (syn. Bosistoa selwynii)	Three-Leaved Bosistoa	V	—	4,5
Brasenia schreberi	Watershield	—	NT	5
Bulbophyllum globuliforme	Miniature Moss-Orchid	V	NT	5
Cadellia pentastylis	Ooline	V	V	5
Callitris baileyi	Bailey's Cypress Pine	—	NT	5
Choricarpia subargentea	Giant Ironwood	—	NT	5
Corchorus cunninghamii	Cunningham's Jute	E	E	2, 5
Cossinia australiana	Cossinia	E	E	5
Cryptocarya foetida	Stinking Cryptocarya, Stinking Laurel	V	V	4
Cryptostylis hunteriana	Leafless Tongue-Orchid	V	—	4, 5
Cupaniopsis newmanii	Long-Leaved Tuckeroo	—	NT	5
Cupaniopsis shirleyana	Wedge-Leaf Tuckeroo	V	V	5
Cupaniopsis tomentella	Boonah Tuckeroo	V	V	5
Cycas megacarpa	—	E	E	4
Eucalyptus curtisii	Plunkett Mallee	—	NT	2, 5
Fontainea venosa	—	V	V	4, 5
Gossia gonoclada (syn) (Austromyrtus gonoclada)	Angle-Stemmed Myrtle	E	E	5
Hernandia bivalvis	Cudgerie	—	NT	5

Scientific Name	Common Name	EPBC Act Status*	NC Act Status*	Source**
Hydrocharis dubia	Frogbit	V	V	4
Jasminum jenniae	Shrubby Jasmine	—	E	5
Kunzea flavescens	—	—	NT	2, 5
Lenwebbia prominens	—	—	NT	5
Leucopogon recurvisepalus	—	—	E	5
Lilaeopsis brisbanica	—	—	E	2
Macadamia integrifolia	Macadamia Nut, Queensland Nut, Smooth-Shelled Macadamia	V	V	5
Marsdenia coronata	Slender Milkvine	V	V	2, 3, 5
Marsdenia longiloba	Clear Milkvine	V	V	5
Maundia triglochinoides	—	—	V	2, 5
Melaleuca irbyana	Bush-House Paperbark	—	E	2, 3, 5
Notelaea ipsviciensis	Cooneana Olive	CE	E	4
Notelaea lloydii	Lloyd's Olive	V	V	4, 5
Nothoalsomitra suberosa	—	—	NT	5
Pararistolochia praevenosa	Richmond Birdwing Vine	—	NT	5
Persicaria elatior	Tall Knotweed	V	V	2, 5
Phaius australis	Southern Swamp Orchid, Lesser Swamp Orchid	E	E	5
Phebalium distans	Mt Berryman Phebalium	CE	E	4
Picris conyzoides	—	—	V	5
Plectranthus habrophyllus	Native Plectranthus	E	E	2, 3, 4, 5
Plectranthus nitidus	Nightcap Plectranthus	E	E	5
Pouteria eerwah	Shiny-Leaved Condoo, Black Plum, Wild Apple	E	E	5
Prasophyllum exilis	—	—	NT	5
Randia moorei	Spiny Gardenia	E	E	2, 5
Ricinocarpos speciosus	—	—	V	2
Sarcochilus weinthalii	Blotched Sarcochilus, Weinthals Sarcanth	V	E	5
Senna acclinis	—	—	NT	2, 5
Sophora fraseri	Brush Sophora	V	V	4, 5
Symplocos harroldii	Hairy Hazelwood	—	NT	2, 5
Taeniophyllum muelleri	Minute Orchid, Ribbon-Root Orchid	V	—	4
Thesium australe	Austral Toadflax	V	V	5
Zieria collina	—	V	V	5
Zieria furfuracea ssp. gymnocarpa	Belmont Zieria	—	E	5

Notes for Table 10:

* NT: Near Threatened; V: Vulnerable; E: Endangered; CE: Critically Endangered

** 1: Observed
2: HERBRECS
3: Wildlife Online
4: EPBC Act Protected Matters Database
5: Defence Threatened Species Database

3.9.4 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on native flora include:

- Removal of 67 ha of remnant and HVR vegetation
- Removal of 67 ha of suitable habitat (but not known habitat) for 12 threatened flora species, and
- Reduced integrity of large areas of intact remnant vegetation.

3.10 Native Fauna

GBTA is 4,655 ha and contains relatively intact vegetation of good to excellent condition. It was not possible to access the Range Area for the MTR-B extension to the BSR during this survey period; consequently, any discussion or assessment for this facility is based on previous documentation as described in Section 3.1.

3.10.1 Patch Size and Connectivity

GBTA is within the Flinders–Greenbank/Karawatha Corridor (EPA, 2002), shown in Map 7, Appendix A, which represents an important wildlife corridor in the broader region. This area is considered particularly important as it represents a relatively intact area of good condition surrounded by rapidly expanding urban development. As such, it provides significant areas of potential habitat for a range of threatened species. Defence has signed a Memorandum of Understanding between the State Government and local councils regarding the management of lands within the Flinders–Greenbank/Karawatha Corridor.

In addition to GBTA, Karawatha Forest Area and Flinders Peak are listed on the Register of the National Estate for natural heritage values.

3.10.2 Listed Fauna Species

Searches of the EPBC Act Protected Matters database, Wildlife Online database, the Defence Threatened Species Database, and the Natural Heritage Listing for the GBTA, identified 31 threatened fauna species that are either known or considered likely to occur within a 10 km radius of GBTA. These species are listed in Table 11.

An assessment of the likelihood of species occurring within the project footprints was made based on the species' habitat requirements. Table 11 shows where species are likely to occur.

Of these species, 10 are listed under both the EPBC Act and the NC Act. Nineteen species are listed as threatened under the NC Act only and two species are listed as threatened under the EPBC Act only. There are six species listed as terrestrial migratory under the EPBC Act that are either known or considered likely to occur within a 10 km radius of GBTA. Marine restricted and migratory wetland species have been excluded from this list as, providing that downstream impacts on marine and wetland areas can be mitigated, such species are not expected to be affected by the proposed developments.

No Spotted-tailed Quoll were trapped during field surveys, nor were any signs of the species detected.

Table 11 Listed terrestrial fauna species potentially occurring at GBTA and within the ELF 2C development areas

Species		Status		Source				Likelihood of Occurring				Habitat Description
Scientific Name	Common Name	NC Act	EPBC Act	Wildlife Online	EPBC Act Protected Matters Database	Threatened Species Database	Commonwealth Heritage Listing	Near GBTA*	MTR-B	SDTA	Range Control, etc	
Birds												
Accipiter novaehollandiae	Grey Goshawk	R	—	✓	—	✓	—	K	U	L	L	Mature forest with overhead canopy and open understorey.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	—	✓	—	✓	—	K	U	L	U	Coastal forest and open inland woodland. Feeds primarily on *Allocasuarina littoralis* or *A. torulosa*.
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	E	E; M	—	✓	—		L	U	U	U	Rainforest, including lowland rainforest of SEQ.
Ephippiorhynchus asiaticus	Black-Necked Stork	R	—	✓	—	—	—	K	U	U	U	Open freshwater environments along the margins of billabongs, lagoons, swamps, floodplains, dams and their adjacent grasslands, pastures and woodlands.
Erythrotriorchis radiatus	Red Goshawk	E	V	✓	✓	✓	—	K	U	U	U	Undisturbed forest or woodland with mosaic of mixed vegetation.
Falco hypoleucos	Grey Falcon	R	—	✓	—	—	—	K	U	U	U	Lightly timbered country or arid districts, especially stony plains and lightly timbered acacia shrublands. Only occurs as a vagrant east of the Great Dividing Range.
Geophaps scripta scripta^	Squatter Pigeon (Southern Subspecies)^	V	V	—	✓	—	—	K	U	L	U	Open grassy woodlands on sandy soils interspersed with low gravelly ridges.
Grantiella picta	Painted Honeyeater	R	—	—	—	✓	—	L	L	L	L	Forests, woodlands, dry scrublands, often with abundant mistletoe.
Haliaeetus leucogaster	White-Bellied Sea-Eagle	—	M	✓	✓	—	—	K	U	U	U	Usually coastal, over islands, reefs and headlands, beaches, bays and estuaries, mangroves, lagoons and floodplains.

Species		Status		Source				Likelihood of Occurring				Habitat Description
Scientific Name	Common Name	NC Act	EPBC Act	Wildlife Online	EPBC Act Protected Matters Database	Threatened Species Database	Commonwealth Heritage Listing	Near GBTA*	MTR-B	SDTA	Range Control, etc	
Lathamus discolor	Swift Parrot	E	E	✓	✓	✓	—	K	L	L	L	Forests and woodlands with flowering trees.
Lophoictinia isura	Square-Tailed Kite	R	—	✓	—	✓	—	K	L	L	L	Eucalypt woodland, open forest and heath-woodland.
Melithreptus gularis	Black-Chinned Honeyeater	R	—	✓	—	✓	—	K	L	L	L	Eucalypt and paperbark forest and woodland and tree-lined watercourses of arid regions.
Monarcha melanopsis	Black-Faced Monarch	—	M	✓	—	—	✓	K	L	L	L	Rainforests, mangroves, moist eucalypt forests.
Monarcha trivirgatus	Spectacled Monarch	—	M	—	✓	—	—	L	U	U	U	Usually rainforests, eucalypt forests and mangroves; often in moist gullies of dense wet eucalypt forests.
Myiagra cyanoleuca	Satin Flycatcher	—	M	✓	✓	—	—	L	L	L	L	Tall eucalypt forest, usually moister environments but not rainforest.
Neophema pulchella	Turquoise Parrot	R	—	✓	—	✓	—	K	L	L	L	Woodland and open grassland, natural or partly cleared.
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-Goose	R	M*	✓	—	—	—	K	U	U	U	Coastal wetlands, preferring deep permanent pools and swamps with abundant aquatic grasses.
Ninox strenua	Powerful Owl	V	—	✓	—	✓	—	K	U	L	U	Eucalypt forests, especially tall forests in ranges.
Rhipidura rufifrons	Rufous Fantail	—	M	✓	—	—	✓	K	U	U	U	Rainforest, dense wet eucalypt and monsoon forests, paperbark, and mangrove swamps, riverside vegetation; open country on migration.
Rostratula australis	Australian Painted Snipe	V	V	—	—	✓	—	L	U	U	U	Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps, and clay pans.
Sternula albifrons	Little Tern	E	—	✓	—	—	—	K	U	U	U	Coastal, harbours, inlets and rivers. Nests in low dunes or on sandy beaches just above high tide mark.
Turnix melanogaster	Black-Breasted Button-Quail	V	V	✓	✓	—	—	K	U	U	U	Closed rainforest, monsoon forests, vine thickets, and drier shrubby scrubs. Also in eucalypt forests with dense understorey.

Species		Status		Source				Likelihood of Occurring				Habitat Description
Scientific Name	Common Name	NC Act	EPBC Act	Wildlife Online	EPBC Act Protected Matters Database	Threatened Species Database	Commonwealth Heritage Listing	Near GBTA*	MTR-B	SDTA	Range Control, etc	
Mammals												
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tailed Quoll (south-eastern mainland population)	V	E	✓	—	✓	—	K	U	L	U	Rainforest, wet and dry sclerophyll forest, coastal heath and scrub, sometimes Red Gum forest along inland rivers.
Petrogale penicillata	Brush-Tailed Rock-Wallaby	V	V	✓	—	—	—	K	U	U	U	Rock piles and cliffs with numerous crevices and ledges in vegetation ranging from rainforest to dry sclerophyll forest.
Phascolarctos cinereus (Southeast Queensland Bioregion)	Koala (Southeast Queensland Bioregion)	V	—	✓	—	✓	✓	K	L	L	L	A range of habitats, from coastal islands and tall eucalypt forests to low woodlands inland. Essential Habitat mapped as occurring at the MTR-B and SDTA.
Pteropus poliocephalus	Grey-headed Flying-fox	—	V	✓	✓	✓	—	K	L	L	L	Roosts near water, such as lakes, rivers or the coast and forages within rainforest, open forest, closed and open woodland, *Melaleuca* swamp, and *Banksia* woodland within 15 km of roost.
Vombatus ursinus	Common Wombat	R	—	✓	—	—	—	K	U	U	U	In Qld, in wet forest above 600 m.
Amphibians												
Adelotus brevis	Tusked Frog	V	—	✓	—	✓	✓	K	U	U	U	Associated with water in rainforest, wet sclerophyll forest, or grassland that is sometimes flooded.
Crinia tinnula	Wallum Froglet	V	—	✓	—	—	—	K	U	U	U	Confined to acid paperbark swamps in the wallum country.
Litoria brevipalmata	Green-thighed Frog	R	—	✓	—	✓	—	K	L	L	L	Rainforest edges, open forest, woodland and disturbed grassy habitats.
Mixophyes iteratus	Giant Barred Frog	E	E	—	✓	—	—	L	U	U	U	Wet sclerophyll forest and rainforest and riparian vegetation beside permanent streams; often in leaf litter near permanent fast-flowing streams.

Species		Status		Source				Likelihood of Occurring				Habitat Description
Scientific Name	Common Name	NC Act	EPBC Act	Wildlife Online	EPBC Act Protected Matters Database	Threatened Species Database	Commonwealth Heritage Listing	Near GBTA*	MTR-B	SDTA	Range Control, etc	
Reptiles												
Acanthophis antarcticus	Common Death Adder	R	—	✓	—	✓	—	K	L	L	U	Various habitats including coastal sand dunes, rainforest, shrublands, heaths, and woodlands.
Delma torquata	Collared Delma	V	V	—	✓	—	—	L	U	U	U	Under rocks and in soil cracks on heavy, stony and lightly timbered soils in SE Qld.
Ophioscincus truncatus	Burrowing Skink	R	—	—	—	✓	—	L	U	U	U	Prefers riparian areas within higher, cooler, moister, forested systems.
Saproscincus rosei	Orange-Tailed Shade Skink	R	—	—	—	✓	—	L	U	U	U	Shady and weakly sun-lit areas in rainforest and tall moist eucalypt forest at higher elevations.
Insects												
Phyllodes imperialis southern subsp. – ANIC 3333	Pink Underwing Moth	—	E	—	✓	—	—	L	U	U	U	Undisturbed, subtropical rainforest in association with the vine *Carronia multisepalea*.
Fish												
Neoceratodus forsteri	Lungfish	*	V	—	✓	✓	—	L	U	U	U	Introduced to Upper and Mid-Brisbane River. Prefers slow flowing rivers, deep pools with aquatic vegetation.
Nannoperca oxleyana	Oxleyan Pygmy Perch	V	E	—	✓	✓	—	L	U	U	U	Restricted to coastal heath or 'wallum' habitats.

Notes:

^ Denotes threatened species detected by AECOM ecologists within GBTA October 2009.

* Threatened freshwater fish species are discussed in Section 3.10.5.

E: Endangered
V: Vulnerable
R: Rare
M: Migratory

K: Known
L: Likely
U: Unlikely

3.10.3 Essential Habitat

Essential Habitat for *Phascolarctos cinereus* (Koala) and *Crinia tinnula* (Wallum Froglet), both of which are vulnerable under the NC Act (Table 12), is mapped as occurring at GBTA under the VM Act. Habitat areas as mapped under the Queensland Koala Plan are shown in Map 8, Appendix A. Essential Habitat for the Koala occurs within the ELF 2C footprint, as described in Section 3.9.1).

Table 12 Habitat Factors for NC Act listed species, provided by DERM

Name	Regional Ecosystems	Vegetation Community	Altitude	Soils
Phascolarctos cinereus (Koala)	Occurs only in SEQ Bioregion in RE 12.1.1, 12.2.4, 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 12.2.11, 12.3.1, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.6, 12.3.7, 12.3.9, 12.3.10, 12.3.11, 12.3.12, 12.3.14, 12.3.15, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.5, 12.5.6, 12.5.7, 12.5.8, 12.5.11, 12.5.12, 12.7.1, 12.7.2, 12.8.1, 12.8.2, 12.8.8, 12.8.9, 12.8.10, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.19, 12.8.23, 12.8.24, 12.8.25, 12.8.26, 12.9-10.1, 12.9-10.2, 12.9-10.3, 12.9-10.4, 12.9-10.5, 12.9-10.6, 12.9-10.7, 12.9-10.8, 12.9-10.10, 12.9-10.11, 12.9-10.12, 12.9-10.13, 12.9-10.14, 12.9-10.15, 12.9-10.17, 12.9-10.18, 12.9-10.19, 12.9-10.20, 12.9-10.21, 12.9-10.23, 12.9-10.24, 12.11.2, 12.11.3, 12.11.5, 12.11.6, 12.11.7, 12.11.8, 12.11.9, 12.11.14, 12.11.15, 12.11.16, 12.11.17, 12.11.18, 12.11.19, 12.11.20, 12.11.21, 12.11.22, 12.11.23, 12.12.2, 12.12.3, 12.12.4, 12.12.5, 12.12.6, 12.12.7, 12.12.8, 12.12.9, 12.12.11, 12.12.1 2, 12.12.14, 12.12.15, 12.12.20, 12.12.21, 12.12.22, 12.12.23, 12.12.24, 12.12.25, 12.12.26, 12.12.27, 12.12.28	Open (structurally complex with mixture young/mature/old growth, especially 30-80cm diameter), mixed (rich in number and species diversity of food trees) eucalypt forest and woodland at lower altitude in undulating country on relatively deep and usually high nutrient soil (main species - *Eucalyptus tereticornis*, *E. fibrosa*, *E. propinqua*, *E. umbra*, *E. grandis*, *E. microcorys*, *E. tindaliae*, *E. resinifera*, *E. populnea*; *E. robusta*, *E. nigra*, *E. signata*).	0–1,000 m.	

Name	Regional Ecosystems	Vegetation Community	Altitude	Soils
Crinia tinnula (Wallum Froglet)	Occurs only in SEQ Bioregion, in RE12.2.5, 12.2.7, 12.2.9, 12.2.10, 12.2.12, 12.2.15, 12.3.4, 12.3.5, 12.3.6, 12.3.12, 12.3.14, 12.5.10.	Vegetation community is a mandatory Essential Habitat factor for this species. Permanent to ephemeral acidic (pH 4.3 - 5.2), soft freshwater in *Melaleuca* (e.g. *M. quinquenervia*) swamps, sedge land, wet and dry heath land (e.g. *Banksia robur*, *Xanthorrhoea*) and wallum (*Banksia aemula* scrubland/woodland) areas coastal lowlands on sand or sandstone, occasionally in adjacent open forest/woodland (e.g. *Eucalyptus racemosa*, *Corymbia citriodora*) with heathy understorey; known to persist in small remnants (<10ha); may be found well away from water.	0–200 m.	Sandy and sandy-alluvial

Koala Habitat

In SEQ, the Koala is under increased threat from development and removal of habitat. The SEQ Koala population is listed as Vulnerable under the NC Act, and planning provisions to protect Koala habitat have been developed under Queensland's *Sustainable Planning Act 2009* (SP Act).

The *South East Queensland Koala State Planning Regulatory Provisions* (SEQ Koala SPRP) target the areas where Koalas are known to be under the most significant risk from habitat reduction. GBTA is outside the area controlled under the SEQ Koala SPRP, so it does not apply to the proposed clearing for ELF 2C at GBTA.

State Planning Policy 2/10 South East Queensland Koala Preservation (Koala SPP) complements the SEQ Koala SPRP. The Koala SPP significantly expands the area within SEQ that must incorporate Koala conservation and habitat protection outcomes into planning decisions. A key goal of the Koala SPP is to maintain the viability of all major Koala populations across the region by increasing the size of their habitat. To achieve this, the Koala SPP requires that development must achieve a net gain in bushland habitat through the use of environmental offsets and other mechanisms, incorporating at a minimum, the requirements of the *Offsets for Net Gain of Koala Habitat in SEQ Policy*.

Under the Koala SPP, GBTA's remnant vegetation is mapped as Medium and Low Value Koala Bushland Habitat, as shown in Map 10, Appendix A. Furthermore, HVR vegetation at GBTA is mapped as Medium and Low Value Koala Bushland Rehabilitation Habitat, also shown on Map 10.

3.10.4 Site Descriptions

The following sections describe the habitat characteristics of the areas that were surveyed. The fauna habitat characteristics and associated vegetation are described as ranging between poor and excellent. The results of the opportunistic survey are presented in Appendix F. It should be noted that the survey was taken across the study area as a whole.

3.10.4.1 SDTA

The 46.88 ha Driver Training Area included 23.35 ha mapped as HVR vegetation and 23.53 ha mapped as remnant vegetation. Habitat characteristics for native species ranged from poor in the cleared regrowth areas to good to excellent in the remnant areas. Areas considered to be of poor habitat, which were slashed and cleared, contained predominantly native grass species, although identification was difficult because of an absence of seed heads. Native grasses would provide limited food resource for granivorous (grain-eating) species. The regrowth/cleared areas were also considered to provide little in the way of cover for native fauna. Areas with remnant vegetation provided a range of foraging resources for native species, flowering was evident in the canopy, and mid storey and weed species were absent. Tree hollow density was reasonable although there were few large hollows.

3.10.4.2 Range Control, Camp and 25/49 RQR Facilities

The proposed facility locations included both regrowth and remnant vegetation. Habitat characteristics for native fauna species were poor in the regrowth areas and the mapped remnant areas lacking a shrub layer and with slashed understorey. Mature trees provided some forage resource and hollows were evident in several remnant trees. The area exhibits some value for urban tolerant native species.

3.10.5 Aquatic Environment

At the time of the October 2009 sampling event, each site exhibited nil flow conditions. The sites on Oxley Creek (OC) were permanent to semi-permanent pools with substrates generally dominated by sand. The sites on Blunder Creek (BC) were smaller, drying semi-permanent pools with substrates generally dominated by silt, clay, and sand (AECOM, 2009).

In-stream habitats of Blunder Creek (GB3 and GB4) were in better condition than the in-stream habitats of Oxley Creek (GB1 and GB2). Most sites exhibited poor in-stream habitat complexities with little structural habitat attributes suitable to support diverse fish and macroinvertebrate faunal communities. Substrates were generally dominated by sand in Oxley Creek and by sand, silt, and clay in Blunder Creek (AECOM, 2009).

Riparian habitats were generally in good condition, with little evidence of significant erosion and sufficient ground and tree cover. The sites sampled on Oxley Creek were largely permanent to semi-permanent pools. The sites sampled on Blunder Creek were generally smaller, semi-permanent pools, which decreased the extent and diversity of available habitats at the time of assessment (AECOM, 2009).

Macroinvertebrates

Taxa Richness

A total of 579 individuals within 55 taxa were identified to the relevant AUSRIVAS (n=49) and SIGNAL 2 (n=55) taxonomic level. The edge habitat exhibited the highest taxa richness at all sites. The highest taxa richness (31) was recorded in the edge habitats of sites GB2 (OC) and GB3 (BC). The lowest number of taxa (9) was recorded from the bed habitat of GB2 (OC) (AECOM, 2009).

EPT Results

Most sites reported low EPT values, indicating that samples were dominated by disturbance-tolerant taxa. The bed habitat at GB1 (OC) had the highest proportion of EPT taxa (29 %).

The EPT taxa from the edge and bed habitats included mayflies (*Ephemeroptera*) from the families *Baetidae*, *Caenidae* and *Leptophlebiidae*; and caddis flies (*Trichoptera*) from the families *Calamoceratidae*, *Ecnomidae*, *Hydroptilidae* and *Leptoceridae*. No stoneflies (*Plecoptera*) were recorded (AECOM, 2009).

AUSRIVAS Model

Macroinvertebrate data from the October 2009 sampling were modelled using the AUSRIVAS "Queensland–Regional–Coastal–Spring" models for the habitats sampled.

Sites GB1 and GB2 on Oxley Creek and GB3 on Blunder Creek exhibited high overall scores (Band A), which is a favourable reference condition indicating that most or all of the expected families were found. Water qualities and/or habitat conditions were roughly equivalent to reference sites in the model. Water qualities and habitat conditions have not adversely affected macroinvertebrate diversity in the habitats.

GB4 (BC) received an overall score of B. Band B is significantly impaired and lacking in some species that would be expected to occur at the site. It is likely to reflect the low water levels recorded at the site and an associated impairment of the habitats (AECOM, 2009).

SIGNAL 2 results

The SIGNAL 2 scores range from 3.5 to 4.0 for the edge habitats and 3.2 to 4.6 for the bed habitats. The SIGNAL 2 scores indicate a range of conditions from severe pollution (SIGNAL<4) to moderate pollution (SIGNAL 4-5) at the sites and habitats sampled (Chessman, 2003).

Only two samples collected from the edge habitat (GB1 and GB2 on Oxley Creek) indicate favourable macroinvertebrate habitat and the absence of stress factors, such as toxic chemicals and harsh physical conditions.

Both habitat samples of site GB3 (BC) indicate higher levels of turbidity, salinity, or nutrients. However, the higher taxa richness indicates that this site does not reflect a high level of disturbance.

Most samples indicate higher values of SIGNAL 2 but few macroinvertebrate types. Pollution, harsh conditions, and ecological events can lead to the presence of only a few species that are tolerant or adapted to those conditions. The simple habitat complexity demonstrated through the habitat assessment and the drying out of site GB4 (BC) were the most likely factors affecting the low taxa richness (AECOM, 2009).

Freshwater Fish

Eleven species were caught or observed in GBTA, none of which is listed as threatened under the EPBC Act or NC Act. More species were detected in Oxley Creek (GB1 and GB2) than Blunder Creek (GB3 and GB4). A total of seven native and two exotic species were caught in Oxley Creek and four native and one exotic species in Blunder Creek (AECOM, 2009).

3.10.6 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on native fauna include:

- Removal of 67 ha of suitable habitat (but not known habitat) for 12 threatened fauna species
- Removal of 67 ha of known suitable habitat for 2 EPBC Act listed fauna species (Squatter Pigeon and Grey-headed Flying-fox)
- Removal of 13.35 ha of vegetation mapped as Essential Habitat for the Koala
- Removal of 36.79 ha of Medium and Low Value Koala Bushland Habitat and 30.21 ha of Medium and Low Value Koala Rehabilitation Bushland Habitat as mapped under the Koala SPP, and
- Reduced integrity of large areas of suitable habitat for threatened fauna species.

3.11 Invasive Species

In Queensland, the *Land Protection (Pest and Stock Route Management) Act 2002* provides the legislative measures to manage weeds and pests (collectively pests) and address their environmental impacts. There are three categories of declared pests. Class 1, Class 2 and Class 3 promote a particular level of action by governments and landholders. For animal pests, 28 introduced species are not declared as they are mammals commonly kept for commercial or social benefit; non-native mammals, reptiles or amphibians that are widespread but have minimal negative commercial, environmental, or social impacts; and/or there are no cost-effective, broad-scale control measures available.

Management actions required for each Class of pest are:

- Class 1: Landholders must keep their land free of Class 1 pests.
- Class 2: Landholders must try to keep their land free of Class 2 pests.
- Class 3: Landholders must not sell, introduce, or release Class 3 pests.

Under the *Fisheries Act 1994*, an introduced fish may be declared a *noxious fish* under the *Fisheries Regulation 2008*. A noxious fish is one that has been declared as harmful because it is, or may become, a pest to native aquatic communities. Noxious fish have characteristics that are detrimental to other fish, aquatic habitats or humans. Noxious fish cannot be kept, hatched, reared or sold, or taken home for eating or any other purpose.

3.11.1 Weed Species

Weed species recorded near GBTA in database searches or during field surveys are listed in Table 13.

Also highlighted in the table are Weeds of National Significance (WONS). These are the top 20 weeds identified for Australia. WONS were prioritised based on each weed's invasiveness, impacts, potential for spread, and socioeconomic and environmental aspects.

Table 13 Weed species likely to occur at and within 10 km of GBTA

Scientific Name	Common Name	Declaration Status	Source*
Acacia farnesiana	Mimosa Bush	—	1
Alternanthera philoxeroides	Alligator Weed	Class 1 WONS	1, 4
Andropogon virginicus	Whiskey Grass	—	1, 2
Asclepias curassavica	Red-Head Cottonbush	—	1

Scientific Name	Common Name	Declaration Status	Source*
Asparagus falcatus	—	—	1
Aster subulatus	Wild Aster	—	1
Baccharis halimifolia	Groundsel Bush	Class 2	1
Brassica x juncea	Indian Mustard	—	1
Caesalpinia gilliesii	Bird-Of-Paradise Flower	—	1
Callisia repens	—	—	1, 2
Campsis radicans	—	—	1, 2
Centaurea jacea	—	—	1
Chrysanthemoides monilifera	Bitou Bush	WONS	4
Coreopsis lanceolata	—	—	1
Cyperus eragrostis	—	—	1
Cyperus involucratus	Umbrella Sedge	—	1
Cyperus prolifer	Dwarf Papyrus	—	1
Daucus carota	Wild Carrot	—	1, 2
Desmodium uncinatum	—	—	1
Digitaria ciliaris	Summer Grass	—	1
Digitaria violascens	Bastard Summergrass	—	1, 2
Diospyros kaki	Persimmon	—	1
Aichhornia sp.	Water Hyacinth	—	3
Eleusine indica	Crowsfoot Grass	—	1
Eleusine tristachya	Goose Grass	—	1
Eragrostis bahiensis	—	—	1, 2
Eragrostis curvula	—	—	1, 2
Eragrostis paniciformis	—	—	1, 2
Eragrostis pilosa	Soft Lovegrass	—	1
Erythrina crista-galli	—	—	1, 2
Euphorbia milii	—	—	1
Hydrocleys nymphoides	Water Poppy	—	1, 2
Hymenachne amplexicaulis	Hymenachne	WONS	4
Hyparrhenia rufa	Thatch Grass	—	1
Hypochaeris albiflora	—	—	1
Ipomoea quamoclit	Star Of Bethlehem	—	1
Juncus cognatus	—	—	1, 2
Lantana camara	Lantana	WONS Class 3	1, 3, 4
Ledebouria petiolata	—	—	1, 2
Leucaena leucocephala subsp. glabrata	—	—	1, 2
Leucaena leucocephala subsp. leucocephala	Leucaena	—	1
Neptunia plena	Water Mimosa	Class 1	1
Nymphaea caerulea	Cape Waterlilly	—	1
Parkinsonia aculeate	Parkinsonia	WONS	4
Parthenium hysterophorus	Parthenium Weed	WONS	4
Pavonia hastata	Pink Pavonia	—	1, 2
Petrorhagia dubia	—	—	1
Physalis angulata	—	—	1
Pistia stratiotes	Water Lettuce	Class 2	1
Plectranthus amboinicus	Allspice	—	1
Polygala paniculata	—	—	1
Richardia brasiliensis	White Eye	—	1, 2
Rubus alumnus	—	—	1
Salvinia molesta	Salvinia	WONS Class 2	1, 2, 3
Scoparia dulcis	Scoparia	—	1
Setaria pumila subsp. pallidefusca	—	—	1
Setaria sphacelata	—	—	1

Scientific Name	Common Name	Declaration Status	Source*
Sida cordifolia	Flannel Weed	—	1
Solanum chrysotrichum	—	—	1, 2
Sphagneticola trilobata	Singapore Daisy	Class 3	1
Sporobolus fertilis	Giant Parramatta Grass	Class 2	1
Talinum paniculatum	Talinum	—	1
Thunbergia alata	Black-Eyed Susan	—	1
Verbena aristigera	Mayne's Pest	—	1
Verbena litoralis var. brevibracteata	—	—	1

Notes for Table 13:

* 1: Wildlife Online
2: HERBRECS
3: Observed
4: EPBC Act Protected Matters Database

3.11.2 Introduced Species

The Wildlife Online and EPBC Act Protected Matters Databases indentified 22 non-indigenous animals within 10 km of GBTA. Of these, ten are not declared, four are declared as Class 2, three are noxious fish, four are non-indigenous fish, and one is a notifiable pest.

Mosquitofish (*Gambusia holbrooki*) were caught at all sites and Goldfish (*Carassius auratus*) were observed at site GB1 (OC). No other pest species were directly observed during site investigations.

Pest species and their declaration status is shown in Table 14

Table 14 Pest species likely to occur within 7 km of GBTA

Scientific Name	Common name	Qld Declared Pests
Anas platyrhynchos	Northern Mallard	Not declared
Canis familiaris	Feral dog	Not declared
Capra hircus	Feral goat	Class 2
Carassius auratus	Goldfish	Nonindigenous
Columba livia	Rock Dove	Not declared
Equus caballus	Feral horse	Not declared
Felis catus	Feral cat	Class 2
Gambusia holbrooki	Mosquitofish	Noxious fish
Lonchura punctulata	Nutmeg Mannikin	Not declared
Misgurnus anguillicaudatus	Oriental Weatherloach	Noxious fish
Oreochromis mossambicus	Mozambique Mouthbrooder	Noxious fish
Oryctolagus cuniculus	Rabbit	Class 2
Passer domesticus	House Sparrow	Not declared
Poecilia reticulate	Guppy	Nonindigenous
Puntius conchonius	Rosy Barb	Nonindigenous
Rhinella marinus	Cane Toad	Not declared
Solenopsis invicta	Red Imported Fire Ant	Notifiable pest under the *Plant Protection Act 1989*
Streptopelia chinensis	Spotted Dove	Not declared
Sturnus tristis	Common Myna	Not declared
Sturnus vulgaris	Common Starling	Not declared
Vulpes vulpes	Red Fox	Class 2
Xiphophorus helleri	Swordtail	Nonindigenous

Red Imported Fire Ant

The Red Imported Fire Ant (RIFA) is an imported pest that could spread to large areas of Australia, severely damaging the environment, agriculture, and tourism industries. The National Fire Ant Eradication Program was established to eradicate RIFA from Australia. Surveillance is ongoing, and treatment and containment measures are continuing in areas of SEQ where RIFA has been detected. Under the *Plant Protection Act 1989*, RIFA is a notifiable pest and suspected sightings must be reported to Queensland Department of Employment, Economic Development and Innovation (DEEDI) (DEEDI, 2009).

Areas surrounding the Classification Ranges and the northwest part of GBTA, including Range Control and the MTR-B are all within the RIFA Restricted Area, as shown in Map 9, Appendix A. Regulations apply to commercial operations that move high-risk materials within and out of the RIFA Restricted Area or disturb soils within the RIFA Restricted Area.

Key points about the regulations are (DEEDI, 2009):

- A site inspection must be conducted by a DEEDI Inspector or an approved person prior to disturbing more than 1m^3 of soil.
- Businesses must not move RIFA infested material outside the Restricted Area without the approval of a DEEDI Inspector and only to approved disposal sites within a restricted area. Infested soil may only be moved to a DEEDI approved disposal site.
- All high-risk materials must be treated before being moved out of the Restricted Area.
- Materials not infested with RIFA may be disposed of within the restricted area using approved disposal sites only.
- A business must operate under an Approved Risk Management Plan (ARMP) or use a 'Fire Ant Declaration' form to move high-risk materials (unless otherwise exempt or directed).
- All materials moved from within the Restricted Area must be accompanied by a movement certificate or 'Fire Ant Declaration' form.

Defence has an ARMP to minimise the risk of spreading RIFA.

3.11.3 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on introduced species include:

- Introduction or spread of invasive species during construction (especially RIFA), and
- Introduction or spread of invasive species during operation, particularly movements of vehicles through GBTA.

3.12 Commonwealth Heritage Values

The extensive natural heritage values of GBTA are demonstrated by its entry in the CHL on 22/06/2004 (Place ID number 105235). It has been listed for two key reasons:

1) *Processes*—GBTA is important for the conservation of old growth forest in SEQ.
Pahl (1990) noted that, with the exception of GBTA, there were few high quality habitat areas for Koalas (*Phascolarctos cinereus*) in the west of Logan City and that GBTA was primarily significant because of its size. He ranked the five most preferred trees by Koalas, locally, in the following order, *Eucalyptus microcorys*, *E. propinqua*, *E. tereticornis*, *E.resinifera*, *E. racemosa*. Koalas at GBTA were found in *E. racemosa* and *E. tereticornis* (Driscoll 1992).

2) *Rarity*—GBTA contains Endangered and Of Concern REs, as listed in the Queensland *Vegetation Management Act 1999*. It is also important for species that are threatened, uncommon, or restricted in the Brisbane area. These REs were once far more prevalent in SEQ but have been severely reduced in area by past clearing for agriculture, forest plantation establishment and urbanisation of coastal regions between the Gold Coast and Noosa.
GBTA is important for species that are threatened, uncommon or restricted in the Brisbane region. For example, the plant *Plectranthus habrophyllus*, which is listed as Endangered both nationally and in Queensland, occurs in the place (DEWHA, 2004).

The CHL values of GBTA recognise environmental values protected under Queensland legislation (remnant vegetation, koala habitat, RE and threatened species). Consequently, the requirements of State legislation should be considered in the assessment of potential impacts.

The CHL entry covers an area of approximately 4,500 ha comprising the whole of the area enclosed by the external boundaries of the training area except a small area in the south. The complete CHL entry is provided in Appendix G. It should be noted, the CHL entry has not been ground truthed, and consequently in the event of inconsistencies, more recent information is expected to be more reliable.

GBTA is a large area of eucalypt forest and woodland with patches of closed vine forest important for maintaining a range of old growth forest types in SEQ. The CHL entry reports three Endangered REs and one Of Concern RE occurring in the place; however, current RE mapping indicates that there are five Endangered and seven Of Concern REs within GBTA. This vegetation was once far more prevalent in SEQ but has been severely reduced in area by past clearing for agriculture, forest plantation establishment and urbanisation of coastal regions between the Gold Coast and Noosa.

As a large area of intact lowland forest in the greater Brisbane region, close to extensive bushland to the south west, GBTA is an important contemporary refuge for species threatened by land clearing. Species dependent on this significant habitat resource area include Native Plectranthus (*Plectranthus habrophyllus*), which is listed as Endangered both nationally and in Queensland, and two fauna species, the Greater Glider (*Petauroides volans*) and the Koala (*Phascolarctos cinereus*).

The topography is gentle with some broad ridge crests and flat, low expanses of 30 m to 40 m, especially around the floodplains of Oxley Creek and a small tributary in the south-eastern corner of the area. Blunder Creek drains much of the remainder of the area and has its headwaters within the area at altitudes of no more than 80m.

The CHL entry reports that eight REs occur within GBTA, including four threatened RE's. However, the REs listed in the CHL entry differ to those in current RE mapping. Current RE mapping for GBTA, based on surveys undertaken for Defence (HLA, 2007), is considered accurate. Table 15 compares the RE reported in the CHL entry with those reported in the Version 6 RE Map.

Table 15 Comparison of RE reported in CHL entry and Version 6 RE mapping

Regional Ecosystem	Status	Reported	
		CHL Entry	RE Map
12.3.1 Gallery vine forest (notophyll vine forest) on alluvial plains	Endangered	✓	×
12.3.3 *Eucalyptus tereticornis* (Forest Red Gum) woodland to open forest on alluvial plains	Endangered	✓	✓
12.5.3 *Eucalyptus tindaliae* and/or *E. racemosa* open forest on remnant Tertiary surfaces	Endangered	×	✓

Regional Ecosystem	Status	Reported	
		CHL Entry	RE Map
12.9-10.12 *Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks	Endangered	×	✓
12.9-10.12/12.9-10.19a *Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks/Open-forest of *Corymbia henryi* ± *Eucalyptus fibrosa* subsp. *fibrosa*, *Corymbia citriodora*, *E. siderophloia*, *E. crebra* and other coastal mesic variants of this RE. Occurs on Cainozoic and Mesozoic sediments	Endangered (Dominant)	×	✓
12.9-10.19a/12.9-10.12 Open-forest of *Corymbia henryi* ± *Eucalyptus fibrosa* subsp. *fibrosa*, *Corymbia citriodora*, *E. siderophloia*, *E. crebra* and other coastal mesic variants of this RE. Occurs on Cainozoic and Mesozoic sediments/*Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks	Endangered (Subdominant)	×	✓
12.9-10.15 Semi-evergreen vine thicket with *Brachychiton rupestris* on sedimentary rocks	Endangered	✓	×
12.3.8 Swamps with *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp	Of Concern	✓	✓
12.9-10.2 *Corymbia citriodora, Eucalyptus crebra* open forest on sedimentary rocks	Least Concern	✓	✓
12.9-10.4 *Eucalyptus racemosa* on sedimentary rocks	Least Concern	✓	✓
12.9-10.5 *Corymbia trachyphloia, C. citriodora, E. crebra*, *E. fibrosa* open forest on quartzose sandstone	Least Concern	✓	×
Mixed forest including *C. citriodora* and *E. siderophloia*	—	✓	✓

Open eucalypt forest occurs on ridges and gentle slopes with mostly grassy understorey. Open *Melaleuca* forests are predominant on the floodplains with grassy or scattered shrub understorey. Mixed open (sometimes closed) forest predominates along creeks with a variable and sometimes dense understorey of heath species, including *Banksia* and sedge. Additional habitat features include grassed open spaces, at least one patch of treeless heath, small patches of woodland with heath understorey and an earth wall dam that provides habitat for a number of waterbirds.

The flowering of canopy trees attracts high numbers of honeyeaters and lorikeets, such as the Fuscous Honeyeater (*Lichenostomus fuscus*) and the Scaly Breasted Lorikeet (*Trichoglossus chlorolepidotus*), and is a major feature of bird activity in the area. Migratory insectivorous birds also use GBTA, including the Black-Faced Monarch (*Monarcha melanopsis*) and Rufous Fantail (*Rhipidura rufifrons*). At least three petaurid gliders are similarly attracted to the sap, nectar, and pollen resources provided by the flowering eucalypts of GBTA. These eucalypts also provide food and habitat for the Greater Glider (*Petauroides volans*) and the Koala (*Phascolarctos cinereus*). Koalas have been found in Scribbly Gum (*E. signata*) and Forest Red Gum.

GBTA provides habitat for at least seven frog species, including the Tusked Frog (*Adelotus brevis*), and at least sixteen reptiles, including the Eastern Water Dragon (*Physignathus leseurii*) and the Frilled Lizard (*Chlamydosaurus kingii*).

The CHL entry indicates that GBTA is underlain by claystone, sandstone, and basalt of the late Jurassic period, and clay, sand, gravel, and silt of the Quaternary/Holocene period. The soil material overlying the bedrock is predominantly clay/sandy clay.

Much of GBTA is undeveloped and well vegetated. The central portion of the training area is comprised of a number of ranges while the outer portions are used as general training areas. At the time of entry to the CHL, much of the land beyond the northern and south-western boundaries of the area was still forested. However, almost all of this has now been developed for residential and industrial purposes.

The closed forest understorey has in many areas been taken over by lantana (*Lantana camara*). Groundsel (*Baccharis halimifolia*), is also scattered throughout the area, mostly in low lying areas and often beneath stands of *Melaleuca*. However, weed control programs by Defence have reduced weed infestations in many areas.

Four species of feral or domestic mammals (fox, cat, horse, pig) have been recorded for the area. However, feral horses were successfully removed from the Training Area in 2008. Within the native vegetation of the area are several mature stands of exotic slash pine on ridges between Blunder and Oxley Creeks. There are also areas of open grassland maintained as firing ranges and as open space under radio masts. An earth wall dam is located in the south-eastern corner of the area and was once used as domestic water supply. It now represents an additional habitat feature that attracts a limited number of birds, reptiles, and frogs.

A Heritage Management Plan is required to better understand and manage the heritage values of GBTA.

3.12.1 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on CHL values include:

- Removal of 36.79 ha of remnant, old growth forest, which is recognised in the CHL value *Processes*
- Removal of 67 ha of suitable habitat for the Koala, which is recognised in the CHL value *Processes*
- Removal of 27.14 ha of Endangered and Of Concern RE, which are recognised in the CHL value *Rarity*, and
- Removal of 36.79 ha of suitable habitat for threatened flora and fauna species, which is recognised in the CHL value *Rarity*.

3.13 Aboriginal Heritage

Prior to European settlement, there is evidence to indicate the Greenbank region was occupied for tens of thousands of years by members of the Jagera, Turrbal, and Yugambeh language groups (Buchanan, 1999). According to Archibald Meston, Protector of Aborigines, the area around current day Browns Plains and the Mount Lindsey Highway was occupied by a clan known as the Yeeroonpan (Steele, 1983, p. 127). The first reported observations of this group occurred when early timber getters, Thomas Pamphlett, John Finnegan, and Richard Parsons passed through the area in the 1820s and found canoes on the banks of the Oxley River (Steele, 1983, p. 135).

3.13.1 Desktop Review

The CHL entry for GBTA does not identify any Aboriginal cultural heritage but notes that places of Aboriginal heritage value may exist within GBTA (ERM, 2009).

The *Aboriginal and Torres Strait Islander Register and Database* (DERM, 2009a) identifies three sites within GBTA and indicates that the Aboriginal parties for the area include the Jagera Daran Pty Ltd, Jagera People #2, and Turrbal People (ERM, 2009). The search results are shown in Table 16 and Map 11 in Appendix A

Table 16 Aboriginal and Torres Strait Islander Register and Database search results

Site ID	Latitude	Longitude	Record Date	Attribute	Aboriginal Party
KB:B52	-27.647999	152.927568	22/06/1981	Earthen arrangement	Jagera Daran Pty Ltd QC003/15 and QC98/26
KB:C11	-27.654316	152.924016	7/02/1994	Artefact scatter	
KB:D14	-27.648911	152.927618	1/03/1993	Earthen arrangement	

A search of the register did not provide a definite result as to whether there is Aboriginal cultural heritage at the project sites as it only contains places that have previously been identified through surveys and research, and therefore may not be a true reflection of the Aboriginal cultural heritage values of the area (ERM, 2009).

While there are no known sites within or close to the proposed development areas, there remains some potential for items of Aboriginal cultural heritage to occur (ERM, 2009).

3.13.2 Site Descriptions

The environmental context of GBTA indicates a likelihood of local Indigenous groups inhabiting the area before European settlement. Based upon the environmental background, historical impacts, regional and local archaeological patterns it is possible to provide a predictive statement for the likely occurrence of Aboriginal sites (ERM, 2009).

Blunder Creek, which is a tributary of Oxley Creek, has its source within GBTA, and a number of temporary water sources exist within this area. There is a high potential for Aboriginal occupation sites to exist close to these water courses, and in particular, Blunder Creek, which is a reliable source of water (ERM, 2009).

There is also a high potential for sites to exist in the western portion of GBTA where two ceremonial sites and one artefact scatter have previously been located (ERM, 2009). The potential for sites of Aboriginal cultural heritage value to occur at proposed development locations is summarised at Table 17.

Table 17 Potential for sites of Aboriginal cultural heritage value at proposed ELF 2C facility locations

Proposed Development	Features of Interest	Potential
Existing Range Entrance Works	Nil	Low
MTR-B	Small watercourse to east and through centre of range	Low-moderate
SDTA	Small temporary watercourse through middle of site	Low-moderate
New Range Control	Nil	Low
Camp	Nil	Low
25/49 RQR Facilities	Nil	Low

3.13.3 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on Aboriginal heritage values include:

- Excavation during earthworks may uncover previously unidentified items of Aboriginal heritage value.

3.14 Historic Heritage

GBTA is not listed on any heritage registers for its historic heritage values.

Greenbank was settled by Europeans early in the 1840s when Peter Jackson and Jack Slack selected land to run horses, and surrounding land was subsequently taken up for cattle grazing, dairying and horse breeding. By 1892, the population in Greenbank had increased to a point where a school was required, and this formally became a State school in 1912. In June 1923, approval was received for the construction of an interstate railway line, which was to pass through a number of pastoral properties at Greenbank, and this was officially opened on 27 September 1930 (ERM, 2009).

The land was previously used for logging and grazing of stock (LCC, 2009). The earliest historical aerials of the site, dating from 1940, show the area as being sparsely vegetated in areas, particularly adjacent the railway line in the east of the site and areas used for grazing in the west. Military training is believed to have commenced at Greenbank during World War Two, and this is corroborated by the additional clearing of a number of pockets of vegetation throughout the 1940s (ERM, 2009).

In 1949, Defence attempted to acquire land at Greenbank for military purposes, but this was met with local opposition. A Progress Association was formed opposing the move (NAA, 1949). Despite protest from the Progress Association, the land resumptions were approved and gazetted by August 1951 (ERM, 2009).

Following its establishment in 1951, Greenbank Army Camp was primarily used for cadet camps. However, plans were made for the rapid expansion of Greenbank following the introduction of National Service in 1951, and the compulsory service of men in the Citizens Military Force (ERM, 2009).

Allocations were made in the 1952 budget for the extension of a Citizen's Military Force camp and rifle range at Greenbank (NAA, 1952-1953). The Department of Army proposed to transport pre-cut timber buildings to the site, and Army personnel were to be used to construct accommodation buildings, an expansion that would allow 2,300 people to occupy the site by April 1953 (NAA, 1952-1953). By 1955, a base had been set up at the southern portion of GBTA (ERM, 2009).

In 1962, plans were made for the establishment of an Australian Communication Army Network Receiving Station at Greenbank (Commonwealth of Australia, Department of Works, Queensland Branch, 1962), which was constructed c1964 (The Australian Army, 2006). This comprised a technical building and married quarters, while the surrounding area was filled with antennas and known as the "antenna farm". This operated until the mid 1970s when these operations were transferred to Enoggera. The technical buildings and married quarters remain at GBTA (ERM, 2009).

Land continued to be resumed for military purposes in the surrounding area to develop Greenbank as a training ground for the regular Army, Army Reserves, and school Cadets in the late 1960s. GBTA continued to expand during the next few decades, and in 1996 was entered in the Register of the National Estate for its natural heritage values, its significance associated with its relatively intact nature as a refuge for wildlife threatened by land clearing (ERM, 2009).

3.14.1 Existing Values

No previous historic cultural heritage studies have been undertaken for GBTA; however, the field survey identified places of historic cultural heritage significance at the SDTA, Camp and 25/49 RQR. Additionally, the construction of the new permanent camp facilities will make the existing H Block redundant, therefore having an indirect impact on the heritage values of this area (ERM, 2009). The locations of items of historic heritage discussed in this section are shown in Map 11 in Appendix A.

3.14.1.1 SDTA

The SDTA contains the original 1960s technical building and married quarters associated with the Signals and Communications Facility that operated until the mid 1970s when the operations were transferred to Enoggera. The remaining buildings have some historical and social heritage value (ERM, 2009).

3.14.1.2 Camp and 25/49 RQR

The Camp is proposed to be located at Accommodation Area L and adjacent to Greenbank Road. Two P1 Huts are at this location. These were prevalent at Defence bases throughout Australia in World War II, but are becoming increasingly rare. The majority of these buildings within GBTA appear to be intact and in good condition, and are still being used for a variety of purposes such as barracks, classrooms, and offices (ERM, 2009).

While these buildings are of cultural heritage significance, they were originally constructed to be temporary buildings during the war; consequently, the remaining P1 Huts at GBTA have been continuously relocated on site. Therefore, while they are significant, the significance is generally associated with GBTA site, and not their current locations (ERM, 2009).

The proposed location for the new camp facilities also contains tent pads and concrete foundations from buildings that occupied the areas from the 1950s until recently. These also have contributory value in demonstrating the past layout of the site (ERM, 2009); however, this is not significant.

3.14.2 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on historic heritage values include:

- Removal of P1 Huts, tent pads and concrete foundations that provide contributory value in demonstrating the past use and layout of GBTA.

3.15 Social and Economic Environment

3.15.1 Social Assessment Study Areas

For the purpose of this Assessment, the Local Community Area is defined as being located within 2 km of GBTA (Map 12, Appendix A). It is recognised that urban and other incompatible uses within a 2 km area from GBTA are at greatest risk of being affected by the proposed GBTA ELF 2C construction work and operations.

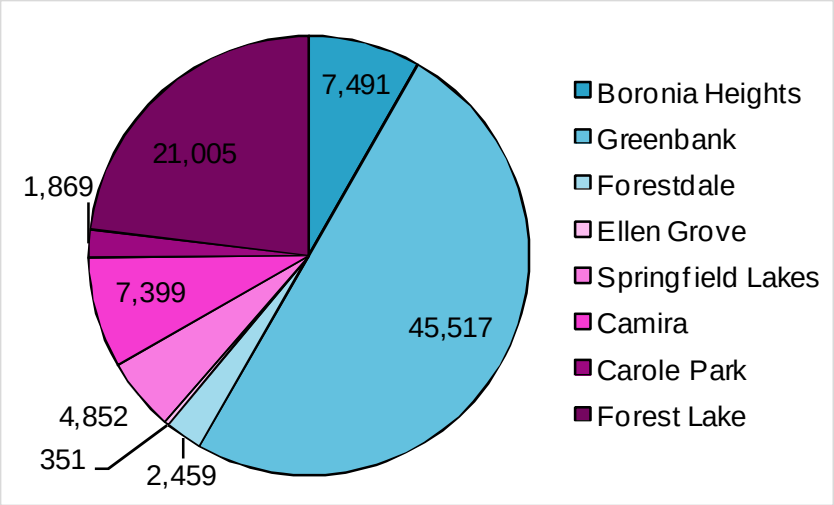
The Broader Community Area is defined as the ABS defined State Suburbs, which adjoin GBTA (Map 12, Appendix A). This Study Area consists of the State Suburbs of Boronia Heights, Greenbank, Forestdale, Ellen Grove, Springfield Lakes, Camira, Carole Park, and Forest Lake.

3.15.2 Socio-Economic Characteristics

An estimate of the Local Community Area population was made by evaluating residential densities under relevant planning schemes and the area of various land use categories within the 2 km buffer area. This method predicted a population within the Local Community Area of between 12,000 and 19,000 persons.

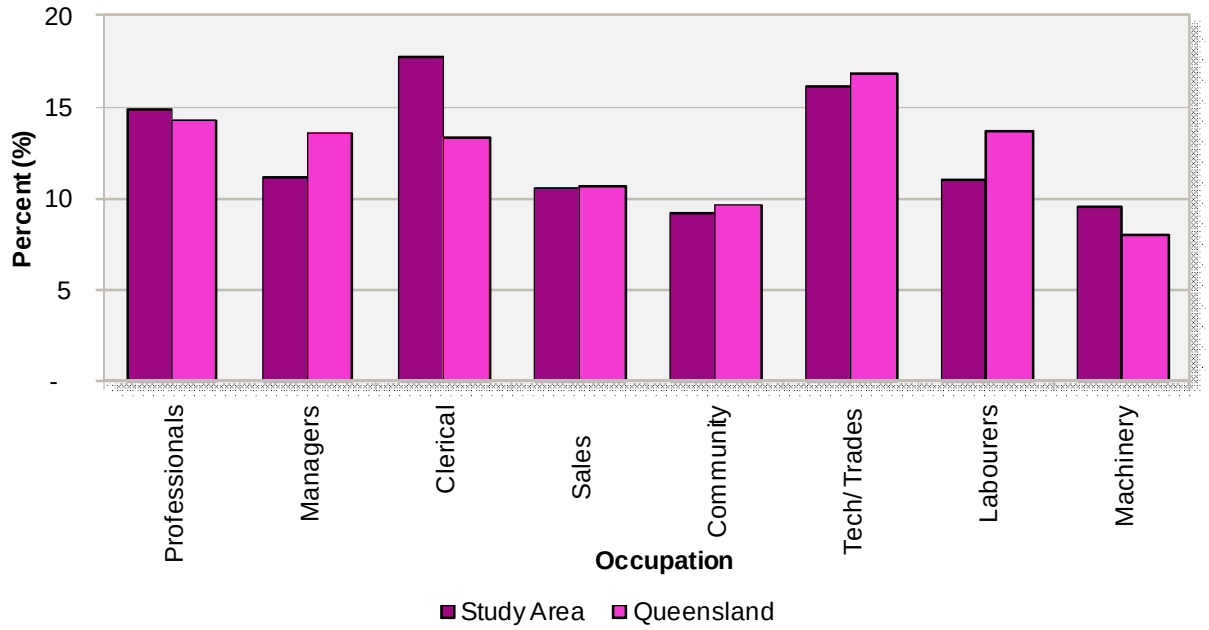
The population of the Broader Community Area at 2006 was approximately 90,943 persons and is provided in Figure 16 (ABS, 2006). Detached dwellings are the predominant housing type (97 %) across the Broader Community Area.

Figure 16 Broader Community Area population



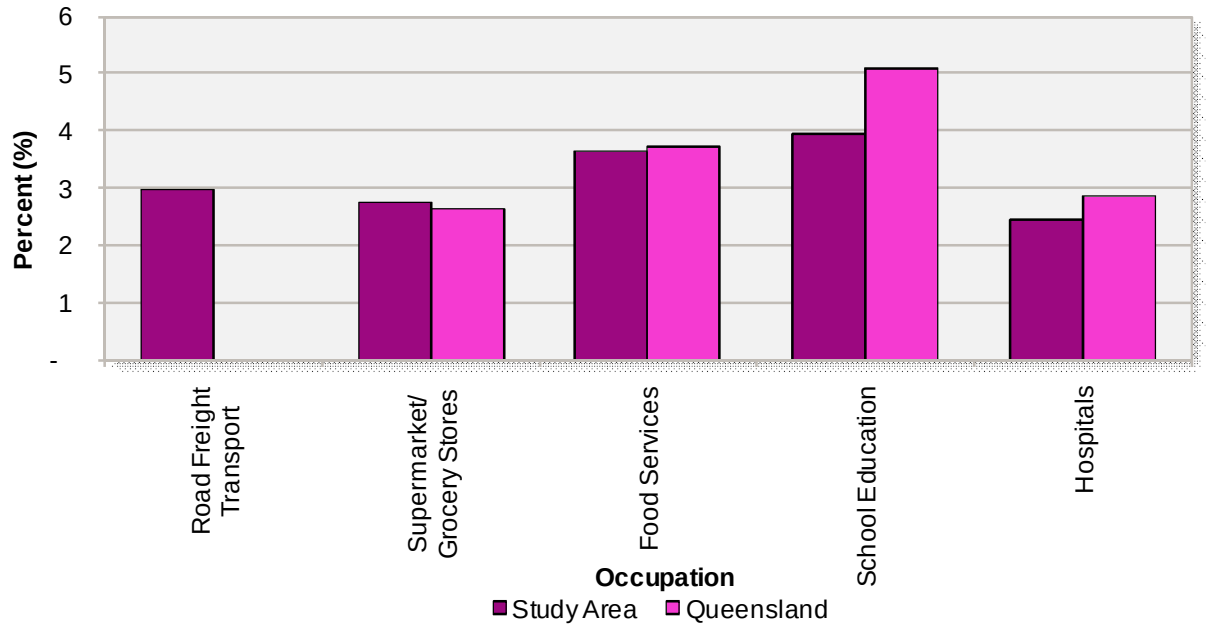
The ABS 2006 Census reported that the primary occupations of residents of the Broader Community Area were clerical or administration roles (17.7 %), a figure notably higher than the Queensland average (13.31 %). Technicians or tradespeople (16.2 %) were the second most common occupation, with a percentage slightly below the Queensland average (16.8 %) (Figure 17).

Figure 17 Occupations in the Broader Community Area



The top five key industries of employment across the Broader Community Area were School Education, Food Services, Road Freight Transport, Supermarket and Grocery Stores and Hospitals (ABS, 2006) (Figure 18). These industries play an important role in supporting the local economy and employment.

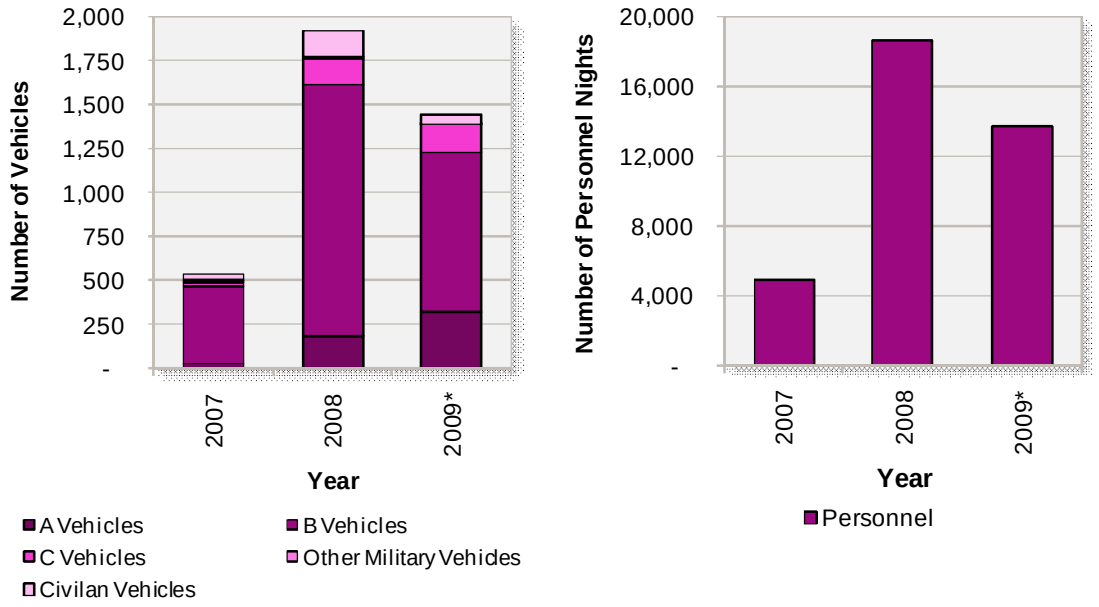
Figure 18 Key industries of employment in the Broader Community Area



3.15.3 Traffic and Access

The GBTA Range Control Officer indicated that the type and number of vehicles entering and leaving the site have generally risen from 2007–2009. Class A These data are displayed in Figure 19 below.

Figure 19 Annual vehicle and personnel numbers from 2007–2009



* 2009 Traffic and personnel numbers to September.
Data provided are indicative only as numbers are based on individual unit or group input. Source: Defence, TASMIS, 2009

A Vehicles: Light road class vehicles (e.g. Landcruiser)
B Vehicles: Heavier armoured vehicles (e.g. PMV, Unimogs)
C Vehicles: Heavy vehicles (e.g. Mack truck)

The Range Control Officer also indicated that use of GBTA is seasonal and varies considerably throughout the year, as reflected by 7 BDE's training and deployment regime. They have highlighted the following patterns of use:

- December and January: low usage with units on stand-down (holiday mode).
- February to April: sub-unit and individual usage is high with groups of 30 to 100 personnel.
- May to July: low to medium level usage, Defence wide exercises held elsewhere.
- August to November: high sub-unit and individual usage with groups of 30 to 100 personnel, and 1,500–2,000 personnel in September for Cadet training.

The Range Control Officer advised that peak access times to and from the site are typically between 7 a.m. to 9 a.m. and 3 p.m. to 5 p.m. It should be noted these coincide with peak hours for drop-off and pick-up at GBSS.

The proposed new entry point is located approximately 290 m north of the existing southern gate, as shown in Figure 20. It is understood that military traffic will travel to the entry point only from the north; however, personal and contractor vehicles may approach from either the north or south. Consequently, it is important to consider the roads both north and south of the proposed entry.

Goodna Road is a two-lane road (one lane each way) with a speed limit of 60 km/h outside the southern entry (GHD, 2010). There is a 40 km School Zone between 0800-0930 and 1430–1600 at GBSS (GHD, 2010). Based on the construction of the road, it is unlikely to withstand heavy axle loading (GHD, 2010); however, this road is expected to be upgraded to urban arterial standard in the future (GHD, 2010).

At the Ipswich City boundary, Goodna Road changes name to the Springfield-Greenbank Arterial (SGA). The SGA is the main arterial road for Springfield Lakes with a speed limit of 60 km/h (GHD, 2010). The SGA is an urban arterial road intended to accommodate heavy vehicles (GHD, 2010).

It is proposed to use the Springfield Parkway to connect from the SGA to the Centenary Highway, which would then be used to travel to RAAF Base Amberley or Gallipoli Barracks.

To the point where the SGA is surrounded by residential housing, there are no dwellings set close to the proposed access roads.

Peak hour traffic reported in a traffic count in 2009 is displayed in Table 18.

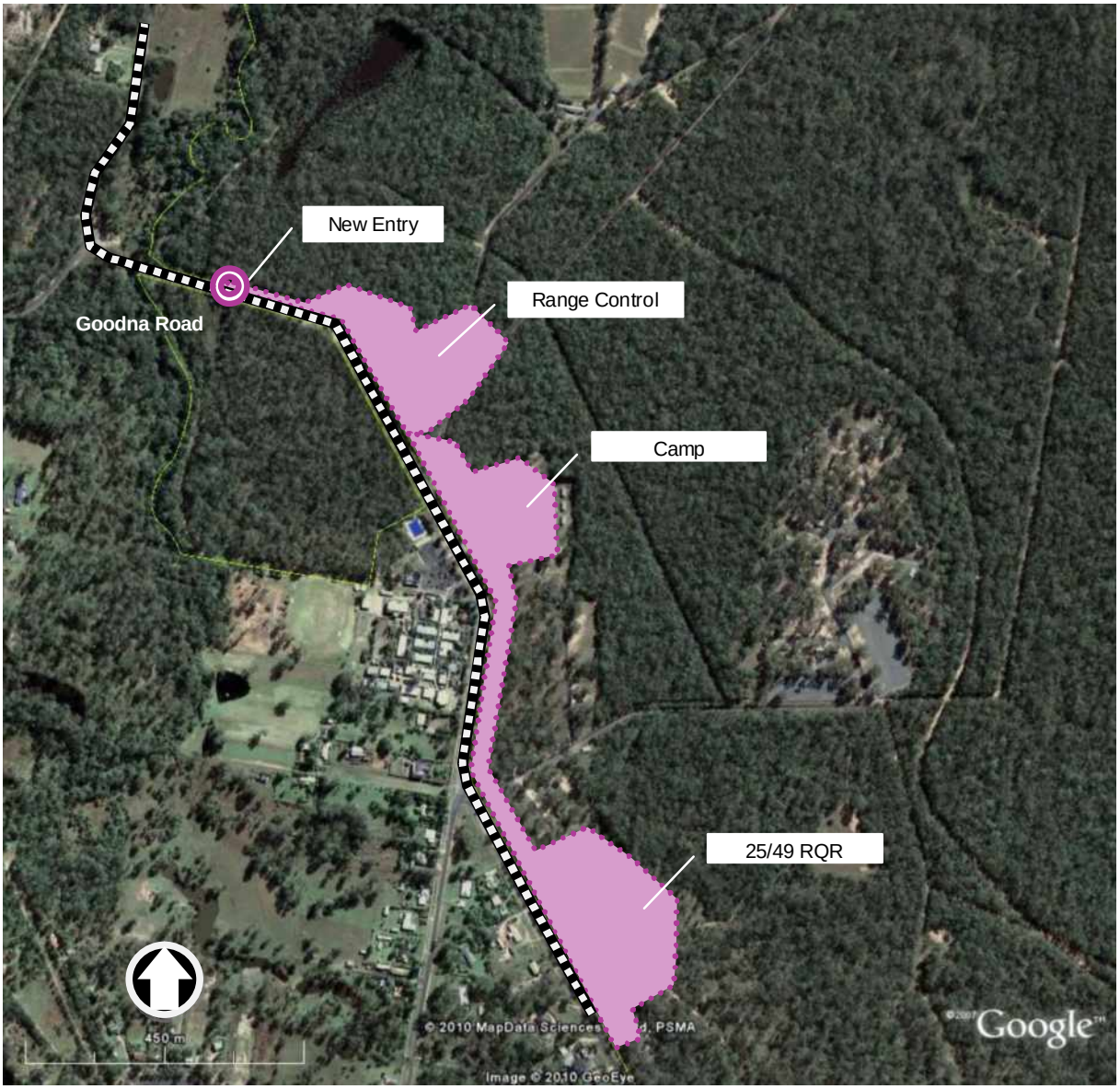
Table 18 Traffic counts for Goodna Rd (GHD, 2010)

		Goodna Rd north of Ison Rd		Goodna Rd, north of the south gate		Goodna Rd, south of the south gate		Old Greenbank Rd, south of New Beith Rd	
		LV[1]	HV[2]	LV	HV	LV	HV	LV	HV
a.m. Peak	Inbound[3]	458	22	450	23	569	17	443	17
	Outbound	178	26	286	26	378	32	501	28
School p.m. Peak	Inbound	235	12	332	25	395	21	468	20
	Outbound	415	34	455	38	665	41	567	36
Commuter p.m. Peak	Inbound	247	10	368	18	353	17	475	17
	Outbound	546	53	572	49	604	62	57	511

Notes:

1. Light Vehicles
2. Heavy Vehicles
3. Northbound

Figure 20 Location of new entry, Range Control, Camp and 25/49 RQR



3.15.4 Noise

Residential areas and sensitive receivers surrounding GBTA are the most susceptible to noise impacts from GBTA activities. High impact noise activities include live-firing, grenade training, and the movement of heavy vehicles to and from the site. However, there is currently no information describing existing noise levels produced by activities at GBTA.

Defence has developed complaint handling procedures that aim to address and resolve noise issues reported by the community. Under these procedures, community members may contact the Range Control Officer, who then notifies the SQ Training Area Manager. The complainant is usually contacted about the issues raised, which are then discussed and appropriate actions for resolution are considered.

3.15.5 Sensitive Receivers

Sensitive receivers are community facilities or particular land uses (e.g. parks, schools, nursing homes) that are sensitive to high impact uses (e.g. industrial areas, processing plants, military uses). A number of community facilities (sensitive receivers) have been identified within 2 km of GBTA. It is important that construction and operation for ELF 2C minimises impacts on the nature of use or persons using these facilities. Existing sensitive receivers within 2 km of GBTA are listed in Table 19, and shown in Map 13, Appendix A.

Table 19 Sensitive receivers within 2 km of GBTA

Sensitive Receiver	Details	Distance from GBTA (m)
Schools	Regents Park Primary School	1,718
	Greenbank State School	95
	Woodcrest College and TAFE	364
	Grand Avenue Primary School	1,001
	Forest Lake High School	1,290
	Forest Lake College	1,457
	Springfield State School	618
	Boronia Heights State School	616
	The Bremer Institute of TAFE	594
	Logan Institute of TAFE	1,959
Parks/Recreation/ Community Facilities	Middle Park	165
	Highland Park	798
	Tovey Park	1,275
	Boronia Bushland Reserve	1,791
	Wineglass Park and Community Centre	1,165
	Butterfly Green	0
	Bob Gibbs Park	74
	O'Dwyers Gully Park	1,517
	Pollard Park	480
	Bennett Park	807
	Camira Recreational Park	147
	Czamecki Park	1,047
	Digi Skate	1,111
Health/ Aged Care	St Paul Chartres Villa Retirement Community	1,699
Churches	Augustinians	1,377
	Church of The Nazarene	1,930
	Grace Family Church	654
	Anglican Church of Australia	1,963
	Uniting Church In Australia	1,037
	Lutheran Church of Australia Queensland District	619
	Presbyterian Church of Queensland	711
	Baptist Union of Queensland	588
	Churches of Christ In Queensland	805
Other	Greenbank Gardens Village	1,752
	Springfield Fair Shopping Centre	353
	Forest Lake Village	1,416
	Logan West Ambulance Station	1,368
	Logan West Fire Station	1,325
	Police Beat	1,378
	Browns Plains Police Station	1,298

3.15.6 Potential Impacts

Potential impacts of the development of the proposed ELF 2C works on the surrounding social and economic environment include:

- Increased noise nuisance for local receptors from construction of the new entry point, Range Control, 25/49 RQR compound and Camp
- Increased noise nuisance from the operation of the SDTA and MTR-B, and
- Increased safety concerns around military vehicles using the new entry point.

3.16 Land Tenure

Map 14 in Appendix A shows the land tenure of GBTA and surrounding areas. GBTA is mapped as Freehold (Non Valued) with the landowner Commonwealth of Australia. Surrounding land parcels are predominantly Freehold, with some areas of Reserve.

3.16.1 Potential Impacts

The proposed ELF 2C works are unlikely to affect the land tenure of GBTA or surrounding properties.

3.17 Land Use

3.17.1 Current Land Use

GBTA is situated on Commonwealth owned land managed by Defence as a military training area. It is important to understand the nature of surrounding land uses to identify the potential existing and future impacts of GBTA on adjacent local communities.

The land directly adjacent to GBTA is currently subject to four separate planning schemes:

- Logan Planning Scheme 2006
- Beaudesert Planning Scheme 2007
- Ipswich Planning Scheme 2006, and
- Brisbane City Plan 2000.

The Beaudesert Planning Scheme applies until a new Logan Planning Scheme is developed for the post 2008 amalgamations boundary.

The application of zoning provisions outlined in the aforementioned planning schemes has generally prevented encroachment of urban uses around GBTA. These provisions have resulted in 'buffer' areas that aim to protect adjacent communities and sensitive receivers from significant impacts associated with GBTA operations.

Based on the *Greenbank Military Training Buffer Area Overlay* in the Logan Planning Scheme, a separation distance of approximately 2 km between urban land uses and GBTA is considered appropriate. Subsequently, a buffer area of 2 km has been applied to assess GBTA and surrounding land uses for land use compatibility and direct community impact.

An assessment of the compatibility of surrounding uses with activities at GBTA is included in Table 20. Land use surrounding GBTA is shown in Map 15, Appendix A.

Table 20 Land uses surrounding GBTA

Planning Scheme	Surrounding Land Uses (Zoning)	'Buffer' Area Details	Existing Potential Community Impacts
Logan	- Public Open Space - Residential 5000 - Residential 600 - Investigation Area	Land uses within approximately 2 km of GBTA are included in the Greenbank Military Training Buffer Area Overlay. This Buffer Area primarily caters for development that is considered consistent with the adjacent GBTA. A specific outcome of the overlay is that 'development is located, sited and designed to ameliorate any adverse impacts from noise, seismic vibrations and sudden intense lighting related to the firing of weapons during day and night operations in GBTA'. Nevertheless, land zoned as Residential 600 (600 m^2 residential lots) is located within this buffer area southeast of GBTA. However, it should be noted that the Brisbane-Sydney freight rail line separates residential and military uses at GBTA.	The buffer area primarily separates urban activities from potential impacts associated with GBTA operations. However, residents within the Residential 5000 and Residential 600 zones may be affected by noise from GBTA operations.
Beaudesert	- Community Facilities - Conservation - Rural Residential - Active Recreation - Passive Recreation	Land uses within 2 km of GBTA are primarily rural residential in nature. Rural residential lot sizes under the Beaudesert Planning Scheme must be a minimum of 2,000 m^2 for lots with houses. This buffer area also contains pockets of community use land that is zoned for community facilities, conservation, and recreation. One sensitive receiver (GBSS) is within this buffer area and is discussed in detail in Section 3.15.	The buffer area primarily separates urban activities from potential impacts associated with GBTA operations. However, residents within the Rural Residential zone may be affected by noise from GBTA. Additionally, as GBSS is close to GBTA, there are most likely existing noise impacts from live firing and other military activities at GBTA.
Ipswich	- Regional Business and Industry (Medium Impact Sub Area) - Regional Business and Industry (Low Impact Sub Area) - Local Business and Industry Buffer - Recreation	Land within 2 km of GBTA acts as a buffer area for nearby Low Density Residential development. The land use character of land directly adjacent to GBTA is industrial (zoned as Regional Business and Industry and Local Business and Industry). A Recreation area is also present in this area. Furthermore, a Local Business and Industry Buffer protects incompatible land uses by separating land zoned as Low Density Residential and Industrial.	The 2 km buffer area and Local Business and Industry Buffer separates urban activities from potential adverse impacts associated with GBTA operations.

Planning Scheme	Surrounding Land Uses (Zoning)	'Buffer' Area Details	Existing Potential Community Impacts
Brisbane	- Emerging Community - Rural Area - Parkland - Low Density Residential - Conservation - General Industry - Future Industry - Environmental Protection	Land located directly adjacent to GBTA under the Brisbane City Plan 2000 is zoned as General Industry, Future Industry, Conservation, and Environmental Protection. Although there are areas zoned as Low Density Residential, Rural, Park Land, and Emerging Community within 2 km of GBTA, the Logan Motorway is located between GBTA and industrial land uses.	Land zoned for Industrial purposes and the Logan Motorway separates urban activities from potential adverse impacts associated with GBTA operations.

3.17.2 Future Land Use

As GBTA is located in a predominantly urban area that is currently undergoing significant redevelopment and population growth, an investigation into future land use patterns in areas surrounding GBTA has been completed.

The SEQRP, Logan Planning Scheme, and Beaudesert Planning Scheme have identified two Investigation Areas close to GBTA (Map 15, Appendix A). These Investigation Areas are the Greenbank Identified Growth Area and Mount Lindsay-Beaudesert Strategic Network Investigation Area and are discussed in Table 21 below.

Table 21 Investigation areas

Investigation Area	Planning Instrument/s	Description of Potential Future Land Use/s	Potential Impacts on GBTA and Community
Greenbank Identified Growth Area (IGA)	Identified Growth Area (Residential & Employment) under the SEQRP 2009–2031 Logan Planning Scheme	Identified Growth Areas are included in the SEQRP for long-term consideration, generally beyond the period of the Plan (i.e. beyond 2036) (DIP, 2009). The Greenbank IGA comprises land that borders the eastern side of Middle Road, extending approximately 1,500 m to the east, and north of the Mt Lindesay Highway. Future investigations will determine the area's cadastral boundaries before being considered for urban use (DIP, 2009). This area may be developed as a residential and employment precinct that benefits from access to a passenger rail system located in the New Beith area (DIP, 2009).	This LGA is located east and within 2 km of GBTA. While residential uses within 2 km of GBTA should be considered incompatible with GBTA operations, the SEQRP regulatory maps show Urban Footprint land use adjoining the GBTA boundary (DIP, 2009). Consequently, there may be an increase in residential dwellings east of GBTA in the long-term (i.e. beyond 2036).

Investigation Area	Planning Instrument/s	Description of Potential Future Land Use/s	Potential Impacts on GBTA and Community
Mount Lindesay-Beaudesert Strategic Network Investigation Area	SEQRP 2009–2031 SEQ Infrastructure Plan & Program Beaudesert Planning Scheme	The Department of Transport and Main Roads (DTMR) is investigating transport options between Brisbane and Beaudesert (Cardno Eppell Olsen, 2009). The Springfield to Greenbank Arterial is under investigation to meet intra-regional travel demands within and between Flagstone, Beaudesert, Yarrabilba, and Bromelton, and in between Ipswich and Beaudesert as well as significant urban development in these regions (Cardno Eppell Olsen, 2009). A passenger rail between Brisbane and Beaudesert is also under investigation to meet future public transport demand. The current option under consideration is to use the exiting Sydney–Brisbane freight line for passenger rail. This passenger rail corridor study is identified as one of the highest priority projects in the Mt Lindesay/Beaudesert Strategic Transport Network Investigation (Cardno Eppell Olsen, 2009).	The rail passenger transport corridor being considered in this investigation is south of GBTA. A section of this corridor (the existing Brisbane-Sydney freight railway) also runs through the eastern portion of GBTA. Development of this corridor would most likely affect Defence operations at GBTA during construction, particularly access to and from the southern entrance of the site along Old Greenbank Road and Teviot Road. Operation of the passenger rail is not expected to have any direct impact on Defence activities.

3.17.3 Potential Impacts

The proposed ELF 2C works are unlikely to have an impact on existing and future surrounding land use.

4.0 Impact Mitigation and Offset Measures

4.1 Design

Mitigation measures adopted in the scope of works and design of the proposed ELF 2C works include:

- Minimising clearing by locating facilities in previously disturbed areas.
- Locating the new entry point and Range Control to reduce potential traffic safety issues.
- Developing a bullet-catcher in the MTR-B to reduce the extent of potential contamination from training with live rounds.
- Developing erosion and sediment control infrastructure in the design of the MTR-B and SDTA to prevent the migration of sediment from the facilities to the downstream environment.
- Developing a new STP to support the Range Control, Camp and 25/49 RQR compound and replace the existing system (which currently discharges to a tributary of Oxley Creek). The new STP will treat water to be reused in toilets and for irrigation at the training area.
- Developing a new vehicle wash bay to reduce the risk of spreading weeds within GBTA.

4.2 Construction

The construction Contractor would be required for prepare a Construction Environmental Management Plan (CEMP), which would be reviewed and approved by Defence before construction commences. The CEMP would include the following:

- An environmental induction and training program for Contractor and subcontractor personnel.
- An Erosion and Sediment Control Plan (ESCP) developed in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008).
- An ARMP to manage the risks of Fire Ants during construction. This would meet all requirements of DEEDI; this would include meeting the requirements outlined in Section 3.11.
- A Traffic Management Plan (TMP), prepared in accordance with the requirements of the Queensland Department of Transport and Main Roads (DTMR). The TMP would give consideration to:
    - Traffic signs and temporary traffic signals
    - Traffic barriers and lighting
    - Traffic controllers for daily operations
    - Speed restrictions through the construction site
    - Provision for pedestrians and cyclists
    - Temporary road closures
    - Maintenance of satisfactory and safe access to property
    - Maintenance of local connectivity or minimise impact
    - Control of Contractor construction vehicles within the road corridor and within GBTA
    - Obtaining a Road Corridor Permit where works extend into the Goodna Road corridor
    - Obtaining a Traffic Control Permit for works in the Goodna Road corridor
    - Ensuring all signage is selected and placed in accordance with the *Manual of Uniform Traffic Control Devices*, and
    - Engaging a Traffic Management Company registered under the TMR Traffic Management Registration Scheme.

- A Dust Management Plan (DMP) to prevent dust causing a nuisance to nearby receptors, particularly GBSS. Requirements for the DMP include:
    - Minimise significant dust generating activities (such as clearing and earthworks) during high wind speeds where practicable on unwatered areas
    - Restrict vehicle speeds on unsealed roads to reduce dust generation
    - Cover haul vehicles moving outside the construction site
    - Stockpiled material should be treated appropriately to prevent wind erosion from the prevailing wind
    - Regularly clean machinery and vehicle tyres to prevent track-out of dust to public roads
    - Revegetate disturbed areas as soon as possible, and
    - Visually monitor dust on a daily basis.
- A Noise Management Plan (NMP) to prevent noise causing a nuisance to nearby receptors, particularly GBSS. Requirements of the NMP include:
    - Complying with AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*
    - Implementing time restrictions on construction works, particularly at Range Control, the Camp and 25/49 RQR, to reduce impacts on GBSS
    - Turning off machinery when not in use
    - Notifying nearby receptors of upcoming construction works, and
    - Implementing a complaint reporting and resolution procedure to report, investigate and resolve noise issues.
- A Heritage Management Plan to ensure that any potential items of cultural heritage significant are identified and protected. Requirements of the HMP include:
    - Observing excavations into natural soil for evidence of items of heritage value
    - Stopping works and notifying the Contractor environmental office if potential items are identified
    - If the environmental office confirms the item as a potential artefact, notifying the Defence Regional Environmental Officer for further directions, and
    - Defence will undertake archival recording of facilities proposed for demolition as deemed necessary to prevent the developmental history of GBTA being lost.
- A Wildlife Management Plan (WMP) to ensure animals are not harmed during clearing. Requirements of the WMP include:
    - Minimising and marking clearing footprints before construction commences
    - Engaging a qualified wildlife spotter/catcher to undertake wildlife clearance surveys immediately before clearing commences, and
    - Where large, old growth or hollow-bearing trees are to be cleared:
        - Clearing the vegetation surrounding tree, but leave to tree standing to allow fauna to move on of their own accord
        - Waiting 2 days after clearing the surrounding vegetation to fell the tree, and
        - Carefully felling the tree and leaving intact on the ground overnight to allow any remaining fauna to escape.

- A Weed Management Plan to reduce the potential for introducing or spreading weeds within GBTA. Requirements of the Weed Management Plan include:
    - Removing existing declared weeds from the project footprints before construction commences
    - Destroying weed material removed from the construction site
    - Mulching disturbed areas with shredded native plant material (which may be sourced from project clearing) to reduce the potential for weed establishment
    - Implementing the ESCP
    - Regularly inspecting and controlling weed infestations within the construction site, and
    - Implementing vehicle washing and cleaning procedure to reduce the introduction and spread of weeds.
- A Materials Handling Plan, detailing the storage, handling and disposal requirements for materials used on site. This must meet the requirements of State and Commonwealth dangerous goods and health & safety legislation.
- An Incident Response Plan describing procedures for responding to and reporting any environmental incident (including spills or leaks).

4.3 Operation

Mitigation measures Defence has committed to implementing during the operational phase of ELF 2C include:

- Implementing a Range Management Plan for the MTR-B, to be developed in accordance with the guidance provided in *Best Management Practices for Lead at Outdoor Shooting Ranges* (USEPA, 2005) and *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges* (NSSF, 1997)
- Regularly maintaining sediment control infrastructure at the MTR-B (covered in the Range Management Plan) and SDTA
- Controlling weeds around the SDTA (and other facilities), particularly in drainage lines, where weed infestation is most likely to occur
- Updating and implementing the Bushfire Management Plan to include the new facilities, and
- Environmental monitoring, including:
    - Continuing the annual water quality monitoring
    - Inspecting and maintaining erosion and sediment control infrastructure, and
    - Inspecting and controlling weeds.

4.4 Compensation Strategy

Defence has considered and propose a number of environmental compensatory developments to help reduce overall impacts to the GBTA environment.

4.4.1 Options Considered

Most of GBTA (97 %) is vegetated by remnant and HVR vegetation, which significantly limits opportunities for offsets within the site. Nevertheless, a number of offset options were considered, including:

- Removal of approximately 53 ha of pine plantation and revegetation to restore surrounding RE
- Decommissioning, removal, remediation and revegetation of the existing STP
- Rehabilitation of Oxley Creek within a 40 m buffer (approximately 34 ha)
- Installation of nest boxes to replace hollows in cleared trees at a ratio of 2:1

A discussion of the offset options considered is provided in the following sections.

4.4.1.1 Rehabilitation of Pine Plantation

Six areas (53 ha) of pine plantation are established at GBTA within the Range Area, which is affected by unexploded ordnance (UXO). Removal and replacement of this pine plantation with native species was considered as an offset measure; however, the considerable cost ($270M–$670 M) associated with UXO clearance of these areas makes this option unfeasible.

4.4.1.2 Rehabilitation of Oxley Creek

Oxley Creek enters GBTA in the south and crosses the Ring Road in the Range Area a short distance from the boundary. Defence had considered erosion remediation works and revegetation around Oxley Creek, which would require the removal of UXO. UXO clearance of the banks would require the removal of all vegetation, including mature trees whose roots would interfere with UXO detection equipment. UXO clearance of the creek bed would require the removal of water, and dredging the creek to the clearance depth. The disturbance cause by UXO clearance was considered to outweigh potential benefits from erosion control and revegetation. Therefore, this was not a practical option.

The Ring Road crosses Oxley Creek near the northern boundary of GBTA. Vehicles crossing this concrete ford have caused erosion of the creek bank in this area. Installation of a culvert crossing in this location would reduce erosive impacts on the creek banks, which would protect riparian vegetation and potential improve downstream water quality. The crossing is outside the Range Area and is therefore clear of UXO, making civil works in this location feasible.

4.4.1.3 Remediation and Rehabilitation of the STP

The existing STP, which includes a number of septic tanks and two waste lagoons, is located on a tributary of Oxley Creek. The STP provides rudimentary treatment of sewage before it is discharged to the tributary. Water quality monitoring indicates the STP is having a negative impact on the downstream aquatic environment. The STP is outside the Range Area, and therefore is not affected by UXO, making civil works feasible.

The disturbed area of the STP covers approximately 1 ha. Remediation and rehabilitation of this area requires:

- Decommissioning of the existing STP: this requires replacement with the new ELF 2C STP and installation of a pump station and rising mains from the existing Accommodation Area H
- Contaminated land investigations and remediation, and
- Revegetation with representative species from surrounding remnant vegetation (RE 12.3.6 and 12.9-10.12).

4.4.1.4 Nest Boxes

As the remnant vegetation to be cleared is likely to require the removal of large hollow-bearing trees, there is the potential for a loss of suitable breeding habitat for a variety of species. To counteract this, it is proposed to install nesting boxes in nearby vegetation. Hollow bearing trees will be identified and recorded by the wildlife spotter/ catcher undertaking pre-clearing surveys (refer Section 4.2). These hollows will be replaced at a ratio 2:1 (i.e. two nesting boxes per hollow removed) within 50 m of the edge of clearing for the relevant facility.

4.4.2 Options Proposed

Of the options considered, some were deemed unfeasible because of UXO clearance requirements. Consequently, the following options are proposed:

- Installation of a culvert crossing on the Ring Road at Oxley Creek
- Remediation and revegetation of the STP, and
- Installation of nest boxes.

5.0 Potential Impacts on Matters of National Environmental Significance

Fieldwork was scaled to provide adequate information to achieve the required assessments in the available timeframe; however, detailed flora and fauna surveys of the proposed facility locations were not possible. Consequently, where suitable habitat for a threatened species was present on site, it was assumed that the species could also be present.

The criteria used to assess the potential for the proposal to have a significant impact on an MNES were those detailed in *EPBC Act Policy Statement 1.1 Significant Impacts Guidelines: Matters of National Environmental Significance*.

Table 22 outlines whether any MNES are present at or near GBTA and the potential impact from undertaking the proposal.

Table 22 Potential impacts on MNES

MNES	Description	Potential Impacts
1) Threatened species and ecological communities	Five Endangered species are likely to occur near GBTA: - Spotted-tailed Quoll - Swift Parrot - Cunningham's Jute - Native Plectranthus - Spiny Gardenia. Four Vulnerable species are likely to occur near GBTA: - Squatter Pigeon (southern) - Grey-headed Flying-fox - Slender Milkvine - Tall Knotweed. No threatened ecological communities are likely to occur within the ELF 2C project footprint.	Clearing may reduce the available habitat for threatened species. Clearing may cause the loss of individuals of the species. Increased training activities may alter suitable habitat for the species by changing fire regimes and trampling.
2) Migratory species	Two migratory species (Black-faced Monarch and Satin Flycatcher) are likely to use foraging resources at GBTA.	Clearing may reduce available foraging and roosting habitat for the species.
3) Wetlands	GBTA is approximately 60 km upstream of the Moreton Bay Ramsar site.	Given the project site's distance from Moreton Bay, and the types of activities proposed, no impacts are anticipated.
4) Commonwealth marine environment	GBTA is not located in or near a Commonwealth marine area	No impact anticipated
5) Great Barrier Reef Marine Park	GBTA is not located in or near the Great Barrier Reef Marine Park	No impact anticipated
6) World Heritage Areas	GBTA is not located in or near a World Heritage Area	No impact anticipated
7) National Heritage Places	GBTA is not located in or near a National Heritage Place	No impact anticipated
8) Nuclear actions	The proposed works do not involve a nuclear action	No impact anticipated

5.1 Critically Endangered and Endangered Species

A detailed assessment for each species against EPBC Act Policy Statement 1.1 is included in Appendix H.

5.1.1 Cunningham's Jute

Cunningham's Jute (*Corchorus cunninghamii*) is listed as Endangered under the EPBC Act. It is an herbaceous plant species with a restricted distribution occurring naturally within a 120 km region between Brisbane and Lismore (Saunders, 2001).

The proposed ELF 2C development is not likely to have a significant impact on Cunningham's Jute, as it is unlikely that a population occurs within the proposed development footprint. The reasons for this assessment are provided in Appendix H.

5.1.2 Native Plectranthus

Native Plectranthus (*Plectranthus habrophyllus*) is listed as Endangered under the EPBC Act. It is known to occur at only six locations in SEQ, between Ipswich and Ormeau (DEWHA, 2008). The total population size is unknown, but some of these sites record only a few plants present (DEWHA, 2008).

The proposed ELF 2C development is not likely to have a significant impact on Native Plectranthus, as it is unlikely that a population occurs within the proposed development footprint. Furthermore, the proposed development would remove less than 1 % of remnant vegetation from GTBA, which is unlikely to cause a significant reduction in available habitat if the species did exist at GBTA. The reasons for this assessment are provided in Appendix H.

5.1.3 Spiny Gardenia

Spiny Gardenia (*Randia moorei*) is listed as Endangered under the EPBC Act. The known range of Spiny Gardenia extends from Lismore in NSW to the Logan River in Queensland. The current distribution and abundance of the species within this range is poorly understood.

The proposed ELF 2C development is not likely to have a significant impact on Spiny Gardenia, because it is unlikely that a population occurs within the proposed development footprint, and the proposed clearing area is not a significant proportion of potentially suitable habitat. The reasons for this assessment are provided in Appendix H.

5.1.4 Spotted-tailed Quoll

The Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) is listed as Endangered under the EPBC Act. It inhabits mature wet forest habitat, especially in areas with rainfall greater than 600 mm/year.

The proposed ELF 2C development is not likely to have a significant impact on the Spotted-tailed Quoll, because it is unlikely that a population occurs within the proposed development footprint, and the proposed clearing area is not a significant proportion of potentially suitable habitat. The reasons for this assessment are provided in Appendix H.

5.1.5 Swift Parrot

The Swift Parrot (*Lathamus discolor*) is listed as Endangered under the EPBC Act. It inhabits dry open Box–Ironbark forests and woodlands. This species breeds in Tasmania and migrates to mainland Australia in autumn.

The proposed ELF 2C development is not likely to have a significant impact on the Swift Parrot, because it is unlikely that a population occurs within the proposed development footprint, and the proposed clearing area is not a significant proportion of potentially suitable habitat. The reasons for this assessment are provided in Appendix H.

5.2 Vulnerable Species

A detailed assessment for each species against EPBC Act Policy Statement 1.1 is included in Appendix H.

5.2.1 Slender Milkvine

Slender Milkvine occurs in SEQ, where it is commonly found in eucalypt forest (Forster P. I., 1995). Scattered populations occur over a range of approximately 250 km from the Gunalda Range, north of Gympie, south to the Great Dividing Range near Killarney, with an estimated area of occurrence of 8,800 km^2 (Halford, 1998).

The proposed ELF 2C development is not likely to have a significant impact on Slender Milkvine, because it is unlikely that a population occurs within the proposed development footprint, and the proposed clearing area is not a significant proportion of potentially suitable habitat. The reasons for this assessment are provided in Appendix H.

5.2.2 Tall Knotweed

Tall Knotweed (*Persicaria elatior*) is known from the North Coast, Central Coast, and South Coast botanical subdivisions of NSW and the Moreton Pastoral District in SEQ (DEWHA, 2008).

The proposed ELF 2C development is not likely to have a significant impact on Tall Knotweed, as it is unlikely that a population occurs within the proposed development footprint. The reasons for this assessment are provided in Appendix H.

5.2.3 Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is a canopy-feeding frugivore and nectarivore, which uses vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands.

The proposed ELF 2C development is not likely to have a significant impact on the Grey-headed Flying-fox, because it is unlikely that an important population occurs within the proposed development footprint, and the proposed clearing area is not a significant proportion of potentially suitable habitat at GBTA. The reasons for this assessment are provided in Appendix H.

5.2.4 Squatter Pigeon

The Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*) prefers grassy woodlands on sandy soils interspersed with low gravelly ridges (DEWHA, 2010d). It is commonly observed in habitats located close to water bodies (DEWHA, 2010d). This species was opportunistically detected at GBTA in October 2009.

The proposed ELF 2C development is not likely to have a significant impact on the Squatter Pigeon (southern), because it is unlikely that an important population occurs within the proposed development footprint, and the proposed clearing area is not a significant proportion of suitable habitat at GBTA. The reasons for this assessment are provided in Appendix H.

There remains the potential for nesting sites to be disturbed during clearing for the proposed ELF 2C facilities. However, this will be mitigated through the implementation of pre-clearing surveys immediately before clearing to identify and remove or protect any threatened species as appropriate (refer Section 4.2).

5.3 Migratory Species

Marine restricted and migratory wetland species are not expected to be affected by the proposed developments, if downstream impacts on marine and wetland environments can be mitigated. Terrestrial migratory species either known or likely to occur within approximately 10 km of the GBTA (Table 11) are Black-faced Monarch (*Monarcha melanopsis*), Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*), Satin Flycatcher (*Myiagra cyanoleuca*), Spectacled Monarch (*Monarcha trivirgatus*), Rufous Fantail (*Rhipidura rufifrons*) and White-bellied Sea-Eagle (*Haliaeetus leucogaster*). Of these species, the Black-faced Monarch and Satin Flycatcher may use habitat of the proposed development areas.

The proposed developments would remove as well as modify available roosting, foraging and possibly nesting habitat for the Black-faced Monarch and Satin Flycatcher. However, habitat for these species is not limited to the development footprints or the broader GBTA. Both species are unlikely to rely on habitat resources of the GBTA. In consideration of the life cycle requirements of these migratory species, it is not considered that they would rely upon the proposed development areas for a significant component of their life cycles. Therefore, it is considered unlikely that the proposal would have a significant impact on migratory species.

A detailed assessment for migratory species against EPBC Act Policy Statement 1.1 is included in Appendix H.

6.0 Potential Impacts on Commonwealth Heritage Values

The MTR-B, SDTA, Camp and 25/49 RQR facilities are within areas of GBTA that demonstrate some historical or ongoing disturbance, for example through clearing for military uses. The alterations in landscape have significantly changed the natural heritage values of these areas to an extent that little or no values remain. Nevertheless, areas surrounding existing disturbance demonstrate individual elements of natural heritage value.

An action is likely to have a significant impact on the heritage values if there is a real chance or possibility that it will cause (DEWHA, 2008e):

- One or more of the heritage values to be lost
- One or more of the heritage values to be degraded or damaged, or
- One or more of the heritage values to be notably altered, modified, obscured, or diminished.

The impacts on the CHL values of these areas by the proposed development are described below.

6.1 Processes

GBTA's CHL values for Processes are:

- GBTA is important for the conservation of old growth forest in southeast Queensland.
- Pahl (1990) noted that, with the exception of GBTA, there were few high quality habitat areas for Koalas (*Phascolarctos cinereus*) in the west of Logan City and that GBTA was primarily significant because of its size. He ranked the five most preferred trees by Koalas, locally, in the following order, *Eucalyptus microcorys*, *E. propinqua*, *E. tereticornis*, *E. resinifera*, and *E. racemosa*. Koalas at GBTA were found in *E. racemosa* and *E. tereticornis* (Driscoll 1992).

The proposed development of the ELF 2C facilities would require the removal of 36.79 ha, or 0.84 %, of remnant vegetation from GBTA. This is not considered a significant proportion of the existing remnant vegetation.

RE mapping indicates 1,746.6 ha of remnant vegetation at GBTA is Essential Habitat for the Koala. The proposed ELF 2C development would require the removal of 13.35 ha (0.76 %) of this Essential Habitat. This is not considered a significant proportion of the available Essential Habitat for the Koala at GBTA.

The proposed development of the ELF 2C facilities would require the removal of 36.79 ha (0.84 %) of Koala Bushland Habitat (Medium and Low Value) and 30.21 ha (31.97 %) of Koala Bushland Rehabilitation Habitat (Medium and Low Value). While removal of over 30 % of Koala Bushland Rehabilitation Habitat appears to be high, this habitat type is considered suitable for revegetation and rehabilitation into Koala Bushland Habitat: it is not recognised as currently containing Koala habitat (although it may contain some Koala food trees). Consequently, the removal of less than 1 % of Koala Bushland Habitat from GBTA is not considered a significant proportion of the existing Koala Bushland Habitat.

It is unclear whether the Koala currently uses habitat at GBTA. The species has not been sighted at GBTA since 1992 (Driscoll, 1992), and no signs of Koala (scats or scratches) were observed during site inspections. Nevertheless, targeted surveys for the species have not been undertaken since 1992.

Overall, the removal of 0.84 % of remnant vegetation and Koala Bushland Habitat and 0.76 % of Essential Habitat for the Koala:

- Is unlikely to cause the CHL value of *Processes* to be lost
- May degrade the CHL value of *Processes*, and
- Is unlikely to cause the notable alteration, modification, obscuration or diminishment of the CHL value *Processes*.

6.2 Rarity

GBTA's CHL values for Rarity are:

- GBTA contains Endangered and Of Concern RE, as listed in the Queensland *Vegetation Management Act 1999*. These RE were once far more prevalent in SEQ but have been severely reduced in area by past clearing for agriculture, forest plantation establishment and urbanisation of coastal regions between the Gold Coast and Noosa.
- It is also important for species that are threatened, uncommon, or restricted in the Brisbane area. For example, the plant *Plectranthus habrophyllus*, which is listed as Endangered both nationally and in Queensland, occurs in the place (DEWHA, 2004).

Table 23 outlines the proposed extent of clearing of Endangered and Of Concern RE as part of the ELF 2C works. Less than 1 % of Endangered and Of Concern RE would be removed under the proposal, which is not considered a significant reduction in area.

No threatened species were identified in targeted threatened flora surveys in 2007 (HLA , 2007) and none were identified within the proposed development sites during site inspections. Furthermore, less than 1 % of available potential habitat would be removed under the proposal. Consequently, the proposed ELF 2C works are not likely to have a significant impact on threatened species or their habitat.

Overall, the removal of 0.99 % of Endangered and Of Concern RE and the removal of 0.84 % of potentially suitable habitat for threatened species:

- Is unlikely to cause the CHL value of *Rarity* to be lost
- May degrade the CHL value of *Rarity*, and
- Is unlikely to cause the notable alteration, modification, obscuration or diminishment of the CHL value *Rarity*.

Table 23 Proposed clearing of Endangered and Of Concern RE as part of ELF 2C

Regional Ecosystem	Status	Area in GBTA (ha)	Area in ELF2C	% Removed
Endangered				
12.3.3 b	E	56.8	5.96	10.49
12.5.3	E	168.2	0.62	0.37
12.9-10.12	E	1,546.10	9.87	0.64
12.9-10.12/ 12.9-10.19a	E	238.8	—	—
12.9-10.19a/ 12.9-10.12	E	106.6	—	—
Sub-Total		**2,116.5**	**16.45**	**0.78**
Of Concern				
12.3.11	OC	223.8	0.51	0.23
12.3.8	OC	3.3	—	—
12.9-10.3	OC	4.8	—	—
12.9-10.7a	OC	10.6	—	—
12.3.11/ 12.3.6	OC	252.5	1.06	0.42
12.3.11/ 12.3.7	OC	52.3	9.12	17.44
12.3.7/ 12.3.11	OC	74.5	—	—
Sub-Total		**621.8**	**10.69**	**1.72**
TOTAL		**2,738.3**	**27.14**	**0.99**

7.0 Potential Impacts on the Commonwealth Environment

7.1 Decommissioning Existing Infrastructure

The following facilities will be decommissioned:

- The existing Range Control complex will be demolished
- The 1960s technical building and married quarters associated with the Signals and Communications Facility will be demolished
- Concrete tent slabs in Accommodation Areas L and J will be demolished
- P1 huts in Accommodation Areas L and J will be demolished or relocated on site.

7.1.1 Historic Heritage

A number of buildings within the proposed development footprint that are to be demolished were assessed to contain historic heritage values, which would be affected by the proposal.

While the former Signals and Communications facility has suffered some neglect since the transfer of the operations to Enoggera in the 1970s, the buildings have some social and historical values. The historical record of the facility will be maintained in archival recording.

Demolition of the existing P1 huts will have an impact on the site's historical heritage values. Similarly, demolition of existing tent slabs and concrete foundations will remove historical evidence of the layout of the site. The historical record of these facilities will be maintained in archival recording.

7.2 Construction and Operation

Developing the proposed ELF 2C facilities will require modification of existing disturbed areas and greenfield sites. Potential impacts from construction and operation of the proposed facilities are discussed below.

7.2.1 Regional Context

As outlined in Section 3.3, GBTA has a number of environmental attributes that make the property environmentally significant in the region, which are recognised in both the Queensland and local government planning schemes. These attributes include:

- Its inclusion in the Directory of Important Wetlands
- Its designation as an area of high ecological significance in the SEQRP
- Its classification as a Conservation Zone in the Logan Shire Plan
- Its role in the Flinders Peak to Greenbank/Karawatha regionally significant fauna corridor
- The presence of Endangered and Of Concern RE
- Areas mapped as Essential Habitat for the Koala (*Phascolarctos cinereus*) and Wallum Froglet (*Crinia tinnula*).

Development at GBTA has the potential to have an impact on each of these attributes, as outlined below.

Important Wetland

Three key areas for protection are (EPA, 2005):

1) The Blunder Creek catchment

2) Remnant patches of closed forest beside Oxley Creek (closed forest remnants are extremely scarce around Brisbane), and

3) The floodplain containing billabongs: melaleuca forests and billabongs of the floodplain are significant because of their relative scarcity regionally and the added diversity of habitat that they represent.

Closed forest and melaleuca forest contribute greatly to maintaining the species diversity in the region, particularly for fauna (EPA, 2005).

Several drainage lines are affected by the proposed works, including:

- Two drainage lines of Blunder Creek that cross the proposed MTR-B, and
- A drainage line that crosses the proposed SDTA site; this drainage line discharges to Oxley Creek approximately1.5 km downstream of the SDTA.

There are likely to be localised changes to the hydrology of these drainage lines.

RE that may contain wetland occurs in the proposed MTR-B (0.62 ha) and SDTA (14.24 ha) development footprints. There are no drainage lines or mapped wetlands within the Range Control, 25/49 RQR or Camp. Closed forest was not identified in the proposed development locations.

As the proposed facilities are generally away from the floodplains of Blunder and Oxley Creeks, they are not likely to have a significant impact on the wetland values of GBTA.

High Ecological Significance Area

GBTA is mapped as a high ecological significance area under the SEQRP (which indicates it has significant biodiversity values) and a Conservation Zone under the Logan Planning Scheme. Relevant policies under the SEQRP for high ecological significance areas include (DIP, 2009):

- Avoid impacts on areas with significant biodiversity values in the Regional Landscape and Rural Production Area, including biodiversity corridors
- Where impacts on areas with significant biodiversity values cannot be avoided, offset impacts in accordance with the principles of the *Queensland Government Environmental Offsets Policy* and relevant specific issue offset policies, and
- Within biodiversity networks, protect significant biodiversity values, improve ecological connectivity, enhance habitat extent and condition, and rehabilitate degraded areas.

The proposed ELF 2C works require the removal areas of remnant and HVR vegetation. While this is not consistent with the SEQRP policies, the proposed clearing is only 1.5 % of the total vegetated area of GBTA. This is not likely to have a significant impact on the ecological significance values of GBTA.

Flinders Peak to Greenbank/Karawatha Fauna Corridor

The SEQRP (DIP, 2009) aims to avoid impacts on areas with significant biodiversity values in the Regional Landscape and Rural Production Area, including biodiversity corridors.

The proposed ELF 2C works require the removal of 36.79 ha of remnant and 30.21 ha of HVR vegetation; this is approximately 1.5 % of the total vegetated area of GBTA. Each of the proposed facilities are adjacent to or incorporate areas that have experience previous disturbance (i.e. are non-remnant or HVR vegetation), and no fragmentation of vegetated areas is anticipated.

Given that the proposed cleared areas are relatively small and do not fragment existing habitat, the proposed ELF 2C facilities are not likely to have a significant impact on the Flinders Peak to Greenbank/Karawatha Fauna Corridor.

Endangered and Of Concern RE

Under Queensland legislation, clearing of Endangered and Of Concern is regulated. The *Regional Vegetation Management Code for South East Queensland Bioregion-Version 2* (VM Code) generally prohibits clearing Endangered RE unless it is for public safety.

The SEQ NRMP includes an objective to have at least 4 % of the original pre-clearing extents of vulnerable RE represented in protective measures.

As discussed in Section 6.2, less than 1 % of the Endangered and Of Concern RE present at GBTA would be cleared to develop the proposed ELF 2C facilities. This is not considered to have a significant impact on Endangered and Of Concern RE at GBTA.

Although 9.87 ha of RE 12.9-10.12, which has no representation in reserves is proposed to be cleared, the proposed offset strategy provides for the rehabilitation of an approximately 16 ha patch of pine plantation surrounded by RE 12.9-10.12, providing an eventual net gain in the RE.

Consequently, the proposed ELF 2C works are not likely to have a significant impact on this value.

Essential Habitat

Essential Habitat for Koala and Wallum Froglet is mapped as occurring within GBTA.

In SEQ, Koalas are under increased threat from development and removal of habitat. The SEQ Koala population is listed as Vulnerable under the NC Act, and planning provisions to protect Koala habitat have been developed under Queensland's SP Act.

Under the *Koala SPP*, remnant vegetation in GBTA is mapped as Medium and Low Value Koala Bushland Habitat, and regrowth areas are mapped as Medium and Low Value Bushland Rehabilitation Habitat.

As discussed in Section 6.1, the proposed development of the ELF 2C facilities would require the removal of 36.79 ha (0.84 %) of Koala Bushland Habitat (Medium and Low Value) and 13.35 ha (0.76 %) of Essential Habitat. This is not likely to have a significant impact on the existing Koala habitat at GBTA.

7.2.2 Surface Water and Hydrology

Drainage lines flow through the proposed MTR-B and SDTA. Consequently, water in these areas is at greatest risk of being affected by the proposal. Potential impacts include:

- Sediment pollution in surface water flowing through the sites
    - Each of the proposed facilities will undergo extensive disturbance during construction, including clearing relatively large areas. Exposed soils will be susceptible to erosion, and sediment from the sites may contaminate runoff from the sites and subsequently downstream waterways. The Contractor will be required to implement an Erosion and Sediment Control Plan (refer Section 4.2), which would prevent downstream impacts in normal circumstances.
- Sediment may accumulate in downstream waterways
    - Sediment accretion in downstream waterways may change the flow conditions and smother in stream vegetation. In addition, sediment may be mobilised in later flow events, causing sediment pollution of the surface water. The Contractor will be required to implement an Erosion and Sediment Control Plan (refer Section 4.2), which would prevent downstream impacts in normal circumstances.
- Surface waters may be polluted by spills or leaks
    - Spills or leaks of fuels or other chemicals used during construction or operation may contaminate surface waters. While a spill directly into a waterway is unlikely, contaminated surface sediments may be transported into downstream waterways. A spill or leak is most likely to occur at the SDTA, where vehicles are used during training activities. Sediment control infrastructure incorporated into the design of the SDTA (refer Section 4.1) would help to prevent downstream impacts in the event of a spill or leak.

- Surface water may be polluted by metals from live firing ranges
    - Runoff from the proposed stop-butt at the MTR-B may contain heavy metals, which could pollute downstream waterways. Sediment control (refer Section 4.1) and regular maintenance (refer Section 4.3) would help to prevent downstream impacts.

As discussed in Section 3.9.1.3, GBTA is listed in the Directory of Important Wetlands. Blunder Creek, the Oxley Creek floodplain and *Melaleuca* swamps were identified as being particular aspects of importance (EPA, 2005). The SDTA is within the floodplain of Oxley Creek (refer Map 3). In addition, the MTR-B and SDTA are in areas mapped as including RE that may include wetlands. Potential impacts on these values are discussed in Section 7.2.1.

The SDTA's location in the Oxley Creek floodplain and the presence of an ephemeral waterway through the site indicates that in stream and overbank flows may be an issue. As the entire catchment upstream of the SDTA is within GBTA, potential tailwater effects from the facility would only affect Defence lands. In any case, the development of an SDTA would be unlikely to have a significant effect. However, the facility may experience some damage from flows in the ephemeral waterway, and potentially on the creek hydrology from overbank flow from the ephemeral waterway and Oxley Creek in flood conditions.

Two drainage lines cross the MTR-B. Both drain a small area to the west of the BSR, as shown in Map 3. Potential tailwater effects from developing the facility would only affect Defence land. However, the facility may experience some damage from flows in the drainage lines in high rainfall events. Consequently, the design of the MTR-B places built infrastructure above the 1 in 100 year flood level.

The new Camp and Range Control facilities are likely to generate an increased volume of wastewater, which will be treated at a new on-site STP and reused for toilet flushing and irrigation. Currently effluent undergoes rudimentary treatment before being discharged into a tributary of Oxley Creek. The proposed STP and recycling is likely to improve water quality in the tributary.

The Vehicle Wash Point has the potential to affect surface water through the release of sediment, oils and greases, and detergents into the environment. The risk is considered low, given the proposed environmental controls including water treatment and recycling, and the facility's location approximately 500 m from the nearest watercourse.

7.2.3 Soils and Geology

Each of the proposed facilities will undergo extensive disturbance during construction, including clearing relatively large areas, and exposed soils will be susceptible to erosion. Erosion during construction may lead to the loss of topsoils, and potentially increase rehabilitation costs on completion. Eroded sediments may also accumulate in downstream areas, as discussed in the previous section. Potential erosion issues will be managed by the implementation of an ESCP in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008) (refer Section 4.0).

The proposed SDTA will have relatively large areas of exposed soils during operation. In addition, the soils will experience ongoing disturbance from vehicle movements during training activities, which may exacerbate erosion. The current proposed Off Road/Class 4 area at the SDTA may be at particular risk of erosion during operation, as this area is located on Hydrosols and vehicle movements are likely to disturb topsoils. Sediment control is included in the design of the SDTA as described in Section 4.1.

Soil compaction is likely to occur at the SDTA where frequent vehicle movements are conducted. To prevent impacts on surrounding vegetation, vehicle movements will be restricted to formed tracks.

Spills or leaks of fuels or other chemicals used during construction or operation may contaminate surface soils. In addition, contaminated surface sediments may be transported into downstream waterways. A spill or leak is most likely to occur at the SDTA, where vehicles are used during training activities. Fuel and chemical handling procedures in combination with spill response procedures would help to prevent and address potential contamination from spills or leaks.

Surface soils may be polluted by heavy metals from live firing at the MTR-B. The proposed stop-butt will limit the extent to which soils at the range are contaminated. Regular maintenance and de-leading of the stop butt will also prevent environmental contamination (refer Section 4.3).

7.2.4 Flora

Developing the proposed ELF 2C facilities will require 67 ha of remnant and regrowth vegetation to be cleared. Clearing this area has the potential to affect regional values of GBTA, as discussed in Section 7.2.1. In addition, it may affect threatened species and vegetation communities. Construction and operational activities also have the potential to introduce weeds and diseases. These aspects are discussed below.

7.2.4.1 Regional Ecosystems and High Value Regrowth

Table 24 below lists the areas of RE and HVR vegetation potentially affected by the proposed works at GBTA.

The proposed clearing for ELF 2C has been minimised by selecting development locations that contain areas of previous disturbance (refer Section 4.1). Nevertheless, the proposed works would require 36.79 ha of RE and 30.21 ha of HVR vegetation to be cleared; this is approximately 1.5 % of the total vegetation at GBTA, which is not considered significant. The proposed clearing will affect three RE listed as Endangered under the Queensland VM Act:

- RE 12.3.3 5.96 ha (10.49 %).
- RE 12.5.3 0.62 ha (0.37 %).
- RE 12.9-10.12 9.87 ha (0.64 %).

This is a total of 16.45 ha, which is not likely to be a significant impact in the context of GBTA.

Table 24 Regional Ecosystems that occur within the proposed ELF 2C development footprint

Vegetation Community	VM Act Status	Extent (ha)				Area to be Cleared (ha)						Total	
		In Reserves	Bioregion	GBTA	% in GBTA	MTR-B	SDTA	Range Control	Camp	25/49 RQR	Roads*	Area (ha)	% of GBTA
Regional Ecosystems													
12.3.3	E	L	962.70	56.80	5.90%	—	5.96	—	—	—	—	5.96	10.49%
12.5.3	E	M	4,589.70	168.20	3.66%	0.62	—	—	—	—	—	0.62	0.37%
12.9-10.12	E	N	2,315.81	1,546.10	66.76%	—	2.93	4.32	1.68	0.36	0.58	9.87	0.64%
12.3.11	OC	M	25,145.07	223.80	0.89%	—	0.40	0.02	—	—	0.09	0.51	0.23%
12.3.11/12.3.6	OC(Dom)	M/H	3,222.11	252.50	7.84%	1.06	—	—	—	—	—	1.06	0.42%
12.3.11/12.3.7	OC(Dom)	L/M	3,844.28	52.30	1.36%	—	9.12	—	—	—	—	9.12	17.44%
12.9-10.4	LC	M	13,284.37	861.10	6.48%	2.04	—	—	—	—	—	2.04	0.24%
12.9-10.2	LC	H	34,122.26	80.50	0.24%	—	5.12	—	—	2.34	0.15	7.61	9.45%
Sub-total				**4,387.10**		**3.72**	**23.53**	**4.34**	**1.68**	**2.70**	**0.82**	**36.79**	**0.84%**
High Value Regrowth													
Endangered RE				46.30		0.00	10.92	0.00	1.32	0.12	0.01	12.37	26.72%
Of Concern RE				17.60		0.26	11.81	0.00	0.00	0.00	0.01	12.08	68.64%
Least Concern RE				30.60		2.79	0.62	0.00	0.00	2.33	0.02	5.76	18.82%
Sub-total				**94.50**		**3.05**	**23.35**	**0.00**	**1.32**	**2.45**	**0.04**	**30.21**	**31.97%**
Non-remnant*													
Non-remnant				120.40		1.10	1.02	0.00	0.00	0.00	7.89	10.01	
TOTAL				**4,602.00**		**7.87**	**47.90**	**4.34**	**3.00**	**5.15**	**8.75**	**77.01**	

Notes for Table 24:

* Areas of non-remnant vegetation calculated by subtracting areas categorised as HVR vegetation from the total area provided by Version 6

Status:

E: Endangered
OC: Of Concern
LC: Least Concern
Dom: Dominant

Extent in Reserves:

N:	None:	No representation in reserves
L:	Low:	Less than 4 % within reserves
M:	Medium	4–10 % of pre-clearing extent within reserves
H:	High	Greater than 10 % of pre-clearing extent within reserves

Clearing remnant vegetation is regulated under the VM Act, and in SEQ under the SEQ Bioregion VM Code (DERM, 2009). Under the VM Code, the ELF 2C facilities would be considered clearing "for constructing necessary built infrastructure and the clearing for the relevant infrastructure cannot reasonably be avoided or minimised". This clearing is regulated under Part P of the VM Code. The VM Act does not apply to Commonwealth land; however, the *Defence Environmental Policy 2003* dictates that Defence aim to comply with State, Territory and local government legislation and requirements to the extent that these do not conflict with Commonwealth legislative objectives.

Performance Requirements and Acceptable Solutions are detailed for this type of clearing in Part P of the VM Code. Relevant Performance Requirements are detailed in Table 25. The third column in the table indicates whether the proposed ELF 2C works are consistent with the Code.

Assessment against the Code provides a suitable context for assessing the project in a regional context. The proposed ELF 2C works are largely inconsistent with the Performance Requirements of the VM Code.

Table 25 Relevant Performance Requirements under the VM Code for clearing remnant vegetation

Performance Requirement	Acceptable Solution	Assessment of ELF 2C
PR P.1: Limits to clearing for public safety and infrastructure To regulate the clearing of vegetation in a way that conserves remnant vegetation that are RE, does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes—subject to the limitations required to meet PR P.2 to PR P.10—clearing is limited to the extent that is necessary for constructing necessary built infrastructure, if there is no suitable alternative site for the fence, firebreak, road, track or infrastructure.		
PR P.2: Wetlands To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes—assessable vegetation associated with any natural significant wetland and/or natural wetland is protected to maintain: a) Water quality by filtering sediments, nutrients and other pollutants b) Aquatic habitat, and c) Terrestrial habitat.	**AS P.2** P.2.1 Clearing does not occur: a) In any natural wetland b) Within 100 m from any natural wetland c) In any natural significant wetland, and d) Within 200 m from any natural significant wetland.	Clearing at GBTA is inconsistent with this Performance Requirement, as all of GBTA is an Important Wetland.
PR P.3: Watercourses To regulate the clearing of vegetation in a way that does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes—assessable vegetation associated with any watercourse is protected to maintain: a) Bank stability by protecting against bank erosion b) Water quality by filtering sediments, nutrients and other pollutants c) Aquatic habitat, and d) Terrestrial habitat.	**AS P.3** P.3.1 Clearing does not occur: a) In any watercourse, or b) Within 10 m from each high bank of each watercourse with a stream order 1 or 2.	Clearing within 10 m of the drainage lines crossing the MTR-B and SDTA is inconsistent with this Performance Requirement.

Performance Requirement	Acceptable Solution	Assessment of ELF 2C
PR P.4: Connectivity To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes—areas of mapped remnant vegetation are retained that are: a) Of sufficient size and configured in a way to maintain ecosystem functioning, b) Of sufficient size and configured in a way to remain in the landscape in spite of any threatening processes, and c) Located on the lot(s) that are the subject of the application to maintain connectivity to mapped remnant vegetation on adjacent properties.	**AS P.4** P.4.1 Where clearing is less than: a) 10 m wide, or b) 2 ha clearing does not: a) Reduce the width of mapped remnant vegetation to less than 100 m, and b) Occur where the width of mapped remnant vegetation is less than 100 m AND P.4.2 Clearing does not: a) Reduce areas of contiguous mapped remnant vegetation to less than 10 ha b) Occur in areas of contiguous mapped remnant vegetation that are less than 10 ha c) Reduce the width of mapped remnant vegetation to less than 100 m d) Occur where the width of mapped remnant vegetation is less than 100 m e) Reduce the total extent of mapped remnant vegetation to less than 30 %, and f) Occur where the total extent of mapped remnant vegetation is less than 30 %.	Clearing Endangered RE at each of the ELF 2C facilities is inconsistent with this Performance Requirement.
PR P.5: Soil Erosion To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—the effect of clearing does not result in: a) mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding, and b) any associated loss of chemical, physical or biological fertility—including, but not limited to water holding capacity, soil structure, organic matter, soil biology, and nutrients, within and/or outside the lot(s) that are the subject of the application.	**AS P.5** P.5.1 Mechanical clearing only occurs on: a) Very stable soils on a slope less than 30 % b) Stable soils on a slope less than 20 % c) Unstable soils on a slope less than 15 %, and d) Very unstable soils on a slope less than 10 %.	As all proposed facility locations have a slope less than 5 degrees, the proposed works are consistent with this Performance Requirement.

Performance Requirement	Acceptable Solution	Assessment of ELF 2C
PR P.6: Salinity To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—clearing does not contribute to: a) Water logging, or b) The salinisation of groundwater, surface water, or soil.	**AS P.6** P.6.1 Where clearing is less than: a) 2 ha, or b) 10m wide clearing does not occur in any discharge area. AND P.6.2 Where clearing is less than: a) 5 ha, or b) 50 m wide; clearing does not occur: a) In any discharge area, and b) Within 200 m of any discharge area. AND P.6.3 Clearing does not occur in areas greater than 5 ha.	Clearing for the SDTA is inconsistent with this Performance Requirement.
PR P.7: Conserving Remnant Vegetation that are Endangered RE and Of Concern RE To regulate the clearing of vegetation in a way that conserves remnant vegetation that is Endangered RE and Of Concern RE—maintain the current extent of Endangered RE and Of Concern RE.	**AS P.7** P.7.1 Clearing: a) Does not occur in an Endangered RE or an Of Concern RE that is listed in Table 1 of the VM Code, and b) In an Endangered RE or an Of Concern RE that is not listed in Table 1 only occurs where the clearing is less than 10 m wide or 0.5 ha.	Clearing for the MTR-B, SDTA, Range Control and Camp is inconsistent with this Performance Requirement as more than 0.5 ha of Endangered RE will be cleared.
PR P.8: Essential Habitat To regulate the clearing of vegetation in a way that prevents the loss of biodiversity—maintain the current extent of Essential Habitat.	**AS P.8** P.8.1 Clearing does not occur in an area shown as Essential Habitat on the Essential Habitat map.	Clearing Essential Habitat in the MTR-B and SDTA is inconsistent with this Performance Requirement.
PR P.9: Conservation Status Thresholds To regulate the clearing of vegetation in a way that conserves remnant vegetation that are RE and prevents the loss of biodiversity—maintain the current extent of RE listed in Table 2 of the VM Code.	**AS P.9** P.9.1 Clearing in an RE listed in Table 2 of the VM Code, does not occur unless the clearing is less than: a) 10 m wide, or b) 2 ha.	None of the RE mapped as occurring within the ELF 2C footprint is listed in Table 2 of the VM Code; therefore, the proposed works are consistent with this Performance Requirement.

Performance Requirement	Acceptable Solution	Assessment of ELF 2C
PR P.10: Acid Sulfate Soils To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—clearing activities do not result in disturbance of acid sulfate soils or changes to the hydrology of the location that will either: a) Aerate horizons containing iron sulfides; or b) Mobilise acid and/or metals.	**AS P.10** P.10.1 Clearing in land zone 1, land zone 2 or land zone 3 in areas below 5m Australian Height Datum (AHD): a) Is carried out in accordance with an acid sulfate soils environmental management plan as outlined in the *State Planning Policy 2/02 Guideline: Planning and Managing Development involving Acid Sulfate Soils*; and b) Follows management principles in accordance with the Soil Management Guidelines in the *Queensland Acid Sulfate Soil Technical Manual*.	No areas of GBTA are below 5m AHD; therefore, the works are consistent with this Performance Requirement.

Clearing of important regrowth vegetation is regulated under the VM Act (DERM, 2009). Regrowth not shown on the Regrowth Vegetation Map is exempt from the VM Act (DERM, 2009).

The Regrowth Vegetation Code (RV Code) applies to the clearing of regulated regrowth vegetation on freehold and Indigenous land, and leasehold land used for agriculture and grazing if other exemptions do not apply. Clearing that is consistent with the RV Code is exempt. Clearing that does not comply with the RV Code requires approval under the VM Act (DERM, 2009).

The relevant Minimum Requirements for clearing regulated regrowth as described in the RV Code are detailed in Table 26. While Defence is not bound by these, their “Good Neighbour Policy” requires that the development be undertaken with consideration of the intent of the requirements. The third column in the table indicates whether the proposed ELF 2C works are consistent with the Code. The proposed ELF 2C works are largely inconsistent with the RV Code and therefore an offset would be required under the Code.

Table 26 Requirements for clearing on freehold land under the Regrowth Vegetation Code (DERM, 2009)

HVR Vegetation Type	Minimum Requirements	Assessment of ELF 2C
Endangered RE	2.1 2.1.1 Clearing is permitted where an exchange area is provided in accordance with part 4 and the clearing is: a) A patch of vegetation located wholly or partially on a property and is less than 4 ha b) More than 500 m from other areas of remnant vegetation or high-value regrowth vegetation, and c) Not an area: • Of essential regrowth habitat • Within 10 m and 20 m of the defining bank of 1st and 2nd order waterways respectively, or • In or within 100 m of a wetland. 2.1.2 Clearing is permitted if an exchange area is provided in accordance with part 4 and the clearing is to construct necessary built infrastructure and the clearing cannot reasonably be avoided or minimised and the activity is conducted in a manner consistent with Schedule 2 of the RV Code.	The proposed ELF 2C works are inconsistent with this Minimum Requirement, as: - All areas of mapped regrowth are within 500 m of remnant vegetation - The MTR-B and SDTA contain areas mapped as essential regrowth habitat and 1st and 2nd order waterways, and - GBTA is mapped as an important wetland.
Of Concern and Least Concern RE	2.2 2.2.1 Clearing is permitted provided the clearing does not occur in areas: a) Of essential regrowth habitat; a) Within 10 m and 20 m of the defining bank of 1st and 2nd order waterways respectively; or b) In or within 100 m of a wetland. 2.2.2 However clearing is permitted in essential regrowth habitat, waterway protection zones, in or within 100 m of a wetland if: 2.2.2a An exchange area is provided in accordance with part 4 and the clearing is to construct necessary built infrastructure, and the clearing for the infrastructure cannot reasonably be avoided or minimised and the activity is conducted in a manner consistent with Schedule 2 of the RV Code.	The proposed ELF 2C works are inconsistent with this Minimum Requirement, as: - All areas of mapped regrowth are within 500 m of remnant vegetation - The MTR-B and SDTA contain areas mapped as essential regrowth habitat and 1st and 2nd order waterways, and - GBTA is mapped as an important wetland.

Schedule 2 of the RV Code (DERM, 2009) requires that:

a) Clearing is limited to the extent necessary to construct necessary built infrastructure and the clearing for the infrastructure cannot reasonably be avoided or minimised; and

b) The effect of clearing regulated regrowth must not result in:

- Mass movement
- Gully erosion
- Rill erosion
- Sheet erosion
- Stream bank erosion
- Wind erosion, or
- Scalding
- Any associated loss of chemical, physical, or biological fertility.

The requirements for exchange areas as described in Part 4 of the RV Code are described in Table 27.

Table 27 Exchange Area requirements under the RV Code (DERM, 2009)

Exchange Area Requirements	Applicability to ELF 2C
4.1: High-value regrowth vegetation or areas shown as a Category C (Category 4) area on PMAV can only be exchanged for: a) Vegetation that would ordinarily be able to be cleared under parts 2.2.1 and/or 2.5.1 of this code, or b) Non-regulated regrowth vegetation that has not been cleared in the last 10 years or is 2 m or more in height.	Vegetation at GBTA is not shown as Category C.
4.2: The ratio of the size of the exchange area to the size of the area cleared must be a minimum of 2:1 (for example an exchange area of 1ha for a clearing area of 0.5 ha).	An exchange area of 60.34 ha would be required; for each ELF 2C facility, this consists of: - MTR-B: 6.10 ha - SDTA: 46.70 ha - Camp: 2.64 ha - 25/49 RQR: 4.90 ha
4.3: Exchange vegetation must be no less than 50 m wide and the total exchange area is a minimum of 1 ha.	Applicable.

7.2.4.2 Threatened Flora

Previous targeted surveys did not locate any threatened flora within GBTA (HLA, 2007). Potential impacts on species listed under the EPBC Act are described in Section 5.0. Therefore, the proposed works would not affect any known populations of State listed threatened flora species. However, the failure to locate any threatened species within GBTA does not exclude the possibility of their occurrence. Consequently, individuals or local populations of threatened species may be affected during clearing to accommodate the proposed facilities. Nevertheless, as there are no known populations within the project area or GBTA and less than 1 % of potentially suitable habitat would be cleared, there is unlikely to be a significant impact on threatened flora species.

7.2.4.3 Weed Species

A feature of the areas inspected across GBTA was the paucity of weed flora. The only declared weed species observed within one of the areas of proposed works was Lantana (*Lantana camara*). The clearing and earthworks associated with construction of the proposed facilities has the potential to introduce or increase the distribution of this and other weed species. Weed control measures will need to be incorporated into the contractor's environmental management plan to prevent spreading weeds or new infestations at GBTA.

Additionally, the movement of vehicles and personnel within GBTA and from other bases and training areas during operation has the potential to introduce or spread weeds at GBTA. The implementation of vehicle cleaning procedures, supported by the proposed vehicle wash point (refer Section 4.1), would reduce the risk of weed introduction.

With appropriate control measures, construction and operation of the proposed facilities is not expected to introduce weeds to an extent that a significant impact occurs.

7.2.5 Fauna

Developing the proposed ELF 2C facilities will require 67 ha of vegetation to be cleared. Clearing this area has the potential to affect regional values of GBTA including areas of important habitat for threatened species, as discussed in Section 7.2.1. Construction and operational activities also have the potential to destroy or degrade habitat, reduce connectivity and introduce pests and diseases. These aspects are discussed below.

7.2.5.1 Destruction of Habitat

The proposed ELF 2C facilities cover an area of approximately 67 ha, including almost 36.79 ha of good to excellent quality habitat in remnant vegetation. The quality of the habitat is attributable to the vegetation's good physical condition, with old growth trees present and minimal weed infestation of the understorey. Although one threatened species was observed during the limited field investigations, the area provides habitat suitable for a number of species listed as threatened under the EPBC Act and NC Act. The 36.79 ha represents 0.84 % of the good to excellent quality habitat provided by remnant vegetation at GBTA. The total disturbance is unlikely to represent a significant loss of habitat at GBTA.

In addition, 30.21 ha of HVR vegetation, representing approximately 31.97 % of HVR vegetation at GBTA, are proposed to be cleared to accommodate the ELF 2C facilities.

Essential Habitat

Areas of remnant and regrowth vegetation are mapped as Essential Habitat for the Koala within the assessment area for ELF 2C. Under the current proposal, approximately 13.35 ha of remnant and 14.86 ha of regrowth Essential Habitat would be cleared to accommodate the ELF 2C facilities. The proposed clearing represents 0.99 % of remnant and 66.97 % of regrowth Essential Habitat for Koalas at GBTA (1.59 % of the total Essential Habitat for the Koala at GBTA). This is unlikely to represent a significant loss of essential Koala habitat within GBTA.

In addition, most of GBTA is mapped as Medium and Low Value Koala Bushland Habitat under the *Koala SPP*. The proposed clearing has the potential to affect the regional values of Koala habitat at GBTA, as discussed in Section 7.2.1. While clearing 0.84 % of remnant vegetation at GBTA may cause a loss of Medium and Low Value Koala Bushland Habitat within GBTA, this is not considered significant.

7.2.5.2 Threatened Fauna Species

A number of EPBC Act listed species potentially occur within the project sites, and potential impacts on these species are described in Section 5.0.

The proposed ELF 2C project sites are likely to provide suitable habitat for a number of species threatened in Queensland, but not nationally including:

- Grey Goshawk (*Accipiter novaehollandiae*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Painted Honeyeater (*Grantiella picta*)
- Square-Tailed Kite (*Lophoictinia isura*)
- Black-Chinned Honeyeater (*Melithreptus gularis*)
- Turquoise Parrot (*Neophema pulchella*)
- Powerful Owl (*Ninox strenua*)
- Koala (Southeast Queensland Bioregion) (*Phascolarctos cinereus*)
- Green-thighed Frog (*Litoria brevipalmata*), and
- Common Death Adder (*Acanthophis antarcticus*).

The removal of good to excellent quality habitat is likely to have some impact on native fauna within GBTA. GBTA provides a range of forage and shelter resources for native species, including species listed under the NC Act, as it contains remnant vegetation in good to excellent condition, hollow bearing trees, and low weed density.

Clearing 67 ha of remnant and HVR vegetation would remove approximately 1.5 % of the total area of remnant and regrowth vegetation at GBTA. The MTR-B will have practically all vegetation cleared from the facility footprint. The SDTA, Range Control, Camp and 25/49 RQR compound facilities would require most vegetation to be cleared from the site; however, mature trees and some pockets of vegetation may be retained. Clearing remnant vegetation to accommodate these facilities would represent an irreversible impact to the immediately affected area. Clearing regrowth vegetation would be a long-term impact, although areas may be rehabilitated at the end of the facilities' operational lives.

Under EPBC Act Policy Statement 1.2, it is unlikely that the removal of 1.5 % of the available habitat would have a significant impact on State threatened species.

Koala Habitat

The development of the ELF 2C facilities requires the removal of vegetation mapped as Koala Bushland Habitat and Koala Bushland Rehabilitation Habitat under the Koala SPP, as outlined in Table 28.

Table 28 Koala Bushland Habitat mapping for proposed ELF 2C facilities (Queensland Government, 2010)

Proposed Facility	Area of Koala Bushland Habitat (ha)			Area of Koala Bushland Rehabilitation Habitat (ha)		
	Medium	Low	Total	Medium	Low	Total
MTR-B	2.66	1.06	3.72	3.05	—	3.05
SDTA	8.05	15.48	23.53	—	23.35	23.35
Range Control	4.64	—	4.34	—	—	—
Camp	1.68	—	1.68	1.32	—	1.32
25/49 RQR	2.70	—	2.70	2.45	—	2.45
Roads	0.82	—	0.82	0.04	—	0.04
TOTAL	**20.25**	**16.54**	**36.79**	**6.86**	**23.35**	**30.21**

The proposed development of the ELF 2C facilities would require the removal of 36.79 ha (0.84 %) of Koala Bushland Habitat (Medium and Low Value) and 30.21 ha (31.97 %) of Koala Bushland Rehabilitation Habitat (Medium and Low Value). While removal of over 30 % of Koala Bushland Rehabilitation Habitat appears to be high, this habitat type is considered suitable for revegetation and rehabilitation into Koala Bushland Habitat: it is not recognised as currently containing Koala habitat (although it may contain some Koala food trees). Consequently, the removal of less than 1 % of Koala Bushland Habitat from GBTA is not considered a significant proportion of the existing Koala Bushland Habitat.

7.2.5.3 Severance of Connectivity

GBTA is part of the Flinders Peak to Greenbank/Karawatha corridor, which is part of a State significant fauna corridor running northeast from Flinders Peak Conservation Park to Greenbank. The removal of vegetation from areas adjacent to existing disturbance is unlikely to significantly affect fauna movement. The Range Control may affect fauna movement from bushland on the opposite side of Goodna Road; however, Goodna Road would already inhibit this.

7.2.5.4 Pests and Diseases

GBTA is within the RIFA restricted area. Queensland legislation regulates the movement and disturbance of soils within the RIFA restricted area.

Earthworks and tree-clearing at GBTA have the potential to introduce or spread RIFA within the area. Nevertheless, Defence have developed an ARMP to control high risk activities at GBTA. Consequently, construction is not expected to increase the extent or severity of RIFA colonies.

Chytrid fungus (*Batrachochytrium dendrobatidis*) is a fungal pathogen that infects amphibians and causes the disease chytridiomycosis. Infection of amphibians with chytrid fungus resulting in chytridiomycosis is listed as a key threatening process under the EPBC Act. The *Threat Abatement Plan for Infection of Amphibians with Chytrid Fungus Resulting in Chytridiomycosis* aims to reduce the impact of chytridiomycosis on native frog species.

Chytrid fungus is most likely to be spread via water or by contact between frogs. It can spread slowly over the landscape by natural methods, but movement over long distances is likely to be caused by human assisted translocation of infected amphibians or water contaminated with the amphibian chytrid. It is unlikely that the proposed development will increase the spread of chytridiomycosis for two reasons (DEH, 2006):

- The disease can only survive in water and it is unlikely that water will be transported between watercourses during the development; and
- The disease is spread through contact with frogs and it is unlikely that staff or contractors will come into contact with frogs.

7.2.6 Aboriginal Heritage

The new Range Control, Camp, and 25/49 RQR sites are unlikely to have sites of Aboriginal cultural heritage value. However, there remains the potential for items to exist, and these may be unearthed during construction of the proposed works.

The MTR-B and SDTA may contain places or items of Aboriginal cultural heritage value, given their proximity to local watercourses.

A small ephemeral watercourse runs parallel to the eastern perimeter and through the centre of the existing BSR. The proposed upgrade to an MTR-B will involve a slight realignment, and extension into approximately 200 m of greenfield area at the southern end of the range. While no sites of Aboriginal cultural heritage value were identified during the field survey, the proximity to small watercourses and the undisturbed nature of surrounding area indicates a potential of items or places of value to exist. Therefore, the proposed development may affect these cultural heritage values; however, this is not likely to be significant.

A large portion of the proposed SDTA area has been used in the past for the Australian Communication Army Network Receiving Station and associated “antenna farm”; however, much of the disturbance occurred in small, localised areas and a considerable portion was not affected at all by this facility. A number of small ephemeral watercourses run through the proposed SDTA location and sites of Aboriginal cultural heritage value may occur close to these. Therefore Aboriginal cultural heritage values may be affected by the proposed development; however, this is not likely to be significant.

Potential impacts to items of Aboriginal heritage will be managed during construction as described in Section 4.2.

7.2.7 Historic Heritage

Historic heritage values may be affected by decommissioning and demolition of existing facilities, as discussed in Section 7.1.1. Construction of new facilities and ongoing military operations are not likely to have a negative effect on the historic heritage values of GBTA.

7.2.8 Social and Economic Environment

The construction of the proposed MTR-B, SDTA, Camp and use of the New Entry may increase noise impacts for nearby sensitive receivers. These receivers include residential dwellings, GBSS and some of the sensitive receivers identified in Section 3.15.

GBSS has been identified as a key sensitive receiver for construction and operational activities associated with the ELF 2C upgrades at GBTA. This school is close to the new entry and therefore will be subject to a number of potential noise and safety impacts.

7.2.8.1 Noise

Construction activity, including earthworks, demolition, and construction, particularly at the new entry, Range Control, Camp and 25/49 RQR has the potential to affect nearby receptors, in particular GBSS. Given that construction hours will coincide with school hours, construction noise may interrupt classes.

Construction of the SDTA and MTR-B may also cause a noise nuisance; however, the likelihood and severity of this is expected to be lower given the separation distances to receptors. The SDTA and MTR-B are all more than 300 m from the nearest residence.

Training activities at the proposed SDTA may increase noise impacts on nearby dwellings and sensitive receivers (e.g. GBSS, community use areas) from increased vehicle movements and training activities. The SDTA is approximately 2,100 m from GBSS and 920 m from the nearest residence. Given the separation distances, noise generated from the SDTA is generally not expected to cause a nuisance. Nevertheless, military vehicle movements on still nights may cause a nuisance to the closest residents on occasion.

The new entry point on Goodna Road, coupled with the proposed training activities are likely to increase noise by increasing the intensity of use and number of vehicles (including convoys) entering and exiting the site (more detail in Section 7.2.8.2). Given the relocation of the entry point and the increased vehicle movement, the proposal presents a considerable change to the noise environment in this area. Increased numbers of vehicles entering and exiting the site will increase noise impacts on sensitive receivers such as the GBSS and potentially on nearby rural residential properties.

The effects of environmental noise depend on the extent to which it interferes with different activities. Interference with rest and recreation are reported as being the most important issues for most communities (Berglund, Lindvall, & Schwela, 1999). The effects that are relevant to the potential noise impacts associated with ELF 2C include:

- Interference with communication
- Noise-induced hearing impairment, and
- Sleep disturbance.

Nevertheless, given the more than 300 m separation from GBSS, noise impacts are not likely to be significant.

7.2.8.2 Traffic and Access

Construction of the new entry road will have an effect on traffic using Goodna Road. Construction and contractor vehicles may cause congestion at the new entry point, particularly in the afternoon, as contractors are expected to leave the site at midafternoon, the same time that school finishes. This will be managed through the Contractor's CEMP as described in Section 4.2.

The proposed ELF 2C upgrades are expected to increase traffic to and from the site during both construction and operation. The Traffic Impact Assessment for the GBTA ELF 2C works (GHD, 2010) indicates that a conservative estimate of peak hour traffic to and from GBTA on completion of the works would be 128 vehicles consisting of:

- 73 light and 43 heavy vehicles inbound in the a.m. peak
- 12 heavy vehicles outbound in the a.m. peak, and
- Vehicle numbers are reversed for the p.m. peak.

B-double equivalent vehicles have been identified as the largest vehicles requiring access to GBTA (GHD, 2010). Other vehicles requiring access will include civilian buses and other military vehicles (e.g. ASLAV, Unimog with trailer).

Military units travel in convoys consisting of five packets of six vehicles (GHD, 2010). In each packet, vehicles travel 100 m apart on highways and 30 m apart on urban roads. Each packet travels 10 to 15 minutes behind the previous packet (GHD, 2010). Adequate parking space will be required to process each packet or convoy before entering the secure Training Area. An internal queuing distance of 90 m is also required to allow efficient approach to the intersection to maintain the integrity of convoys (GHD, 2010).

This information indicates that heavy vehicles will frequently be entering and exiting GBTA via the Southern Entrance. The peak hours of site entry and egress are expected to reflect existing seasonal patterns, with the highest levels of vehicular usage (access and egress) from GBTA primarily occurring during school term periods (March, April, August, September and November) and school start and finish hours (7 a.m.–9 a.m. and 3 p.m.–5 p.m.). However, it should be noted that Ipswich City Council requested that convoys travel outside of school hours to prevent potential impacts on Springfield College, which has access from Springfield Parkway (GHD, 2010).

The proposed entry road has good sight lines and is unlikely to present a safety risk to children at GBSS or other traffic using Goodna Road.

7.2.8.3 Economy

It is expected that the construction workforce will be sourced locally. This may have positive economic impacts on the local community through job creation and supporting local businesses.

Investment in ELF 2C by Defence will create a range of broader economic impacts including employment opportunities (both direct and multiplied) and an injection of wealth into the wider economy. At a more local level, works associated with the proposed upgrades may create a range of employment opportunities for local contractors.

7.2.8.4 Land Use

Land used for community purposes such as educational or health facilities are susceptible to impacts from incompatible land uses. The GBSS is expected to be the most sensitive land use within the study area because it is close to GBTA activities. GBSS existed before the establishment of GBTA and provides a key service to the area.

As discussed above, the new entry and associated infrastructure will increase the number and size of vehicles travelling along Goodna Road; however, the entry is some 300 m from the school and minimal effects are anticipated. Training activities at GBTA may also occasionally cause noise nuisance at the school as discussed previously.

Other surrounding land uses that may be affected by GBTA include rural residential and community use areas located to the east and south of the training area. These areas may be affected by elevated noise (live/blank firing and vehicle movements) associated with an increased intensity of use at GBTA. However, as discussed above, the ELF 2C facilities are separated from the nearest receivers and consequently a noise nuisance is expected only rarely, if at all.

The application of the GBTA buffer area as reflected in planning schemes primarily prevents the use of land for higher economic purposes such as residential or commercial uses; therefore, the proposed ELF 2C works are unlikely to have a significant impact on surrounding land use.

7.3 Summary of Impacts on the Commonwealth Environment

The following table provides an assessment of the proposed ELF 2C works under *Policy Statement 1.2 Significant impact guidelines: Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies*.

Table 29 Potential impacts on the Commonwealth environment

Will the action…	Likelihood	Discussion
Landscapes and Soils		
Substantially alter natural landscape features?	Unlikely	Some minor modification to landscape features to develop suitable foundations and working platforms for the proposed facilities.
Cause subsidence, instability or substantial erosion?	Unlikely	Some erosion may occur during construction; however, this will be controlled through the Contractor's CEMP. Minor erosion may occur at the SDTA, but this would be contained to a small area.

Will the action…	Likelihood	Discussion
Involve medium or large-scale excavation of soil or minerals?	Unlikely	No medium or large-scale excavation of soils is proposed.
Coastal Landscapes and Processes		
Alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns?	N/A	The proposal is not located in a coastal area.
Permanently alter tidal patterns, water flows or water quality in estuaries?		
Reduce biological diversity or change species composition in estuaries?		
Extract large volumes of sand or substantially destabilise sand dunes?		
Ocean Forms, Ocean Processes and Ocean Life		
Reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments?	N/A	The proposal is not located in an ocean or marine area.
Alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures?		
Substantially damage or modify large areas of the seafloor or ocean habitat, such as sea grass?		
Release oil, fuel or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes?		
Release large quantities of sewage or other waste into the marine environment?		
Water Resources		
Measurably reduce the quantity, quality or availability of surface or ground water?	Unlikely	There may be localised impacts to water quality downstream of the MTR-B and SDTA. Nevertheless, these are unlikely to be significant as the design of each facility includes measures to protect water quality.
Channelise, divert or impound rivers or creeks or substantially alter drainage patterns?	Unlikely	No alterations to waterways are proposed.
Measurably alter water table levels?	Unlikely	While groundwater might be used for the Vehicle Wash Bay, this is unlikely to cause a decrease in groundwater levels in the area.
Pollutants, Chemicals and Toxic Substances		
Generate smoke, fumes, chemicals, nutrients, or other pollutants that will substantially reduce local air quality or water quality?	Unlikely	Live firing at the MTR-B will generate spent ammunition, which contains heavy metals. Nevertheless, the design includes a bullet-catcher to 1) contain used bullets, and 2) facilitate the regular de-leading of the target area. Consequently, the potential impact on downstream areas is unlikely to be significant.

Will the action…	Likelihood	Discussion
Result in the release, leakage, spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal?	Unlikely	Live firing at the MTR-B will generate spent ammunition, which contains heavy metals. Nevertheless, the design includes a bullet-catcher to 1) contain used bullets, and 2) facilitate the regular de-leading of the target area. Consequently, the potential release is unlikely to be significant.
Increase atmospheric concentrations of gases that will contribute to the greenhouse effect or ozone damage?	Unlikely	While greenhouse gases will be generated from use of the SDTA, this is unlikely to increase atmospheric concentrations.
Substantially disturb contaminated or acid-sulphate soils?	Unlikely	Existing soil contamination may occur at the MTR-B and this will be managed in accordance with Defence's contaminated land policies to ensure no release of contaminated material into the environment. Consequently, the potential impacts associated with the development are unlikely to be significant.
Plants		
Involve medium or large-scale native vegetation clearance?	Possible	In the context of the surrounding areas, the removal of 67 ha of remnant and HVR vegetation could be considered medium scale native vegetation clearing.
Involve any clearance of any vegetation containing a listed threatened species which is likely to result in a long-term decline in a population or which threatens the viability of the species?	Unlikely	No threatened species were observed during site inspections, nor were any identified during previous threatened species surveys (HLA, 2007). Regardless, the proposed removal of 1.5 % of available habitat is unlikely to threaten the viability of a threatened species.
Introduce potentially invasive species?	Unlikely	Defence operates under an ARMP to prevent the spread of RIFA at GBTA. The Contractor would be required to operate under a CEMP, which would include requirements for weed and pest management. The introduction of a vehicle wash bay should also help prevent the spread and introduction of weeds to GBTA.
Involve the use of chemicals that substantially stunt the growth of native vegetation?	Unlikely	No chemical use for plant control is proposed.
Involve large-scale controlled burning or any controlled burning in sensitive areas, including areas that contain listed threatened species?	Unlikely	No controlled burning is proposed under the ELF 2C project. Defence manages GBTA to manage bushfire risks through the Bushfire Management Plan.
Animals		
Cause a long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals?	Unlikely	The Contractor would be required to undertake pre-clearing surveys for fauna within the project footprint. This should largely prevent harm to native fauna, and therefore the project is unlikely to cause a decline in a species as a result to harm to individuals.
Displace or substantially limit the movement or dispersal of native animal populations?	Unlikely	The proposed development would remove 67 ha (1.5 %) of available habitat for fauna at GBTA. The proposed development sites are located adjacent to, or incorporate, previously disturbed areas, and therefore do not fragment available fauna corridors. Consequently, the extent of clearing is unlikely to displace or prevent the movement of native fauna.
Substantially reduce or fragment available habitat for native species?	Unlikely	The proposed development sites are located adjacent to, or incorporate, previously disturbed areas, and therefore do not fragment habitat.

Will the action…	Likelihood	Discussion
Reduce or fragment available habitat for listed threatened species, which is likely to displace a population, result in a long-term decline in a population, or threaten the viability of the species?	Unlikely	Populations of threatened fauna species were not observed within the project footprints. Furthermore, 98.5 % of available habitat would remain and the clearing would not cause fragmentation of that habitat. Consequently, the proposed works are unlikely to cause a decline in a native fauna species.
Introduce exotic species that will substantially reduce habitat or resources for native species?	Unlikely	Defence operates under an ARMP to prevent the spread of RIFA at GBTA. The Contractor would be required to operate under a CEMP, which would include requirements for weed and pest management. The introduction of a vehicle wash bay should also help prevent the spread and introduction of weeds to GBTA.
Undertake large-scale controlled burning or any controlled burning in areas containing listed threatened species?	Unlikely	No controlled burning is proposed under the ELF 2C project. Defence manages GBTA to manage bushfire risks through the Bushfire Management Plan.
People and Communities		
Substantially increase demand for, or reduce the availability of, community services or infrastructure that have direct or indirect impacts on the environment, including water supply, power supply, roads, waste disposal, and housing?	Unlikely	The proposed works are unlikely to cause a significant increase in demand for services. The relocation of the entry point would increase the demand on Greenbank Road; however, this is unlikely to affect the availability of that road.
Affect the health, safety, welfare or quality of life of the members of a community, through factors such as noise, odours, fumes, smoke, or other pollutants?	Unlikely	Noise, dust and fumes are unlikely to be generated from ELF 2C facilities to an extent that they affect the health, safety, welfare or quality of life of members of the community
Cause physical dislocation of individuals or communities?	Unlikely	No individuals or communities will be relocated.
Substantially change or diminish cultural identity, social organisation or community resources?	Unlikely	The proposed works internal to GBTA are unlikely o affect the cultural or social identity of the surrounding communities.
Heritage		
Permanently destroy, remove or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place?	Possible	The proposed works require the removal of 36.79 ha (0.84 %) of remnant vegetation at GBTA, which is recognised under GBTA's CHL values of *Processes*. The proposed works require the removal of 67 ha (1.5 %) of habitat suitable for the Koala, which is recognised under GBTA's CHL values of *Processes*. The proposed works require the removal of 27.14 ha (0.99 %) of Endangered and Of Concern RE, which are recognised under GBTA's CHL values of *Rarity*. The proposed works require the removal of P1 huts, tent slabs and foundations that may contain some historical value. The proposed works are unlikely to affect items of Aboriginal heritage value.

Will the action…	Likelihood	Discussion
Involve extension, renovation, or substantial alteration of a heritage place in a manner that is inconsistent with the heritage values of the place?	Possible	The proposed works require the removal of 36.79 ha of remnant vegetation (including 27.14 ha of Endangered and Of Concern RE), which is recognised as a CHL value of GBTA. This is inconsistent with the values of GBTA. The proposed works require the removal of 67 ha of habitat suitable for the Koala, which is recognised as a CHL value of GBTA. This is inconsistent with the values of GBTA. The proposed works require the removal of P1 huts, tent slabs and foundations that may contain some historical value. This is inconsistent with the values of these items. The proposed works are unlikely to affect items of Aboriginal heritage value.
Involve the erection of buildings or other structures adjacent to, or within important sight lines of, a heritage place that are inconsistent with the heritage values of the place?	Unlikely	GBTA's CHL values are not related to line of sight.
Substantially diminish the heritage value of a heritage place for a community or group for which it is significant?	Unlikely	GBTA is not known to be significant to a group of people for heritage reasons.
Substantially alter the setting of a heritage place in a manner that is inconsistent with the heritage values of the place?	Unlikely	The proposed works would not alter the setting of a heritage place.
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site?	Unlikely	GBTA is not currently used as a cultural or ceremonial site.

The proposed ELF 2C development may have a significant impact on the Commonwealth environment through:

- Medium scale clearing of remnant and HVR vegetation, and
- Impacts to the heritage values of GBTA through the removal of 36.79 ha of remnant vegetation and 67 ha of habitat suitable for the Koala.

8.0 Conclusions

The ELF 2C proposal is an integral part of, and necessary for the implementation of the Hardened and Networked Army initiative, including the re-raising and battle readiness training for 8/9 RAR. This initiative is considered a crucial strategy to enable Defence to continue to defend Australia and its national interests. The proposed ELF 2C works have been positioned to incorporate areas of previous disturbance as much as possible, and thereby minimise the extent of remnant vegetation to be cleared. Other mitigation measures are recommended to minimise the potential impact of the proposed works. After mitigation, the residual impacts amount to the removal of 67 ha of habitat with high ecological value that would be cleared to accommodate the proposed facilities. This equates to approximately 1.5 % of the remnant and HVR vegetation present at GBTA.

Formal assessments of impact significance pursuant to the EPBC Act indicate the proposal is unlikely to have a significant impact on Matters on National Environmental Significance. The proposal has the potential to have a significant impact on the Commonwealth Heritage Values of GBTA. Furthermore, the removal of 67 ha of remnant and HVR vegetation could be considered medium scale clearing under EPBC Act Policy Statement 1.2.

Bibliography

ABS. (2006, February 8). *Census Data*. Retrieved October 2009, from Australian Bureau of Statistics: http://abs.gov.au/websitedbs/D3310114.nsf/home/Census+data

AECOM. (2009). *Aquatic Survey Report: Greenbank Training Area.* Brisbane: AECOM Australia Pty Ltd.

AECOM. (2009). *Enhanced Land Force Stage 2C Initial Environmental and Operational Review Volume 2.4: ELF 2C-1 Greenbank Training Area.* Brisbane: AECOM Australia Pty Ltd.

AECOM. (2011). *Environmental Impact Assessment for ELF 2C at Greenbank Training Area.* Brisbane: AECOM Australia Pty Ltd.

AECOM. (2009). *Greenbank Military Camp Traffic Assessment: North and South Entrances.* Brisbane: AECOM Australia Pty Ltd.

Allen, G. R., Allen, M., & Midgley, S. H. (2002). *Field Guide to the Freshwater Fishes of Australia.* Perth: Western Australian Museum.

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra: Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

Arthington, A., Kennard, M., & Pusey, B. (2004). *Freshwater Fishes of North-Eastern Australia.* Brisbane: CSIRO Publishing.

Australian Weeds Committee. (—). *Weeds of National Significance*. Retrieved November 18, 2009, from Australian Weeds Committee: http://www.weeds.org.au/natsig.htm

BCC. (2003). *Erosion Treatments for Urban Creeks Guidelines.* Brisbane: Brisbane City Council.

BCC. (2003). *Natural Channel Design Guidelines.* Brisbane: Brisbane City Council.

Berglund, B., Lindvall, T., & Schwela, D. H. (1999). *Guidelines for Community Noise.* Geneva: World Health Organization.

BES. (2008). *Bushfire Management Plan: Greenbank Training Area.* St Georges Basin: Bushfire and Environmental Services Pty Ltd.

Birds Australia. (—). *Swift Parrot - Lathamus discolor*. Retrieved January 2010, from Birds Australia: http://www.birdsaustralia.com.au/our-projects/swift-parrot.html

BOM. (2009, April). *Monthly Climate Statistics for '040211 ARCHERFIELD AIRPORT'*. Retrieved April 2009, from Australian Government, Bureau of Meteorology: http://www.bom.gov.au/climate/averages/tables/cw_040211.shtml

Brooks, S. G., & Kind, P. K. (2002). *Ecology and Demography of the Queensland Lungfish (Neoceratodus forsteri) in the Burnett River, Queensland with Reference to the Impacts of Walla Weir and Future Water Infrastructure Development.* Brisbane: Queensland Government, Department of Primary Industries, Queensland Agency for Food and Fibre Services.

Brown, K., Isbell, R., Jacquier, D., & McKenzie, N. (2004). *Australian Soils and Landscapes—An Illustrated Compendium.* Melbourne: CSIRO Publishing.

Buchanan, R. (1999). *Logan: Rich in History, Young in Spirit*. Retrieved October 26, 2009, from Logan City Council: http://www.logan.qld.gov.au/lcc/logan/history/publications/richinhistory.htm

Cardno Eppell Olsen. (2009). *Mt Lindesay/Beaudesert Strategic Transport Network Investigation: Draft for Consultation.* Brisbane: Cardno Eppell Olsen for Department of Transport and Main Roads.

Chessman, B. C. (2003). New Sensitivity Grades for Australian River Macroinvertebrates. *Marine and Freshwater Research* , 95-103.

Claridge, W. A., Dawson, J., Mifsud, G., Murray, A. J., Paull, D., Poore, R., et al. (2005). Home Range of the Spotted-tailed Quoll (Dasyurus maculatus maculatus), a Marsupial Carnivore, in Rainshadow Woodland. *Wildlife Research* , 7-14.

Commonwealth of Australia, Department of Works, Queensland Branch. (1962, May). *Greenbank Austcan Receiving Station - Plan, Elevations, and Sections.* Retrieved October 26, 2009, from Australian Government, National Archives of Australia: http://naa12.naa.gov.au/scripts/ResearcherScreen.asp

Corfield, J., Flynn, A., & Smith, R. (2007). *Lungfish Study. Survey of Lungfish in the Brisbane, North Pine and Mary River Systems.* Brisbane: Hydrobiology Pty Ltd.

CSIRO. (2009). Retrieved October 26, 2009, from Australian Soil Resource Information System: http://www.asris.csiro.au/index_ie.html

DAFF. (2009, May 21). *Regional Forest Agreements Home*. Retrieved February 24, 2010, from Department of Agriculture, Fisheries and Forestry: http://www.daff.gov.au/rfa

Davis Langdon. (2008). *Enhanced Land Force Stage 2 Functional Design Brief: Package ELF 2C-1 Works: Design Package A.* Melbourne: Davis Langdon .

DEC. (2004). *Approved NSW and National Recovery Plan: Randia moorei (Spiny Gardenia).* Sydney: NSW Government, Department of Environment and Conservation.

DEC. (2005, September 1). *Tall Knotweed - Profile*. Retrieved November 2009, from Department of Environment and Conservation: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10590

DEEDI. (2009, December 18). *Fire Ants*. Retrieved February 26, 2010, from Queensland Government, Department of Employment, Economic Development and Innovation: http://www.dpi.qld.gov.au/4790_4538.htm

DEEDI. (2009, February). *Regulations on the Movement of High-Risk Materials (Commercial)*. Retrieved February 2010, from Department of Employment, Economic Development and Innovations: http://www.dpi.qld.gov.au/4790_4699.htm

DEH. (2006). *Background Document for the Threat Abatement Plan for the Infection of Amphibians with Chytrid Fungus Resulting in Chytridiomycosis.* Canberra: Australian Government, Department of Environment and Heritage.

DEH. (2004). *Chytridiomycosis (amphibian chytrid fungus disease).* Canberra: Australian Government, Department of the Environment and Heritage.

DEH. (2006). *Threat Abatement Plan: Infection of amphibians with chytrid fungus resulting in chytridiomycosis.* Canberra: Australian Government, Department of Environment and Heritage.

DERM. (2009a). *Aboriginal and Torres Strait Islander Register and Database.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009, November 6). *Essential Habitat Map (Version 3.0)*. Retrieved November 2009, from Queensland Government, Environment and Resource Management: http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/introduction_and_status/regional_ecosystem_maps/index.php

DERM. (2009c). *Fire Ant Restricted Area Boundary Version 41: Effective Date: 18 December 2009.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009). *Geology Data.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009). *Policy for Vegetation Management Offsets - Version 2.4.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009). *Queensland Wetland Map Version 2.0: Wetlands: Ipswich 9442.* Retrieved March 2, 2010, from Department of Environment and Resource Management, WetlandInfo: http://www.epa.qld.gov.au/wetlandinfo/site/MappingFandD/WetlandMapsAndData/PDFMaps.html

DERM. (2009, November 6). *Regional Ecosystem (RE) Map Version 6.0*. Retrieved November 2009, from Queensland Government, Environment and Resource Management: http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/introduction_and_status/regional_ecosystem_maps/index.php

DERM. (2009). *Regional Vegetation Management Code for South East Queensland Bioregion—Version 2.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009). *Regrowth Vegetation Code—On Freehold and Indigenous Land and Leasehold Land for Agriculture and Grazing—Version 1.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009, November). *Regrowth Vegetation Map Version 2.0*. Retrieved November 2009, from Queensland Government, Environment and Resource Management: http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/introduction_and_status/regional_ecosystem_maps/index.php

DERM. (2009). *Regulations for Clearing Regrowth Vegetation*. Retrieved November 20, 2009, from Department of Environment and Resource Management: http://www.derm.qld.gov.au/vegetation/regrowth_vegetation_regulations.html

DERM. (2009). *South East Queensland Natural Resources Management Plan 2009–2031.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DERM. (2009, September). *Wildlife Online Database*. Retrieved October 2009, from Queensland Government, Environment and Resource Management: http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/index.html

DERM. (2010). *Wildlife Online Database.* Brisbane: Queensland Government, Department of Environment and Resource Management.

DEWHA. (2008). *Approved Conservation Advice for Marsdenia coronata (Slender Milkvine.* Canberra: Australian Government, Department of the Environment, Water, Heritage and the Arts.

DEWHA. (2008). *Approved Conservation Advice for Persicaria elatior (Knotweed).* Canberra: Australian Government, Department of the Environment, Water, Heritage and the Arts.

DEWHA. (2008). *Approved Conservation Advice for Plectranthus habrophyllus.* Canberra: Australian Government, Department of the Environment, Water, Heritage and the Arts.

DEWHA. (2008). *Approved Conservation Advice for Plectranthus habrophyllus.* Canberra: Australian Government, Department of the Environment, Water, Heritage and the Arts.

DEWHA. (2010). *Dasyurus maculatus maculatus (SE mainland population) - Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)*. Retrieved January 2010, from Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=75184

DEWHA. (2009). *EPBC Act Protected Matters Database*. Retrieved October 2009, from Australian Government, Department of the Environment, Water, Heritage and the Arts: http://www.environment.gov.au/erin/ert/epbc/index.html

DEWHA. (2010). *EPBC Act Protected Matters Database.* Canberra: Australian Government, Department of the Environment, Water, Heritage and the Arts.

DEWHA. (2010). *Erythrotriorchis radiatus — Red Goshawk*. Retrieved January 2010, from Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=942

DEWHA. (2010d). *Geophaps scripta scripta—Squatter Pigeon (southern)*. Retrieved February 2010, from Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440

DEWHA. (2004, June 22). *Greenbank Military Training Area (part), Middle Rd, Greenbank, QLD, Australia* . Retrieved November 2009, from Australian Government, Department of the Environment, Heritage, Water and the Arts, Heritage: Australian Heritage Database: http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3Dgreenbank%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart

DEWHA. (2010). *Lathamus discolor - Swift Parrot*. Retrieved January 2010, from Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=744

DEWHA. (2010). *Pteropus poliocephalus — Grey-headed Flying-fox*. Retrieved January 2010, from Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=186

DEWHA. (2009). *Species Profile and Threats Database*. Retrieved November 2009, from Department of the Environment, Water, Heritage and the Arts: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DEWHA. (2008, June). *Working Together: Managing Commonwealth Heritage Places.* Retrieved November 2009, from Australian Government, Department of the Environment, Water, Heritage and the Arts: http://www.environment.gov.au/heritage/publications/protecting/working-together-commonwealth.html

DEWHA. (2008e, June). *Working Together: Managing Commonwealth Heritage Places.* Retrieved November 2009, from Australian Government, Department of the Environment, Water, Heritage and the Arts: http://www.environment.gov.au/heritage/publications/protecting/working-together-commonwealth.html

DIP. (—). *Greenfield Land Supply in South East Queensland.* Retrieved March 3, 2010, from Department of Infrastructure and Planning: http://www.dip.qld.gov.au/statewide-planning/greenfield-land-supply-in-south-east-queensland.html

DIP. (2009). *SEQ Regional Plan 2009–2031: State Planning Regulatory Provisions: Map SEQ RP 24.* Brisbane: Queensland Government, Department of Infrastructure and Planning.

DIP. (2010). *South East Queensland Koala Conservation State Planning Regulatory Provisions.* Brisbane: Queensland Government, Department of Infrastructure and Planning.

DIP. (2009). *South East Queensland Regional Plan 2009–2031.* Brisbane: Queensland Government, Department of Infrastructure and Planning.

DIP. (2009). *South East Queensland Regional Plan 2009–2031: Fact Sheet: Identified Growth Areas.* Brisbane: Queensland Government, Department of Infrastructure and Planning.

DNRM. (2001). *Queensland Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual.* Brisbane: Queensland Government, Department of Natural Resources and Mines.

Driscoll, P. (1992). *The Terrestrial Vertebrate Fauna of the Greenbank Army Training Area.* Brisbane.

ENSR. (2008). *Defence Threatened Species Database.* Melbourne: ENSR Australia Pty Ltd.

ENSR. (2008). *Threatened Species Overview (Commonwealth and State Listed Species and Ecological Communities).* Melbourne: ENSR Australia Pty Ltd.

ENSR. (2008). *Water Quality Monitoring Annual Report 2008: GBTA.* Brisbane: ENSR Australia Pty Ltd.

EPA. (2005). *A Directory of Important Wetlands in Australia, 3rd Edition.* Brisbane: Queensland Government, Environmental Protection Agency.

EPA. (2002). *Biodiversity Assessment and Mapping Methodology (BAMM) Assessment.* Brisbane: Queensland Government, Environmental Protection Agency, Biodiversity Planning Unit.

EPA. (2005). *Digital Geological Mapping Data: South East Queensland.* Brisbane: Queensland Government, Environmental Protection Agency.

EPA. (1999). *Guidelines for Flora and Fauna Surveys.* Brisbane: Queensland Government, Environmental Protection Agency, Southern Region.

EPA. (2006). *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006–2016.* Brisbane: Queensland Government, Environmental Protection Agency.

EPA. (2007). *Oxley Creek Environmental Values and Water Quality Objectives.* Brisbane: Queensland Government, Environmental Protection Agency.

EPA. (2007). *Queensland Water Quality Guidelines 2006: Minor Updates March 2007.* Brisbane: Queensland Government, Environmental Protection Agency.

ERM. (2009). *ELF 2C Greenbank Training Area: Heritage Issues.* Brisbane: Environmental Resources Management Australia.

ERM. (2010). *ELF 2C Heritage: Greenbank Training Area and Wide Bay Training Area—Proposed UOTF Locations: Heritage Issues.* Brisbane: Environmental Resources Management Australia Pty Ltd.

Forster, P. I. (1995). Circumscription of Marsdenia (Asclepiadaceae: Mardeniae), with a Revision of the Genus in Australia and Papuasia. *Australian Systematic Biology , 8* (5), 703-933.

Forster, P. (1994). Ten New Species of Plectranthus L'Her. (Lamiaceae) from Queensland. *Austrobaileya* , pp. 159-186.

Geosciences Australia. (2005). *Digital 1:250,000 Geology Database.* Canberra: Australian Government, Geosciences Australia.

GHD. (2009). *ELF 2C-1: Greenbank Training Area 30% Concept Design.* Brisbane: GHD Pty Ltd.

GHD. (2010). *Report for Greenbank Range Entry Upgrade: Traffic Impact Assessment.* Brisbane: GHD.

GHD. (2006). *Stage One Environmental Review of Greenbank Training Area.* Brisbane: GHD Pty Ltd.

Grundy, M. J., McKenzie, N. J., Ringrose-Voase, A. J., & Webster, R. (2008). *Guidelines for Surveying Soil and Land Resources, Second Edition.* Melbourne: CSIRO Publishing.

Halford, D. (1998). *Survey of Threatened Plant Species in South East Queensland Biogeographical Region.* Brisbane: Queensland Government, Department of Environment.

HLA . (2007). *Threatened Flora Species and Vegetation Communities Survey Report Greenbank Training Area.* HLA Envirosciences Pty Ltd.

HLA. (2007). *Threatened Flora Species and Vegetation Communities Survey Report: Greenbank Training Area.* Brisbane: HLA-Envirosciences Pty Ltd.

HLA. (2005). *Weed Control Operations: February–June 2005 Field Work Completion Report: Greenbank Training Area.* Brisbane: HLA-Envirosciences Pty Ltd.

Hon MP Fitzgibbon, J. (2008, May 13). *Ministerial Release: Budget 2008-09: $650 Million Committed to Army's New infantry Battalions.* Retrieved July 2009, from Department of Defence: http://www.minister.defence.gov.au/Fitzgibbontpl.cfm?CurrentId=7714

Hopkins, M. S., Isbell, R. F., McDonald, R. C., Speight, J. G., & Walker, J. (1990). *Australian Soil and Land Survey: Field Handbook.* Melbourne: Inkata Press.

IECA. (2008). *Best Practice Erosion and Sediment Control.* Picton, NSW: International Erosion Control Association Australia.

Isbell, R. F. (2002). *The Australian Soil Classification - Revised Edition.* Collingwood: CSIRO Publishing.

Johnson, J. W. (2001). *Review of the Draft Lungfish Report (Ecology and Demographics of Lungfish (Neoceratodus forsteri) and General Fish Communities in the Burnett River, Queensland with Reference to the Impacts of Walla Weir and Future Water Infrastructure Development).* Brisbane: Queensland Museum.

Joint Standing Committee on Foreign Affairs, Defence and Trade. (2008, June 2). *Review of the Defence Annual Report 2005-2006.* Retrieved July 2009, from Parliament of Australia Joint Committee: http://www.aph.gov.au/house/committee/jfadt/defenceannualreport_2005_2006/report.htm

Kemp, A. (1995). Threatened Fishes of the World - Neoceratodus forsteri (Krefft 1870) (Neoceratodontidae). *Environmental Biology of Fishes* , 43-310.

LCC. (2009, August 6). *Greenbank*. Retrieved October 26, 2009, from Logan City Council: http://www.logan.qld.gov.au/lcc/logan/history/suburbanhistories/greenbank.htm

Leggett, R. (1990). A Fish in Danger Nannoperca oxleyana. Fishes of Sahul. *Journal of the Australian New Guinea Fishes Association* , 247-249.

Lloyd, S., & Robbins, A. (2009). *The Status and Conservation of the Spotted-Tailed Quoll (Dasyurus maculatus maculatus) in the Flinders Peak to Greenbank Karawatha Corridor.* Brisbane: University of Queensland.

Lt Col Ryan, S. (2006, February). *Hardened and Networked Army—an Army for Now and the Future*. (Australian Government, Department of Defence) Retrieved April 2009, from Defence Magazine: http://www.defence.gov.au/defencemagazine/editions/200602/features/feature01.htm

Miller, G. J., & Worland, J. L. (2004). *Greenbank Army Training Area - QLD180*. Retrieved February 26, 2010, from Department of the Environment, Water, Heritage and the Arts, Directory of Important Wetlands in Australia–Information Sheet: http://www.environment.gov.au/cgi-bin/wetlands/search.pl?smode=DOIW

Munsell. (2000). *Munsell Soil Colour Charts.* New York: New Windsor.

NAA. (1952-1953). *Greenbank Military Camp–Accommodation–Architectural: Series BP888/1, #3102004.* Canberra: Australian Government, National Archives of Australia.

NAA. (1949). *Greenbank. Acquisition for Defence Purposes: Series BP153/1, #339404.* Canberra: Australian Government, National Archives of Australia.

NLWRA. (2000). *Australian Water Resources Assessment 2000: Groundwater Management Units.* Canberra: Australian Government, National Land and Water Resources Audit.

NSSF. (1997). *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges.* Newtown, Connecticut: National Shooting Sport Foundation.

NSWF. (1997). *The Australian Code of Electrofishing Practice.* Sydney: New South Wales Government, New South Wales Fisheries.

OCCA. (1999). *Oxley Creek Catchment Management Plan.* Brisbane: Oxley Creek Catchment Association Inc.

Queensland Government. (2009). *SEQ Koala Protection Area: Map SEQK 24.* Brisbane: Queensland Government.

Queensland Government. (2010). *South East Queensland Koala State Planning Regulatory Provisions Map SEQKH 24.* Brisbane: Queensland Government.

Queensland Herbarium. (2009). *HERBRECS Database.* Brisbane: Queensland Government.

Queensland Herbarium. (2009, October 7). *Regional Ecosystems*. Retrieved November 2009, from Queensland Government, Environment and Resource Management: http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/index.php

Ryan, S. (2006). *Conservation Management Profile: Red Goshawk, Erythrotriorchis radiatus.* Brisbane: Environmental Protection Agency.

Saunders, M. (2001). *Recovery Plan for the Endangered Native Jute Species, Corchorus cunninghamii F. Mull in Queensland (2001–2006).* Canberra: Commonwealth Government, Natural Heritage Trust.

SEQ Healthy Waterways Partnership. (2009). *Oxley Catchment*. Retrieved March 4, 2010, from Health-e-Waterways: http://www.health-e-waterways.org/reportcard/2009/catchment/Oxley

SKM. (2008). *An Overview of the Impacts of Translocated Native Fish Species in Australia.* Canberra: Australian Government, Department of the Environment, Water, Heritage and the Arts.

SKM. (1999). *Erosion Management Plan for Oxley Creek.* Brisbane: Sinclair Knight Merz Pty Ltd.

Stanley, T. R. (1989). *Flora of South-eastern Queensland Volume 3.* Brisbane, Queensland: Department of Primary Industries.

Steele, J. G. (1983). *Aboriginal pathways in southeast Queensland and the Richmond River.* Brisbane: University of Queensland Press.

Sunset Downs. (2008). *Feral Horse Management 2008: Greenbank Military Training Area.* Brisbane: Sunset Downs Pty Ltd.

The Australian Army. (2006, May 24). *History*. Retrieved October 26, 2009, from ARMY: Royal Australian Corps of Signals: 136 Signals Squadron: http://www.defence.gov.au/army/rasigs/136_Sig_Sqn.htm

USEPA. (2005). *Best Management Practices for Lead at Outdoor Shooting Ranges.* New York: United States Environmental Protection Agency.

Wells, M. (2001). A Method of Assessing Water Erosion Risk in Land Capability Studies: Swan Coastal Plan and Darling Range. *Resource Management Technical Report No. 73* .