Final Environmental Assessment Report

Belmont Shooting Complex—Clay Target Range

November 2018

Document history

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Abbreviations

ACTA	Australian Clay Target Association
ACH Act	*Aboriginal Cultural Heritage Act 2003*
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ANEF	Australian Noise Exposure Forecast
ARI	Average Recurrence Interval
AS	Australian Standards
ASS	Acid Sulfate Soils
BA 1974	*Building Act 1974*
BCC	Brisbane City Council
BSC	Belmont Shooting Complex
CEMP	Construction Environmental Management Plan
CLR	Contaminated Land Register
DES	Department of Environment and Science
DHPW	Department of Housing and Public Works
DHPW SRS	Department of Housing and Public Works (Sport and Recreation Services)
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
DTMR	Department of Transport and Main Roads
EMR	Environmental Management Register
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cth)
ESCP	Erosion and Sediment Control Plan
ESD	Environmental Sustainable Design
EVNT	Endangered Vulnerable and Near Threatened
GC 2018	Gold Coast Commonwealth Games 2018
IECA	International Erosion Control Association
ISSF	International Sports Shooters Federation
MCU	Material Change of Use
NC Act	*Nature Conservation Act 1992*
NJKHA	Non-juvenile Koala Habitat Tree
QMRC	Queensland Military Rifle Club
QRA	Queensland Rifle Association
PA 2016	*Planning Act 2016*
PR 2017	*Planning Regulation 2017*
RLRPA	Regional Landscape and Rural Production Area
SA	Shooting Australia
SBSMP	Site Based Stormwater Management Plan
SEQRP	South East Queensland Regional Plan
SQAS	South Queensland Archery Society
SPP	State Planning Policy
SSAA	Sports Shooters Association of Australia

TWCM	Total Water Cycle Management
WSUD	Water Sensitive Urban Design
VM Act	*Vegetation Management Act 1999*

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PART A – EXECUTIVE SUMMARY

1 Infrastructure Proposal

This Infrastructure Proposal is made by Department of Housing and Public Works (DHPW), Sport and Recreation Services (SRS). The Infrastructure Proposal requests that the Minister designate premises for the development of infrastructure, which is a type prescribed by regulation (PR 2017, schedule 5).

A new three-position plus practice area shotgun range was constructed for the Gold Coast Commonwealth Games 2018 (GC 2018), and collocated with a pre-existing 300m long bore range that also accommodates pistol and rifle shooting. The clay target range was conceived as a temporary land use to be decommissioned following GC 2018 use.

Permanent retention of the range is now proposed to preserve a legacy use and provide a future opportunity for an existing club at the Belmont Shooting Complex's (BSC) to relocate to the new range.

With reference to section 36(3) of the *Planning Act 2016* (PA 2016), below is a summary of the Infrastructure Proposal for the BSC, Clay Target Range, prepared in accordance with the Minister's Guidelines and Rules, Chapter 7—Guidelines for the process for environmental assessment and consultation for making or amending a Ministerial designation.

Matter	Proposal Details	
a) the site description including the location of the premises proposed to be designated;	Real property description:	Part of Lot 1 RP169229 (designation area and coordinates identified at **Appendix A**).
	Property address:	1485 Old Cleveland Road, Belmont
	Registered owner / Trustee	The State of Queensland (Represented by Department of Housing and Public Works)
	Tenure	Freehold
	Site area:	The land that is subject to the proposed designation identified at **Appendix A**.
	Property materials at Appendix B ***Planning Scheme property information at Appendix C***	
b) any existing uses on the premises proposed to be designated;	• The BSC land (use comprising the whole of the Lot including the designation area) was established as a rifle range in the 1920s and developed substantially ahead of the Brisbane Commonwealth Games 1982, and more recently GC 2018. The BSC hosts a number of sports predominantly shooting clubs, and archery clubs. • There is a Powerlink Transmission line traversing the Lot which is subject to an Infrastructure Designation (Belmont to Murarrie 110 kilovolt and 275 kilovolt electricity transmission line). The designation area for the transmission line does not overlap with the proposed designation area for the Clay Target Range.	
c) existing uses on adjoining sites;	• The BSC land and the designation area has frontage to Old Cleveland Road to the North. • The BSC site also has frontages to Mount Petrie Road to the West, Prout Road (unformed) and Eastwood Street to the East. • The Gateway Motorway lies West beyond Mount Petrie Road.	

	• To the North, East and South of the BSC land are rural residential allotments. • The Sleeman Sports Complex adjoins the BSC land to the North-East. • The site of the designation lies within the BSC site in the North East Corner accessed from within internal BSC roadways.	
d) the type of infrastructure;	15 sporting facilities	
e) information about the nature, scale and intensity of the infrastructure and each use proposed;	***Drawings at Appendix D*** MP 045F demonstrates the proposed concept design for the proposed permanent use of the range including existing and future works extent, and the extent of cleared area to manage lead aggregation. This concept proposal is for all lead cartridge use and denotes two operational fallout areas and one safety template area where lead will rarely be deposited if at all. The operational cleared area will require ongoing lead remediation and removal and the non cleared operational area includes for trees to remain but will require monitoring of lead accumulation. Vegetation removal is unlikely to occur and it requires strong wind effects to result in fallout reaching this zone.	
f) the intended outcomes of the proposed uses on the site;	The project objectives for the Clay Target Range are to: • Provide a national and international standard sports and recreational venue that facilitates a wide range of elite and community sport training, competition and community events and activities. • Provide a design solution that offers spatial flexibility that creates maximum opportunities to promote a long-term centralised clay target facility with best practice environmental and community amenity outcomes for the existing discipline shot within BSC for the sport of clay target shooting. • Support the temporary overlay for major events and complete the venue's ability to hold world class elite shooting events by combining with the newly upgraded Brisbane International Shooting Complex to be able to hold combined shotgun, pistol and rifle shooting. • Provide for the future possibility to consolidate some of the existing shotgun shooting that currently takes place across BSC to the new clay target range.	
g) any anticipated impacts on the surrounding infrastructure network (both state and local);	Nil. Impacts on surrounding infrastructure are explored in this Final Environmental Assessment Report (fEAR).	
h) a list of the applicable state interests as identified by the infrastructure entity and a statement about how they relate to the infrastructure proposal;	TOURISM	As a national and international standard sports and recreational venue that facilitates elite and community sport training, competition and community events and activities, the Clay Target Range supports sports tourism in Queensland from international shooters and major events.
	LIVEABLE COMMUNITIES	Well-located, cost-effective and multi-functional sport and recreation facilities support the State interest and re establishes Belmont Shooting centre's ability to continue to hold world class

		shooting events that the temporary use clay target range would not otherwise allow.
	BIODIVERSITY	The BSC site includes Matters of State Environmental Significance (MSES) including: • Protected areas (nature refuge) • Wildlife habitat • Regulated vegetation (category B, of concern and least concern regional ecosystem) • Regulated vegetation (essential habitat) • Regulated vegetation (intersecting a watercourse) An ecological report has been prepared as part of the fEAR to assess the impact of further disturbance as part of the permanent use outcome, integrated with the proposed management practices that have been defined. ***Environmental Assessment Report at Appendix E.*** Nil adverse impact is envisaged by the proposed permanent usage where the proposed management practices are instituted.
	CULTURAL HERITAGE	Assessment against the duty of care guideline under the *Aboriginal Cultural Heritage Act 2003* has been undertaken as part of the fEAR. Further investigations will be required within proposed areas to be cleared prior to any proposed clearing activities.
	WATER QUALITY	A stormwater management plan has been prepared as part of the fEAR. Nil adverse impacts have been identified when the recommendations within the report are addressed and where integrated with the proposed management strategies. ***Site Based Stormwater Management Plan at Appendix F***.
	EMMISSIONS AND HAZARDOUS ACTIVITIES	The site is on the Environmental Management Register (EMR) as the site is subject to the following Notifiable Activity: GUN, PISTOL OR RIFLE RANGE - operating a gun, pistol or rifle range. ***EMR / CLR Search Result at Appendix G.*** Impacts of the sport and recreation activity including noise emissions are addressed in this fEAR. A noise report has been prepared with mitigation strategies identified to achieve compliance with environmental objectives ***Noise Impact Assessment at Appendix H.*** Impacts of proposed activity including contamination by lead shot have been fully explored in this fEAR by a Contamination

		Report—including a proposal for management to address ongoing lead usage. ***Contamination Report at Appendix I.***
	NATURAL HAZARDS RISK AND RESILIENCE • Flood hazard area – Local government mapping area • Bushfire prone areas	The site is impacted by overland flow flood planning areas under the *Brisbane City Plan 2014*. A FloodWise Property Report is included at **Appendix J**. A Stormwater Management Plan addressing overland flow catchments has been prepared as part of this fEAR. The proposed permanent use range is planned to be raised and generally isolated from surrounding overland flow paths. ***Site Based Stormwater Management Plan at Appendix F***. The site is in a bushfire prone area. A bushfire management plan has been prepared as part of this fEAR. ***Bushfire Management Plan at Appendix K***.
	ENERGY AND WATER SUPPLY • Pipelines and channels (Seqwater) • Major electricity infrastructure (Powerlink)	Energy and Water supply interests are present on the Lot and secured by Easement. The mapped interests will not be impacted by the Shotgun Range. SEQ Water and Powerlink will be notified as part of the consultation strategy. The proposed designation area includes land subject to an Easement benefiting Energex Limited – Easement in Gross No 601423971 (Easement B on RP170328). While the clay target range safety template overlaps the Easement, Energex will be notified as part of the consultation strategy. It is planned to seek to have the safety template adjusted during later design stage investigations as it can be shown there will be nil impacts to the easement due to the physical constraints existing. Refer Contamination report
	TRANSPORT INFRASTRUCTURE • State-controlled road • Future busway corridor	There is not expected to be any impact on State Transport Infrastructure as a consequence of the permanent operation of the Clay Target Range. This range is planned to ultimately replace the existing BSC shotgun range by providing a world class facility for competition and practice usage. Traffic Advice has been prepared as part of this fEAR to consider the impact of proposed usage on the external road network. ***Traffic Advice at Appendix L***.

	STRATEGIC AIRPORTS AND AVIATION FACILITIES • Obstacle limitation surface area • Obstacle limitation surface contours (152.5m AHD) • Wildlife hazard buffer zone 13km	Nil impacts are anticipated to this interest as the building infrastructure does not breach the OLS contour.
	SPP Report and relevant maps at Appendix N	
i) a statement about any relevant regional plans and state development areas that are applicable to the site and how they are relevant to the infrastructure proposal;	The relevant regional plan is the South East Queensland Regional Plan. The site is in the Regional Landscape and Rural Production Area land use category. The proposal does not involve a RAL, or a MCU ordinarily triggering assessment under the PR 2017, schedule 10, part 16, s 24. The site is not included in a State development area. ***Regional Plan and State Development Areas map at Appendix O.***	
j) sufficient information to address the requirements of section 36(1) of the Act;	The proposed infrastructure meets the criteria in the PA 2016, s 36 as there is a need for the timely and efficient supply of the infrastructure. The Infrastructure Designation will enable the legacy use of the facility—there is a need for the efficient and timely availability of the venue for use following the Games for ongoing maintenance management of the asset and continuum of use.	
k) a proposed consultation strategy for the proposed designation that has taken into account the level of impact of the infrastructure proposal and that includes a method for consultation with directly affected landowners, adjoining landowners, and identified Native Title parties, differentiated from general public consultation;	Refer to ***Part G – Consultation*** of the fEAR which described the consultation strategy.	
l) any other matter the infrastructure entity considers relevant to the request.	**Protected Plants** • The BSC site is in a high risk area for protected plants under the NC Act and the Nature Conservation (Wildlife Management) Regulation 2006.	

- A Flora Survey of the key habitat areas affected within the designation site has been undertaken in accordance with the Flora Survey Guidelines - Protected Plants.
- ***Environmental Assessment Report at Appendix E.***

Contamination

- An assessment of the potential impact associated with contamination has been prepared to assess the impact of permanent retention and use of the clay target range.
- The critical matters associated with the project to be considered include:
    - Shooting of projectiles primarily comprised of lead, with minor proportions of antimony and arsenic
    - The possible shooting of clay targets comprising a large proportion of polynuclear aromatic hydrocarbons (PAHs); and
    - The proximity of the development to sensitive ecological receptors.
- ***Contamination Report at Appendix I.***

PR 2017, Schedule 10

- If not for an Infrastructure Designation, the following assessment or referral triggers would otherwise apply under the PR 2017, schedule 10:
    - Part 3 Clearing native vegetation
    - Part 9 Infrastructure-related referrals
        - Division 1 Designated premises
        - Division 2 Electricity infrastructure
        - Division 4 State transport infrastructure
- Part 16, Division 2 is not relevant.

PART B – INTRODUCTION

In accordance with the requirements of the PA 2016, it is proposed to undertake an Infrastructure Designation of land within the Brisbane City Council (BCC) local government area for the BSC, Clay Target Range. The proposed designation applies to land located at 1485 Old Cleveland Road, Belmont and described as Part of Lot 1 RP169229. The Part of Lot 1 RP169229 that is proposed to be designated is identified in ***Appendix A***.

The Part of Lot 1 RP169229 that is to be designated is improved by the new three-position plus practice area existing Shotgun Range. The range was constructed for GC 2018 and was conceived as a temporary land use, intended to be decommissioned following GC 2018. The proposed Infrastructure Designation seeks to retain and enhance this range for permanent use.

The proposed infrastructure meets the criteria in the PA 2016, s 36 as there is a need for the timely and efficient supply of the infrastructure.

The Infrastructure Designation will enable the ongoing legacy use of the facility—there is a need for the efficient and timely availability of the venue for use following the conclusions of GC 2018, for ongoing maintenance management of the asset and continuum of use to work with existing elite pistol and rifle facilities constructed for the games and offer the ability to continue to hold future world class events at BSC.

2 Legislative Context

2.1 The Planning Act 2016

The PA 2016 describes the way in which a designation can be undertaken. Chapter 2, Part 5 of the PA 2016 prescribes that a Minister, before designating land for infrastructure, must be satisfied that for development the subject of the proposed designation:

- the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or
- there is or will be a need for the efficient and timely supply of the infrastructure.

One way in which the requirements for adequate environmental assessment and public consultation may be met is for the assessment of the proposal to be carried out in accordance with the guidelines made by the chief executive under the PA, section 36(3). The applicable guideline is the *Minister's Guidelines and Rules* (July 2017) and is available at http://www.dilgp.qld.gov.au. In particular, Chapter 7—Guidelines for the process for environmental assessment and consultation for making or amending a Ministerial designation outlines the five-step process which includes:

1. Planning and Preparation;
2. Minister's Acknowledgement;
3. Draft Environmental Assessment Report;
4. Consultation and State Interest Review; and
5. Finalise Environmental Assessment.

This fEAR has been prepared in accordance with the Chapter 7 of the *Minister's Guidelines and Rules*.

With the exception of building work under the *Building Act 1975*, development in relation to an Infrastructure Designation is accepted development (see PA 2016, s 44(6)(b).

PART C – SITE DETAILS

3 Subject Site

3.1 Property Snapshot

Site Overview	
Street Address	1485 Old Cleveland Road, Belmont
Real Property Description	Part of Lot 1 RP169229 (designation area and coordinates identified at ***Appendix A***).
Site Area	Land subject to proposed designation identified at ***Appendix A***.
Tenure	Freehold
Ownership	The State of Queensland (Represented by Department of Housing and Public Works)
Current Land Use	• The allotment is improved with the BSC. The land use was established as a rifle range in the 1920s and developed substantially during the 1980s ahead of the Brisbane Commonwealth Games 1982, and more recently for GC 2018. The BSC hosts a number of sports predominantly shooting clubs, and also archery clubs. • There is a Powerlink Transmission line traversing the Lot which is subject to an Infrastructure Designation (Belmont to Murarrie 110 kilovolt and 275 kilovolt electricity transmission line). The designation area for the transmission line does not overlap with the proposed designation area for the Clay Target Shotgun Range. • The Part of Lot 1 RP169229 that is to be designated is improved by a new three-position plus practice area Clay Target Range that was built for GC 2018.

3.2 Ownership and Tenure

Lot 1 RP169229 is a Freehold allotment owned by the State of Queensland (represented by Department of Housing and Public Works).

Property Information is included at Appendix B.

3.3 Location

The BSC at 1485 Old Cleveland Road, Belmont is located within the Brisbane City Council (BCC) local government area, and more specifically within Brisbane's south-east.

The BSC is located in the outer Brisbane suburb of Belmont, approximately 12km South-East of the Brisbane CBD. *Figure 1* and *Figure 2* show the location of the BSC within the Greater Brisbane context, and within the immediate local context.

While much of the suburb remains as undeveloped blocks of bushland mixed with large rural properties, residential estates established well after the establishment of the BSC facility have been allowed to encroach and have changed the surrounding recent residential profile and amenity.

The Gateway Motorway and Old Cleveland Road intersect not far West of the BSC site.

Figure 1 Regional context *Source: DAMS*

Figure 2 Local context *Source: DAMS*

3.4 Surrounding Land Uses

The BSC site has a primary frontage to Old Cleveland Road. The site also has frontages to Mount Petrie Road to the West, Prout Road (unformed) and Eastwood Street to the East. The Gateway Motorway lies West of the site beyond Mount Petrie Road.

Adjoining the BSC site to the North-East are rural residential lots and the Sleeman Sports Complex. To the East and South are rural residential lots and roads. To the North-West beyond the Gateway Motorway and opposite the BSC site on Old Cleveland Road is primarily residential dwellings on large lots. Residential subdivisions lie to the West.

The Designation site is located within in the North East corner of the BSC site.

3.5 Easements and Encumbrances

There are a number of leases and other encumbrances affecting the BSC site. Namely there is a head lease granted to the Queensland Rifle Association Incorporated (QRA). There are also a number of sub-leases granted to a multitude of associated shooting and sports clubs operating within the lease area controlled by QRA.

Energy and Water supply interests are present on the Lot and secured by Easement. Infrastructure of State interest including pipelines and channels (owned by Seqwater) and major electricity infrastructure (owned by Powerlink) will not be impacted by the proposed Clay Target Shotgun Range.

The proposed designation area includes land subject to an Easement benefiting Energex Limited – Easement in Gross No 601423971 (Easement B on RP170328). Energex Ltd will be notified as part of the consultation strategy for the Infrastructure Designation.

The Energex easement overlaps the outer extremity of the ISSF safety template for international Skeet. There is a very low likelihood that projectiles will cause an unacceptable risk to safety in the Energex Easement arising from this overlap.

In regards to potential firearm safety impacts associated with this overlap, key considerations include the following:

- The Energex easement falls outside firearm safety templates that are typically adopted for clay target ranges by Queensland Police (and other Australian authorities). The ISSF safety template is considered to be a conservative template, and is generally adopted as an added precaution for major events only (with four allowable in the life of the range) and it assumes a flat cleared site
- Skeet, which is the discipline that causes the ISSF safety template overlap has a maximum pellet size of Number 7.5 which, based on a number of assumptions, the National Rifle Association of the United States considers has a maximum trajectory of 205m which is outside of the easement
- Given the nature of projectile trajectories, projectiles go a lesser distance if fired uphill. The relevant shooting position, Skeet Range 1, has an elevation of RL 32m and the ground level in the easement at the ISSF safety template overlap is at RL 42m. It is understood that the Energex powerlines are above-ground, and are therefore at a higher elevation than RL 42m
- At this late stage of the pellet trajectory there will be very little kinetic energy in the pellets and leaves, branches and trunks, if impacted will serve to halt the pellets. Trees are within the flight path towards the ISSF safety template overlap, have a canopy height of approximately 20m in this area, and would further serve to halt any pellets.

- The angles of fire for ISSF skeet typically fall within an arc 80 degrees left and right of centre, which is less than the 90 degrees left and right of centre that is adopted for the ISSF template.

For reasons including those outlined above it is considered that there is a negligible risk to infrastructure in the Energex corridor, and that there is likely to be a negligible firearm safety risk to any users of the Energex easement.

The safety template will be reviewed during the design development phase, with a view to assessing any potential risk to occupiers or users of the Energex easement, managing any risks accordingly and reducing the firearm safety template applicable to ISSF skeet given the topography impacts which would physically reduce the maximum pellet trajectory length.

Property materials at Appendix B.

3.6 Site History

The BSC land was purchased by the Commonwealth Government in 1916 and a small range was constructed in 1920. It was used by the Belmont-Wynnum Rifle Club. During World War II, the Volunteer Defence corps constructed a range for training purposes, and this area was developed into the range currently used by the Cannon Hill Rifle Club. There also remains an historic shooting range on the slopes of Mount Petrie used for practice by MacArthur's forces during World War Two.

In June 1964 the Queensland Rifle Association (QRA) moved its operation from Enoggera to Belmont under a guarantee provided by the Minister for Army in 1962. The land comprising the BSC was to be retained by the Department of Army as a defence area for an indefinite period, and that no action would be initiated by it for disposal of any portion upon which the QRA established and regularly used rifle range facilities.

From 1964 many groups took up occupancy of parts of the Belmont Shooting Complex under the direction and guidance of QRA.

In 1982 the facilities were upgraded to a standard that enabled the Commonwealth Games shooting events to be staged.

In 1989 the Commonwealth advised its intention to divest assets, and one of those assets was the BSC site.

The property was purchased from the Commonwealth by the State and formally transferred on 1 March 1993. One of the conditions of sale was that it be retained by the State for the purpose of shooting. The lease to QRA came into force on 4 July 1993.

3.7 Topography

There is a ridge in the southern third of the BSC site with a maximum elevation of approximately 165m AHD. Elevations at the North of the BSC site are approximately 14m AHD at the lowest point.

Within the designation area, contours are generally between 25 and 35m AHD. A contour and detail plan confirms contours within the designation area and has informed stormwater and overland flow investigations.

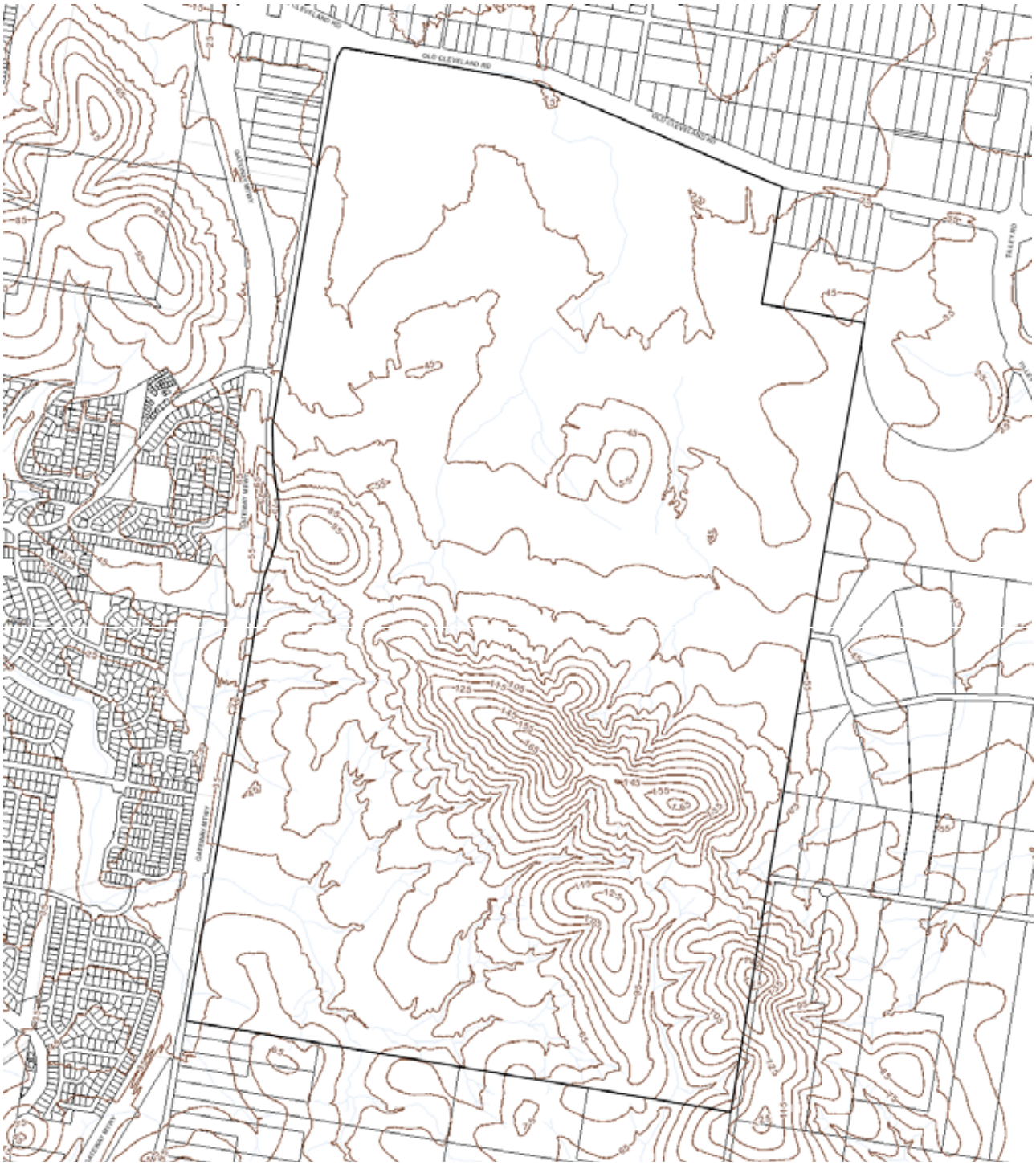


Figure 3 BSC site contours *Source: Brisbane City Plan 2014, Interactive Mapping*

3.8 Socio-economic Profile

3.8.1 City of Brisbane Local Government Area Profile

The City of Brisbane is a local government area (LGA) in South East Queensland, Australia and is the most populous local government area in Australia .

The Brisbane LGA has a resident population of approximately 1.13 million persons (at 2016).

	People	**1,131,155**
	Male	49.2%
	Female	50.8%

	Median age	35
	Families	**286,093**
	Average children per family	-
	for families with children	1.8
	for all families	0.7
	All private dwellings	**463,601**
	Average people per household	2.6
	Median weekly household income	$1,746
	Median monthly mortgage repayments	$2,000
	Median weekly rent	$390
	Average motor vehicles per dwelling	1.7

3.8.2 Belmont Suburb Profile

Belmont is an outer suburb of the City of Brisbane, Queensland, located south-east of the Brisbane CBD. The suburb has a resident population of 4,374 persons at the 2016 Census.

	People	**4,374**
	Male	49.5%
	Female	50.5%
	Median age	38
	Families	**1,242**
	Average children per family	-
	for families with children	1.8
	for all families	0.9
	All private dwellings	**1,604**
	Average people per household	2.9
	Median weekly household income	$2,094
	Median monthly mortgage repayments	$2,058
	Median weekly rent	$435
	Average motor vehicles per dwelling	2.1

While much of the suburb remains as undeveloped bushland intermixed with large rural-residential properties, some areas have built-up residential estates. This is reflected in Census data which shows that of 1,453 occupied private dwellings in Belmont, 89.5% were separate houses, 10.0% were semi-detached, row or terrace houses, townhouses etc, 0.0% were flat or apartments and 0.4% were other dwellings.

The tenure of occupied private dwellings is characterised as 19.8% rented, and 77.6 owned (either outright or with a mortgage).

3.8.3 Sport Shooting

Sports shooting is governed by a number of sports shotting organisations.

Generally, all shooting disciplines have seen strong growth across the State.

Clay target disciplines have very strong increases between 2014 and 2017 and there is no reason why this would change.

Indication of shooting participation at Belmont Shooting Complex from the Queensland Rifle Associated indicate there is 85,000 users per annum across all site user clubs.

4 Infrastructure Characteristics

The below provides a description of the existing infrastructure characteristics relating to the subject site. Further discussion on potential impacts and mitigation measures from the proposed development are discussed in further detail in Part F – Environmental Assessment.

4.1 Transport Infrastructure

4.1.1 Road Network

Two of Brisbane's main roads, the Gateway Motorway and Old Cleveland Road, cross at a large intersection just West of the BSC site. Both these roads are State Controlled Roads.

There are a number of access points into the BSC site, including crossovers at Old Cleveland Road, Mount Petrie Road, and Eastwood Street. The Clay Target Range is accessible via the BSC internal road network from Old Cleveland Road.

4.1.2 Public Transport Network

The closest permanent public transportation facilities are located along Old Cleveland Road, adjacent to the main entrance to the BSC site.

4.1.3 Active Transport Network

There are limited pedestrian and cycle networks linking the site.

4.2 Services

The BSC site is connected to urban services. The Clay Target Range has limited services availability, with most services bumped in,

The Clay Target Range is presently serviced by reticulated electricity from the main BSC swithchboard with 100MM conduit with provided cabling sized for 160 Amp with Energex providing only 80 Amp supply and no other services.

PART D – DESIGNATION PROPOSAL

5 Proposed Designation

5.1 Infrastructure Description under the PR 2017

The proposal seeks to designate the site as follows:

Belmont Shooting Complex, Clay Target Range

1485 Old Cleveland Road, Belmont

Part of Lot 1 on RP169229

Pursuant to Chapter 2, Part 5 of the PA 2016, it is proposed to designate the land for infrastructure. Ministerial designation is proposed in order to enable the timely supply of the infrastructure. The proposed infrastructure is best described in the *Planning Regulation 2017*, Schedule 5, Part 2 as:

15 sporting facilities

5.2 Intent of Designation

A three-position plus practice area clay target shooting range that exists within the designation area was constructed for GC 2018, operating under the *Major Events Act 2014*. The range was collocated with a pre-existing 300m range that accommodates pistol and rifle disciplines. The range was conceived as a temporary land use that was intended to be decommissioned following the Games.

This proposed Infrastructure Designation will enable retention and enhancement of the Clay Target Range for permanent legacy use.

Sporting facilities are defined as infrastructure under the PR 2017, schedule 5—being assets that support communities and for the public benefit. The proposed infrastructure meets the criteria in the PA 2016, s 36—there is a need for the efficient and timely availability of the venue for use following GC 2018, for ongoing maintenance management of the asset and continuum of use.

5.3 Proposal Development

Permanent retention and enhancement of the Clay Target Range is planned to preserve a legacy use following the close of GC 2018.

Retention will enable major international sports shooting events at BSC which cannot be accommodated at the existing BGC clay target range located on the West side of the complex (the range does not comply with current international sports shooting regulations which necessitated the construction of the temporary range to hold the Commonwealth Games shooting events).

The designation is for the Clay Target Range covers only the area of the recently constructed Commonwealth Games Clay Target range facility, consisting of three trap and skeet housing structures, hardstand and the associated drainage and clay target curtain, and the proposed addition of a future fourth skeet and trap housing structure and eight ‘down the line’ ranges (three of which overlay existing layouts), clubhouse and associated structures and additional pollutant control measures, earthworks and shot curtain modifications.

The Clay Target Range is for use by the following seven known disciplines in clay target shooting:

- ISSF/ACTA Trap

- ISSF/ACTA Double Trap
- ISSF Skeet
- Universal Trench
- American Skeet
- Down-the-line (DTL) Trap
- 5 Stand sporting clays trap.
- Other future disciplines provided impacts do not exceed those identified and mitigated by this designation.

Future works relating to the Clay Target Range that are to be facilitated by the Infrastructure Designation are demonstrated on the drawings at ***Appendix D*** and include:

- 4th multi-disciplinary shooting position and associated control building and trap machinery bunkers and skeet towers
- Likely future stage comprising a total of 8 DTL shooting positions (3 overlain on existing layouts)
- Future clubhouse, related structures (i.e. storage, armoury) associated amenities and carparking
- Stands either temporary or permanent.
- Safety barriers
- Sound Attenuation device
- Temporary removal of the shot curtain (which will be reinstated for major events) Further investigation may lead to retention subject to completion of cost benefit analysis.
- Ramped access for forklift to load bunkers and load and remove DTL trap houses.
- Banking realignment to the South and West of the existing three range footprint.
- Vegetation clearing and earthworks to enable environmental isolation and management of lead deposition
- Upgraded environmental protection measures

As a result of the above, consequential works to adjoining or collocated facilities within the BSC will occur. The works include relocation of two field archery galleries and two minor gallery shifts, and relocation of the firing line for the 300m range (reducing this range to 150m). These works do not rely on the Infrastructure Designation.

5.3.1 Hours of Operation

Normal operations for BSC occur between 5 and 7 days per week.

Hours of operation at the expanded legacy range could reasonably be expected to be 8am to 9pm, Wednesday to Sunday. Hours will be restricted in accordance with the legislative requirements set out in s 440ZC of the *Environmental Protection Act 1994*.

During competition it is likely that the range may operate Monday and Tuesday to enable all matches and practice to fit into the program.

Hours could be extended in preparation for and during major competition events.

5.3.2 Operational Guidelines

Operational guidelines will need to be developed for the Clay Target Range to address key environmental operational impacts. A conceptual review of operational considerations has been

identified in the below table, which includes key environmental and operational impacts and proposed mitigation processes and controls. This document will require refinement prior to the use commencing.

Key Environmental and Operational Impacts	Mitigation processes and controls to be put in place / addressed before permanence use can commence
Management Impacts • Hours of usage proposed. • Range safety • Ongoing Range ownership and maintenance requirements. • Permitted clay target shooting disciplines on this range. • Permitted frequency of major events and related shooting impact controls to minimize lead deposition.	• Permanent range usage for all 8 positions is permitted in accordance with the Permitted Discipline Use table. • All ranges shall only allow shooting to occur for 7 days a week from 8 AM to 9 PM and as limited in the Permitted Discipline Use table for particular ranges. • Belmont Shooting Complex lessee the Queensland Rifle Association (QRA) shall in conjunction with the Department of Housing and Public Works - Sport and Recreation Services negotiate a new Business Plan with an approved Sporting Club that will be required to manage the usage of the new clay target range and be responsible for range safety, ongoing maintenance. • The site lessee or sublessee shall be responsible for developing, maintaining and seeking approval for the following plans from the Site Owner (DHPW-Sport): o Business Plan which shall include ▪ Contaminants Control Requirements. ▪ Bushfire Management Requirements. • The Business Plan shall consider inclusion of charges for example range users to pay an environmental levy to assist with provision of the ongoing required testing, mitigation, reclamation and remediation works for the use of lead shot or for ongoing maintenance of the curtain etc. • Where prescriptive control strategies are described within the approved business plan indicating how permanent use is to be undertaken, alternative control strategies can be considered and adopted subject to submission to and approval of the Site Owner. I.e.: o Discipline types may be changed within the designation area subject to appropriate impact analysis and provided there is no net increase in the number of ranges within the designation site area. o Future changes to shell technology may allow amendments to the contamination control requirements to be undertaken and be adjusted to be appropriate for the new technologies deployed. o Where proposed changes in material use will lead to lead deposition increasing in areas beyond the proposed cleared operational area a revised MID approval will be required. o Additional shot capture curtains may be deployed within the designation site area to assist in reducing the cleared operational areas and reduce lead deposition areas without requiring a MID amendment provided appropriate analysis is undertaken. o Minor changes to the designation approved plans for range setout can be undertaken provided environmental approvals are not triggered and all local authority approvals are sought.

	• The Site's lessee will be required to develop new sublease arrangements with the adjoining sublessee Field Archery affected by the works of this designation. The development and completion of this sublease agreement shall not prevent the allowable permanent use of this clay target range. • Permanent fulltime usage can commence when the infrastructure requirements identified in the approved fEAR have been installed. Completion of the additional ranges and clubhouse and carparking are not considered a prerequisite to permanent range usage. Limited range usage can commence immediately after MID decision to assist with equipment maintenance and before curtain is removed. • The existing shot curtain is intended to be deployed for major events only and is not a prerequisite for lead deposition control for day to day shooting with lead. • If additional or retained lead capture curtains are proposed to be deployed for day to day shooting during the life of the permanent use range, the operational control areas can be reduced from that shown and the non-cleared operational areas increased accordingly. Such reductions in operational areas shall be on the basis of and support of approved analytical modelling and as approved by the Site Owner.
Contamination Impacts • It is assumed no illegal shots are permitted on this range. (ie legal shots shall be for shooting clays only and from nominated shooting positions only. • Random and target less shots and shots from within the field of play are deemed illegal shots.	• The lead deposition areas are divided into three key zones. Each zone requires lead management control plans to be produced to prevent migration of lead from and into site areas beyond the designation area. o Cleared Operational area. Refer drawing MP-045F o Uncleared Operational area. Refer drawing MP-045F o Negligible impact area. Refer MP-045F • Summary Requirements for Cleared Operational area (refer contamination and stormwater reports) o Provide an isolated area within this operational area to raise, isolate and control water overland flow and isolate lead and control its states to prevent migration of the lead from both the designation and BSC site. o Provide testing regimes to test lead levels within the operational area in accordance with the Contamination report and site owner approved frequency. o Provide fill platform to South West areas to raise and isolate the lead deposition areas above surrounding overland flow areas traversing the site from the South and South East. o Provide catchment and treatment pond to control lead migration. Include a sediment control basin and a gross pollutant trap to control shooting detritus and lead migration, in accordance with contamination and stormwater management reports. o Provide within the business plan a Site owner approved lead mitigation plan. o All lead management plans and work within the operational areas must be checked and vetted by an approved contamination consultant and approved by the Site owner.

- Testing shall include the ground water with lead control plans developed to minimise lead migration into the ground water table.

- Summary Requirements for Uncleared Operational area
  - Note lead may accumulate in this zone depending on prevalent conditions ie high wind velocities affecting lead trajectories.
  - Provide a regime of testing to ensure lead does not reach the environmental trigger levels, as identified in the contamination report, within each key ecological zone within this uncleared zone.
  - Should lead levels exceed the nominated and site owner approved environmental trigger levels, develop lead remediation strategies and comply with environmental contamination legislation.
  - Trigger levels are not to be exceeded and are as set as nominated within the contamination report for this zone.
- The entity appointed to operate the permanent use clay target range is required to develop a Site Owner approved business plan based on the recommendations identified in the contamination report. The approved plan must detail the physical and operational works required to isolate, manage, reclaim, neutralise and control of lead deposition and migration within the cleared and non cleared operational areas.
- Immediately stop ongoing lead shell usage associated with all disciplines and ranges that have caused the trigger levels to be reached within the uncleared operational areas.
- Environmental shells are preferred ie biodegradable wads and plastics. Should non- sensitive plastic shell components be used, the Business Plan shall allow for a regular removal program and additional catchment devices for the infield to prevent this material building up excessively or leaving the range‘s cleared operational area.
- Only Nontoxic clay targets (resin based) are recommended to be used at this range for all disciplines and elite events including ISSF and ACTA sanctioned events. Should non-environmentally friendly clays (ie pitch/ petroleum based) be used for major events all detritus the result of these events shall be collected and safely removed from the cleared operational area. It is recommended associated costs should to be built into the cost to run the event.
- Site design of the cleared operational areas must be approved by the site owner and allow to isolate lead deposition from the surrounding overland flow paths to ensure lead migration, control and capture and runoff are controlled.
- Include in the facility design and ongoing management practices, the requirements to minimize contamination impacts in accordance with the measures outlined in the contamination report sections 5 and 6to the extent as approved by the Site Owner.

Acoustic Impact • The legislated sound level of 95dba is exceeded for one residential property adjoining the Northern boundary of the designation area.	• Provide approved attenuation proposal to reduce sound levels to meet legislated sound level of 95dba to all ranges except DTL ranges 7 and 8. • Permitted use of DTL range numbers 7 and 8 inclusive is only to occur at a maximum yearly frequency of 2 major events for a maximum use of three days per event. No attenuation will be required for these ranges for this restricted use. • Integration of a clubhouse into the attenuation solution can be considered. • Alternative attenuation solutions can be considered, provided they meet the performance attenuation criteria noted in the Acoustic Report. These can include et alia, noise reduction berms, noise reduction walls, container walls or combinations. • Include in the design for the noise reduction requirements and suggested measures as outlined in the acoustic report.
Environmental Impact • There is a low risk impact of fauna present ingesting lead.	• Develop a Site Owner approved Business Plan which includes for a testing regime to monitor lead at the edge of the site within the adjoining main overland flow paths to ensure the site-specific lead in the environment trigger levels are not exceeded. Refer to the contamination report. • Should the unlikely occurrence of lead aggregation/and migration occur beyond allowable site specific set limits in areas beyond the cleared or noncleared operational areas, develop and carry out appropriate Site owner approved remediation plans. • Develop strategies to remediate lead accumulation within any uncleared operational zone where trees may be elected to be retained. If no such strategies can be successfully deployed allow to remove the trees and remediate the site as required. Allow to reinstate the vegetation to the Site Owner's approval
Bushfire Impact Protect the shotgun range users from Bushfire attack	• Prepare a subset bushfire management plan to ensure the safety of users within this range. This plan is to be integrated into the BSC site wide Bushfire management plan. • The localized plan for this range is to be in place before permanent use is allowed.
Range Planning Allowable Flexibility	• The range layout design indicated in DWG No. MP-045H the MID is conceptual only. Site owner approved Final design work can determine layouts which meet MID specified design parameters/criteria that may produce improved outcomes and impacts that do not exceed those impacts resulting from the conceptual proposal.

Permitted Discipline Use Table

Discipline	Shot type	Shots over design life	Comments / assumptions
ISSF Trap	Lead	Unlimited	Ranges 1,2,3
ISSF Trap	Lead	Limited	Range 4 limited to major events requiring a 4th range ie world cups and Olympics. Note limit of 4 events (of this event standard) in design life for the range. (Note any desired increase will require MID amendment)
Down The Line (DTL)	Lead	Unlimited	Ranges 1,2,3,4 and 6.

DTL	Lead	Limited	Ranges 5,7 and 8 limited to two major events a year (State and National championships)
Universal Trap	Lead	Unlimited	Ranges 1,2,3
Universal Trap	lead	Limited	Range 4 limited to major events requiring a 4th range ie World Cups and Olympics. Note limit of 4 events in design life for the range. (Note any desired increase will require MID amendment)
ACTA/American Skeet	Lead	Unlimited	Ranges 1,2,3 only (range 4 excluded)
ISSF Skeet	Lead	Unlimited	Range 1,2,3
ISSF Skeet	Lead	Limited	Range 4 limited to major events requiring a 4th range ie world cups and Olympics. Note limit of 4 events (of this event standard) in design life for the range. (Note any desired increase will require MID amendment)
ISSF Double Trap	Lead	Unlimited	Ranges 1,2,3 only (range 4 excluded)
5 Stand Sporting Trap	Lead	Unlimited	Range 5 only
Future new disciplines	Lead	Limited/Unlimited	Requires Site Owner approval. Submissions shall include supporting evidence and adequate investigations to prove lead deposition and control remains within approved boundaries and CCA contamination guidelines. (Note any desired amendments beyond set values will require MID amendment)

5.4 Future Asset Consolidation

It is envisaged that the Infrastructure Designation for the new permanent use Clay Target Range will facilitate potential future opportunities to consolidate some of the existing shotgun shooting currently taking place across BSC to the new clay target range.

There is no present commitment or timeline for this activity, but it is an objective of the land owner (DHPW SRS) and the site leaseholder (QRA) to where possible consolidate assets and improve the amenity and environmental management within the BSC site.

5.5 Impact to Existing 300m Range

The proposed clay target range is located on the old 300m range. The 300m range is leased land controlled by QRA. There are no subleases using the 300m range.

QRA are satisfied the remaining section of the 300m range can remain as a 50M or 100M shooting range (subject to satisfactory management of safety template overlap issues).

QRA have identified that the activities previously shot on the 300m range can be satisfactorily shot elsewhere on the site. Briefing meetings have been held with the (Queensland Military Rifle Association a key user that uses the 300M range.

PART E – LOCAL AND STATE PLANNING INSTRUMENTS

To make a designation the Minister must have regard to:

- all planning instruments that relate to the premises; and
- any assessment benchmarks, other than in planning instruments, that relate to the development that is the subject of the designation; and
- if the premises are in a State development area under the State Development Act—any approved development scheme for the premises under that Act; and
- if the premises are in a priority development area under the *Economic Development Act 2012*—any development scheme for the priority development area under that Act; and
- any properly made submissions made as part of the consultation carried out under section 37; and
- the written submissions of any local government.

This Part will examine relevant matters to address the first four dot points of the above list.

6 Development Summary

But for the Infrastructure Designation, the development proposed in Section 5.3 of this report would be categorised as follows under relevant planning instruments and the PR 2017.

Aspects of Proposed Development			
☒ Material Change of Use	☐ Reconfiguring a Lot	☒ Building Work	☒ Operational Work

Brisbane City Plan 2014:	• 5.5 Categories of development and assessment—material change of use Table 5.5.13 Sport and Recreation Zone and Table 5.5.14 Conservation Zone Outdoor sport and recreation is assessable development (impact assessment) • 5.8 Categories of development and assessment—Operational work Table 5.8.1 Filling or excavation is assessable development (code assessment) • (plus associated triggers in 5.10 Categories of development and assessment—Overlays)	
Planning Regulation 2017:	Schedule 9 Building Work under the Building Act • Building work under the Building Act is assessable development, unless the building work is accepted development under schedule 7 of the PR 2017.	
	Schedule 10 Development assessment	
	☐ Part 1 Airport Land ☐ Part 2 Brothels ☒ Part 3 Clearing native vegetation ☐ Part 4 Contaminated land ☐ Part 5 Environmental relevant activities ☐ Part 6 Fisheries ☐ Part 7 Hazardous chemical facilities ☐ Part 8 Heritage places ☒ Part 9 Infrastructure-related activities ☐ Part 10 Koala habitat area ☐ Part 11 Noise sensitive place on noise attenuation land	☐ Part 13 Ports ☐ Part 14 Reconfiguring a lot under Land Title Act ☐ Part 15 SEQ development area ☐ Part 16 SEQ regional landscape and rural production area and SEQ rural living area ☐ Part 17 Tidal works or work in a coastal management district ☐ Part 18 Urban design ☐ Part 19 Water-related development ☐ Part 20 Wetland protection area ☐ Part 21 Wind farms

	☐ Part 12 Operational work for reconfiguring a lot	

With the exception of building work under the *Building Act 1975*, development in relation to an Infrastructure Designation is accepted development (see PA 2016, s 44(6)(b).

7 Planning Instruments

7.1 Brisbane City Plan 2014

Planning Scheme Information	
Planning Scheme:	*Brisbane City Plan 2014*
Area Classification:	SR3 Sport and Recreation (Metropolitan) CN Conservation
Local Plan:	Not applicable
Land Use Definition:	Outdoor Sport and Recreation

Planning Scheme Overlays (as applicable to the designation area and proposed development)	
☐ Active frontages in residential zones	☐ Industrial amenity
☒ Airport environs	☐ Landslide
☒ Bicycle network	☐ Potential and actual acid sulphate soils
☒ Biodiversity areas	☐ Pre-1911 buildings
☒ Bushfire	☐ Regional infrastructure corridors and substations
☐ Coastal hazard	☒ Road hierarchy
☐ Commercial character building	☐ Significant landscape tree
☐ Community purposes network	☐ Traditional building character
☒ Critical infrastructure and movement network	☐ Transport air quality corridor
☐ Dwelling house character	☐ Transport noise corridor
☐ Extractive resources	☐ Water resource catchment
☒ Flood	☐ Waterway corridors
☐ Heritage	☐ Wetlands

7.1.1 Area Classification

The planning scheme identifies the designation area includes and within the SR 3 Sport and Recreation Zone and the Conservation Zone as illustrated in *Figure 4*.

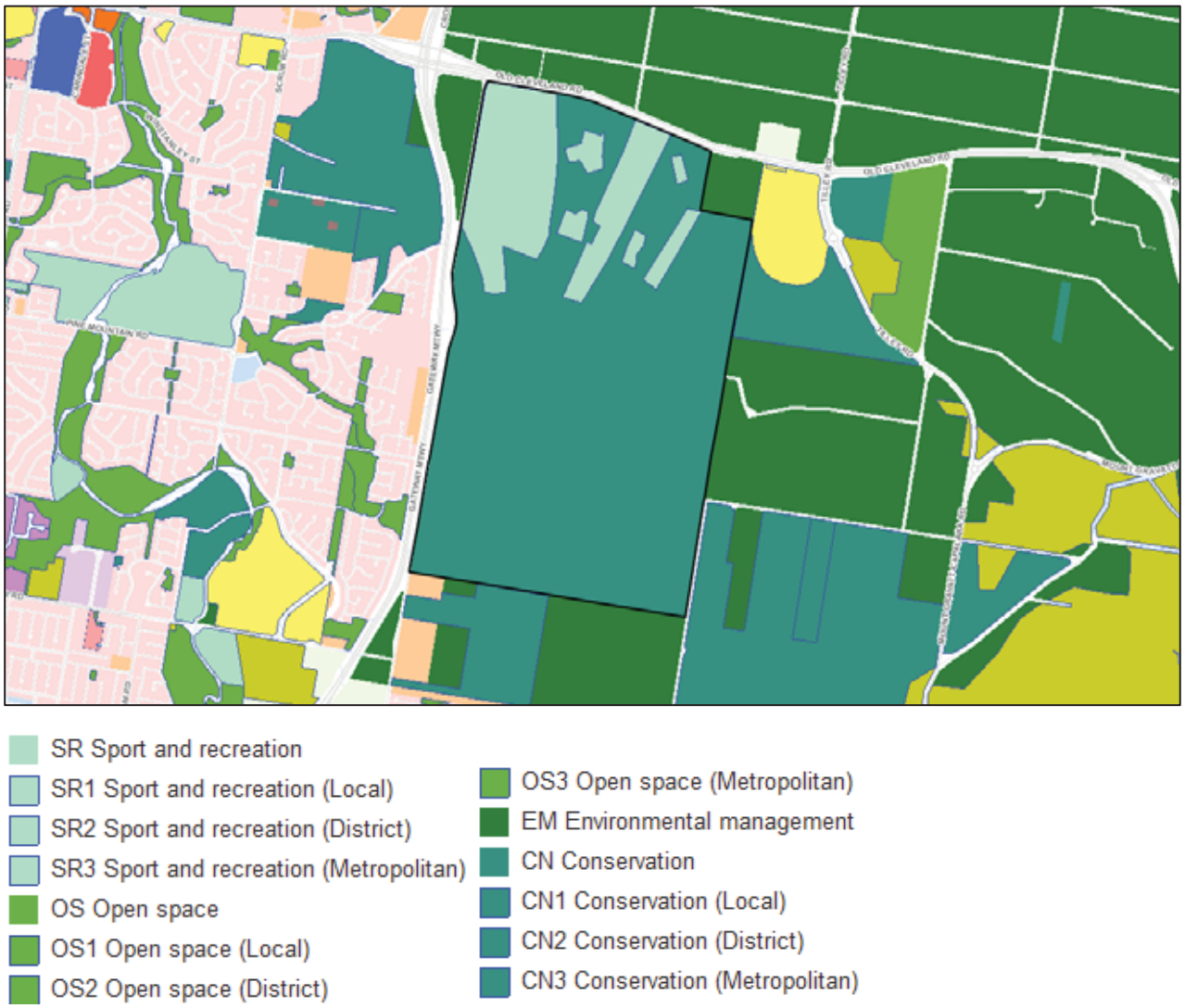


Figure 4 Area classification *Source: Brisbane City Plan 2014, Interactive Mapping*

The purpose of the Sport and Recreation Zone is to provide for a range of organised activities that includes sport, cultural and educational activities where the uses require a level of built infrastructure. The Sport and Recreation Zone includes built structures, such as clubhouses, gymnasiums, public swimming pools and tennis courts, and infrastructure to support the activities, safe access and essential management, where required to meet community needs.

The Metropolitan zone precinct is characterised as a major park (including regional) with a high level of infrastructure that caters for major events and high levels of use over long periods.

Development location and uses overall outcomes:	
(a) Development provides for land in the Sport and recreation zone to make an important contribution to Brisbane's liveability.	The proposed Infrastructure Designation and development is consistent with this intent.
(b) Development provides for a wide range of organised sporting, recreational, community and cultural activities primarily park, environment facility and outdoor sport and recreation to be accommodated at local, district and metropolitan levels whether they are on publicly or privately owned land.	The BSC achieves this outcome as it provides a consolidated centre for a wide array of shooting disciplines and clubs. The facility caters to local, district, metropolitan, national and international sports shooting needs. The proposed usage also provides for future opportunities to consolidate some of the existing shotgun shooting currently taking place at BSC to the new clay target.

	BSC also accommodates other sports and community events including off Road Remote Control Car Racing, Pidgeon Racing, Orchid Societies, community events (car shows, flower shows and Christmas carols).
(c) Development accommodates areas for active sport and outdoor recreational pursuits such as playing fields, equestrian facilities, outdoor cultural facilities, educational activities, swimming pools, outdoor courts and skate facilities.	The flexibility of the venue to cater for alternative recreational outlets needs to be balanced against safety and amenity factors. The Clay Target Range is only for the clay target shooting disciplines mentioned.
(d) Development accommodates a diverse range of vibrant activities including activities which may generate noise and light during evening hours, sometimes on a regular basis.	The Clay Target Range will generate noise on a regular basis. Acoustic modelling has been conducted and mitigation will be implemented to ensure default noise standards are met. Operational restrictions are also proposed to control noise outputs The proposed Infrastructure Designation will enable the future development of a club house and associated amenities.
(e) Development for a compatible land use of club, community use, food and drink outlet, function facility, indoor sport and recreation, health care services, market or theatre (where an outdoor cinema) may be located in a district or metropolitan- scale facility where it complements the leisure and recreation experience of users.	The proposed Infrastructure Designation will enable the future development of a club house and associated amenities.
(f) Development maximises opportunities for sporting clubs using outdoor recreation infrastructure to establish club facilities in multifunction facilities, rather than single-use facilities.	The Infrastructure Designation does not prevent the establishment of multifunctional club facilities—however the relative isolation of the range will likely restrict use to range users.
(g) Development for a building or structure such as a clubhouse, kiosk, shelter, stand, amenity facility, picnic table, playground or other outdoor recreation infrastructure is provided where necessary.	The proposed Infrastructure Designation will enable the future development of a club house and associated amenities.
(h) Development provides for land in the Sport and recreation zone to be maintained or re-used for sport, recreation, cultural or community facilities or services should the current activity cease.	The proposed Infrastructure Designation is consistent with this objective.
Development form overall outcomes:	
(a) Development minimises any adverse impacts on the amenity of an adjacent area, particularly a residential area, through the sensitive design and siting of facilities.	The Clay Target Range will generate noise on a regular basis. Acoustic modelling has been conducted and mitigation will be implemented to ensure default noise standards are met. Operational restrictions are also proposed to control noise outputs

(b) Development is designed to incorporate sustainable practices including climate responsiveness and water conservation.	Such measures may be incorporated into future club facilities.
(c) Development of high-patronage activities is supported by the necessary level of transport infrastructure to promote safe and efficient public transport use, walking and cycling.	High patronage events, such as major competitions events, will be supported by event specific transport management plans.
(d) Development responds to land constraints, mitigates any adverse impacts on environmental values and addresses other specific characteristics, as identified by overlays affecting the site or in codes applicable to the development.	The Environmental Assessment addresses the environmental values of the Designation site, the impacts of proposed development, and the proposed mitigation and management responses required
Metropolitan zone overall outcomes:	
(a) Development provides a park or sport or recreation setting that will attract and cater for users from across the Brisbane metropolitan area.	The proposed Infrastructure Designation is consistent with this intent.

The purpose of the Conservation Zone is to provide for the protection, restoration and management of areas identified as supporting significant biological diversity and ecological integrity.

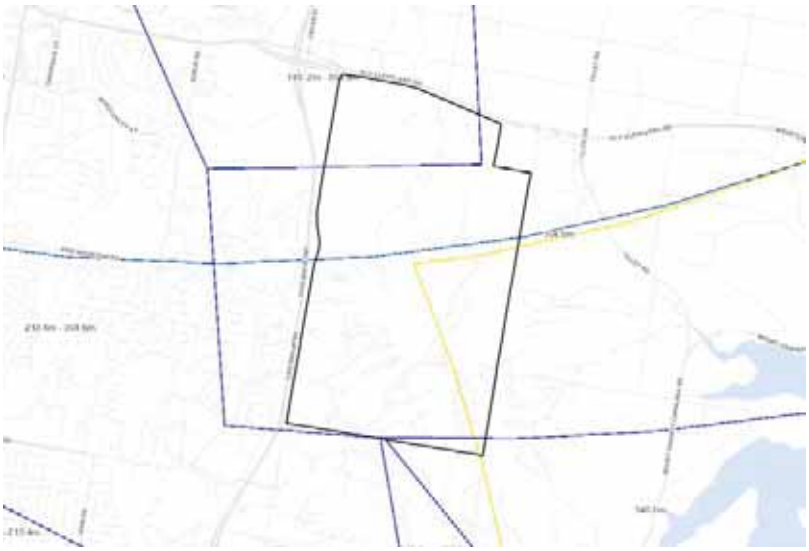
Development location and uses overall outcomes:	
(a) Development provides for publicly owned land in the Conservation zone to be managed primarily as a park or environment facility, for its nature conservation values and ecological functions, including a broad range of ecosystem services.	The existing BSC does not achieve this outcome. This objective is inconsistent with the safety requirements of the land use. Environmental management is a key consideration of the proposed Clay Target Range.
(b) Development opportunities are limited to sustainable outdoor recreation and educational activities that are provided for on public land in accordance with a best-practice planning and management framework.	The existing BSC and proposed Clay Target Range does not achieve this outcome.
(c) Development for housing comprises a 1 or 2 storey dwelling house which is: (i) on private land; (ii) part of a nature conservation partnership program; (iii) located on an agreed portion of the site; (iv) sited to respect the environmental values and identity of the Conservation zone.	This project does not propose housing.
(d) Development for a home based business may operate in a dwelling house and is of a scale and nature that protects the amenity of adjoining residents.	This project does not propose a home based business.
(e) Development provides for the restoration of wildlife habitat and associated features to occur through active rehabilitation and	It is envisaged that the Infrastructure Designation for the new Clay Target Range will provide the future possibility of consolidating some of the existing

	management of biosecurity threats on land which functions as a receiving site for biodiversity offsets.	shotgun shooting currently taking place across BSC to the new range. There is no present commitment or timeline for this activity, but it an objective of the land owner (DHPW SRS) and the site leaseholder (QRA) to consolidate assets and improve the amenity and environmental management of BSC.
Development form overall outcomes:		
(a)	Development adopts and promotes sustainable operational features and practices, including climate responsiveness and water conservation.	Environmental Sustainable Design (ESD) can be considered as part of detailed design for future club and other facilities that the Infrastructure Designation will enable.
(b)	Development protects the values and function of the Conservation zone through innovative design, planning and construction approaches, including application of noise, light and physical buffers external to the values being conserved.	The Infrastructure Designation and concept for development addresses environmental impacts relating to contamination (lead deposition), vegetation clearing, and noise. These matters are explored further in the environmental assessment.
(c)	Development of a small-scale non-residential use of food and drink outlet, landing or outdoor sport and recreation is accommodated in the District zone precinct and the Metropolitan zone precinct where it supports the nature-based experience of the Conservation zone and does not undermine nature conservation values.	Not applicable
(d)	Development responds to land constraints, mitigates any adverse impacts on environmental values and addresses other specific characteristics, as identified by overlays affecting the site or in codes applicable to the development.	The Infrastructure Designation and concept for development addresses the constraints and specific characteristics and features of the site.

7.1.2 Overlays

The Planning Scheme identifies physical constraints affecting development through the inclusion of overlay maps. Where a site is affected by a constraint, development limitations may be placed over the property or the development, or may flag hazard risks that may need to be taken into account during the planning scheme design of development.

The site is affected by the following overlays:

Constraint	Overlay Map
Airport Environs The Airport environs overlay deals with issues of State Interest. It may also include locally identified issues that relate to airport environments. Assessment benchmarks are included in the Airport Environs Overlay Code. • The site is within the OLS Horizontal limitation surface contour. The Procedures for Air Navigation Surfaces (PANS) is 304.8m AHD • The site is within the 8-13km separation distance from the Brisbane Airport. This overlay is not relevant to the Clay Target Shotgun Range.	
Bicycle Network The bicycle network overlay deals with the provision of bikeway infrastructure and facilities to encourage the safe and efficient movement of pedestrians and cyclists through the movement network. Assessment benchmarks are included in the Bicycle Network Overlay Code. • Old Cleveland Road is a Primary cycle route; Mount Petrie Road is a Secondary cycle route. BSC users are generally not reliant on active transport.	
Biodiversity Areas The Biodiversity areas overlay deals with biodiversity Areas of Ecological Significance (AES). Assessment benchmarks are included in the Biodiversity Overlay Code. • The BSC site includes large areas of High Ecological Significance with a small area of General Ecological Significance at the North-West of the site. Impacts on environmental values are addressed in the EAR.	

Bushfire

The Bushfire overlay constrains areas of land identified as high and medium bushfire hazard management areas and deals with issues of State Interest. Assessment benchmarks are included in the Bushfire Overlay Code.

- The site includes areas subject to medium and high bushfire hazard, and parts of the site are identified as medium and high hazard buffer area.

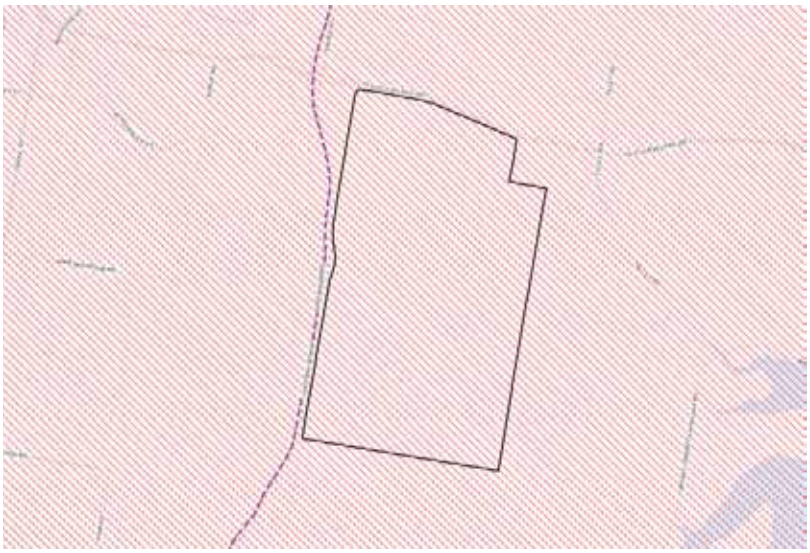
Bushfire hazard has been addressed in the EAR.

Critical Infrastructure and Movement Network

The Critical infrastructure and movement network overlay identifies critical assets and movement networks. Assessment benchmarks are included in the Critical Infrastructure and Movement Network Overlay Code

- The entire BSC site is identified in the critical infrastructure and movement planning area.

This overlay is generally not relevant to proposed Clay Target Shotgun Range.



Flood

The Flood overlay identified areas subject to Brisbane River and creek / waterway flooding, and areas impacted by overland flow. Assessment benchmarks are included in the Flood Overlay Code.

- The BSC site is not impacted by river or creek / waterway flooding, however is impacted by overland flow paths

Impacts on overland flow and stormwater catchments are addressed in the EAR.

Road Hierarchy The Road hierarchy overlay applies to the existing and future road networks, including state controlled roads. Assessment benchmarks are included in the Road Hierarchy Overlay Code. • Old Cleveland Road is identified as an Arterial Road and a Primary Freight Route. Mount Petrie Road is a Suburban Route and a Primary Freight Access. The Gateway is a Motorway and is located just West of the site, intersecting with Old Cleveland Road. Impacts on road network are not anticipated as intensification of current land use function is not proposed.	

7.2 State Planning Policy

Under Schedule 2 of the PA, a state interest means an interest that the Minister considers:

- affects an economic or environmental interest of the state or a part of the state', or
- affects the interest of ensuring that the purpose of the Act is achieved.

The State Planning Policy (SPP) is the overarching document which promotes the State's interests in land use planning and development. Under section 8(4)(a) of the PA 2016 the SPP has effect throughout Queensland and sits above planning schemes in the hierarchy of planning instruments.

Notwithstanding that State interests have been incorporated into the planning scheme, the SPP has been assessed below.

Application of the SPP	Who is responsible	Parts of the SPP that are applicable, to the extent relevant						
		Part A, B & C	Part D	Part E: State interest policies	Part E: Assessment benchmarks	Part F	Part G: Appendix 1	Part G: Appendix 2
Designating premises for infrastructure	State and local government	✓	✓	✓	✓	✓	✓	✓

Consideration of how the proposal meets the relevant parts of the SPP is included below:

7.2.1 The Guiding Principles

OUTCOME FOCUSED

Clearly focus on the delivery of outcomes

- *Plans and development outcomes integrate and balance the economic, environmental and social needs of current and future generations in order to achieve ecological sustainability.*

- *Plans express clear performance outcomes for development, supported by a range of acceptable outcomes, where possible.*
- *Innovative and flexible approaches to design and development are supported and encouraged when consistent with a plan's strategic intent.*
- *Decision making ensures that, where acceptable, when outcomes are satisfied by development, then the relevant performance outcome is taken to be satisfied in full. Performance outcomes may still be satisfied, even though an associated acceptable outcome is not met.*
- *Plans and development outcomes support stated objectives, needs and aspirations of the community at the state, regional and local level.*

The proposal seeks to designate the site for the purposes of delivering a sports facility for community benefit (for the local, district, regional, national, and international community). The designation considers economic, environmental and social needs of current and future generations through the delivery of the infrastructure.

INTEGRATED

Reinforce the role of local planning schemes as the integrated, comprehensive statement of land use policy and development intentions for a local area

- *Plans coordinate and integrate land use policy for a local area by considering:*
  - *— international agreements, such as the UNESCO world heritage listing of the Great Barrier Reef and Ramsar Convention*
  - *—national, state, regional and local matters, to the extent relevant.*
- *Plans integrate land use, resource management and infrastructure needs and considerations.*
- *Plans support a 15 year supply of land for development.*
- *The zoning of land reflects and responds to the characteristics of the land that constrain its use.*
- *Overlays should be compatible with and not operate either individually or cumulatively to prevent or restrict land from being used for the purpose for which it has been zoned.*
- *Plans include a performance-based assessment of development against a clear hierarchy of policies linked to the achievement of realistic and long-term strategic planning.*

Not applicable as the proposal is for a Infrastructure Designation and not for plan making.

EFFICIENT

Support the efficient determination of appropriate development

- *Plans and assessment processes result in development outcomes that are certain, responsive and performance-based.*
- *Plans regulate development only to the extent necessary to address potential impacts. When applied, plans adopt the lowest appropriate level of assessment required to efficiently and effectively address those impacts.*
- *The level of assessment for development is proportionate to the potential impacts and level of risk of the development being regulated and a plan's strategic intent and purpose of the relevant zone, local plan and/or precinct, for instance development that is:*
  - *—minor, low-risk and that is encouraged or contemplated in a zone should be identified as accepted development*
  - *— consistent and in accordance with the broad intent of a zone and able to be assessed against assessment benchmarks, should be identified as code assessable development*
  - *— contrary to the intent of a zone, requires public input or is unforeseen by a planning scheme, should be identified as impact assessable development and assessed against a broader range of matters.*

It is proposed to designate the site for the purposes of delivering appropriate sport and recreation facilities for Queensland, which is consistent with the existing use of the land. The designation forwards the efficient and timely delivery of infrastructure and provides certainty of land use allocation.

POSITIVE

Enable positive responses to change, challenges and opportunities

- *Contemporary information, challenges and community needs and aspirations are reflected through up-to-date plans.*
- *Evidence and objectively assessed needs form a basis for planning that uses the best available knowledge.*
- *Plans are written using clear, concise and positive language to describe what outcomes are sought, required or encouraged in a particular location, rather than what is to be avoided, prevented or discouraged.*
- *Community health and wellbeing, and resilience and adaptability to change (including economic change, social change, and climate change adaptation and mitigation), are promoted in plans and development outcomes.*
- *Plans adopt a performance-based approach to development assessment to allow for innovation and flexibility in how development in a local area can be achieved.*
- *Plans are drafted to ensure that development is assessed on its individual merits.*

This objective is generally not applicable as the proposal is for a Infrastructure Designation and not for plan making. However, the provision of sports and recreation facilities to service widely ranging interests (including sports shooting) is aligned with policy relating to community health and wellbeing.

ACCOUNTABLE

Promote confidence in the planning system through plans and decisions that are transparent and accountable

- *Plans and development outcomes reflect balanced community views and aspirations based on a clear understanding of the importance of the community's involvement in plan making.*
- *Plans resolve competing state and local interests through using an evidence-based approach, which balances community needs, views and aspirations.*
- *Reasonable, logical and fair development decisions are supported by clear and transparent planning schemes.*
- *Plans only seek to regulate land use and planning outcomes and do not address matters regulated outside of the planning system, for instance building work regulated under the Building Act 1975 (unless permitted).*
- *Obtaining access to planning information is simple and direct, capitalising on opportunities presented by information technology.*

The Infrastructure Designation process if made will be in accordance with Chapter 2 of the PA 2016. Development of plans and assessment of impacts contained in this report has had due consideration to relevant state and local plans and mapping. Consultation with relevant State agency stakeholders, political representatives, local government and the community will occur as part of this process.

7.2.2 State Interest Statements

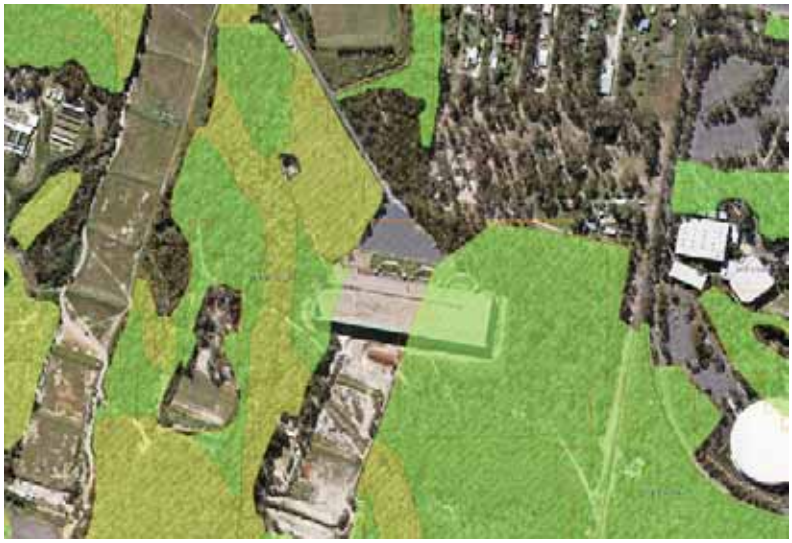
The following table lists the State interests contained in the SPP relevant to the subject site.

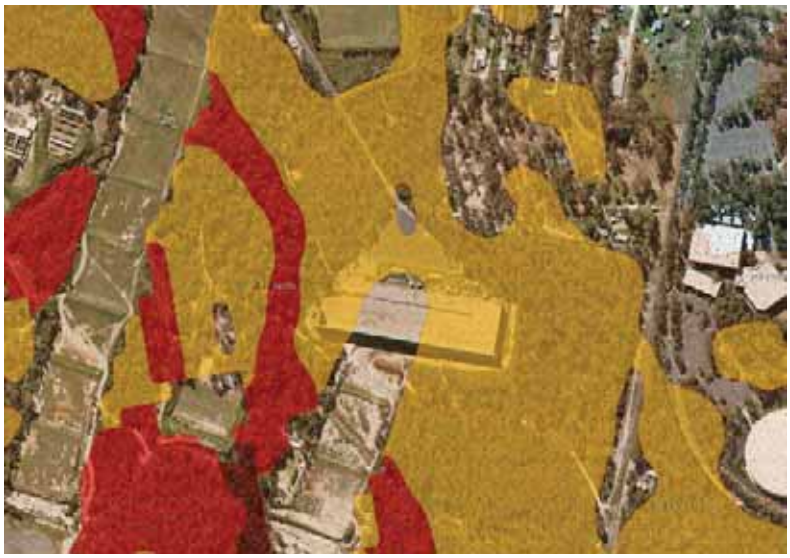
State Government Interests		
☒ Liveable communities	☒ Biodiversity	☒ Energy and water supply
☐ Housing supply and diversity	☐ Coastal environment	☐ Infrastructure integration

☐ Agriculture	☒ Cultural heritage	☒ Transport infrastructure
☐ Development and construction	☒ Water quality	☐ Strategic airports and aviation facilities
☐ Mining and extractive resources	☒ Emissions and hazardous activities	☐ Strategic ports
☒ Tourism	☒ Natural hazards, risk and resilience	

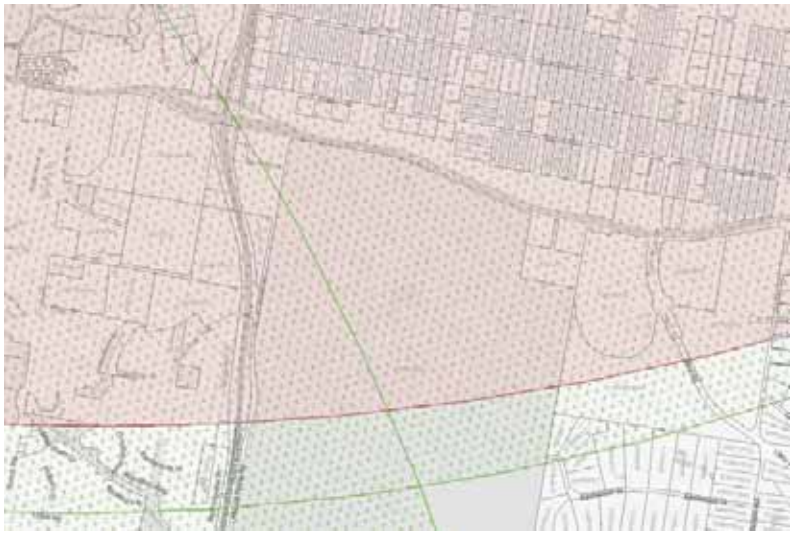
7.2.3 SPP Interactive Mapping System

Relevant state interests as identified in section 7.2.2 are further described in the following table, as obtained from the SPP Interactive Mapping System:

State Interest	Mapping Layer
Liveable communities	No mapping layer applies.
	Well-located, cost-effective and multi-functional sport and recreation facilities support the state interest.
Tourism	No mapping layer applies.
	As a national and international standard sports and recreational venue that facilitates elite and community sport training, competition and community events and activities, the Clay Target Range supports sports tourism in Queensland.
Biodiversity The site includes MSES including: • Protected areas (nature refuge) • Wildlife habitat • Regulated vegetation (category B, of concern and least concern regional ecosystem) • Regulated vegetation (essential habitat) • Regulated vegetation (intersecting a watercourse)	
	An ecological report has been prepared as part of the fEAR to assess the impact of further disturbance as part of the legacy outcome. ***Environmental Assessment Report at Appendix E.***
Cultural heritage	No mapping layer applies.
	The designation area includes undisturbed areas and the proposal constitutes 'activities causing additional surface disturbance (category 5)', under the *Aboriginal Cultural Heritage Act 2003*, Section 28 Duty of Care Guidelines.

Water quality • The site is in a water resource catchment area. • A water supply buffer area encroaches the designation area, but will not be impacted by development.	 A stormwater management plan has been prepared as part of the fEAR. ***Stormwater Management Plan at Appendix F***.
Emissions and hazardous activities • The site is on the Environmental Management Register (EMR) as the site is subject to the following Notifiable Activity: GUN, PISTOL OR RIFLE RANGE - operating a gun, pistol or rifle range. ***EMR / CLR Search Result at Appendix G.***	No mapping layer applies. Impacts of the sport and recreation activity including noise emissions are addressed in this fEAR. An acoustic report has been prepared with mitigation strategies identified to achieve compliance with environmental objectives ***Noise Impact Assessment at Appendix H.*** Impacts of proposed activity including contamination by lead shot have been fully explored in this fEAR by a Contamination Report—including a proposal for management. ***Contamination Report at Appendix I.***
Natural hazards, risk and resilience • Flood hazard area – Local government mapping area • Bushfire prone areas • The site is impacted by overland flow flood planning areas under the Brisbane City Plan 2014. A FloodWise Property Report is included at **Appendix J**.	 A Stormwater Management Plan addressing overland flow catchments has been prepared as part of this fEAR. ***Stormwater Management Plan at Appendix F***.

	The site is in a bushfire prone area. A bushfire management plan including hazard assessment has been prepared as part of this fEAR. ***Bushfire Management Plan at Appendix K***.
Energy and water supply • Major Electricity Infrastructure (Powerlink) is present within the western BSC site • Pump station and reservoir facilities (SEQ Water) are present on the BSC site.	
	The Energy and Water supply interests are present on the BSC site and secured by Easement. The mapped interests will not be impacted by the Clay Target Range. SEQ Water and Powerlink will be notified as part of the consultation for the Infrastructure Designation.
Transport infrastructure • State-controlled road • Future busway corridor	
	There is not expected to be any impact on State Transport Infrastructure as a consequence of the legacy operation of the Clay Target Shotgun Range. The range will complement the existing BSC facilities by providing a world class facility for competition and practice usage. Traffic Advice has been prepared as part of this fEAR to consider the impact of proposed usage on the external road network. ***Traffic Report at Appendix L***.

Strategic airports and aviation facilities • Obstacle limitation surface area • Obstacle limitation surface contours (152.5m AHD) • Wildlife hazard buffer zone 13km	 Nil impacts are anticipated to this interest as the building infrastructure does not breach the OLS contour.

8 State Planning Framework

8.1 Regional Planning

The BSC site is located within the *South East Queensland Regional Plan 2017* (SEQ Regional Plan) area. The purpose of the SEQ Regional Plan is to manage regional growth and set planning direction for sustainable growth, global economic competitiveness and high quality living.

These objectives are achieve by:

- identifying a long-term sustainable pattern of development which focuses more growth in existing urban areas
- harnessing regional economic strengths and clusters to compete globally
- ensuring land use and infrastructure planning are integrated
- valuing and protecting the natural environment, productive land, resources, landscapes and cultural heritage
- promoting more choice of housing and lifestyle options
- locating people and jobs closer together, and moving people and goods more efficiently and reliably
- promoting vibrant, fair, healthy and affordable living and housing to meet all of the community's needs
- valuing design and embracing the climate to create high-quality living environments
- maximising the use of existing infrastructure and planning for smarter solutions for new infrastructure
- supporting strong rural communities and economic diversification.

The site is identified as a Regional Landscape and Rural Production Area (refer *Figure 5*).

The Regional Landscape and Rural Production Area (RLRPA) identifies land with regional landscape, rural production or other non-urban values. The intent of the RLRPA is to:

- protect the values of this land from encroachment by urban and rural residential development
- protect natural assets and regional landscapes, and ensure their sustainable use and management
- support development and economic growth of rural communities and industries.

The RLRPA is to be protected from inappropriate development, particularly urban and rural residential development.

Development assessment triggers under the PR 2017, schedule 10, part 16 are not applicable. An MCU for the Clay Target Range does not meet the qualifications in s 24(b).

Figure 5 SEQ Regional Plan land use categories *Source: DAMS*

PART F – ENVIRONMENTAL ASSESSMENT

9 Assessment of Environmental Impacts

Before designating land for infrastructure, the Minister must be satisfied that adequate environmental assessment, including adequate consultation, has been carried out in relation to the development that is subject to the designation.

The environmental assessment must have regard to—

- all planning instruments that relate to the premises; and
- any assessment benchmarks, other than in planning instruments, that relate to the development that is the subject of the designation or amendment; and
- if the premises are in a State development area under the *State Development Act*—any approved development scheme for the premises under that Act; and
- if the premises are in a priority development area under the *Economic Development Act 2012*—any development scheme for the priority development area under that Act; and
- any properly made submissions made as part of the consultation carried out under section 37; and
- the written submissions of any local government.

This section of the Report provides an environmental assessment of impacts the development or use may generate, and ways in which those environmental impacts are being managed or mitigated. Regard is given to natural and physical resources, as well as short and long term effects and impacts on the environment and community from both the construction and operational phase of the proposal. The range of matters considered includes:

- infrastructure, traffic and transport;
- flora and fauna;
- soils and geology;
- conservation and heritage values;
- natural resources and hazards; and
- health, safety, amenity and social impacts.

Reference should also be made to **Part E – Local and State Planning Provisions** with regards to mapping relevant to the subject site.

9.1 Road Infrastructure

9.1.1 Site Access and Traffic

Context

Two of Brisbane's main roads, the Gateway Motorway and Old Cleveland Road, cross at a large intersection just West of the BSC site. Both these roads are State Controlled Roads.

There are a number of access points into the BSC site, including crossovers at Old Cleveland Road, Mount Petrie Road, and Eastwood Street. The Clay Target Range is accessible via the BSC internal road network from Old Cleveland Road.

As part of the build for the Commonwealth Games, the access road to the range was significantly upgraded, being widened to 6m, and fully paved, as far north as the entry to the adjacent archery

range. North and east of the archery range entry, the existing road width varies between 5m and 6m.

Proposal

There is no change to the proposed vehicles crossover or main entrance into the site. Vehicle access to the range has been established and will be maintained.

Two modes of operation are anticipated for the expanded legacy range.

1. Normal operations will occur between 5 and 7 days per week. The balance of the existing complex generally operates from 1pm-5pm Monday to Thursday and from 8am to 5pm Friday to Sunday. Similar hours of operation could reasonably be expected at the expanded legacy range. An average of up to 60 shooters per day (+ 10% for spectators / officials).
2. Moderate sized events, it has been assumed, will occur 1-2 times per year, generally on the weekend commencing at 8:00am, with up to 140 shooters per day (+ 10% for spectators / officials).

During normal operations, arrivals are expected to be distributed across the day, with no obvious or significant peak. Hourly entry volumes are not expected to exceed 20vph.

During events, it is estimated that up to 80% of competitors / spectators / officials could arrive in the hour immediately prior to the start of the event (ie 85vph, taking into consideration car occupancy).

Given the very low traffic volumes generally using the broader site, this additional traffic is unlikely to cause any operational issues for the internal road network during normal operations.

At 20vph, the estimated traffic generation during normal operations is considered very minor, and given a) the access from Old Cleveland Road is restricted to left-in / left-out movements, and b) the recent construction of a dedicated auxiliary left turn lane (AUL) into the site, the anticipated impacts will be both minimal, and managed appropriately.

Whilst traffic generation during events is estimated to be somewhat higher (85vph), the recently constructed auxiliary left turn lane will have sufficient capacity to comfortably accommodate it. Furthermore, it should be noted that these events will generally occur on weekends, starting in the early morning between 8am and 9am, when traffic on Old Cleveland Road is relatively light. Consequently, the impact of the additional traffic generated by the new shotgun range on the external state controlled road is expected to be minimal.

Actions and Recommendations

Should the opportunity arise to consolidate and move any existing shotgun shooting currently taking place at BSC to the new range from its current location, access improvement should occur by widening the narrow sections of pavement on the existing road to a minimum 6m pavement width.

Event Traffic Management may be required to support large, multi-disciplinary events at the site (site-wide and international events).

9.1.2 Car Parking

Context

As part of the build for the Commonwealth Games, a hardstand area (gravel finish) was constructed immediately adjacent to the range. The hardstand covers approximately 6000sqm, and is ideally suited for use as a low turnover car park and overlay to support major events.

Proposal

Based on the assumed person numbers noted in section 9.1.1, and assuming an average car occupancy of 1.25 per car (during normal operations) and 1.5 per car (during events), the expected parking demand is roughly between 45 during normal operations, to 85 during events. Based on the above assumptions, and allowing for 10% vacancy, a parking supply of 95 spaces is considered appropriate.

Assuming 45sqm per parking space (based on the informal, unmarked nature of the parking area), the existing hardstand area (approximately 6,000m^2) can easily accommodate the required car parking demand.

If this space were to be formalised, significant efficiencies could be realised, with an average of approximately 35sqm per parking space, thus requiring a smaller footprint for the required number of parking spaces – approximately 3,325m^2 for 95 parking spaces.

Actions and Recommendations

The current hardstand arrangement provides sufficient car parking capacity for expected peak parking demand and major event overlay activities, as evidenced by the successful Commonwealth Games.

9.1.3 Public Transport Infrastructure

Context

The closest permanent public transportation facilities are located along Old Cleveland Road, adjacent to the main entrance to the BSC site.

Proposal

During normal operations, public transport usage is not expected to be high. Public transport may be an option supporting event traffic management.

Actions and Recommendations

Event Traffic Management supporting large, multi-disciplinary events at the site (for site-wide and international events), may include requirements for public passenger transport.

9.1.4 Active Transport Infrastructure

Context

There are limited pedestrian and cycle networks linking the site.

Proposal

It is anticipated that vehicles will be the primary travel mode to the BSC.

No modification to the existing active transport infrastructure is proposed as part of the development. BSC is not expected to generate demand for active transport.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.2 Services Infrastructure

9.2.1 Water Infrastructure

Context

The BSC site has access to municipal services. The Clay Target Range does not presently have reticulated water infrastructure.

Proposal

Water supply may be brought to the Clay Target Range in the future.

Actions and Recommendations

Any future services alignment should seek to follow the internal road alignments and avoid significant additional ground disturbance.

9.2.2 Sewer Infrastructure

Context

The BSC site has access to municipal services. The Clay Target Range does not presently have reticulated sewer infrastructure.

Proposal

Sewer infrastructure may be brought to the Clay Target Range in the future.

Actions and Recommendations

Any future services alignment should seek to follow the internal road alignments and avoid significant additional ground disturbance.

9.2.3 Electricity Infrastructure

Context

The Clay Target Range is presently serviced by reticulated electricity from the main BSC swithchboard with 100MM conduit with provided cabling sized for 160 Amp with Energex providing only 80 Amp supply and no other services.

Proposal

No changes are presently proposed to electricity infrastructure and capacity.

Actions and Recommendations

Any future services alignment should seek to follow the internal road alignments and avoid significant additional ground disturbance.

9.2.4 Telecommunications Infrastructure

Context

The BSC site has access to telecommunications infrastructure. The Clay Target Range does not presently have reticulated telecoms.

Proposal

Telecommunications infrastructure may be brought to the Clay Target Range in the future.

Actions and Recommendations

Any future services alignment should seek to follow the internal road alignments and avoid significant additional ground disturbance.

9.2.5 Stormwater Infrastructure

Context

A Site Based Stormwater Management Plan (SBSMP) has been prepared for the development. The principles of Water Sensitive Urban Design (WSUD) and Total Water Cycle Management (TWCM) have been applied to protect environmental values and achieve required Standards.

The SBSMP specifically addresses the following items for the Ministerial Infrastructure Designation, incorporating both the existing and proposed development:

- Stormwater quantity (changes in runoff characteristics);
- Stormwater quality (treatment measures); and
- Maintenance of water quality treatment devices.

Refer to ***Appendix F Site Based Stormwater Management Plan***.

Proposal

The overland flow path within the designation site joins the local waterway corridor downstream within the Belmont Shooting Complex before leaving the property boundary at the existing point of discharge in the North. The existing clay target range facility and the proposed extension does not, and will not, affect the flow characteristics as it discharges from the site. Nor does it, or will it cause an actionable nuisance.

It is considered that maintaining discharge to the mapped overland flow path within the property ensures that there is no change to the lawful point of discharge from the current Belmont Shooting Complex site.

Pre Development Stormwater Condition

Prior to the construction of the temporary clay target facility, an existing south facing 300M overlapped the location of the new range. This range consisted of a shed, canopy structure. Significant clearing and earthworks had been undertaken for this range. The site could be classified as generally pervious (grassed).

The catchments to the East of this range were piped under the previous 300M range, approximately in the middle of the new field of play for the clay target range.

Post Development Stormwater Condition

The construction of the new temporary clay target range has seen the pipe removed and external catchments to the East managed via an overland diversion channel. Additional clearing has been undertaken. Surfaces are largely pervious (grassed). The small impervious surfaces such as trap houses and pathways all drain directly onto pervious surfaces.

The site changes are not significant from a stormwater volume perspective and will not substantially impact any of the following:

- Catchment hydrology: runoff volumes and peak flows, time of concentration and base flows within watercourses,
- The general form and alignment of the overland flow path and waterway corridors downstream of the facility.

The proposed facility will not materially change stormwater quantity.

This Infrastructure Designation aims to protect the environmental and water quality values through the adoption of locally appropriate and specialist advised solutions to avoid or minimise the impacts of stormwater discharge to receiving waters. This SBSMP demonstrates that the treatment process achieves the Water Quality Objectives for the site, and is in accordance with the SPP.

It was not considered applicable or best practice to adopt standard Water Quality Objectives and treatment measures typically incorporated within the SPP and reference guidelines as these are targeted at urban development. Due to the specialist nature of the facility and potential contaminants, specialist advice from Groundcorp Pty Ltd (contamination consultancy) has been used to set the proposed stormwater treatment train for the proposed permanent use Clay Target Range facility.

Groundcorp Pty Ltd completed an environmental assessment and produced a report titled Contamination Report dated June 2018. The report's objective was to identify and assess the potential impacts of contamination for the Clay Target Range facility. The report identified the main sources of contamination as clay target pellets, gunshot residue, and pitch based clay targets; with lead being the contaminant of greatest concern.

The Groundcorp Pty Ltd report made a number of recommendations relevant to surface stormwater management. The SBSMP integrates these recommendations.

The proposed treatment train detailed in *Figure 6* consists of diversion drains to divert flow from external catchments, recycled concrete trenches to help stabilise the lead particles through pH management, a concrete lined sediment forebay to screen coarse sediment and regulate flows, a gross pollutant trap to screen larger pollutant items, and an overflow basin to further regulate flows. Some areas have rock scour protection.

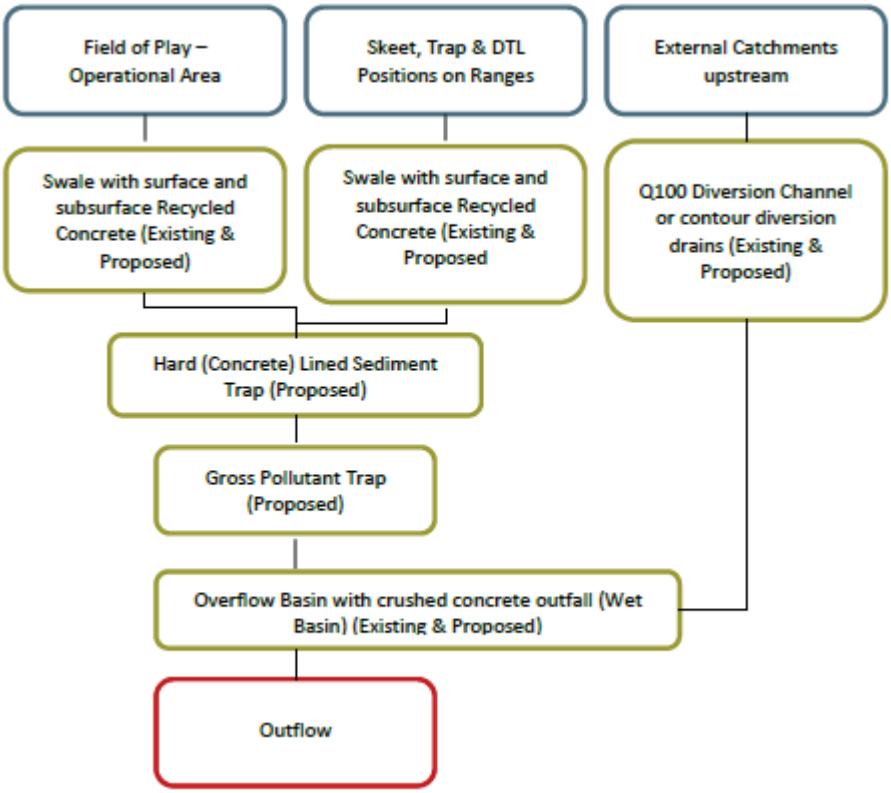


Figure 6 Proposed treatment train (some of the measures are existing and some are required items to allow for the permanent use of the facility) *Source: SBSMP, Wood & Grieve Engineers.*

Actions and Recommendations

The recommendations within the Site Based Stormwater Management Plan are to be followed.

9.3 Biodiversity

Context – Flora

A number of flora and vegetation surveys (Lambert & Rehbein, 2016; Lambert & Rehbein, 2017a; Lambert & Rehbein, 2017b, Lambert & Rehbein, 2018) have been undertaken in association with this project to determine the vegetation communities and flora species present within Infrastructure Designation Area.

Although no specific Quaternary Regional Ecosystem Assessment sites were established during site surveys, the underlying geology, site observations of soils, and the vegetation associations recorded indicate that the vegetation on site is similar to the mapped REs (Lambert & Rehbein, 2016). Notable differences include differences between the mapped and observed boundaries of the endangered RE 12.11.27 in the south-western area of the investigation area, and an area more closely resembling the least concern RE 12.11.5 behind the eastern half of the shot curtain (refer to *Figure 3* of ***Appendix E Environmental Assessment Report***, Lambert and Rehbein, 30 October 2018)). An area dominated by Allocasurina littoralis exists to the east of the clay target facility.

Desktop information indicates the project area is within the Protected Plants Flora Survey Trigger Map area (refer **Appendix E**). Protected plant surveys have been undertaken at various stages of the project (Lambert & Rehbein, 2016; Lambert & Rehbein, 2017a; Lambert & Rehbein, 2017b).

Although protected plants survey specifically target EVNT species listed under the NC Act, given the nature of this project and other surveys being undertaken, EVNT species listed under the EPBC Act were also searched for. No EVNT species have been recorded during these surveys (Lambert & Rehbein, 2016; Lambert & Rehbein, 2017a; Lambert & Rehbein, 2017b).

A number of conservation significant flora species have been recorded within 5 km of the project area or have the potential to occur in the area (refer *Table 1* and *Table 2* of ***Appendix E Environmental Assessment Report***, Lambert and Rehbein, 30 October 2018).

Context – Fauna

Although fauna and fauna habitat have been observed during all surveys, only one site specific fauna survey has been undertaken (Lambert & Rehbein, 2016). The investigation (Lambert & Rehbein, 2016) included a small area approximately 210 m x 150 m, located at the northern end of the 300 m rifle range.

In addition to the 2016 (Lambert & Rehbein) fauna survey, an ecology survey undertaken in June 2018 (Lambert & Rehbein) opportunistically identified fauna and fauna habitat while investigating vegetation and non-juvenile koala habitat trees. Many of the mature trees, in particular Eucalytpus racemose, contained extensive hollow development often occupied by Rainbow Lorikeets (Trichoglossus maluccanus).

A night survey was undertaken during the 2016 survey (Lambert & Rehbein), faunal activity was very low during the ecological assessment, with only two species – Cane Toad (Rhinella marina) and Common Brushtail Possum (Trichosurus vulpecula) observed during the spotlight surveys.

There were no direct observations of any EVNT fauna species during the fauna surveys.

Observations of ant nest diggings consistent with echidna (Tachyglossus aculeatus) (Special Least Concern (NC Act)) use, provided limited and unconfirmed evidence that echidnas may be active in the Infrastructure Designation Area, despite no direct observations of this species.

No koalas were observed on the site or in close proximity to the site. A juvenile Koala (Vulnerable EPBC Act and NC Act) skeleton was observed approximately 70 m to the east of the clay target facility (Lambert & Rehbein, 2016). A large number of non-juvenile koala habitat trees (NJKHT) have been identified within the project area across multiple surveys undertaken in 2016 and 2018.

Four trees were identified with obvious evidence of koala scats, tracks or scratchings. During the survey undertaken in June 2018 the overshoot area was searched of trees with signs of koala activity. None were identified, although this does not mean that none are present. Other survey methodologies including individual tree counting is more likely to identify trees with signs of activity.

There were a total of 903 trees identified. Approximately 5.4 ha of the Infrastructure Designation Area was surveyed for NJKHTs (167 NJKHTs / ha). It was not practical to individually survey all trees in the proposed cleared operation area. To determine if the density of NJKHTs is consistent across the entire Infrastructure Designation Area, three additional transects were surveyed to the south and south-west of the curtain. The three transects totalled approximately 0.54ha and 205 trees NJKHTs were identified (approximately 380 NJKHTs / ha). This suggests the density of NJKHTs increased to the south of the clay target facility compared to the areas directly adjacent to the north, east and west.

Proposal

The potential environmental impacts associated with this project can be considered direct and / or indirect. The potential impacts have been summarised as follows:

- Direct:
    - Loss of vegetation
    - Loss of fauna / fauna habitat
    - Contamination of soils by lead shot
- Indirect:
    - Noise pollution to surrounding sensitive receptors (adjacent residences)
    - Contamination of offsite soils and surface water through the movement of lead transported off site
    - Change to surface hydrology concentrating surface water flows and mobilizing sediment that is deposited in the creek.

In particular, the project requires the loss of 5.4 ha of vegetation clearing within the cleared operational area (and including the toe of the proposed batter), including:

- RE12.11.25 (of concern) – 2.40 ha
- RE11.5 (least concern) – 1.20 ha
- RE12.11.27 (endangered) – 0.32
- RE12.3.5 (least concern) – 0.15 ha
- Allocasuarina dominated – 0.10 ha
- Non-remnant (but generally well vegetated) – 0.23 ha
- Partially cleared / sporadic vegetation – 1.0 ha

The uncleared operational area contains approximately a further 2 ha of vegetation, that may wholly or partly need to be cleared if the need arises in the future (if the level of lead in the environment exceeds agreed thresholds).

The tow of the proposed batter will be revegetated.

Actions and Recommendations

The management objectives in section 4.3 and the management and mitigation recommendations in section 6.0 of ***Appendix E Environmental Assessment Report***, Lambert and Rehbein, 30 October 2018) are to be generally observed to maintain key environmental values. These management objectives have been developed to the scale of the project and can be revisited throughout the life of the clay target facility.

9.3.1 Invasive Species

Context

The *Queensland Biosecurity Act 2014* refers to 'Designated Biosecurity Matter' which includes pest plants and animals. These are further classified as either 'Prohibited' or 'Restricted':

- Prohibited Matter is biosecurity matter not currently present or known to be present in Queensland. It is prohibited because it may have a significant adverse effect on a biosecurity consideration if it did enter Queensland.
- Restricted Matter is biosecurity matter found in Queensland that may have adverse effects on a biosecurity consideration if conditions or restrictions under the Act were not imposed.

Prohibited Plants are listed in Schedule 1 Part 3 and Prohibited Animals are listed in Schedule 1 Part 4 of the *Biosecurity Act 2014*. Restricted Plants and Restricted Animals are also listed in Schedule 2 Part 2 of the *Biosecurity Act 2014*.

Actions and Recommendations

The presence of any pest plants and/ or animals is to be confirmed prior to the commencement of construction. If found, these will be removed in accordance with legislative requirements.

9.4 Soils and Geology

9.4.1 Geotechnical Conditions

Context

A geotechnical investigation was carried out prior to works for the Commonwealth Games development.

Subsurface conditions at the site were investigated by drilling and sampling eight boreholes to depths of 4.5m. In addition, dynamic cone penetrometer tests were carried out adjacent to the boreholes.

Subsurface conditions encountered can be broadly grouped into three material types:-

- Fill Material
- Natural Soils
- Weathered Rock

Fill material was encountered in all borehole locations (with the exception of Borehole's 03, 09 and 11) to depths of between 0.25m and 0.6m comprising clay and gravel based materials.

Natural soils were encountered in all borehole locations generally comprising stiff to hard silty/sandy clay of medium to high plasticity overlying extremely weathered and distinctly weathered siltstone and sandstone of weak and medium strong strength and continued to the termination of the borehole.

Refer to ***Appendix M Geotechnical Investigation***.

Proposal

The geotechnical investigation includes engineering analysis of the site investigation and laboratory test results to evaluate:-

- Trafficability and site preparation
- Earthworks recommendations
- Foundation recommendations

- Retaining wall design recommendations
- Pavement recommendations
- Site management recommendations

Actions and Recommendations

The recommendations of the Geotechnical Investigation are to be applied in the detailed design of planned and future works. Where necessary, additional boreholes may be required to verify sub-surface conditions for some of the proposed future works.

9.4.2 Erosion Risk

Context

The release of sediments or other contaminants to water is an offence under the *Environmental Protection Act 1994*. All activities that expose soil have the potential to result in release of sediment to waterways or stormwater systems.

Proposal

To minimise the risk of releasing sediment (and other contaminants) to waters during construction and to the meet the General Environmental Duty under the *Environmental Protection Act 1994*, a site erosion and sediment control plan (ESCP) is to be prepared in accordance with the IECA Best Practice Erosion and Sediment Control prior to commencing construction.

Actions and Recommendations

An ESCP that addresses the erosion risks identified for the site is required to be supplied by the building contractor. The Plan is to be implemented and monitored throughout the construction phase for the proposed development.

9.4.3 Acid Sulfate Soils

Context

The Clay Target Range site is on land between approximately 25m to 25m AHD and not within a low-lying coastal area.

Proposal

Acid sulfate soils are not likely to be encountered. The proposal is not anticipated to result in any disturbance or impacts to ASS.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.4.4 Contaminated Land

Context

With reference to **Appendix G**, the site is listed on the Environmental Management Register (EMR). The site has been subject to the following Notifiable Activity or Hazardous Contaminant—GUN, PISTOL OR RIFLE RANGE - operating a gun, pistol or rifle range.

Clay target shooting typically involves the use of hazardous materials that are a source of potential contamination. Examples of hazardous materials typically used during clay target shooting include pellets that are predominantly made of lead, and clay targets that contain Polycyclic Aromatic Hydrocarbons.

Generally, on a clay target range the primary contamination sources can be separated into projectiles, clay targets and gunshot residue. Secondary contamination distribution can arise from migration or movement of contaminated materials, or other activities on the site such as fuel storage and batteries for mobile trap throwers that can give rise to potential contamination.

Lead on a shooting range generally exists in three forms:

- Metallic lead (i.e. the form that comes out of the gun)
- Fine solid corrosion by-products either in lead compounds or bound to soil
- Dissolved phase lead

Proposal

Consistent with the requirements of the *Environmental Protection Act 1994*, reasonable steps must be taken to protect the environment and human health from impacts that may arise from the development and ongoing use of the facility. Practical measures exist to enable the risks associated with contamination on clay target shooting ranges to be suitably managed.

A Contamination Report (Ground Corp Pty Ltd, October 2018) has been prepared to evaluate the potential impacts of sources of contamination that may arise from the permanent use of the proposed Clay Target Range; and demonstrate that an appropriate contamination management strategy can been adopted.

The report specifically addresses the following items associated with contamination arising from the existing and proposed development:

- Protection of human health within the Operational Area of the facility;
- Protection of ecological receptors that may enter the Operational Area of the facility; and
- Protection of human health and ecological receptors outside the Operational Area of the facility.

Consistent with the requirements of the *Environmental Protection Act 1994*, the overarching management philosophy for the proposed facility is to protect the environment and human health by, to the extent that is reasonable to do so, and to take reasonable steps to develop and implement measures to:

- Avoid / minimise generating a source of potential contamination
- Understand the nature of potential sources of contamination and their potential impacts
- Where the activity generates a source of potential contamination, implement management measures to reduce impacts at the source
- Reduce the migration of contaminants and manage potential offsite impacts
- Manage the performance of the mitigation measures

A conceptual site model has been developed for the proposed facility, and the primary sources of contamination are depicted in Figure A-2 of **Appendix I**.

Site Management

For practical reasons, it is prudent to manage different areas of the Designation Site in different ways. This is associated with the nature of the management required in the areas, for example some areas require soil disturbance so the mineral composition of the soils will stop lead migrating, and other areas will not. A key consideration is whether clearing of vegetation is required.

To help describe the management measures proposed the designation site has been broken down into three area.

The different areas and some insight the nature of differing management requirements for each of them is outlined below:

- Cleared Operational Area:
    - This area will require clearing for its practical management. Management measures will incorporate soil treatment, the installation of surface water treatment measures, diversion of external surface water and filling.
- An Uncleared Operational Area:
    - This area may not require clearing for its practical management, however given the variables associated with clay target shooting there is a moderate risk clearing may be required at some stage during the facility's operation to manage contamination.
    - Maintaining consistency with the precautionary principle, allowance should be made for the eventual clearing of this area. However to allow for the possibility of clearing not ultimately being required to protect human health and the environment, a reasonable approach, that maintains certain environmental values, is to not clear this area unless monitoring indicates it is necessary to do so.
- Negligible Impact Zone:
    - This is an area of the Designation Site that falls within a firearm safety template however appears to present a negligible risk to human health and the environment in relation to contamination.

Figure 7 Operation Area (indicative cleared operational area shaded grey) *Source: Drawings MP – O45F*

Discussion about the management techniques that are applied that give rise to these different areas is further articulated in the Contamination Report in **Appendix I**. In particular part 5.4 details the specific measures for management within the Operational Area including the requirement for further development of an Environmental Management Plan, measures for reclamation activities including maintenance and treatment, and risk management.

Shotgun Curtain

A shotgun curtain was installed for the Commonwealth Games that significantly reduces the distribution of shot, however due to the nature of clay target shooting the shotgun curtain does not capture all of the shot, and over the proposed life of the facility it is apparent based on modelling that substantial disturbance of the area beyond the existing curtain would be required to manage the amount of lead shot deposited beyond.

Analysis of the ongoing viability of retaining the shotgun curtain primarily identified that:

- With the nature of shooting required for the facility to be sustainable and economically viable, the amount of lead pellets distributed beyond the shotgun curtain is significant enough to require substantial disturbance of the area beyond to facilitate protection of the environment and human health
- Even if shooting with lead pellets was only performed during elite practice and elite events, substantial disturbance beyond to the existing shotgun curtain would still be required to appropriately facilitate protection of the environment and human health with best practice lead management techniques.
- Maintaining the shotgun curtain for permanent deployment incurs substantial cost and appears to be financially unviable for sustainable management of the facility

Analysis has indicated that maintaining the curtain for permanent deployment is likely to be unsustainable and does not enable substantial disturbance of the area beyond to be avoided.

As a result, the curtain is proposed to be removed and stored for day to day operation, and erected only for major competition events. The curtain does allow for concentration of the shot and its use may in the future be retained if found viable in lead reclamation strategies to be adopted.

Actions and Recommendations

With the measures proposed in the Contamination Report (Ground Corp Pty Ltd, October 2018), it is considered that the facility can be managed so that there is an acceptable risk to the environment and human health in relation to sources of contamination that arise during the facility's proposed shooting activities.

Subject to detailed design and the best practice operation of the facility, an indication of the potential monitoring requirements is as follows:

- Annual surface water monitoring in the treatment basins, the downstream monitoring / recycling basin and downstream surface water receptor, and visual inspection of the treatment trains
- Groundwater monitoring every second year in 3 to 4 wells (including on the eastern boundary near a neighbouring registered bore
- Limited soil monitoring and visual inspection every second year (say six locations), including in the Cleared and Uncleared Operational Area, Cleared Operational Area and visual inspection of the negligible impact Safety Template Area
- Annual review of site operations, including range shooting breakdown, maintenance activities.

It is noted that above can be adjusted as approved by the Site Owner, should no ongoing adverse impacts result from monitoring.

9.5 Heritage and Native Title

9.5.1 Historical Heritage

Context

The site is not listed on the Local or State Heritage register. A search of the Australian Government's Australian Heritage Places indicated that the site is not listed on the database.

Proposal

As no heritage values exist on-site, the proposed development will have no further impacts.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.5.2 Cultural Heritage

Context

The *Aboriginal Cultural Heritage Act 2003* (ACHA) requires that a person must exercise Due Diligence and reasonable precaution before undertaking an activity which may harm Aboriginal Cultural Heritage. The ACHA – Duty of Care Guidelines (the Guidelines) was gazetted in April 2004 to provide guidance on actions required to demonstrate compliance with this Act.

Proposal

As part of the Commonwealth Games project, Jagera Daran Pty Ltd was contacted on behalf of the Traditional Owners of the area to ascertain the impact on Aboriginal cultural heritage. To ascertain the levels of disturbance, a survey was conducted of the impact area by Jagera Daran

The survey located two potential areas for subsurface Aboriginal remains on the eastern impact area. The two sites were located above a small watercourse running through the middle of the area and were identified as test excavation points.

The test excavation strategy was based around two test pits and 1 exploration test trench (refer *Figure 8*).

Test Trench 1 uncovered no Aboriginal heritage items. The low lying nature of the region most likely had this as a resource area rather than focused on occupation.

Test Pit 2 uncovered 19 stone artefacts. The excavation also uncovered ample quartzite raw material. There is also one piece of raw material linked to the reduction in the region.

Test Pit 3 uncovered seven stone artefacts.

Figure 8 Test pit locations Source: Aboriginal Cultural Heritage Mitigation Report of the Belmont Shoot Range Upgrade

The information provided by the excavations confirmed the accessing of the quartzite raw material and the knapping or making of stone tools from the material. The mitigation show small level occupation with in the area and the high potential for a large occupation in the immediate vicinity. The information provided to the Traditional Owners help recreate the past occupation of the

Belmont area and inform the Yagara people on further subsurface heritage that would be in the area.

For the Commonwealth Games development, the Department of State Development (now Department of State Development, Manufacturing, infrastructure an Planning) entered into a Cultural Heritage Management Agreement (CHMA) with Jagera Daran outlining the process to be undertaken onsite.

Actions and Recommendations

Further contact with the cultural heritage party is to be undertaken when further clearing is identified to ensure compliance with the ACHA.

9.5.3 Native Title

Context

Native title recognises the traditional rights and interests to land and waters of Aboriginal and Torres Strait Islander people in accordance with the *Native Title Act 1993*.

Proposal

Native title has been resolved for Lot 1 on RP169229 for the reasons below.

- On 21 April 1888, Deed of Grant No. 70163 (10698173) was granted to the GRASSDALE LAND COMPANY LIMITED under the provisions of The Corrected Titles to Land Act of 1882 over Portion 336, Parish of Tingalpa, County of Stanley, as shown on plan M331687. A deed of grant is a freehold estate which if granted validly on or before 23 December 1996 is a PEPA under s. 23B(2)(c)(ii) of the NTA and wholly extinguishes native title under s. 20 of the NTQA.
  This deed of grant does not fall within any of the exclusions listed in Module BA of the State Government Native Title Work Procedures.
- On 5 February 1883, Land Purchase No. 49661 (10449171) was granted to John PROUT in conformity with the Regulations then in force for the Alienation of Crown Lands in the Territory of Queensland over Portion 354, Parish of Tingalpa, County of Stanley, as shown on S31800. A land purchase is a freehold estate which if granted validly on or before 23 December 1996 is a PEPA under s. 23B(2)(c)(ii) of the NTA and wholly extinguishes native title under s. 20 of the NTQA.
  This land purchase does not fall within any of the exclusions listed in Module BA of the State Government Native Title Work Procedures.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.6 Natural Hazards

9.6.1 Flooding

Context

The site is not impacted by river or creek / waterway flooding, however is impacted by overland flow paths

Proposal

The stormwater management plan at **Appendix F** investigated the external catchments impacting on the designation area, and addresses these flows.

Actions and Recommendations

The recommendations within the Site Based Stormwater Management Plan are to be followed.

9.6.2 Bushfire

Context

The existing Brisbane City Council (BCC) Planning Scheme Bushfire Overlay Map indicates most of the site marked as medium hazard, and smaller isolated areas as high hazard.

Proposal

A bushfire hazard assessment has been carried out for the designation area. This area includes the north and west facing vegetated slopes leading towards the Clay Target Range, which are most likely to represent the path of hazardous bushfires potentially impacting the Shotgun Range. The focus of the bushfire hazard assessment is the Clay Target Range itself, rather than other infrastructure located within the site.

The assessment indicates that most vegetated areas represent medium bushfire hazard, with high bushfire hazards only on the undulating and north to west facing slopes south–east of the Clay Target Range. Those slopes are, however, rising away from the Clay Target Range, and the path of a fire front here is likely to be away from the Clay Target Range, in a generally easterly direction. Thus, although this area is marked as a high bushfire hazard, this is a hazard potentially presented to assets to the east, such as the Sleeman Sporting Complex, rather than the Clay Target Range.

A Bushfire Management Plan (prepared by Lambert and Rehbein, 1 November 2017) has been prepared (refer **Appendix K**) which includes specific management and mitigation strategies for the Clay Target Range and associated infrastructure.

Actions and Recommendations

The range is to operate in compliance with the Bushfire Management Plan.

The Bushfire Management Plan (prepared by Lambert and Rehbein, 1 November 2017) is also to be incorporated into the Bushfire Management Plan for the whole of the Belmont Shooting Complex. This will assist to ensure management and emergency evacuation procedures do not occur in isolation.

9.6.3 Landslip

Context

The site is not mapped as affected by landslip hazard.

Proposal

The proposal will involve earthworks to accommodate new infrastructure, however will not result in the creation of any potential landslip areas over the site.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.7 Socio-economic Impacts

9.7.1 Socio-economic Profile

Context

The BSC services the Region and is access by population at the existing facility, that aligns with the population demographics of the catchment and their risk factors.

Appropriate consideration should be given to the social and economic impacts from the proposed development, which includes matters such as employment opportunities, access to services, quality of education and the demographics profile.

Proposal

The Clay Target Range will provide positive socio-economic impacts by:

- providing a national and international standard sports and recreational venue that facilitates a wide range of elite and community sport training, competition and community events and activities.
- supports the temporary overlay for major events and complete the venue's ability to hold world class elite shooting events by combining with the newly upgraded Brisbane International Shooting Complex to be able to hold combined shotgun, pistol and rifle shooting.
- providing the future possibility to consolidate some of the existing shotgun shooting currently taking place across BSC t to the new clay target facility.
- supporting sports tourism in Queensland from international shooters and major events.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.8 Construction Impacts

9.8.1 Construction Management

Context

During development and construction it is essential to minimise impacts on neighbouring residents, the general public and the environment.

Proposal

A Construction Environmental Management Plan (CEMP) is to be prepared for the development. The plan will include at a minimum default noise standards detailed in the *Environmental Protection Act 1994*, dust mitigation methods, waste control and erosion and sediment control plans.

The construction phase water quality objectives in section 5.5 of the Site Based Stormwater Management Plan by Wood and Grieve are also to be incorporated into the CEMP.

Actions and Recommendations

A CEMP is required to be supplied by the building contractor. The Plan is to be implemented and monitored throughout the construction phase for the proposed development.

9.8.2 Noise and Hours of Construction Operation

Context

The site is located in an semi-urban area and construction activities should be within appropriate hours to avoid impacts to nearby residences.

Proposal

Unless otherwise approved in any development approvals and/ or statutory permits, works must comply as a minimum with default noise standard detailed in the *Environmental Protection Act 1994* including:

- Building work should be restricted to Monday to Saturday (excluding public holidays) between 6.30am and 6.30pm;
- Operation of regulated devices such as chainsaws, mulches and electrical, mechanical or pneumatic power tools should be restricted to Monday to Saturday (excluding public holidays) between 7:00am and 7:00pm; and
- Work should not be undertaken on public holidays.

Actions and Recommendations

Default noise standards are to be included in the Contractor's CEMP.

9.8.3 Traffic

Context

Traffic associated with construction activities is not likely to impact on surrounding road and land uses.

Proposal

Site access during construction will be via Old Cleveland Road. All movements and construction traffic and parking can be accommodated within the site.

Actions and Recommendations

Construction traffic and parking is to be addressed in the Contractor's CEMP.

9.8.4 Air Quality

Context

Air quality impacts (i.e. dust) is able to be managed during construction.

Proposal

Potential air quality impacts are to be managed through the construction period to limit the likelihood of nuisance to any adjoining and nearby land owners, occupiers and users.

Actions and Recommendations

Appropriate air quality management and mitigation procedures are to be included in the Contractor's CEMP.

9.8.5 Light

Context

Lighting impacts from construction activities to neighbouring properties are not anticipated.

Proposal

Unless otherwise approved, construction hours will be limited to the days and hours as specified under the *Environmental Protection Act 1994*, and listed in section 9.8.2 of this Report.

Given the proposed times for construction, the proposed works is unlikely to generate any adverse lighting impacts.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.8.6 Waste

Context

Construction waste must be appropriately disposed to avoid impacts to the environment.

Proposal

Construction waste is to be managed to minimise environmental impact, and disposed lawfully.

Actions and Recommendations

The building contractor will be responsible to remove and lawfully dispose of all construction based waste. A waste management procedure is to be included in the Contractor's CEMP.

9.9 Operational Impacts

9.9.1 Traffic

Context

Development traffic can cause impacts to the continuing operation and efficiency of surrounding road networks, and residential amenity.

Proposal

Given the very low traffic volumes generally using the broader site, this additional traffic is unlikely to cause any operational issues for the internal road network during normal operations.

Event Traffic Management may be required to support large, multi-disciplinary events at the site (site-wide events).

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.9.2 Air Quality

Context

The site currently does not produce any emissions, gasses or negative air quality impacts.

Proposal

The proposal is unlikely result in emissions, gases or negative air quality impacts.

Actions and Recommendations

No further actions or recommendations are considered necessary.

9.9.3 Noise

Context

The Queensland Rifle Association (QRA) has a noise management plan for the overall Complex. This document details the responsibilities of the various organisations and clubs working on the Complex. The intention of the document is to formalise and provide a record of noise management measures undertaken by each club. It also provides details of complaint handling, proposed intensification of uses on the site and provides a reporting structure for QRA to provide information back to the lessor (Sport and Recreation within DHPW).

In addition to the overall Complex noise management plan, individual noise management plans are required for the individual clubs that operate on the Complex. These documents are similar to the overall noise management plan, however, they go into specific noise control measures and firearms utilised by each club on their ranges and hours of operation.

A noise impact assessment has been prepared by ASK Consulting (refer **Appendix H**).

The purpose of this report is to evaluate the potential impacts of making the new Clay Target Range a permanent use location as follows:

- Outline the relevant project noise criteria.
- Present the results of noise monitoring. It is noted that this revised report includes results from monitoring conducted (in order):
    - prior to the range construction
    - after range construction
    - during the test event (championships) for the Games
    - during the Games
    - after the Games.
- Predict and assess the potential noise impact from the new Clay Target Range in permanent usage.
- Describe minimum noise reduction requirements to meet legislative requirements.
- Describe an example noise mitigation design to meet the minimum noise reduction requirements.

Environmental noise criteria applicable to shooting noise in Queensland are contained in the *Environmental Protection Act 1994*. Criteria which specifically refer to shooting noise are contained in Section 440ZC.

Proposal

The sensitive receivers to the Clay Target Range are identified in Figure 5.1 and Figure 5.2 of the Noise Report at **Appendix H**.

Measurements of noise levels were undertaken on a number of occasions as detailed in section 5 of the Noise Report. These included controlled measurement tests in October 2017 and May 2018, measurements at Championships in October / November 2017, and measurements at the Commonwealth Games in April 2018.

A detailed summary of the measurements and a comparison and discussion of the results is included in the Appended report (**Appendix H**).

Noise modelling has been undertaken with the SoundPLAN computer software. The noise model was setup with detailed 3D terrain data. Coordinates for measurement shooting positions, measurement receiver positions and nearby dwellings was determined from Google Earth including the Queensland Globe overlay, and the range layouts. Two noise models were setup

- The existing 3 or 4 range layout.

- The proposed eight range layout.

The particulars of the noise model—algorithms, assumptions and adjustments is detailed in the Noise Report.

Noise levels have been calculated at the measurement locations for various range uses as follows:

- 4 range skeet on STD1 to STD4
- 4 range trap on STD1 to STD4
- 6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6

The predicted noise levels, without any barriers or shielding are below:

Event	Calculated Maximum 40 Shot Average Peak Noise Levels LZpeak dBZ		
	R6 (property boundary to North East)	R6e (8m from house to North-East)	R5a (property boundary South-East)
4 range skeet on STD1 to STD4	102	101	95
4 range trap on STD1 to STD4	100	98	95
6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6	100	98	95

It can be seen that the predicted noise levels are excessive by 3 to 6 dB at the house to the north-east (R6e) and compliant at the property boundary to the south-east (R5a).

Noise levels have subsequently been predicted with the following mitigation measures in place, with the results shown further below:

- 4m high clubhouse
- 5m high acoustic fence atop a 7m high mound for a 12m total height. The levels at the ends of the barrier are as follows:
    - Western end: Ground RL 29.33, Top of Fence RL 41.33
    - Eastern end: Ground RL 33.54, Top of Fence RL 45.54

Event	Calculated Maximum 40 Shot Average Peak Noise Levels LZpeak dBZ		
	R6 (property boundary to North East)	R6e (8m from house to North-East)	R5a (property boundary South-East)
4 range skeet on STD1 to STD4	95	95	95
4 range trap on STD1 to STD4	92	92	95
6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6	93	93	95

The predicted noise levels are compliant, albeit marginally, at the house to the north-east (R6e) and property to the south-east (R5a) with the mitigation measures in place.

A comparison of proposed Clay Target Range and the Former 300m Range (over which the Clay Target Range has been located) indicates the noise impacts at nearby residents from the proposed new Clay Target Range can be considered as similar to the noise impacts at residents near to the former 300m range.

A comparison of the existing Clay Target Range on Western Side of the BSC and the proposed new permanent use Clay Target Range indicates that the noise impacts at nearby residents from

the proposed new Clay Target Range can be considered as similar or less than the noise impacts at residents near to the existing BGC target range on Mt Petrie Road.

Actions and Recommendations

Acoustic treatment is required to be initiated to ensure compliance with the *Environmental Protection Act 1994*, criteria for shooting noise contained in Section 440ZC.

The modelling supposes a 12m high barrier (5m acoustic fence atop 7m high mound) and clubhouse. Alternative barrier designs would be possible to achieve the required attenuation. It is recommended that further development and optimisation of barrier options be considered during detailed design.

The proposed barrier is to be designed to allow for koala movement through the line of the barrier. This could be achieved with appropriately designed openings.

Given the substantial height of the barrier, a staged approach to construction is recommended, e.g. remeasure the noise levels after the mound is built but before the construction of the acoustic fence.

To minimise noise emissions from the site, the use of the western ranges is to be prioritised. The two eastern DTL7 and DTL8 ranges are limited in use, as their noise levels are predicted to exceed criteria at nearby residences. The DTL7 and DTL8 ranges are therefore only approved for use twice per year over 3 days per event (National and State Championships).

9.9.4 Light

Context

After hours use of the facility is not expected.

Proposal

It is not expected that there will be lighting for night use.

The proposal is not considered to result in the generation of adverse lighting impacts. If any external lighting is required it will be provided in accordance with the applicable Australian Standards relating to the obtrusive effects of outdoor lighting.

Actions and Recommendations

No further actions or recommendations are considered necessary.

PART G – CONSULTATION

10 Consultation Engagement

10.1 Stakeholders

The stakeholders relevant for consultation with regards to the proposed designation includes:

Affected Parties

- Brisbane City Council
- Department of Housing and Public Works (Sport and Racing).

Stakeholders

- State Government Departments
    - Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP), representing relevant State Agencies;
    - Department of Housing and Public Works (Sport and Racing).
- Elected Representatives
    - o Local (Doboy) – Ryan Murphy
    - o State (Chatsworth) – Steve Minnikin MP
    - o Federal (Bonner) – Ross Vasta MP
- Site Users and Interest Holders:
    - Queensland Bulk Water Supply Authority (SEQ Water) – Easement in Gross No 714684387 (Easement E, F and G on SP242313)
    - Queensland Electricity Transmission Corporation Limited (Powerlink) – Easement in Gross No 713510449 (Easement P on SP163158)
    - Brisbane City Council – Easement in Gross No 601423970 (Easement A on RP171885) for drainage
    - Energex Limited – Easement in Gross No 718168524 (Easement AA on SP246243)
    - Energex Limited – Easement in Gross No 601423971 (Easement B on RP170328)
    - Queensland Rifle Association
    - Clubs including: Brisbane Gun Club, South Queensland Archery, Military Rifle Club
- Adjoining land owners
- Surrounding residents
- Community Representatives

10.2 Initial Consultation

Prior to the commencement of the Infrastructure Designation, DSDMIP undertook initial consultation activities with:

Activity	Description	Stakeholder Group	Actions
Prior to Public Notification			
Stakeholder Meetings	DSDMIP (Previously DSD) led meetings with key stakeholders	DSDMIP (Previously DSD), DHPW (previously DNPSR), Brisbane Gun Club, Queensland Rifle Association, consultants	19 June 2017 (completed) 10 January 2018 (completed) 25 January 2018 (completed)

		BAS also in attendance.	
Prelodgement	Prelodgement meeting with DSDMIP (previously DILGP).	DSDMIP (previously DILGP and DSD), DHPW (previously DNPSR), BAS	07 December 2017 (completed)
Meeting	DHPW (Previously DNPSR) led meetings with site users affected by the project	South Queensland Archery Society, Queensland Military Rifle Club DSD and BAS also in attendance.	30 November 2017 (completed)
Meeting	DSDMIP (previously DSD) led Stakeholder presentation and discussion about design and key issues associated with permanent usage, and future vision for the shotgun range.	Metropolitan Pistol Club Queensland Military Rifle Club Sports Shooter's Association of Australia Brisbane Gun Club Shooting Australia Australian Clay Target Association Queensland Clay Target Association Gold Coast Clay Target Club Caboolture Clay Target Club Redcliffe Clay Target Club BAS also in attendance.	17 May 2018 (completed)

10.3 Initial Consultation

The entity's proposed consultation during the Infrastructure Designation includes:

Activity	Description	Stakeholder Group	Actions
During Public Notification			
Public notice (newspaper)	Place public notice in local newspaper	Broader community	Prepare and book public notice
Public notice (signage)	Place signage at Old Cleveland Road frontage	Broader community	Prepare and erect public notice
Update web content	DSDMIP web content with information about the Infrastructure Designation proposal, including the fEAR and details about the engagement process.	Broader community	DSDMP Publish content update
Letters to stakeholders	Prepare letters that outline the Infrastructure Designation proposal and the engagement process. Distribute the letters.	Affected parties and surrounding residents.	Prepare letters Distribute

Email address and telephone contact	Email: infrastructuredesignation@dilgp.qld.gov.au Phone: 1300 967 433 Submissions during public notification can be made online or by infrastructuredesignation@dilgp.qld.gov.au	Affected parties and stakeholders Broader community	Publish contact information in relevant public notices and letters

PART H – CONCLUSION

This EAR has been prepared by BAS, seeking an Infrastructure Designation of land for a Clay Target Range at the BSC, located at 1485 Old Cleveland Road, Belmont and otherwise described as Part of Lot 1 on RP169229.

The PA 2016 prescribes the way in which a designation can be undertaken. Chapter 2, Part 5 of the PA prescribes that a Minister, before designating land for infrastructure, must be satisfied that for development the subject of the proposed designation:

- the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or
- there is or will be a need for the efficient and timely supply of the infrastructure.

Sporting facilities are defined as other infrastructure under Schedule 5, Part 2 of the *Planning Regulation 2017*.

The Infrastructure Designation will enable the legacy use of the facility— there is a need for the efficient and timely availability of the venue for use following the Games for ongoing maintenance management of the asset and continuum of use.

The Clay Target Range legacy use will provide the following benefits:

- Provide a national and international standard sports and recreational venue that facilitates a wide range of elite and community sport training, competition and community events and activities.
- Provide a design solution that offers spatial flexibility that creates maximum opportunities to promote a long-term centralised clay target facility with best practice environmental and community amenity outcomes for the existing discipline shot within BSC for the sport of clay target shooting.
- Support the temporary overlay for major events and complete the venue's ability to hold world class elite shooting events by combining with the newly upgraded Brisbane International Shooting Complex to be able to hold combined shotgun, pistol and rifle shooting.
- Provide the future possibility of consolidating some of the existing shotgun shooting that currently takes place at BSC to the new clay target facility..

The assessment provided within the fEAR provides key details with respect to the proposed Clay Target Range, and has undertaken an assessment of the proposed infrastructure against the relevant statutory frameworks, incorporating local and state assessment benchmarks.

PART I – APPENDICES

The following is a list of appendices to this Final Environmental Assessment Report:

Appendix A	Designation Area
Appendix B	Property Materials
Appendix C	Planning Scheme Property Information
Appendix D	Drawings
Appendix E	Environmental Assessment Report
Appendix F	Site Based Stormwater Management Plan
Appendix G	EMR / CLR Search
Appendix H	Noise Report
Appendix I	Contamination Report
Appendix J	Floodwise Property Report
Appendix K	Bushfire Management Plan
Appendix L	Traffic Advice
Appendix M	Geotechnical Report
Appendix N	SPP Interest Maps
Appendix O	State Development Area and Regional Plan Map

Appendix A

Designation Area

BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3253 9900
bne@modedesign.com.au

DEPARTMENT OF HOUSING AND PUBLIC WORKS

BELMONT SHOOTING COMPLEX

1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT USE & UPGRADED CLAY TARGET RANGE - SITE PLAN

0 50 100 150

Project No: 14479BNE
Date: 10/10/18 ISSUE(PR3)
Scale:
Drawn / Check: LM MP
MP - 046A 3

11/10/2018 4:52:43 PM

BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3253 9900
bne@modedesign.com.au

DEPARTMENT OF HOUSING AND PUBLIC WORKS

BELMONT SHOOTING COMPLEX
1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT USE & UPGRADED CLAY TARGET RANGE - SITE PLAN

Project No:	14479BNE
Date:	26/11/18
Scale:	1 : 5000@ A3
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Appendix B

Property Materials

CURRENT TITLE SEARCH

NATURAL RESOURCES, MINES AND ENERGY, QUEENSLAND

Request No: 28469084
Search Date: 23/04/2018 15:36 **Title Reference: 16063149**
Date Created: 02/12/1980

Previous Title: 15932091

REGISTERED OWNER

Dealing No: 718607832 01/03/2018

THE STATE OF QUEENSLAND
(REPRESENTED BY DEPARTMENT OF HOUSING AND PUBLIC WORKS)

ESTATE AND LAND

Estate in Fee Simple

LOT 1 REGISTERED PLAN 169229
Local Government: BRISBANE CITY

EASEMENTS, ENCUMBRANCES AND INTERESTS

1. Rights and interests reserved to the Commonwealth by
   Conveyance No. 601423976 (G179957) (Lot 1 on RP 169229)

2. EASEMENT IN GROSS No 601423970 (G313092) 09/03/1981
   BURDENING THE LAND
   TO BRISBANE CITY COUNCIL
   OVER EASEMENT A ON RP171885

3. EASEMENT IN GROSS No 601423971 (G660753) 03/03/1982
   BURDENING THE LAND
   TO THE SOUTH EAST QUEENSLAND ELECTRICITY BOARD
   OVER EASEMENT B ON RP170328

4. TRANSFER No 714613452 08/08/2012 at 16:26
   EASEMENT IN GROSS: 601423971 (G660753)
   ENERGEX LIMITED A.C.N. 078 849 055

5. LEASE No 601053832 (L823181K) 01/02/1994 at 09:03
   To
   QUEENSLAND RIFLE ASSOCIATION INCORPORATED

   OF PART OF THE LAND
   COMMENCING ON 5 JUL 1993
   TERMINATING ON 4 JUL 1998

6. PAR/SURRENDER No 700373527 01/12/1994 at 09:24
   of
   LEASE: 601053832 (L823181K)
   SO FAR AS RELATES TO 50 SQUARE METRES AS SHOWN ON SKETCH
   PLAN

7. AMENDMENT No 705581244 30/04/2002 at 09:47
   LEASE: 601053832 (L823181K)

CURRENT TITLE SEARCH

NATURAL RESOURCES, MINES AND ENERGY, QUEENSLAND

Request No: 28469084
Search Date: 23/04/2018 15:36 **Title Reference: 16063149**
Date Created: 02/12/1980

EASEMENTS, ENCUMBRANCES AND INTERESTS

8. PAR/SURRENDER No 705930899 06/09/2002 at 09:26
   LEASE: 601053832 (L823181K)
   OF LEASE J ON SP132530

9. AMENDMENT OF LEASE No 718300443 28/09/2017 at 11:41
   LEASE: 601053832 (L823181K)
   TERM: 05/07/1993 TO 04/07/2043 OPTION NIL

10. LEASE No 712990711 13/01/2010 at 12:16
    CROWN CASTLE AUSTRALIA PTY LTD A.C.N. 090 873 019
    OF LEASE V ON SP226982
    TERM: 21/02/2009 TO 20/02/2019 OPTION NIL

11. LEASE No 712990717 13/01/2010 at 12:17
    CROWN CASTLE AUSTRALIA PTY LTD A.C.N. 090 873 019
    OF LEASE CC ON SP226993
    TERM: 05/07/2013 TO 20/02/2019 OPTION NIL

12. EASEMENT IN GROSS No 713510449 11/10/2010 at 14:23
    burdening the land
    QUEENSLAND ELECTRICITY TRANSMISSION CORPORATION LIMITED
    A.C.N. 078 849 233
    over
    EASEMENT P ON SP163158

13. EASEMENT IN GROSS No 714684387 19/09/2012 at 15:55
    burdening the land
    QUEENSLAND BULK WATER SUPPLY AUTHORITY
    over
    EASEMENTS E, F AND G ON SP242313

14. EASEMENT IN GROSS No 718168524 21/07/2017 at 15:04
    burdening the land
    ENERGEX LIMITED A.C.N. 078 849 055
    over
    EASEMENT AA ON SP246243

15. LEASE No 718607839 01/03/2018 at 11:56
    THE AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY
    OF LEASE AC ON SP295665
    TERM: 01/01/2018 TO 31/12/2027 OPTION NIL

ADMINISTRATIVE ADVICES

Dealing	Type	Lodgement Date	Status
711200242	VEG NOTICE VEGETATION MANAGEMENT ACT 1999	21/11/2007 11:30	CURRENT
711380483	VEG NOTICE VEGETATION MANAGEMENT ACT 1999	30/01/2008 09:22	CURRENT
711779933	VEG NOTICE VEGETATION MANAGEMENT ACT 1999	09/07/2008 09:54	CURRENT

UNREGISTERED DEALINGS - NIL

CURRENT TITLE SEARCH

NATURAL RESOURCES, MINES AND ENERGY, QUEENSLAND

Request No: 28469084
Search Date: 23/04/2018 15:36 **Title Reference: 16063149**
Date Created: 02/12/1980

CERTIFICATE OF TITLE ISSUED - No

Caution - Charges do not necessarily appear in order of priority

** End of Current Title Search **

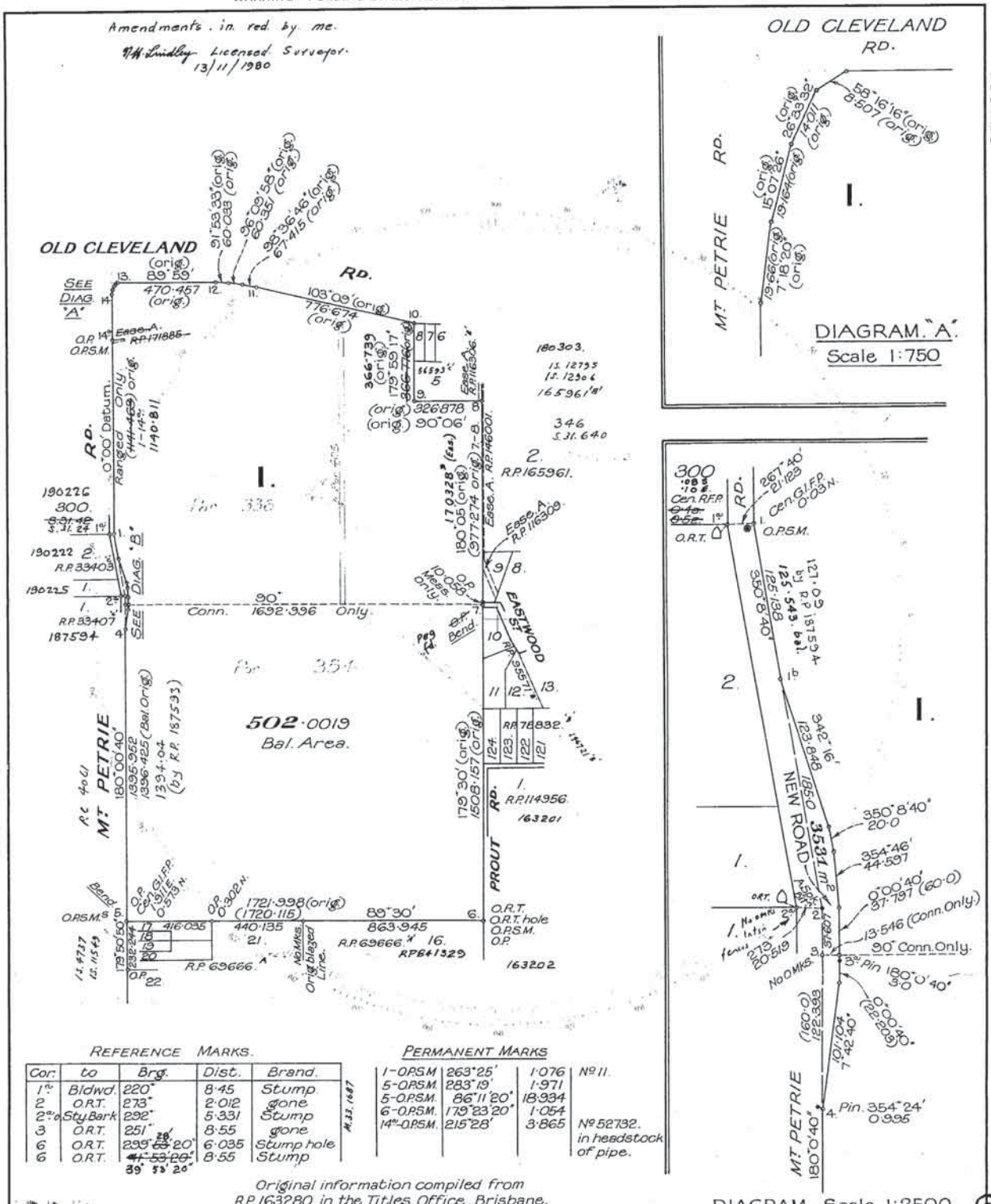
Requested By: SMIS .

WARNING—FOLDING OR MUTILATING WILL LEAD TO REJECTION—PLAN MAY BE ROLLED

169229

PLAN MUST BE DRAWN WITHIN BLUE LINES

Amendments in red by me.
W.H. Lindley Licensed Surveyor.
13/11/1980



REFERENCE MARKS.

Cor:	to	Brg.	Dist.	Brand.
1	Bldwd.	220°	8·45	Stump
2	O.R.T.	273°	2·012	gone
2a	Sty Bark	292°	5·331	Stump
3	O.R.T.	251°	8·55	gone
6	O.R.T.	239° 53' 20"	6·035	Stump hole
6	O.R.T.	39° 53' 20"	8·55	Stump

PERMANENT MARKS

1-O.P.S.M	263°25'	1·076	No 11.
5-O.P.S.M.	283°19'	1·971	
5-O.P.S.M.	86°11'20"	18·934	
6-O.P.S.M.	179°23'20"	1·054	
14m-O.P.S.M.	215°28'	3·865	No 52732. in headstock of pipe.

Original information compiled from R.P. 163280 in the Titles Office, Brisbane.

NO FIELD NOTES LODGED	LINES NOT SURVEYED STNS	CORNERS NOT MARKED STNS
ORIGINAL PORTION 336, 354 & 405.	PLAN OF Lot 1.	TOWN City of Brisbane.
ORIGINAL GRANT C/W Acquisition Government Gazette No. 91, Dated 27th July 1916.	CANCELLING Lot 354 on R.P. 163280.	PARISH TINGALPA.
		COUNTY Stanley.
MAP REF. 157 C.C. 133 & 145	PROCLAIMED SURVEY AREA	SURVEYED BY N.H. Lindley 8/9/78 MERIDIAN SCALE 1:1500
		REGISTERED PLAN 169229

CISP MF

WARNING—FOLDING OR MUTILATING WILL LEAD TO REJECTION—PLAN MAY BE ROLLED

Nº 56329

169229

CERTIFICATE

I, Norman Harry Lindley hereby certify that I have surveyed the land comprised in this plan personally that the plan is accurate, that the said survey was performed in accordance with the 'Surveyors Act 1977' and the 'Surveyors Regulations 1978' and that the said survey was completed on 8.9.78

N H Lindley
Signature of Licensed Surveyor.

Date 28/2/1980

Council of the ...... of ...... certifies that all the requirements of this Council, the Local Government Acts of 1936 to 19 and all By-Laws have been complied with and approves this Plan of Subdivision.

Dated this ...... day of ...... 19......

Mayor or Chairman

B.C.C.

Town or Shire Clerk

~~I/We~~ The Commonwealth of Australia as proprietor of this land, agree to this Plan and dedicate the new roads shown hereon to public use.
(Names in full)

Signature of Proprietor/s

Signed on the sixteenth day of July 1980, by the Delegate of the Attorney General for and on behalf of THE COMMONWEALTH OF AUSTRALIA, in the presence of:

An officer of the Attorney-General's Department

New C.T. ...

Lot	Vol.	Fol.
1	6263	149

FOR TITLES OFFICE USE ONLY

Previous Title
C.T. 5932-91 Lot 354 R.P.163280
Lot 1 see easement plan No. 170328
(Part) Lot 1 see R.C. 5654 (...)
Lot 1 see IS 20812
5932
91

For Additional Plan & Document Notings Refer to CISP

Lodged by Commonwealth Crown Solicitor, ~~R.P. O'BRIEN, CITY SOLICITOR, B.C.C.~~ 294 Adelaide St Brisbane.
247

Fees Payable		
	Postal fee and Postage	
52.00	Lodgt, Exam. & Ass.	52.00
	Entd. on Docs.	
15.00	New Title	15.00
6.00	Entd. on Deeds	6.00
4.00	Photo Fee	4.00
$77.00	Total	77.00
	Short Fees Paid	

Received
Registrar of Titles
Journal No. G179957
Receipt No 44594

RECEIVED REGR. OF TITLES Oct 3 9 33 AM '80

Calc. Bk. No. 322/129
Examined 18/11/80
Passed 18/11/80
Charted 27/11/1980
Map Ref. CC.133,145 & 157
CC133 CC 133 & 145
CC145

Particulars entered in Register Book Vol. 5932 Folio 91

24 NOV 1980 at 0.33

REGISTRAR OF TITLES

24-10-80

REGISTERED PLAN 169229

STANDARD MAP NUMBER
9542-41443

0 1.2 2.4 3.6 4.8 6.0 km

HORIZONTAL DATUM:GDA94 ZONE:56 SCALE 1 : 60000

SmartMap
An External Product of
SmartMap Information Services

Based upon an extraction from the
Digital Cadastral Data Base

MAP WINDOW POSITION &
NEAREST LOCATION

153°08'03".095
27°31'10".665
BELMONT
1.52 KM

SUBJECT PARCEL DESCRIPTION

DCDB

Lot/Plan	1/RP169229
Area/Volume	502.0019ha
Tenure	FREEHOLD
Local Government	BRISBANE CITY
Locality	BELMONT
Segment/Parcel	18282/1

CLIENT SERVICE STANDARDS

PRINTED (dd/mm/yyyy) 23/11/2017

DCDB 22/11/2017 (Lots with an area less than 4.000ha are not shown)

For further information on SmartMap products visit http://nrw.qld.gov.au/property/mapping/blinmap

GDA

Queensland Government

Appendix C

Planning Scheme Property Information

Department of Housing and Public Works

Queensland Government

Brisbane City Council - City Plan 2014 Property Holding Report

Property Address

1485 Old Cleveland Rd Belmont 4153

Property Holding Details

Full Property Holding:
1 on RP169229

Title Area: 5020019 m2

PDF Maps GRID Reference: Map 30, 37

Ward: CHANDLER

City Plan 2014 Zones

Zone Name	Description
SR3 Sport and recreation (Metropolitan)	The purpose of the Sport and recreation zone code is to provide for a range of organised activities that includes sport, cultural and educational activities where the uses require a level of built infrastructure. It includes built structures, such as clubhouses, gymnasiums, public swimming pools and tennis courts, and infrastructure to support the activities, safe access and essential management, where required to meet community needs. Refer to Part 6 in the City Plan 2014 and the Factsheets.
CN Conservation	The purpose of the Conservation zone code is to provide for the protection, restoration and management of areas identified as supporting significant biological diversity and ecological integrity. Refer to Part 6 in the City Plan 2014 and the Factsheets.

City Plan 2014 Overlays

Overlay Name	Description
Airport environs overlay	The Airport environs overlay deals with issues of State Interest. It may also include locally identified issues that relate to airport environments. Refer to Part 8 in the City Plan 2014.
OLS – Horizontal limitation surface boundary	OLS – Horizontal limitation surface boundary sub-categories of the Airport environs overlay.
Procedures for air navigation surfaces (PANS)	Procedures for air navigation surfaces (PANS) sub-categories of the Airport environs overlay.
BBS zone – Distance from airport 8-13km	BBS zone – Distance from airport 8-13km sub-categories of the Airport environs overlay.
Bicycle network overlay	The Bicycle network overlay deals with the provision of bikeway infrastructure and facilities to encourage the safe and efficient movement of pedestrians and cyclists through the movement network. Development is governed by the Bicycle network overlay code. Refer to Part 8 in the City Plan 2014. The Bicycle network overlay includes: • Primary cycle route sub-category • Secondary cycle route sub-category • Local cycle route sub-category • Riverwalk - Typology 1 (City reaches north and south) sub-category • Riverwalk - Typology 2 (Urban reaches) sub-category • Riverwalk - Floating walkway sub-category Refer to overlay map to see which sub-categories are relevant. NOTE: Land that adjoins land where an overlay sub-category applies, is within the overlay sub-category.
Biodiversity areas overlay	The Biodiversity areas overlay deals with biodiversity Areas of Ecological Significance (AES). This may include areas of High Ecological Significance (HES) and also areas of General Ecological Significance (GES) among others. Refer to Part 8 in the City Plan 2014.
Priority koala habitat area sub-category	Priority koala habitat area sub-category of the Biodiversity areas overlay. NOTE: This sub-category is best viewed in the mapping at a scale of 1:10,000 or higher.
Biodiversity interface area sub-category	Biodiversity interface area sub-category of the Biodiversity areas overlay.

General ecological significance sub-category	General ecological significance sub-category of the Biodiversity areas overlay.
High ecological significance sub-category	High ecological significance sub-category of the Biodiversity areas overlay.
Bushfire overlay	The Bushfire overlay constrains areas of land identified as high and medium bushfire hazard management areas and deals with issues of State Interest. It applies, at a minimum, to development that: • increases the number of people living and working in the natural hazard management area; or • involves institutional uses, essential community infrastructure, or where evacuating people may be difficult; or • involves the manufacture or storage of hazardous materials in bulk. Note – The Building Act 1975 adopts the requirements of the Building Code of Australia and AS 3959-2009 and thus regulates construction standards of all premises identified in bushfire prone areas subsequent to development approval.Refer to Part 8 in the City Plan 2014.
High hazard area sub-category	Area mapped within the Bushfire overlay as high hazard area considering vegetation type, slope and aspect.
Medium hazard area sub-category	Area mapped within the Bushfire overlay as medium hazard area considering vegetation type, slope and aspect.
High hazard buffer area sub-category	Land mapped within the Bushfire overlay as buffer areas extending 100 metres from high hazard areas.
Medium hazard buffer area sub-category	Land mapped within the Bushfire overlay as buffer areas extending 50 metres from medium hazard areas.
Critical infrastructure and movement network overlay	The Critical infrastructure and movement network overlay identifies critical assets and movement networks.Refer to Part 8 in the City Plan 2014. The Critical infrastructure and movement network overlay includes: • Critical assets sub-category • Critical infrastructure and movement planning area sub-category Refer to the overlay map to see which sub-categories are relevant to specific properties.
Critical infrastructure and movement planning area sub-category	Critical infrastructure and movement planning area sub-category of the Critical infrastructure and movement network overlay.
Flood overlay	The Flood overlay deals with areas of land identified as subject to flooding, and deals with issues of State Interest. It may include the following areas of land identified within the local government area as: • areas of land with flooding and inundation potential; • overland flow paths identified locally. It applies, at a minimum, to development that: • increases the number of people living and working in the natural hazard management area, except where the premises are occupied on a short term or intermittent basis; or • involves institutional uses where evacuating people may be difficult; or • involves the manufacture or storage of hazardous materials in bulk. Refer to Part 8 in the City Plan 2014. Individual property flood levels are provided on Council's Floodwise Property Report. Information to help understand your flood risk can be found on Council's Flood Awareness webpage.
Overland flow flood planning area sub-category	Overland flow flood planning area sub-category of the Flood overlay.
Landslide overlay	The Landslide overlay deals with areas of land identified as having landslide potential and deals with issues of State Interest. It may include areas of land identified within the local government area as having landslide potential. It applies, at a minimum, to development that: • increases the number of people living and working in the natural hazard management area, except where the premises are occupied on a short term or intermittent basis; or • involves institutional uses where evacuating people may be difficult; or • involves the manufacture or storage of hazardous materials in bulk. Refer to Part 8 in the City Plan 2014.
Potential and actual acid sulfate soils overlay	The Potential and actual acid sulfate soils overlay deals with issues of State

	Interest. It may include areas of land identified within Brisbane as having potential or actual acid sulfate soils. Refer to Part 8 in the City Plan 2014.
Potential and actual acid sulfate soils sub-category	Potential and actual acid sulfate soils sub-category of the Potential and actual acid sulphate soils overlay.
Land above 5m AHD and below 20m AHD sub-category	Land above 5m AHD and below 20m AHD sub-category of the Potential and actual acid sulphate soils overlay.
Road hierarchy overlay	The Road hierarchy overlay applies to the existing and future road networks, including state controlled roads. Refer to Part 8 in the City Plan 2014. The Road hierarchy overlay includes: • Motorways sub-category • Arterial roads sub-category • Suburban roads sub-category • District roads sub-category • Neighbourhood roads sub-category • Future motorway sub-category • Future arterial road sub-category • Future suburban road sub-category • Future district road sub-category • Primary freight routes sub-category • Primary freight access sub-category Refer to the overlay map to see which sub-categories are relevant to specific properties. NOTE: Land that adjoins land where an overlay sub-category applies, is within the overlay sub-category.
Streetscape hierarchy overlay	The Streetscape hierarchy overlay identifies the various functions of the streetscape network and determines how development is assessed to ensure high quality subtropical streetscape outcomes are achieved. Refer to Part 8 in the City Plan 2014. The Streetscape hierarchy overlay includes: • Subtropical boulevard – in centre sub-category • Subtropical boulevard – out of centre sub-category • City street major sub-category • City street minor sub-category • Neighbourhood street major sub-category • Neighbourhood street minor sub-category • Industrial street sub-category • Cross block link - in centre sub-category • Cross block link - out of centre sub-category • Corner land dedication sub-category • Locality street sub-category • Laneway sub-category • Wildlife movement solution sub-category Refer to the overlay map to see which sub-categories are relevant to specific properties. NOTE: Land that adjoins land where an overlay sub-category applies, is within the overlay sub-category.
Transport air quality corridor overlay	The Transport air quality corridor overlay identifies properties located on busy roads where residential development and other sensitive land uses are subject to potential impacts of air pollution from vehicle traffic. Development for residential and other sensitive land uses is governed by the Transport air quality corridor overlay code. Refer to Part 8 in the City Plan 2014. The Transport air quality corridor overlay includes: • Transport air quality A sub-category • Transport air quality B sub-category • Tunnel ventilation stack sub-category Refer to the overlay map to see which sub-categories are relevant to specific properties.
Transport noise corridor overlay	The Transport noise corridor overlay deals with areas of land identified as being affected by transport noise as established under Chapter 8B of the Building Act 1975. It may include areas of land affected by noise from: • State controlled roads(State mapping) • Franchised roads • Local government controlled roads • Railway land(State mapping)
Designated State Noise corridor - Statecontrolled road (MANDATORY area):	Designated State Noise corridor - State-controlled road (MANDATORY area): Category 1: 58 dB(A) - 63 dB(A) of the Transport noise corridor overlay.

Category 1: 58 dB(A) - 63 dB(A)	
Designated State Noise corridor - Statecontrolled road (MANDATORY area): Category 2: 63 dB(A) - 68 dB(A)	Designated State Noise corridor - State-controlled road (MANDATORY area): Category 2: 63 dB(A) - 68 dB(A) of the Transport noise corridor overlay.
Designated State Noise corridor - Statecontrolled road (MANDATORY area): Category 3: 68 dB(A) - 73 dB(A)	Designated State Noise corridor - State-controlled road (MANDATORY area): Category 3: 68 dB(A) - 73 dB(A) of the Transport noise corridor overlay.
Designated State Noise corridor - Statecontrolled road (MANDATORY area): Category 4: Noise Level > 73 dB(A)	Designated State Noise corridor - State-controlled road (MANDATORY area): Category 4: Noise Level > 73 dB(A) of the Transport noise corridor overlay.
Water resource catchment overlay	The Water resource catchment overlay deals with declared catchment areas and areas identified by a local government or Bulk Water Supply Authority as a water resource requiring protection of water quality (e.g. local catchments or bores). Refer to Part 8 in the City Plan 2014.
Waterway corridors overlay	The Waterway corridors overlay deals with waterway corridors and surrounding riparian areas. Refer to Part 8 in the City Plan 2014.
Citywide waterway corridor sub-category	Citywide waterway corridor sub-category of the Waterway corridors overlay.
Local waterway corridor sub-category	Local waterway corridor sub-category of the Waterway corridors overlay.
Wetlands overlay	The Wetlands overlay deals with wetlands and surrounding riparian areas. Refer to Part 8 in the City Plan 2014.

City Plan 2014 Neighbourhood Plans

Neighbourhood Plan	Description

City Plan 2014 Local Government Infrastructure Plan

Priority Infrastructure Area	Description
NOT INCLUDED in Priority Infrastructure Area	The priority infrastructure area identifies the area the local government gives priority to provide trunk infrastructure for urban development. The priority infrastructure area mapping identifies the priority infrastructure areas subject to the Local Government Infrastructure Plan (which provides for predicted existing and future residential and non-residential development). LGIP maps are referenced in Part 4 of City Plan 2014. Local Government Infrastructure Plan mapping and support material are in Schedule 3 of City Plan 2014. Refer to the LGIP mapping to see which sub-categories are relevant to specific properties.
Plans for Trunk Infrastructure (PFTI)	All Networks
PFTI Map Grid Reference Map Grid #216, #236, #256 All networks applicable	The Plans for Trunk Infrastructure maps (Schedule 3) have been grouped by map tile. Please also refer to the map indexes relevant to each of the networks: Active & public transport network maps; Community purposes network maps; Road network maps; Sewerage network maps; Stormwater network maps; Water supply network maps.

NOTES
Some information relating to overlays and neighbourhood plans is not shown in this report. Refer to mapping to see which sub-categories and neighbourhood plan precincts are relevant.
The Title area shown is approximate only. The Survey Plan should be referred to for accurate area calculation and for boundary dimensions. Contour information shown is from Council's 2002 Contour records. The Digital Cadastre Database (supplied by State of Queensland – Department of Natural Resources and Mines) will be updated from time to time.

Mining tenements are shown on the Extractive Resources Overlay – for information purposes only, under the Mineral Resources Act 1989. Further details can be obtained from the chief executive, Department of Natural Resources and Mines.

From time to time, Council may create Temporary Local Planning Instruments (TLPI) which for affected properties, may suspend or otherwise affect the operation of a planning scheme (i.e. Brisbane City Plan 2014) for a period of up to two (2) years from its effective date. TLPIs are not identified in this report. Check here to confirm whether this property is included in a TLPI.

Areas identified in an overlay may be land (property) based or infrastructure based (e.g. road, tunnel, bicycle networks etc). Infrastructure-based overlay areas identify infrastructure that is sensitive to the effects of development of adjoining or neighbouring land and/or identify where required infrastructure is to be provided as a result of development. Land that adjoins, has frontage and/or direct access to such identified infrastructure in an overlay, is identified as land within the relevant overlay code. Where development is proposed on land adjoining, having frontage and/or access to identified infrastructure to which an overlay applies, it must address the corresponding overlay code.

This report is notional only and should not be used for interpreting City Plan 2014 provisions relating to specific sites. To properly interpret the mapping, the planning scheme must be referred to.
Report based on mapping as adopted by Council, effective 3 July 2017.

Appendix D

Drawings

BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3253 9900
bne@modedesign.com.au

DEPARTMENT OF HOUSING AND PUBLIC WORKS

BELMONT SHOOTING COMPLEX

1485 OLD CLEVELAND ROAD, BELMONT QLD

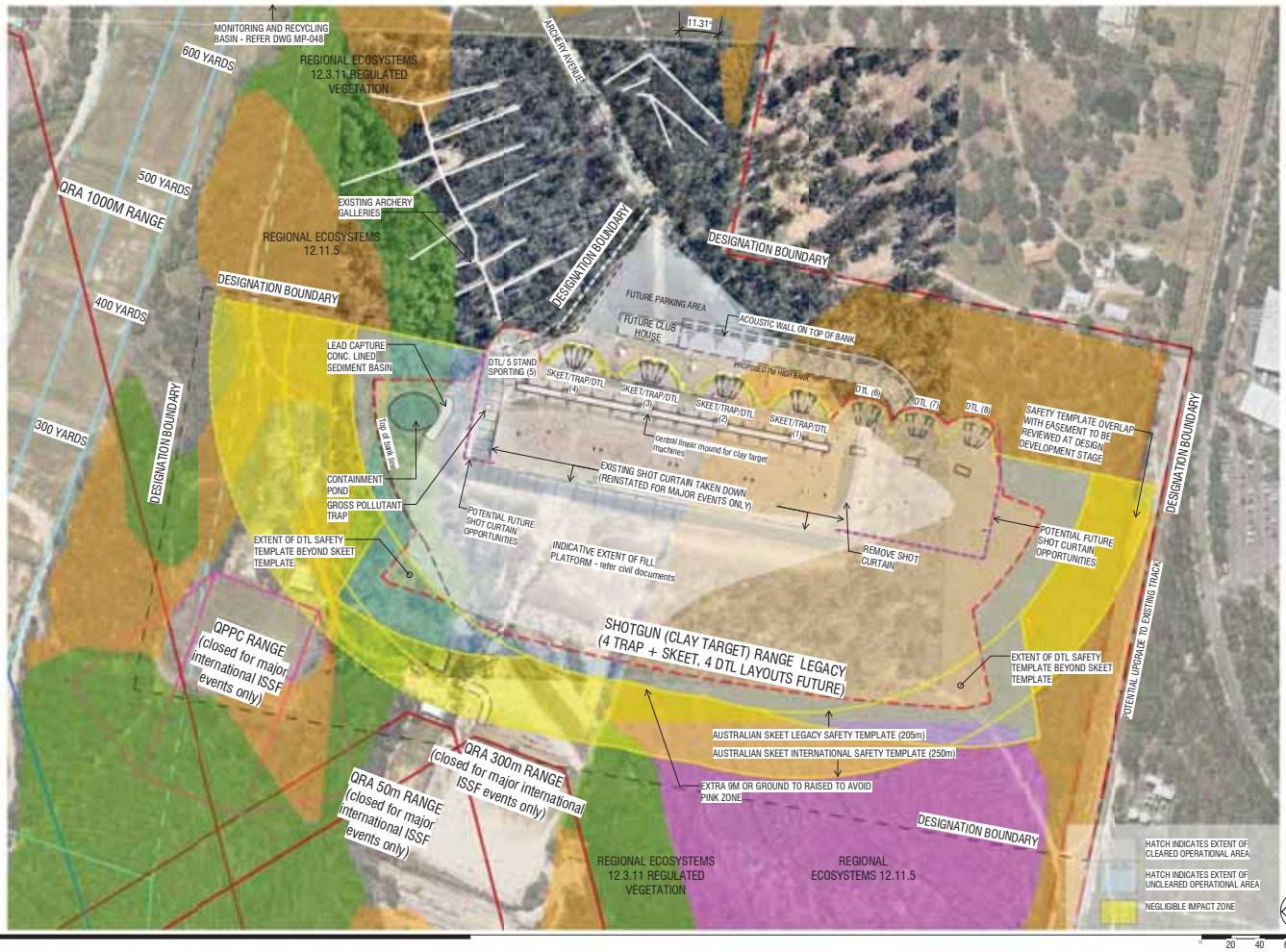
Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT USE & UPGRADED CLAY TARGET RANGE - SITE PLAN - PRESENTATION BOARD

Project No: 14479BNE
Date: 10/10/18 ISSUE(PR2)
Scale:
Drawn / Check: LM MP
MP - 045H 2

11/10/2018 4:50:39 PM



BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3253 9900
bne@modedesign.com.au

DEPARTMENT OF HOUSING AND PUBLIC WORKS

BELMONT SHOOTING COMPLEX
1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT USE & UPGRADED CLAY TARGET RANGE - SITE PLAN

20 40 60 80 100

Project No: 14479BNE
Date: 31/10/18
Scale: 1 : 2500@ A3
Drawn / Check: MP PB

MP - 045F 1

31/10/2018 8:52:55 AM

Appendix E

Environmental Assessment Report

Department of Housing and Public Works

Queensland Government

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

DATE 30 October, 2018

CONTACT JOSEPH TOON

OUR REF B15016ER010

Clay Target Facility Ministerial Infrastructure Designation Environmental Assessment Report

For Mode Design

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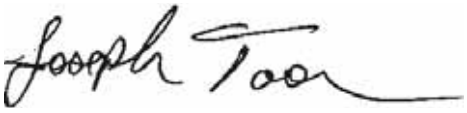
APPENDIX H

APPENDIX I

Revision	Date	Description	Author	Verifier	Approver
A	14/12/17	Draft	MD	JT	JT
B	23/01/18	Draft	MD	JT	JT
C	23/07/18	Draft	JT	SM	JT
D	23/08/2018	FINAL	JT	SM	JT
E	18/10/2018	REVISED	SU	JT	JT
F	30/10/18	REVISED	SU	JT	JT

Authorised by:

Joseph Toon



……

Position: Division Manager, Environmental

EXECUTIVE SUMMARY

Constructed for the Gold Coast Commonwealth Games, the clay target facility at the Belmont Shooting Complex is now proposed to become a permanent piece of infrastructure through the Ministerial Infrastructure Designation process. As part of this process the plans include completion of the fourth skeet position and an additional four down the line positions. To enable these additional shooting positions to be constructed and allow subsequent proposed management and mitigation activities to be constructed and undertaken, an additional approximate 5.4 ha of vegetation is proposed to be cleared. This includes areas mapped as regional ecosystems (RE), non-remnant vegetation and areas that are partially cleared / scattered vegetation. The cleared areas will allow for best practice isolation and management of lead contamination.

Ecological investigations undertaken within the Infrastructure Designation Area did not identify any conservation significant flora or fauna species. They did however confirm the presence of “Of Concern“ and “Endangered” regional ecosystems (RE) within the Infrastructure Designation Area.

The direct impacts associated with the construction and use of the facility are associated with both the construction of the expanded clay target facility, and also the ongoing use of lead shot and the actions proposed to assist in the management and containment of lead within the Infrastructure Designation Area.

Lead shot and clay targets have the potential to result in contamination of soils and surface water. While the contaminants of concern (lead) is not generally in a soluble or mobile form, over time degradation of the lead pellets and clay targets has the potential to increase levels above background resulting in a contaminated site and potential for elevated levels to migrate offsite. If not managed, it is estimated that, depending on level of use, lead levels in the soils will exceed trigger values within a few years of operation.

The majority of the vegetation proposed to be removed is considered either “Of Concern” or “Endangered” REs that support koala habitat. While no koalas were observed during the surveys, evidence of their presence was observed. Vegetation clearing has been minimised where possible through the inclusion of uncleared operational areas and modelling to understand the areas impacted as a result of lead deposition.

Indirect impacts associated with the permanent use of the facility include noise impacts to adjacent sensitive land uses, mobilisation of sediment and soils as a result of changes to surface water flows and management that result in the deposition of sediments into the adjacent downstream watercourse, and the potential for contamination of soils and surface water beyond the direct impact area following mobilisation of soils.

Management and mitigation measures have been developed to address both direct and indirect impacts. While vegetation clearing is unavoidable under the current proposal, this is partly associated with proposed best practice management and mitigation measures to control lead from mobilising and leaving the deposition area within the Infrastructure Designation Area.

A number of the indirect impacts have been addressed through site design, such as surface water management to address sedimentation and erosion that has the potential to enter the nearby waterways, and the construction of a noise attenuation wall to manage the noise impacts on nearby sensitive receptors.

1.0 INTRODUCTION

1.1 BACKGROUND

A clay target facility has been constructed at the Belmont Shooting Centre (Appendix A), located on Lot 1 RP169229 at 1485 Old Cleveland Road, Belmont (Belmont Shooting Centre) (Figure 1). The clay target facility was constructed as a temporary facility for the 2018 Gold Coast Commonwealth Games. It is now proposed the clay target facility become permanent use infrastructure. Approval to retain the clay target facility is proposed to be undertaken through the Ministerial Infrastructure Designation (MID) process. To support the MID application an environmental assessment report is required. The Environmental Assessment Report (EAR) is prepared to ensure the requirements for adequate environmental assessment are met.

This EAR describes the existing environment, the current infrastructure, proposed activities, and potential environmental impacts and subsequently addresses environmental management opportunities.

1.2 GENERAL DESCRIPTION OF THE PROPOSED AREA

Lot 1 on RP169229 (Lot 1) is situated at 1485 Old Cleveland Road, Belmont on about 499 hectares that have been used by a number of shooting clubs for over 150 years. Much of the site supports open forest and woodland remnant vegetation (Appendix B).

The area is zoned Sport and Recreation and is surrounded by Open Space, Low Density Residential and Emerging Community as per the Brisbane City Council City Plan 2014 (Appendix C). The designated Open Space to the north and east of Lot 1 is predominantly small acreage blocks with little mapped remnant vegetation (Appendix B), or locally significant vegetation present.

Lot 1 is undulating to steep (Appendix D) and includes vegetated watercourses, overland flow paths, drainage features, poorly drained areas, foothills, slopes and ridges, and Mount Petrie (170 metres).

The clay target facility is located in the north-east area of Lot 1 (Figure 1) and was overlaid over an existing 300 m rifle range, in a relatively flat area. The clay target facility is generally surrounded by remnant vegetation, an overland flow line, field archery lanes to the west and the reduced 300 m rifle range to the south. The clay target facility is accessed by a sealed road and includes a carpark area. Lot 1 is further connected to vegetation on surrounding lots.

1.3 THE PROJECT

As the facility was constructed for the Commonwealth Games use only, the majority of the clearing and direct impacts associated with the existing clay target facility infrastructure have

already occurred and relevant environmental approvals obtained. Future proposed activities to facilitate permanent use include but are not limited to (Appendix E):

- Construction of a fourth skeet/trap position;
- Construction of four down-the-line (DTL) positions;
- Removal of the eastern side shot curtain;
- Construction of a future amenities / potential club house facility / building within the carpark area and completion for a sealed carpark area;
- Construction of a noise barrier / wall along the north edge of the carpark to reduce noise at the adjacent residences; and
- Clearing of approximately 5.4 ha of additional vegetation to accommodate additional shooting skeet/trap and DTL positions, and the cleared operational area for improved contamination mitigation works and procedures both within the shot enclosure and in the operational area. This is approximately 1.5% of the vegetated area of Lot 1 (approximately 360 ha).

The project area is described as the “Infrastructure Designation Area”.

1.4 PURPOSE

The purpose of this EAR is to evaluate the potential impacts on the environment associated with the permanent use of the clay target facility and to identify proposed management and mitigation strategies to address the environmental impacts.

2.0 LEGISLATION AND PLANNING

The following overview of legislation and agreements is for those that generally apply to projects that require clearing of remnant vegetation or have potential impacts on the environment. As this project is being managed through the MID process many of these provisions do not apply. However, as the MID process is still required to address environmental impacts an overview of these typical legislative requirements assists in identifying key aspects to be considered:

- International agreements
  - *Ramsar Convention On Wetlands 1971;*
- Commonwealth legislation
  - *Environment Protection And Biodiversity Conservation Act 1999;*
- State Legislation
  - *Vegetation Management Act 1999;*
  - *Nature Conservation Act 1992;*
  - The *Environmental Offsets Act 2014* and subordinate legislation;
  - *Biosecurity Act 2014;*
  - Referrable Wetlands;
  - Koala assessable development areas under the Planning Act 2016 (former Koala SPRP mapping);
  - Nature Conservation (Koala) Conservation Plan 2017; and
  - State Government Supported Infrastructure - Koala Conservation Policy
- Local Government Legislation
  - *Brisbane City Plan 2014*; and
  - *Natural Assets Local Law 2003.*

3.0 SITE DESCRIPTION

3.1 FLORA AND VEGETATION

A number of flora and vegetation surveys (Lambert & Rehbein, 2016; Lambert & Rehbein, 2017a; Lambert & Rehbein, 2017b, Lambert & Rehbein, 2018) have been undertaken in association with this project to determine the vegetation communities and flora species present within Infrastructure Designation Area. Desktop investigations (Appendix B, Appendix F, Appendix G) (Figure 2) identified a number of Regional Ecosystems (RE) within the Infrastructure Designation Area:

- 12.3.5 – *Melaleuca quinquenervia* open forest on coastal alluvium (Least Concern);
- 12.3.6 – *Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains (Least Concern);
- 12.11.25 – Corymbia henryi and/or Eucalyptus fibrosasubsp. fibrosa +/- E. crebra*, E. carnea, E. tindaliae* woodland on metamorphics +/- interbedded volcanics (Of Concern)
- 12.11.27 – *Eucalyptus racemosa* subsp. *racemose* and/or *E. seeana* and *Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics (Endangered); and
- 12.9-10.4 - *Eucalyptus racemosa* subsp. racemose woodland on sedimentary rocks.

Although no specific Quaternary Regional Ecosystem Assessment sites were established during site surveys, the underlying geology, site observations of soils, and the vegetation associations recorded indicate that the vegetation on site is similar to the mapped REs (Lambert & Rehbein, 2016). Notable differences include differences between the mapped and observed boundaries of the endangered RE 12.11.27 in the south-western area of the investigation area, and an area more closely resembling the least concern RE 12.11.5 behind the eastern half of the shot curtain (Figure 3). An area dominated by *Allocasurina littoralis* exists to the east of the clay target facility (Figure 3).

Desktop information indicates the project area is within the *Protected Plants Flora Survey Trigger Map* area (Appendix B) and a number of conservation significant flora species have been recorded within 5 km of the project area (Appendix F) or have the potential to occur in the area (Appendix G) (Table 1).

Table 1 EVNT flora species potentially occurring within the site

Scientific Name	Common Name	Habit	NCA Status	EPBC Status	Preferred Habitat
Arthraxon hispidus	Hairy-joint Grass	Grass	-	Vulnerable	Freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, and on sandy alluvium in creek beds in open forests, and also with bog mosses in mound springs.
Baloghia marmorata	Marbled Balogia, Jointed Baloghi	Shrub / small tree	-	Vulnerable	Subtropical rainforest/notophyll vine forest and wet sclerophyll forest (brush box woodland) with rainforest understorey between 150 and 550 m above sea level.
Bosistoa transversa	Three-leaved Bosistoa, Yellow Satinheart	Small to medium sized tree	-	Vulnerable	Lowland subtropical rainforest up to 300 m above sea level.
Corchorus cunninghamii	Native Jute	Shrub	-	Endangered	Ecotone of wet sclerophyll forest and dry to dry-subtropical rainforest.
Cryptocarya foetida	Stinking Cryptocarya, Stinking Laurel	Medium sized tree	-	Vulnerable	Coastal sands.
Cupaniopsis shirleyana	Wedge-leaf Tuckeroo	Tree	Vulnerable	Vulnerable	Depauperate rainforest.
Endiandra floydii	Floyd's Walnut	Small tree	-	Endangered	Warm-temperate and subtropical rainforest.
Eucalyptus curtisii	Plunkett Mallee	Tree	Near Threatened	-	Sandy or stony soils, often in sandstone areas. Often cultivated.
Macademia integrifolia	Macademia Nut	Tree	Vulnerable	Vulnerable	Rainforest. Often cultivated.
Macadamia tetraphylla	Macademia Nut	Tree	-	Vulnerable	Rainforest. Often cultivated.
Phaius australis		Large terrestrial orchid up to 2m tall	Endangered	Endangered	Swamps.
Samadera bidwillii	Quassia	Shrub / tree	-	Vulnerable	Lowland rainforest or on rainforest margins.
Symplocos harroldii	Hairy Hazelwood	Tree/shrub	Near Threatened	-	Depauperate rainforest.

Scientific Name	Common Name	Habit	NCA Status	EPBC Status	Preferred Habitat
Thesium australe	Austral Toadflax, Toadflax	Herb	-	Vulnerable	Subtropical, temperate and subalpine climates. Semi-parasitic on roots of a range of grass species.
Zieria furfuraceae subsp. gymnocarpa	-	Shrub	Endangered	-	Rainforest fringes or wetter forest areas in coastal areas.

As the Infrastructure Designation Area is within the Protected Plants Flora Survey Trigger Map area, protected plant surveys have been undertaken at various stages of the project (Lambert & Rehbein, 2016; Lambert & Rehbein, 2017a; Lambert & Rehbein, 2017b). Although protected plants survey specifically target EVNT species listed under the NC Act, given the nature of this project and other surveys being undertaken, EVNT species listed under the EPBC Act were also searched for.

No EVNT species have been recorded during these surveys (Lambert & Rehbein, 2016; Lambert & Rehbein, 2017a; Lambert & Rehbein, 2017b).

3.2 FAUNA

Desktop searches (Appendix F; Appendix G) identified a number of conservation significant fauna potentially occurring within the Infrastructure Designation Area (Table 2).

Table 2 EVNT fauna species potentially occurring within the site

Species	Common Name	NCA Status	EPBC Status	EPBC Comments
Amphibians				
Adelotus brevis	Tusked frog	Vulnerable	-	
BIRDS				
Anthochaera phrygia	Regent Honeyeater	Endangered	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus	Australasian Bittern	-	Endangered	Species or species habitat known to occur within area
Calidris canutus	Red knot	Endangered	Endangered	Species or species habitat known to occur within area
Calidris ferruginea	Curlew sandpiper	Endangered	Critically endangered	Species or species habitat known to occur within area
Calidris tenuirostris	Great knot	Endangered	-	

Species	Common Name	NCA Status	EPBC Status	EPBC Comments
Calyptorhynchus lathami lathami	Clossy black-cockatoo (eastern)	Vulnerable	-	
Charadrius leschenaultii	Greater sand plover	Vulnerable	-	
Charadrius mongolus	Lesser sand plover	Endangered	-	
Dasyornis brachypterus	Eastern Bristlebird	-	Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus	Red Goshawk	-	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	-	Vulnerable	Species or species habitat may occur within area
Lathamus discolor	Swift Parrot	-	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica baueri	Western Alaskan bar-tailed godwit	Vulnerable	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit, Bar-tailed	-	Critically Endangered	Species or species habitat known to occur within area
Ninox strenua	Powerful owl	Vulnerable	-	
Numenius madagascariensis	Eastern Curlew	Endangered	-	
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	-	Endangered	Species or species habitat may occur within area
Rostratula australis	Australian Painted Snipe	-	Endangered	Species or species habitat may occur within area
Turnix melanogaster	Black-breasted Button- quail	-	Vulnerable	Species or species habitat may occur within area

MAMMALS				
Chalinolobus dwyeri	Large-eared Pied Bat	-	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus	Northern Quoll	-	Endangered	Species or species habitat may occur within area
Dasyurus maculatus maculatus	Spotted-tail Quoll	-	Endangered	Species or species habitat may occur within area
Petauroides volans volans	Southern greater glider	Vulnerable	Endangered	Species or species habitat may occur within area
Phascolarctos cinereus	Koala (SEQ bioregion)	Vulnerable	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus	Grey-Headed Flying- Fox	-	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides	Water Mouse, False Water Rat, Yirrkoo	-	Vulnerable	Species or species habitat likely to occur within area
REPTILES				
Delma torquata	Collared Delma	-	Vulnerable	Species or species habitat may occur within area
Saiphos reticulatus	Three-toed Snake-tooth Skink	-	Vulnerable	Species or species habitat may occur within area
Insects				
Argynnis hyperbius inconstans	Australian Fritillary	-	Critically Endangered	Species or species habitat may occur within area

Although fauna and fauna habitat have been observed during all surveys, only one site specific fauna survey has been undertaken (Lambert & Rehbein, 2016). The investigation (Lambert & Rehbein, 2016) included a small area approximately 210 m x 150 m, located at the northern end of the 300 m rifle range. This was prior to the area being modified and cleared for the clay target facility (Figure 4). General site observations at the time of the survey included:

- The site drained east to west by minor overland flow waterways, channels and depressions, although some of the drainage is interrupted by earthworks for the previously existing 300 m rifle range;
- The main receiving waterway runs south-west to north-east running parallel to the western side of the clay target facility. This waterway retains substantial environmental values including a series of ephemeral waterholes downstream from the site, and mature and connected riparian vegetation. This waterway is connected to the Infrastructure Designation Area by an overland flow path that runs through the western side of the Infrastructure Designation area (Appendix H);
- The centre and southern extent of the site was already cleared. The cleared area had been filled and levelled. Surface water flow was diverted around the northern side of the range, and was piped under the range from east to west. The drain was observed to be partially blocked leading to water damming to the east side of the existing 300 m range. This blockage has since been removed as part of the works associated with the construction of the clay target facility;
- The northern, western and eastern sides of the survey area were vegetated and were dissected by an entrance road and linear archery target ranges, creating slight habitat fragmentation and potential barriers to some faunal movement;
- Ecological connectivity with the larger and more intact areas of vegetation to the south and south-east of the site, and ecological connectivity with a larger waterway corridor to the west and south-west of the site, is intact;
- The canopy is closed across the vegetated areas of the proposed development site. Although there were no significant habitat trees observed within the survey area, there were a number of mature trees with potential for hollows observed in the south-west corner of the survey area. Trees observed along the eastern boundary, also have the potential for hollows; and
- Noise from the adjacent shooting ranges was intermittent but a characteristic of this site at all times during the ecological assessment work.

In addition to the 2016 (Lambert & Rehbein) fauna survey, an ecology survey undertaken in June 2018 (Lambert & Rehbein) opportunistically identified fauna and fauna habitat while investigating vegetation and non-juvenile koala habitat trees. Many of the mature trees, in particular *Eucalytpus racemose*, contained extensive hollow development often occupied by Rainbow Lorikeets (*Trichoglossus maluccanus*).

Fauna species observed within the project area are listed in Table 3. A night survey was undertaken during the 2016 survey (Lambert & Rehbein), faunal activity was very low during the ecological assessment, with only two species – Cane Toad (*Rhinella marina*) and Common Brushtail Possum (*Trichosurus vulpecula*) observed during the spotlight surveys.

Table 3 Fauna observed within the survey area

Species	Common Name
Amphibians	
**Rhinella marina*	Cane Toad
Birds	
Platycercus eximius	Pale-headed Rosella
Grallina cyanoleuca	Magpie Lark
Manorina melanocephala	Noisy Miner
Pardalotus striatus	Striated Pardalote
Cracticus nigrogularis	Pied Butcher-bird
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet
Trichoglossus haematodus	Rainbow Lorikeet
Dacelo novaeguineae	Laughing Kookaburra
Gymnorhina tibicen	Australian Magpie
Melithreptus albogularis	White-throated Honey-eater
Threskiornis spinicollis	Straw-necked Ibis
Egretta novaehollandiae	White-faced Heron
Reptiles	
Physignathus lesueurii	Water Dragon
Mammals	
Macropus giganteus	Eastern Grey Kangaroo
Trichosurus vulpecula	Common Brushtail Possum
**Vulpes vulpes*	European Red Fox

There were no direct observations of any EVNT fauna species during the fauna surveys. Observations of ant nest diggings consistent with echidna (*Tachyglossus aculeatus*) (Special Least Concern (NC Act)) use, provided limited and unconfirmed evidence that echidnas may be active in the Infrastructure Designation Area, despite no direct observations of this species.

No koalas were observed on the site or in close proximity to the site. A juvenile Koala (Vulnerable EPBC Act and NC Act) skeleton was observed approximately 70 m to the east of the clay target facility (Lambert & Rehbein, 2016). A large number of non-juvenile koala habitat trees (NJKHT) have been identified within the project area across multiple surveys undertaken in 2016 and 2018 (Figure 5). Four trees were identified with obvious evidence of koala scats, tracks or scratchings (Figure 5).

There were a total of 903 NJKHTs identified across all surveys. Approximately 5.4 ha of the Infrastructure Designation Area was surveyed for NJKHTs (167 NJKHTs / ha). It was not practical to individually survey all trees in the area cleared operational area. To determine if the density of NJKHTs is consistent across the entire Infrastructure Designation Area, three additional transects were surveyed to the south and south-west of the curtain (Figure 5). The three transects totalled approximately 0.54ha and 205 trees NJKHTs were identified (approximately 380 NJKHTs / ha). This suggests the density of NJKHTs increases to the south of the clay target facility compared to the areas directly adjacent to the north, east and west.

3.3 WATERWAYS AND WETLANDS

An existing secondary overland flow dry watercourse runs from the south around to the west of the Infrastructure Designation Area to join downstream with a larger watercourse running from the south across the 300 m range towards the north-west (Appendix H) (Figure 6).

There are no referrable wetlands mapped within or adjacent to the project area.

4.0 ENVIRONMENTAL IMPACTS

4.1 ENVIRONMENTAL RISK ASSESSMENT

A risk-based approach was implemented to determine the potential environmental impacts associated with the project. This approach was adopted as it allowed for ease of refinement within the project team and provided a framework to allow for adaptive management as the project has evolved.

The framework, whereby measurable management objectives are identified for all relevant environmental factors, and the risk of not being able to meet these objectives, due to the undertaking of specific activities, is determined. The adaptive management process also offers a framework for continual improvement and an ongoing ability to maintain environmental values in the project area.

4.2 RISK EVALUATION PROCESS

An environmental risk evaluation was undertaken to assess the potential or realised effects of the project activities on the environmental values in the project area, referred to as 'Key Environmental Values' (KEV). KEVs can be broadly classified into four groups – land, air, water and social (Table 4). There are a number of environmental factors associated with each KEV.

The outcomes of the evaluation are used to identify the need for specific environmental management measures. Management measures may include a range of design and environmental management programs, procedures or initiatives. The evaluation process also allows a repeatable mechanism for evaluating the effectiveness of management measures that are currently adopted, identification of areas for improvement, or draws attention to areas that have insufficient management in place.

Table 4 Project area key environmental values and identifiable environmental factors

Key Environmental Value	Environmental Factors
Land	Soils, flora and vegetation, weeds and pests, fauna, flooding, sedimentation and erosion, waste generation
Air	Noise, dust, emissions, odour, lighting
Water	Surface water, groundwater, aquatic ecology/wetlands, sedimentation and erosion
Social	Tourism, amenity, traffic, Indigenous heritage, European heritage

Each stage within the Environmental Management Framework process is defined below:

1. Identify KEVs and the various environmental factors that sit within each. This is achieved by an assessment on State and Commonwealth environment registers and databases, as well as on the ground studies, reports and observations, including the work undertaken as part of the environmental impact assessment process.
2. Determine an effective Management Objective and Management Target for each of the environmental factors of the KEVs.
3. Compile a list of project-specific activities undertaken as part of project delivery.
4. An unmitigated risk evaluation is then conducted to evaluate the environmental effects that may arise from each activity to determine the potential that exists for the activity to impact on the proponent's ability to meet the defined management objectives:
    a. The initial evaluation does not take into account any design and environmental procedures, programs, initiatives or other controls that may be common practise in this type of project that contribute to avoiding, minimising or mitigating environment impacts. This is known as an unmitigated Environmental Risk Evaluation and is what might occur in the absence of any controls.
5. Identify design and environmental management measures (control measures) that will be used / are currently in place to avoid, minimise or mitigate each risk.
    a. Once the unmitigated impacts are understood, determine controls that can be implemented to reduce the risk of the impacts occurring. Controls can be developed that may either reduce the likelihood of an impact occurring, or reduce the severity of the impact when it occurs. It should be noted that it is rare for a single control to address both likelihood and severity. Multiple controls are usually required to reduce both.
6. A residual risk evaluation is conducted:
    a. This second evaluation accounts for the change in risk profile as a result of all the existing risk mitigation measures, to arrive at a residual risk. That is, the risk assessment is undertaken for a second time taking into account the control measures that are proposed to be implemented.
7. Identify improvement opportunities and re-evaluate these risks through the adaptive management process.
    a. This final step is used as part of the continual improvement cycle. The risk assessment is a live document that should be re-visited as knowledge improves. Reductions in risk profiles should be investigated when the risk of an incident occurring is still considered unacceptable. Opportunities also exist for improvements if risks are considered acceptable but are not as low as reasonably practical.

This risk assessment was undertaken using available desktop information and ecological surveys undertaken at the site.

Once risks are identified, the likelihood of any associated environmental impacts on KEVs being realised, as a result of project activities, is assessed for each the KEVs against the environmental risk evaluation consequence categories. The initial evaluation is undertaken without consideration of any controlling provisions that may be considered standard operating procedures and assesses the likelihood of not meeting the management objective for each KEV.

4.3 MANAGEMENT OBJECTIVES

To effectively evaluate and manage the potential or realised impacts on KEVs, management objectives (Table 5) have been developed for each of the KEV's environmental factors. These management objectives have been developed to the scale of the project and can be revisited throughout the life of the clay target facility.

Table 5 Project environmental management objectives.

Key Environmental Value	Environmental Factor	Management Objective	Target
Land	Soil	Minimise contamination and land disturbance.	Maintain soil contamination below trigger values.
Land	Flora and fauna	Avoid any conservation significant flora and no clearing outside required footprint.	Retain significant flora and fauna communities, where possible. Implement management activities to minimise impact on connectivity, structure and function of ecosystems the site is associated with. Only the discrete areas marked for infrastructure and other project areas will be cleared.
Land	Weeds and pests	Control any weeds and pests to minimise risk of establishment and spreading beyond site boundaries.	Ensure no outbreak of weeds and pests escape the site boundaries. Eradicate any weeds and pests following collection of bulk sample and leaving the site in maintenance mode.
Land	Flooding	Minimise flooding impacts.	Design site infrastructure to appropriate engineering standards to minimise potential flooding impacts.
Land	Sedimentation and erosion	Minimise the transport of soil off-site during both construction and ongoing operation.	Ensure that all development is undertaken in accordance with sediment and erosion control plans.

Key Environmental Value	Environmental Factor	Management Objective	Target
Land	Waste generation	Minimise waste generation and maximise recycling and reuse of materials and ensure correct handling of waste.	No uncontained materials. Presence and use of recycling receptacles (where appropriate). Provision of adequate quarantine waste facilities. Minimise waste through procurement of low waste goods and services.
Air	Noise	Minimise noise impacts.	Design equipment and operations to minimise noise emissions. Do not exceed agreed noise criteria at the relevant environmental receptor monitoring sites. Where exceedances occur, undertake the necessary measures to reduce noise emissions to below noise reference criteria at relevant environmental receptor monitoring sites. Minimise noise nuisance.
Air	Dust	Minimise dust impacts.	Design equipment and operations to minimise dust emissions. Do not exceed agreed human health reference criteria at relevant environmental receptor monitoring sites. Where exceedances occur, undertake the necessary measures to reduce dust emissions to below agreed human health reference criteria at relevant environmental receptor monitoring sites. Minimise dust nuisance.
Air	Emissions	Minimise air emissions.	Design equipment and operations to minimise air emissions.
Air	Lighting	Minimise lighting impacts.	Minimise nuisance from lighting by directing light away from sensitive receptors where appropriate to do so.
Water	Surface water	Minimise impacts to surface water quality.	Minimise the potential impact of the clay target facility on local surface water resources. Design stormwater, and erosion and sediment control in accordance with relevant guidelines. Comply with the conditions of any relevant Environmental Authority concerning stormwater management and stormwater discharges.
Water	Groundwater	Minimise impacts to groundwater quality.	Minimise the potential impact of the clay target facility on local groundwater resources.

Key Environmental Value	Environmental Factor	Management Objective	Target
Water	Aquatic ecology / wetlands	No net loss of wetland values. No change to the condition assessment of streams and waterways outside the boundaries of the site.	No change to aquatic ecology / wetland values in adjacent overland flow path areas.
Water	Sedimentation and erosion	Minimise the transport of soil and sediment off-site during both construction and ongoing operation.	Ensure sedimentation of overland flow path does not occur as a result of changes due to the clay target facility.
Social	Tourism	Minimise negative socio-economic impacts on the tourism sector and help enhance any positive impacts.	Minimise impact to adjacent facilities and users.
Social	Amenity	Minimise the impact of site development on the overall visual amenity of the area.	No visual amenity issues identified.
Social	Traffic	Minimise the impact of construction and operation traffic on the local road network. Minimise the impact of construction and operation traffic on local amenity.	Undertake all construction and operational activities in accordance with traffic management plans.
Social	Waste generation	Minimise waste generation and maximise recycling and reuse of materials, and ensure correct handling of waste.	No uncontained waste materials. Presence and use of recycling receptacles (where appropriate). Minimise waste through procurement of low waste goods and services.
Social	Indigenous heritage	Avoid unnecessary disturbance to identified cultural heritage sites.	Undertake all construction activities in accordance with cultural heritage management plans.
Social	European heritage	Avoid unnecessary disturbance to identified European heritage sites.	Undertake all activities in accordance with cultural heritage management plans.

5.0 ENVIRONMENTAL IMPACTS

5.1 PROJECT ACTIVITIES

The key construction or operational activities identified include:

- Construction activities:
  - Clearing, cutting and filling to the east and west for a fourth skeet position and four DTL positions, including clearing, cutting and filling within the cleared operational area.

    It is proposed to construct a fourth skeet position at the western end of the clay target facility. In additional it is also proposed to construct a DTL position to the west of the proposed fourth skeet position and three DTLs to the east of the existing first skeet position. To facilitate this, the eastern and western shot curtain will require removal and repositioning. Clearing, cutting and filling will also be required (Appendix E).

    Further, two archery lanes will be relocated within the adjacent field archery range to ensure no archery lanes are within the shotgun safety template. Minimal clearing is required to locate the replacement lanes. The longest lane will use an old redundant lane position.

    It is proposed to clear approximately an additional 5.4 ha of vegetation to accommodate the proposed new infrastructure and cleared operational area. The 5.4 ha of area proposed to be cleared includes the following approximate vegetation areas (Figure 3):

    RE12.11.25 (of concern) – 2.40 ha

    RE12.11.5 (least concern) – 1.20 ha

    RE12.11.27 (endangered) – 0.32 ha

    RE12.3.5 (least concern) – 0.15 ha

    Allocasuarina dominated – 0.10 ha

    Non-remnant (but generally well vegetated) – 0.23 ha

    Partially cleared / sporadic vegetation – 1.0 ha

    Tree counts within the overshoot area indicates there are approximately 903 trees likely to be removed.
  - Construction of a noise attenuation wall.

    The nearest residence is less than 200 m to the north-east of the clay target facility. Recent modelling (ASK, 2018) indicated noise levels were above noise

restriction levels. A noise attenuation wall is proposed to be built along the northern edge of the current carpark area (Appendix E).

- Construction of a clubhouse.

  It is proposed a future clubhouse be built on the existing carpark area. This activity is not expected to require any clearing or significant earthworks. Services will be provided to the clubhouse.

- Operational activities
  - Shooting.

    The main operational use of the clay target facility is for shooting. Lead shot is the preferred cartridge by shooters. Others type of shot used include steel shot however this is not a preferred option for shooters. Additionally current competitions require lead shot to be used. Use of lead shot is known to contaminate soils, surface water and also potentially groundwater. While the majority of lead shot stays where it falls, over time lead shot corrodes, including dissolving into solution binding with soil particles or being transported offsite by surface water flows. Although dependent on use, without controls in place modelling indicates soil will exceed trigger values for lead within a few years (Ground Corp, 2018). Lead is the key contaminant associated with the use of the clay target facility (Ground Corp, 2018). Other potential contaminants of concern include polynuclear aromatic hydrocarbons, antimony, arsenic and components of gunshot residue (Ground Corp, 2018).

5.2 RISK ASSESSMENT OUTCOMES

The unmitigated risk evaluation for the KEVs for this project is shown in Table 6. Environmental management and mitigation strategies were developed to reduce the risk to as low as reasonably practical (ALARP).

The residual risk to each KEV for this project is shown in Table 7. The Environmental Risk Assessment is attached at Appendix I.

Table 6 Unmitigated risk evaluation outcomes for the project.

			Activity / Work Package			
	KEV	Environmental Factor	Construction of the shot curtain, retaining wall and noise barrier wall	Construction and establishment of the future clubhouse.	Shooting (use of lead shot)	Site rehabilitation
Environmental Factors	Land	Soils (eg contamination)				
		Flora and vegetation				
		Fauna				
		Weeds and Pests				
		Flooding				
		Sedimentation and Erosion				
		Waste Generation				
	Air Quality	Noise				
		Dust				
		Emissions				
		Odour				
		Lighting				
	Water	Surface water quality				
		Groundwater quality				
		Aquatic ecology / wetlands				
	Social	Tourism				
		Amenity				
		Traffic				
		Indigenous heritage				
		European heritage				

Legend:

	Very low impact
	Low impact
	Moderate impact
	Significant impact
	High impact
	Extreme impact

Table 7 Residual risk evaluation outcomes for the Project.

			Activity / Work Package			
	KEV	Environmental Factor	Construction of the shot curtain, retaining wall and noise barrier wall	Construction and establishment of the future clubhouse.	Shooting (use of lead shot)	Site rehabilitation
Environmental Factors	Land	Soils (eg contamination)				
		Flora and vegetation				
		Fauna				
		Weeds and Pests				
		Flooding				
		Sedimentation and Erosion				
		Waste Generation				
	Air Quality	Noise				
		Dust				
		Emissions				
		Odour				
		Lighting				
	Water	Surface water quality				
		Groundwater quality				
		Aquatic ecology / wetlands				
	Social	Tourism				
		Amenity				
		Traffic				
		Indigenous heritage				
		European heritage				

Legend:

	Very low impact
	Low impact
	Moderate impact
	Significant impact
	High impact
	Extreme impact

The potential environmental impacts associated with this project can be considered direct and / or indirect. The potential impacts have been summarised in Table 9.

Table 8 Identified key potential direct and indirect impacts

Description	Potential Impact
Direct	Loss of vegetation within the designation area
	Loss of fauna / fauna habitat
	Contamination of soils by lead shot
Indirect	Noise pollution to surrounding sensitive receptors (adjacent residences)
	Contamination of offsite soils and surface water through the movement of lead transported offsite
	Change to surface hydrology concentrating surface water flows and mobilising sediment (that may or may not be contaminated with lead) that is deposited in the creek.

The direct impacts associated with the construction and use of the facility are associated with both the construction of the expanded clay target facility, and also the ongoing use of lead shot and the actions proposed to assist in the management and containment of lead within the Infrastructure Designation Area.

Lead shot and clay targets have the potential to result in contamination of soils and surface water. While the contaminants of concern (lead) is not generally in a soluble or mobile form, over time degradation of the lead pellets and clay targets has the potential to increase levels above background resulting in a contaminated site and potential for elevated levels to migrate offsite. It is estimated that, depending on level of use, lead levels in the soils will exceed the nominated site specific trigger values within a few years of operation (Ground Corp, 2018).

The majority of the vegetation proposed to be removed is considered either “Of Concern” or “Endangered” REs that support NJKHTs. While no koalas were observed during the surveys, evidence of their presence was observed. Given no koalas were observed during the multiple surveys it is considered the population in the area using the area proposed to be cleared is relatively low. The area proposed to be cleared is approximately 1.4% of the vegetation within Lot 1 (5.4 ha proposed to be cleared of approximately 360 ha of vegetation). Vegetation clearing has been minimised where possible through the inclusion of uncleared operational areas and modelling to understand the areas impacted as a result of lead deposition. Additionally, although

it is assumed the surrounding vegetation will provide sufficient habitat to support koalas in the area, it is proposed to offset the area proposed to be cleared by rehabilitating the Brisbane Gun Club clay target facility in the north-west area of the site.

Indirect impacts associated with the permanent use of the facility include noise impacts to adjacent sensitive land uses, mobilisation of sediment and soils as a result of changes to surface water flows and management that result in the deposit of sediments into the adjacent downstream watercourse, and the potential for contamination of soils and surface water associated with the use of lead shot and clay targets.

The ongoing and permanent use of the clay target facility has the potential to impact the amenity of the residents immediately adjacent to the north boundary (ASK Consulting, 2017).

Mobilisation of sediments during construction or from permanently altered hydrology has the potential to cause sedimentation of the adjacent overland flow path. Although there have been no conservation significant flora species identified within or adjacent to the area, the overland flow path is identified as local waterway corridor. Sedimentation of the waterway has the potential to change the ecology and alter vegetation.

6.0 MANAGEMENT AND MITIGATION

Direct and indirect impacts can be minimised through the implementation of management and mitigation strategies, some of these have already been included into the design of the existing infrastructure for the temporary works.

Due to the proposed clearing for the overshoot area, it is expected offsets will be required for the approximate 903 trees likely to be removed, and at a ratio of 3:1 require an offset of approximately 2,709 trees to be planted. At approximately 10 m^2 per tree this will require an area of approximately 2.7 ha. A number of locations have been identified around the Belmont Shooting Complex where this can be accommodated (Figure 7). All areas increase connectivity, are connected to existing areas of vegetation or are part of the long term planning for the site. Additionally, offset trees were planted for an earlier project. An extra 1,142 trees were planted in preparation for this potential project, requiring a further 1,567 trees to be planted to offset the trees removed for this project. This equates to an area of approximately 1.6 ha required to plant 1,567 trees.

Other management and mitigation opportunities are described in Table 9.

Table 9 Management and mitigation opportunities for extension activities proposed for the range to become permanent use.

Potential Impact	Activity	Potential Opportunity	Management and Mitigation Opportunity
Reduction of vegetation	Shot curtain extension	Minimise area to be cleared	Develop construction methodology to minimise clearing footprint. Potential offset areas identified within Belmont Shooting Complex (Figure 7).
	Fourth skeet position and four DTL positions		Design to minimise clearing required and area impacted by lead shot (e.g. utilise retaining wall rather than battered slope on edge of fill areas, direction of positions to minimise shot spread). Potential offset areas identified within Belmont Shooting Complex (Figure 7).
	Noise attenuation wall		Build on or adjacent to already cleared areas. Utilise future buildings as part of noise attenuation to minimise the size of the noise attenuation wall required. This will include prototype testing to confirm the wall height required.
	Relocation of two archery lanes		If possible, take advantage of previously cleared lanes or look for opportunities to modify existing lanes.

Potential Impact	Activity	Potential Opportunity	Management and Mitigation Opportunity
	Rehabilitation of overshoot area at end of lease		Detailed site contamination assessment to map clearly where areas of contamination exist to ensure only areas required to be cleared for remediation are cleared. Preference to have offset areas planted immediately following approval. Offset areas will be mature by the end of lease providing an immediate benefit. The offset area to be planted will be determined by modelling of the likely contamination areas within the deposition area. Potential offset areas identified within Belmont Shooting Complex (Figure 7).
Increased noise	Shooting	Reduce noise at the sensitive receptors	Design and construct a noise attenuation wall.
Sedimentation of the creek	Construction	Stop sediments from entering the creek	Develop and implement a sediment and erosion control plan during construction activities.
	Operation	Stop sediments from entering the creek	Design stormwater discharge points to diffuse surface water flow. Prepare and implement stormwater management plan that details surface water management. Develop and implement an erosion and sediment control plan for any ongoing lead remediation activities that involve disturbance of the soil.
Contamination of soils and surface water	Use of range by lead shot and clay targets	Reduce potential for lead shot and clay targets to results in contamination of the facility	Develop methods and implement practices to regularly collect lead shot. Use gross pollution traps to restrict debris from leaving the site. Operational area design to ensure all surface water is captured and discharged through controlled points for water quality management. entering overland flow areas from the isolated shot area within shot curtain zone. Prepare and implement stormwater management plan that details ongoing surface water management, including during remediation activities.
			Develop and implement strategies to reduce the use of lead shot and plan to move from lead shot use to other less contaminating shot materials. This is a long term consideration that is subject to changes to International Shooting Federation rule changes allowing the use of lead alternatives in relevant competitions.

Potential Impact	Activity	Potential Opportunity	Management and Mitigation Opportunity
			Unless specific clay targets are required for competition purposes there is the potential to utilise clay targets that do not contain contaminating materials.

7.0 REFERENCES

ASK Consulting (2018) *Clay Target Facility Noise Impact Assessment*. Brisbane, QLD.

DEHP (2017a) Koala legislation and policy. https://www.ehp.qld.gov.au/wildlife/koalas/legislation/. Queensland Government. (Accessed 14/12/2017).

DEHP (2017b) Map of referrable wetlands. https://www.ehp.qld.gov.au/ecosystems/wetlands/referable-wetlands-maps.html. Queensland Government. (Accessed 14/12/2017).

Ground Corp (2018)*Clay Target Facility, Belmont Shooting Complex – Ministerial Infrastructure Designation, Contamination (June 2016)*. Brisbane, QLD.

Lambert & Rehbein (2016) Terrestrial Ecology Survey Report – Belmont Clay *Target Shooting Range*. Brisbane, QLD.

Lambert & Rehbein (2017a) Protected Plants Survey Infrastructure Designation Process. Brisbane, Qld.

Lambert & Rehbein (2017b) *Protected Plant Survey Report – Power Supply to Clay Target Shooting Range, Belmont Rifle Range*. Brisbane, QLD.

Lambert & Rehbein (2018) *Flora, Vegetation and Koala Tree Survey – Clay Target Range Overshoot and Safety Buffer Areas, Belmont Rifle Range*. Brisbane Queensland

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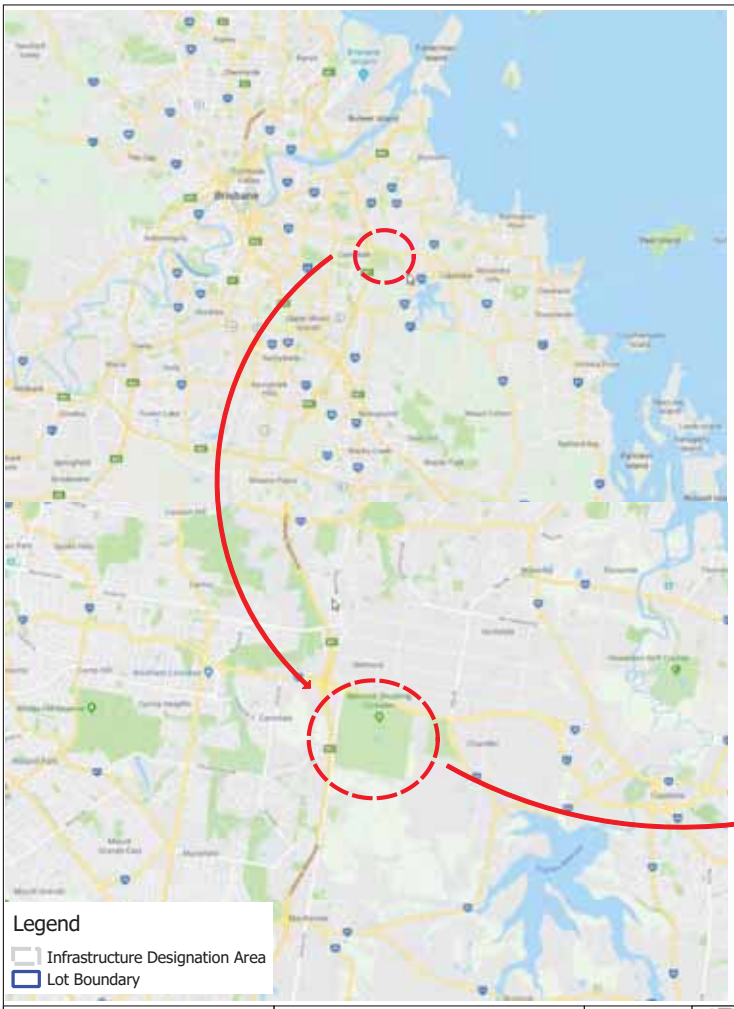
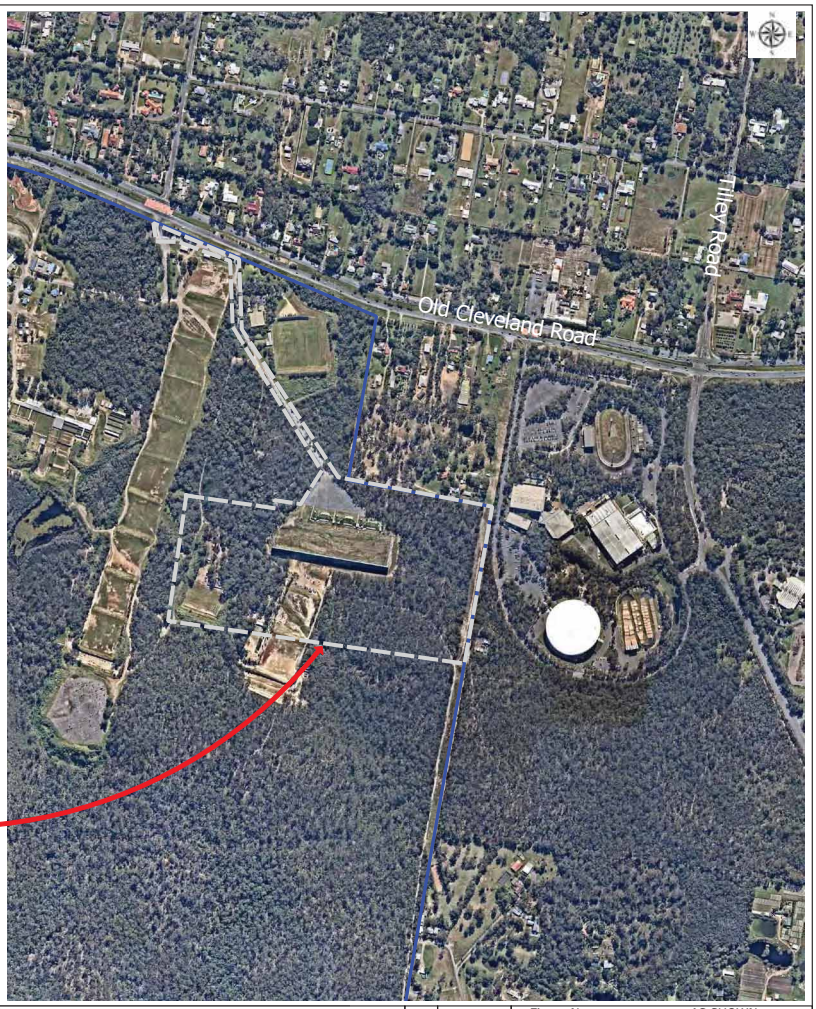
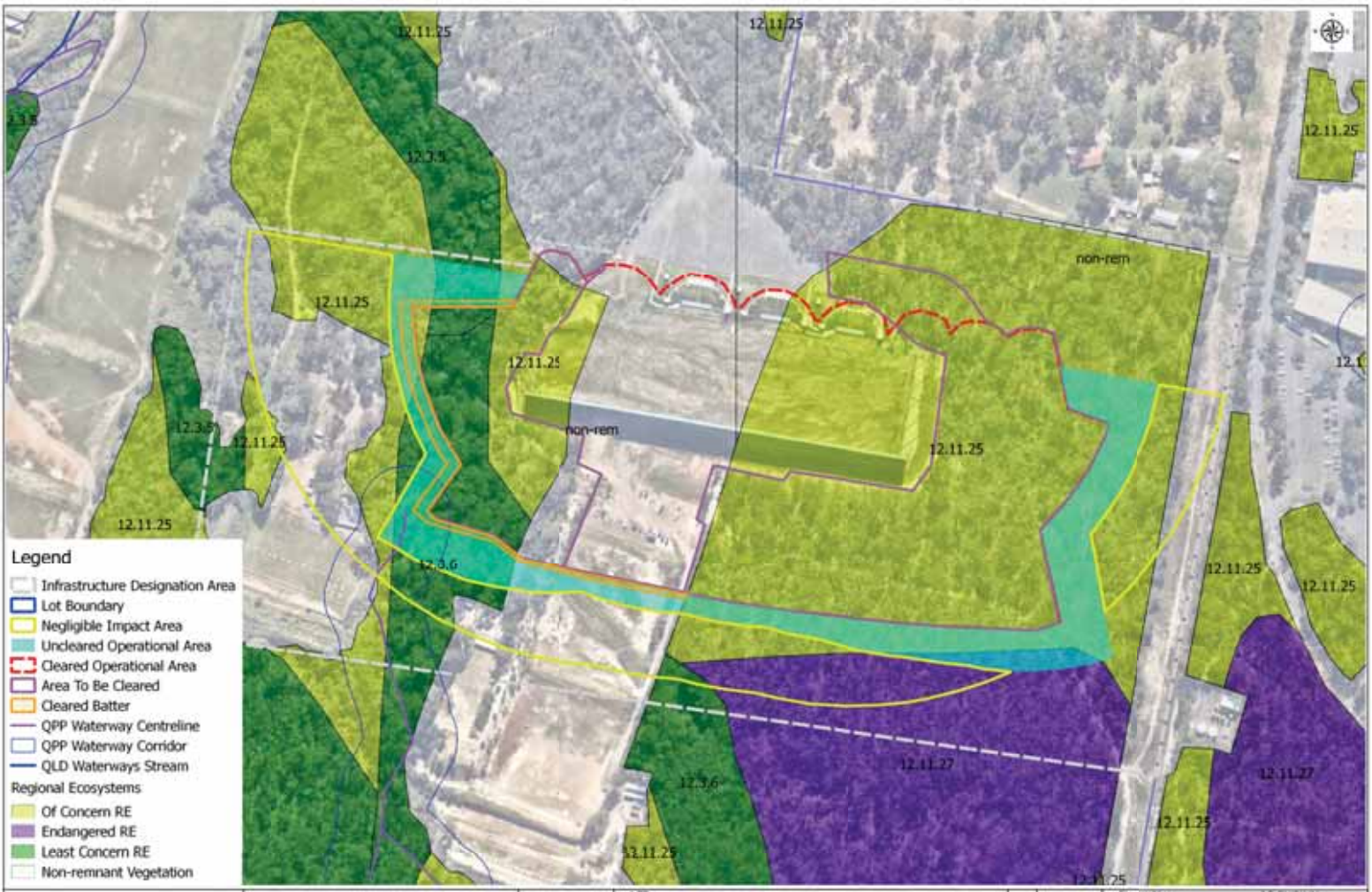
FIGURES





Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design Title Site Location	Drawn J.T Checked S.M Approved J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS CBD HOUSE LEVEL 3, 120 WICKHAM STREET FORTITUDE VALLEY QLD 4006 FA.BOX 52 FORTITUDE VALLEY QLD 4006 TELEPHONE (07) 3250 9000 FACSIMILE (07) 3250 9001 EMAIL mail@lar.net.au A.C.N. 010 451 902 The Association of Consulting Engineers Australia	REV / DATE	Figure No: AS SHOWN Figure 1 Scale: NTS File Ref:	A3 Sheet size



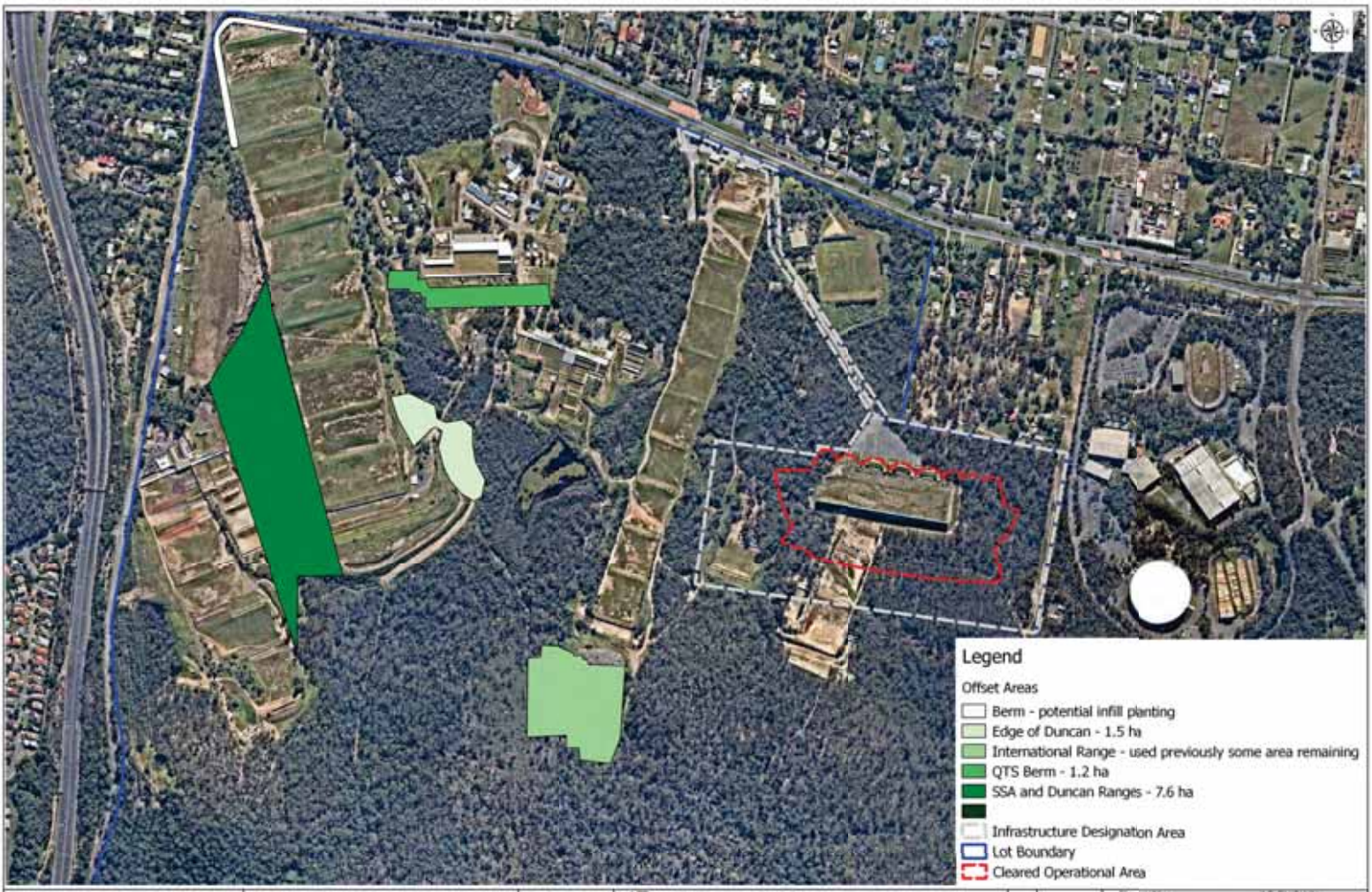
Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design Title Vegetation Mapping (QLD Gov RE Mapping)	Drawn J.T Checked S.M Approved J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS	Figure No: AS SHOWN Figure 2 Scale: NTS File Ref:	A3

Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design Title Vegetation Mapping (L&R investigations)	Drawn J.T Checked S.M Approved J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS	REV / DATE	Figure No: AS SHOWN Figure 3 Scale: NTS File Ref: A3

Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design	Drawn J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS		Figure No: AS SHOWN Figure 4
	Title Fauna Survey Area (L&R, 2016)	Checked S.M Approved J.T		REV DATE	Scale: NTS A3 File Ref:

Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design	Drawn J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS	Figure No:	AS SHOWN
	Title Koala Habitat Trees	Checked S.M		Figure 5	
		Approved J.T		Scale: NTS	A3
			REV DATE	File Ref:	

Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design	Drawn J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS		Figure No: A5 SHOWN Figure 6
	Title Mapped Drainage Lines	Checked S.M			Scale: NTS A3
		Approved J.T		REV DATE	File Ref:



Project **Clay Target Ministerial Infrastructure Designation** **Environmental Assessment Report**	Client: Mode Design	Drawn J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS		Figure No:	A5 SHOWN
	Title Potential Offset Areas	Checked S.M			Figure 7	
		Approved J.T		REV DATE	Scale: NTS File Ref:	A3 Sheet size

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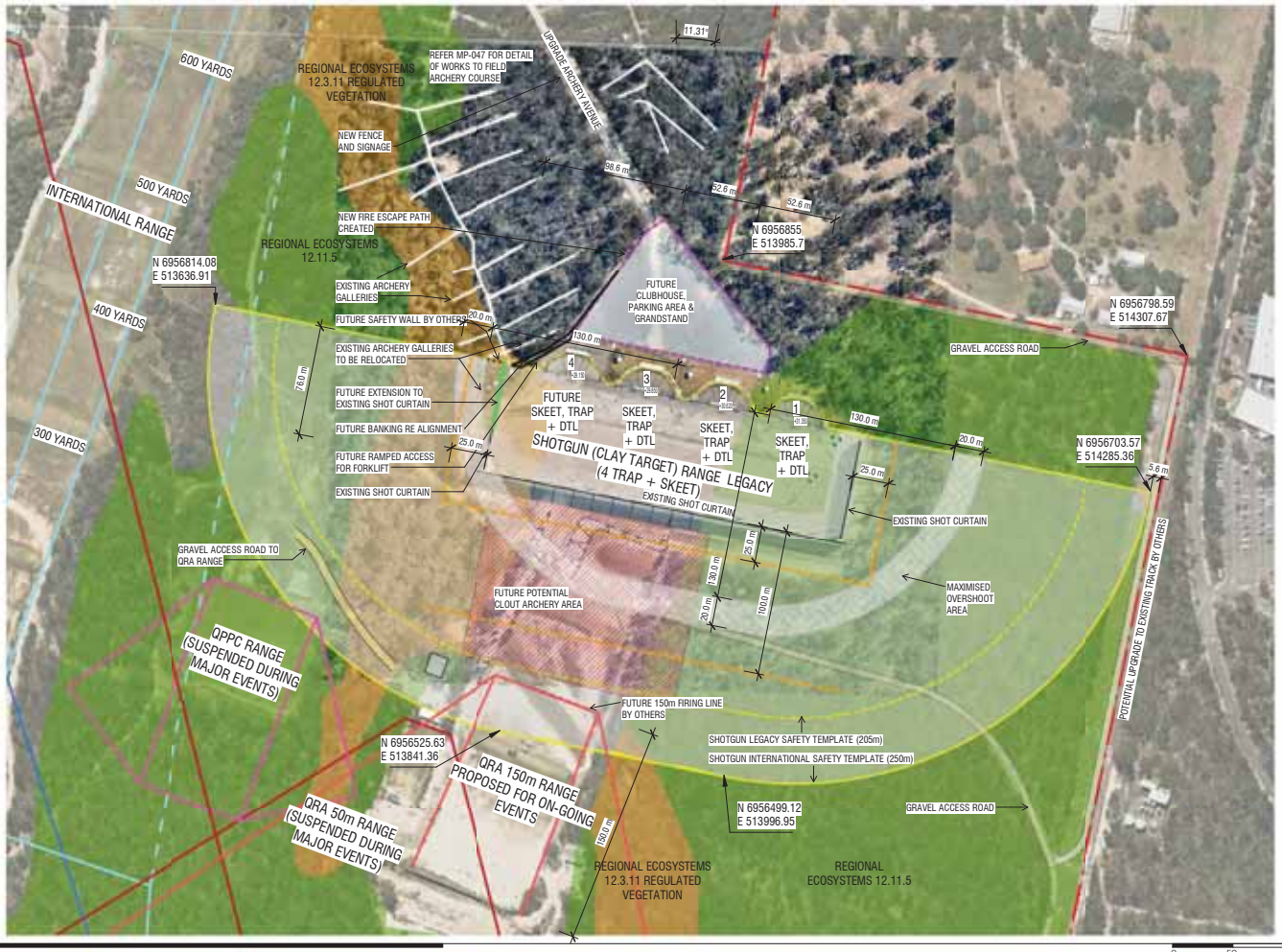
APPENDIX A

EXISTING FACILITY



BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3846 0877
bne@modedesign.com.au

DEPARTMENT OF STATE DEVELOPMENT

BELMONT SHOOTING CENTRE SHOTGUN ID
1485 OLD CLEVELAND ROAD, BELMONT QLD

Infrastructure Designation

Do not scale off this drawing

SHOTGUN (CLAY TARGET) LEGACY

0 50 100 150

Project No: 14479BNE
Date: 08/01/18
Scale: 1 : 2500@ A3
Drawn / Check: AutChecker

MP - 044 **DRAFT** 5

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APPENDIX B

VEGETATION MANAGEMENT PROPERTY REPORT

Department of Natural Resources, Mines and Energy

Vegetation management report

For Lot: 1 Plan: RP169229

Current as at 18/07/2018

Queensland Government

This publication has been compiled by Operations Support, Department of Natural Resources, Mines and Energy.

Recent changes

New vegetation clearing laws

New vegetation management laws were passed by the Queensland Parliament on 3 May 2018 and may affect the clearing you can undertake on your property.

For more information, read about the new vegetation management laws (https://www.dnrme.qld.gov.au/land-water/initiatives/vegetation-management-laws/) or call 135VEG (13 58 34) between 8.30am and 4.30pm Monday to Friday.

Updated mapping

The Regulated Vegetation Management Map and Supporting Map was updated in March 2018 to reflect the most up to date information available in relation to regional ecosystems, essential habitat and wetland mapping (Version 10).

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

- *Vegetation management framework* - an explanation of the application of the framework.
- *Property details* - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s), catchment(s), coastal or non coastal status, and any applicable area management plans associated with your property.
- *Vegetation management details for the specified Lot on Plan* - specific information about your property including vegetation categories, regional ecosystems, watercourses, wetlands, essential habitat, and protected plants.
- *Contact information.*
- *Maps* - a series of colour maps to assist in identifying regulated vegetation on your property.
- *Other legislation contact information.*

This information will assist you to determine your options for managing vegetation, which may include:

- exempt clearing work
- accepted development vegetation clearing code
- an area management plan
- a development approval.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as Queensland's Protected Plants framework or the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 6 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

Table of Contents

1. Vegetation management framework

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

1.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify DNRME or obtain an approval. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 5.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval. For all other land tenures, contact DNRME before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/vegetation/exemptions/.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Contact DNRME prior to clearing in any of these areas.

1.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/vegetation/codes/

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify DNRME before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

1.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

As a result of the new laws, AMPs for fodder harvesting, managing thickened vegetation and managing encroachment will continue for 2 years. New notifications cannot be made for these AMPs.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an area management plan applies to your property for which you can make a new notification, it will be listed in Section 2.2 of this report. Before clearing under one of these AMPs, you must first notify the DNRME and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/vegetation/area-plans/

1.4 Development approvals

If your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/vegetation/applying/

2. Property details

2.1 Tenure

All of the lot, plan and tenure information associated with property Lot: 1 Plan: RP169229, including links to relevant Smart Maps, are listed in Table 1. The tenure of the property (whether it is freehold, leasehold, or other) may be viewed by clicking on the Smart Map link(s) provided.

Table 1: Lot, plan and tenure information for the property

Lot	Plan	Tenure	Link to property on SmartMap
1	RP169229	Freehold	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=1\RP169229
E	SP242313	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=E\SP242313
G	SP242313	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=G\SP242313
AA	SP246243	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=AA\SP246243
B	RP170328	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=B\RP170328
A	RP171885	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=A\RP171885
F	SP242313	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=F\SP242313
P	SP163158	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=P\SP163158

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

2.2 Property location

Table 2 provides a summary of the locations for property Lot: 1 Plan: RP169229, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Brisbane City

Bioregion(s)	Subregion(s)
Southeast Queensland	Burringbar - Conondale Ranges

Catchment(s)
Logan-Albert
Brisbane

For the purposes of the accepted development vegetation clearing codes and the State Development Assessment Provisions (SDAP), this property is regarded as*
Coastal

*See also Map 5.4

Area Management Plan(s): Nil

3. Vegetation management details for Lot: 1 Plan: RP169229

3.1 Vegetation categories

Vegetation categories are shown on the regulated vegetation management map in section 5.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 501.72ha

Vegetation category	Area (ha)
Category B	359.3
Category C	5.37
Category Water	2.15
Category X	134.9

Table 4

Category	Colour on Map	Description	Requirements / options
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact DNRME to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing is considered accepted development on freehold land, indigenous land and leasehold land for agriculture and grazing purposes. Contact DNRME to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

This report does not confirm if a Property Map of Assessable Vegetation (PMAV) exists on a lot. To confirm whether or not a PMAV exists on a lot, please check the PMAV layer on the Queensland Globe2, or contact DNRME on 135VEG (135 834).

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 5.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
12.11.24	Least concern	B	87.78	Eucalyptus carnea, E. tindaliae, Corymbia intermedia +/- E. siderophloia or E. crebra woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.25	Of concern	B	80.20	Corymbia henryi and/or Eucalyptus fibrosa subsp. fibrosa +/- E. crebra, E. carnea, E. tindaliae woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.25	Of concern	C	5.05	Corymbia henryi and/or Eucalyptus fibrosa subsp. fibrosa +/- E. crebra, E. carnea, E. tindaliae woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.27	Endangered	B	90.53	Eucalyptus racemosa subsp. racemosa and/or E. seeana and Corymbia intermedia woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.3	Least concern	B	18.78	Eucalyptus siderophloia, E. propinqua +/- E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides open forest on metamorphics +/- interbedded volcanics	Mid-dense
12.11.5	Least concern	B	51.33	Corymbia citriodora subsp. variegata woodland to open forest +/- Eucalyptus siderophloia/E. crebra, E. carnea, E. acmenoides, E. propinqua on metamorphics +/- interbedded volcanics	Mid-dense
12.3.11	Of concern	B	3.84	Eucalyptus tereticornis +/- Eucalyptus siderophloia, Corymbia intermedia open forest on alluvial plains usually near coast	Mid-dense
12.3.5	Least concern	B	6.36	Melaleuca quinquenervia open forest on coastal alluvium	Mid-dense
12.3.5	Least concern	C	0.15	Melaleuca quinquenervia open forest on coastal alluvium	Mid-dense
12.3.6	Least concern	B	16.97	Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia open forest on coastal alluvial plains	Mid-dense
12.3.6	Least concern	C	0.12	Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia open forest on coastal alluvial plains	Mid-dense
12.9-10.4	Least concern	B	3.51	Eucalyptus racemosa subsp. racemosa woodland on sedimentary rocks	Sparse
non-rem	None	X	134.90	None	None
water	None	C	0.05	None	None

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
water	None	Water	2.15	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work
- accepted development vegetation clearing codes
- performance outcomes in State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 5.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA), and includes endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 5.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map as assessable vegetation -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
686	Crinia tinnula	wallum froglet	V	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, sedgeland, wet and dry heathland (e.g. Banksia robur, Xanthorrhoea) and wallum (Banksia aemula shrubland/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.	Sea level to 150m.	Sandy and sandy-alluvial substrates.	None
860	Phascolarctos cinereus	koala	V	SEQ: Open eucalypt forest and woodland that has: a) multiple strata layers containing Eucalyptus, Corymbia, Angophora, Lophostemon or Melaleuca trees that-at 1.3 metres above the ground-have a diameter both greater and less than 30 centimetres; and b) at least 1 of the following species: Eucalyptus tereticornis, E. fibrosa, E. propinqua; E. umbra, E. grandis, E. microcorys, E. tindaliae, E. resinifera, E. populnea, E. robusta, E. nigra, E. racemosa, E. crebra, E. exserta, E. seeana, Lophostemon confertus, L. suaveolens, Melaleuca quinquenervia. Outside SEQ: Open eucalypt forest and woodland that contains Eucalyptus &/or Corymbia spp. Tree species used for food varies across State and can include Eucalyptus tereticornis, E. camaldulensis, E. coolabah; E. drepanophylla, E. platyphylla, E. orgadophilla, E. thozetiana, E. melanophloia, E. populnea, E. melliodora, E. dealbata, E. microtheca, E. crebra, E. exserta, E. blakelyi, E. papuana, Corymbia tessellaris, C. citriodora, Melaleuca quinquenervia, M. leucadendra.	Sea level to 1000m.	None	Riparian areas, plains and hill/escarpment slopes.
848	Petauroides volans	greater glider	V	Tall mature open wet and dry eucalypt forest (Eucalyptus &/or Corymbia spp.) to low open eucalypt woodland; presence of hollow-bearing trees.	Sea level to 1300m.	Usually on soils of relatively high fertility.	None
1107	Ninox strenua	powerful owl	V	Wet and dry tall open eucalypt forest (Eucalyptus pilularis, E. acmenoides, E. tereticornis, E. camaldulensis, E. crebra, E. melliodora, Corymbia citriodora & C. intermedia), including mountain forest gullies/gorges; forests aged 60+ years (large & old) on fertile soils with suitable hollows; roosting in dense foliage of closed forest (occasionally caves) and foraging in open forest and woodland including areas adjacent to urban/rural development. Nest in large hollows (45-75cm diameter, 50-180cm deep) 6-45m above ground, in large (>100cm dbh) old eucalypts on the side or at the head of heavily wooded gully.	Sea level to 1000m.	None	Gully.
1478	Anthochaera phrygia	regent honeyeater	E	Dry eucalypt woodland and open forest, woodland, rural and urban areas with mature eucalypts; favours box-ironbark associations including Eucalyptus sideroxylon, E. albens, E. melliodora, E. moluccana, E. robusta, E. caliginosa, E. maculata occasionally with Angophora leiocarpa, and Casuarina cunninghamiana in riparian forest; generally comprise large/mature trees that are reliable nectar producers (both in timing and quantity) with tall shrub layer on moist fertile sites (lower foothills/river valleys/creeklines). Nest in mistletoe, usually on horizontal branch or in vertical fork of rough-barked tree 1-30m above ground.	Sea level to 550m.	None	None
3235	Zieria furfuracea subsp. gymnocarpa	None	E	open forest of Lophostemon confertus, Eucalyptus crebra, Eucalyptus carnea, Acacia disparrima, or Eucalyptus propinqua, E. microcorys, Corymbia intermedia, or Eucalyptus propinqua, E. crebra, E. umbra, Corymbia intermedia, or Eucalyptus acmenoides, E. drepanophylla, E. propinqua, E.microcorys; open eucalypt forest with occasional rainforest elements; woodland of Eucalyptus crebra, Acacia disparrima and Mallotus philippensis	0 to 200 m	None	gully or hill slope

Label	Regional Ecosystem (mandatory unless otherwise specified)
686	12.2.5, 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, 12.3.20, 12.5.2, 12.5.10. These regional ecosystems are not a mandatory essential habitat factor for this species.
860	SEQ: 11.3.2, 11.3.4, 11.3.25, 11.3.26, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.9.9, 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 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, 12.3.14, 12.3.18, 12.3.19, 12.3.20, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.6, 12.5.7, 12.5.10, 12.5.12, 12.8.1, 12.8.8, 12.8.9, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.20, 12.8.24, 12.8.25, 12.9-10.1, 12.9-10.2, 12.9-10.3, 12.9-10.4, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.11, 12.9-10.12, 12.9-10.14, 12.9-10.17, 12.9-10.18, 12.9-10.19, 12.9-10.21, 12.9-10.25, 12.9-10.26, 12.9-10.27, 12.9-10.28, 12.9-10.29, 12.11.2, 12.11.3, 12.11.5, 12.11.6, 12.11.7, 12.11.8, 12.11.9, 12.11.14, 12.11.16, 12.11.17, 12.11.18, 12.11.22, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.2, 12.12.3, 12.12.5, 12.12.6, 12.12.7, 12.12.8, 12.12.9, 12.12.11, 12.12.12, 12.12.14, 12.12.15, 12.12.23, 12.12.24, 12.12.25, 12.12.28. Outside SEQ: 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6, 4.3.8, 4.3.10, 4.3.11, 4.4.1, 4.5.3, 4.5.5, 4.5.6, 4.5.8, 4.5.9, 4.7.1, 4.7.7, 4.7.8, 4.9.6, 4.9.10, 4.9.12, 4.9.17, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.11, 6.3.12, 6.3.17, 6.3.18, 6.3.22, 6.3.24, 6.3.25, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, 6.5.13, 6.5.14, 6.5.15, 6.5.16, 6.5.17, 6.5.18, 6.5.19, 6.6.2, 6.7.1, 6.7.2, 6.7.5, 6.7.6, 6.7.7, 6.7.9, 6.7.11, 6.7.12, 6.7.13, 6.7.14, 6.7.17, 6.9.3, 7.2.3, 7.2.4, 7.2.7, 7.2.11, 7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.47, 7.3.48, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.8.19, 7.11.5, 7.11.6, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 7.11.48, 7.11.49, 7.11.50, 7.11.51, 7.12.4, 7.12.5, 7.12.17, 7.12.21, 7.12.22, 7.12.23, 7.12.25, 7.12.26, 7.12.27, 7.12.29, 7.12.31, 7.12.32, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.10, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.27, 9.4.1, 9.4.2, 9.4.3, 9.5.1, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.15, 9.5.16, 9.5.17, 9.7.1, 9.7.2, 9.7.3, 9.7.4, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.3, 9.8.4, 9.8.5, 9.8.9, 9.8.10, 9.8.11, 9.8.13, 9.10.1, 9.10.3, 9.10.4, 9.10.5, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.12, 9.11.13, 9.11.14, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.21, 9.11.22, 9.11.23, 9.11.24, 9.11.25, 9.11.26, 9.11.28, 9.11.29, 9.11.30, 9.11.31, 9.11.32, 9.12.1, 9.12.2, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.14, 9.12.15, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.25, 9.12.26, 9.12.27, 9.12.28, 9.12.29, 9.12.30, 9.12.31, 9.12.32, 9.12.33, 9.12.35, 9.12.36, 9.12.37, 9.12.38, 9.12.39, 9.12.44, 10.3.2, 10.3.3, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.17, 10.3.20, 10.3.27, 10.3.28, 10.4.3, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.21, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.18, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.11, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.11.9, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.6, 13.12.8, 13.12.9, 13.12.10.
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Label	Regional Ecosystem (mandatory unless otherwise specified)
1107	8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.2.8, 8.2.11, 8.2.13, 8.2.14, 8.3.1, 8.3.3, 8.3.6, 8.3.8, 8.3.9, 8.3.10, 8.3.11, 8.5.1, 8.8.1, 8.10.1, 8.11.2, 8.11.3, 8.11.5, 8.12.1, 8.12.2, 8.12.3, 8.12.4, 8.12.5, 8.12.7, 8.12.8, 8.12.11, 8.12.12, 8.12.14, 8.12.16, 8.12.17, 8.12.18, 8.12.19, 8.12.26, 8.12.27, 8.12.28, 8.12.29, 8.12.30, 8.12.31, 8.12.32, 11.2.2, 11.2.3, 11.3.1, 11.3.11, 11.3.12, 11.3.25, 11.3.26, 11.3.40, 11.4.1, 11.4.3, 11.4.7, 11.4.9, 11.5.7, 11.5.16, 11.8.1, 11.8.13, 11.9.1, 11.9.4, 11.9.5, 11.9.6, 11.9.10, 11.9.13, 11.10.1, 11.10.2, 11.10.5, 11.10.8, 11.10.9, 11.10.13, 11.11.3, 11.11.5, 11.11.13, 11.11.14, 11.11.18, 11.12.4, 11.12.13, 11.12.19, 11.12.21, 12.2.1, 12.2.2, 12.2.3, 12.2.4, 12.2.5, 12.2.7, 12.2.8, 12.3.1, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.7, 12.3.9, 12.3.10, 12.3.11, 12.3.15, 12.3.16, 12.3.17, 12.3.18, 12.3.19, 12.3.20, 12.3.21, 12.5.1, 12.5.3, 12.5.6, 12.5.7, 12.5.13, 12.8.1, 12.8.2, 12.8.3, 12.8.4, 12.8.5, 12.8.6, 12.8.7, 12.8.8, 12.8.9, 12.8.10, 12.8.11, 12.8.12, 12.8.13, 12.8.14, 12.8.18, 12.8.21, 12.8.22, 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, 12.9-10.14, 12.9-10.16, 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, 12.9-10.25, 12.9-10.26, 12.9-10.29, 12.11.1, 12.11.2, 12.11.3, 12.11.4, 12.11.5, 12.11.6, 12.11.9, 12.11.10, 12.11.11, 12.11.12, 12.11.13, 12.11.16, 12.11.17, 12.11.18, 12.11.19, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.1, 12.12.2, 12.12.3, 12.12.4, 12.12.5, 12.12.6, 12.12.11, 12.12.13, 12.12.15, 12.12.16, 12.12.17, 12.12.18, 12.12.20, 12.12.26, 12.12.28, 13.3.2, 13.3.3, 13.3.5, 13.9.2, 13.11.2, 13.11.5, 13.11.6, 13.11.7, 13.12.1, 13.12.4, 13.12.11
1478	8.2.1, 8.2.3, 8.2.4, 8.2.6, 8.2.7, 8.2.8, 8.2.12, 8.2.13, 8.2.14, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.8, 8.3.11, 8.3.13, 8.5.1, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.9.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.12.4, 8.12.5, 8.12.6, 8.12.7, 8.12.8, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 8.12.26, 8.12.27, 8.12.31, 8.12.32, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.4, 11.7.6, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.19, 11.12.20, 11.12.21, 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, 12.3.16, 12.3.17, 12.3.18, 12.3.19, 12.3.20, 12.3.21, 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, 12.9-10.12, 12.9-10.13, 12.9-10.14, 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, 12.9-10.25, 12.9-10.26, 12.9-10.28, 12.9-10.29, 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, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 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, 12.12.12, 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, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.8, 13.12.9, 13.12.10
3235	12.11.5

3.6 Protected plants (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA), with clearing of protected plants in the wild regulated by the Nature Conservation (Wildlife Management) Regulation 2006. These requirements apply irrespective of the classification of the vegetation under the *Vegetation Management Act 1999*.

Prior to clearing, if the plants proposed to be cleared are in the wild (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') and the exemptions under the Nature Conservation (Wildlife Management) Regulation 2006 are not applicable to the proposed clearing, you must check the flora survey trigger map to determine if any part of the area to be cleared is within a high risk area. The trigger map for this property is provided in section 5.5. The exemptions relate to:

- imminent risk of death or serious injury (refer s261A)
- imminent risk of serious damage to a building or other structure on land, or to personal property (refer s261B)
- *Fire and Emergency Service Act 1990* (refer 261C)
- previously cleared areas (refer s261ZB)
- maintenance activities (refer s261ZC)
- firebreak or fire management line (refer s261ZD)
- accepted development vegetation clearing code (refer s261ZE)
- conservation purposes (refer s261ZG)
- authorised in particular circumstances (refer s385).

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) from the *Vegetation Management Act 1999* (i.e. listed in the Planning Regulations 2017) while some are different.

If the proposed area to be cleared is shown as blue (i.e. high risk) on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken in accordance with the flora survey guidelines. The main objective of a flora survey is to locate any endangered, vulnerable or near threatened plants (EVNT plants) that may be present in the clearing impact

area.

If a flora survey identifies that EVNT plants are not present within the clearing impact area or clearing within 100m of EVNT plants can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing. The clearing must be conducted within two years after the flora survey report was submitted.

If a flora survey identifies that EVNT plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the application form clearing permit.

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that EVNT plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

Further information on protected plants is available at
http://www.ehp.qld.gov.au/licences-permits/plants-animals/protected-plants/

For assistance on the protected plants flora survey trigger map for this property, please contact the Department of Environment and Science at palm@des.qld.gov.au.

3.7 Emissions Reduction Fund (ERF)

The ERF is an Australian Government scheme which offers incentives for businesses and communities across the economy to reduce emissions.

Under the ERF, landholders can earn money from activities such as planting (and keeping) trees, managing regrowth vegetation and adopting more sustainable agricultural practices.

The purpose of a project is to remove greenhouse gases from the atmosphere. Each project will provide new economic opportunities for farmers, forest growers and land managers.

Further information on ERF is available at https://www.qld.gov.au/environment/land/state/use/carbon-rights/.

4. Contact information for DNRME

For further information on vegetation management:
Phone 135VEG (135 834)
Email vegetation@dnrme.qld.gov.au
Visit www.dnrme.qld.gov.au/our-department/contact-us/vegetation-contacts to submit an online enquiry.

For contact details for other State and Commonwealth agencies, please see Section 6.

5. Maps

The maps included in this report may also be requested individually at:

https://www.dnrme.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form
and
http://www.ehp.qld.gov.au/licences-permits/plants-animals/protected-plants/map-request.php

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

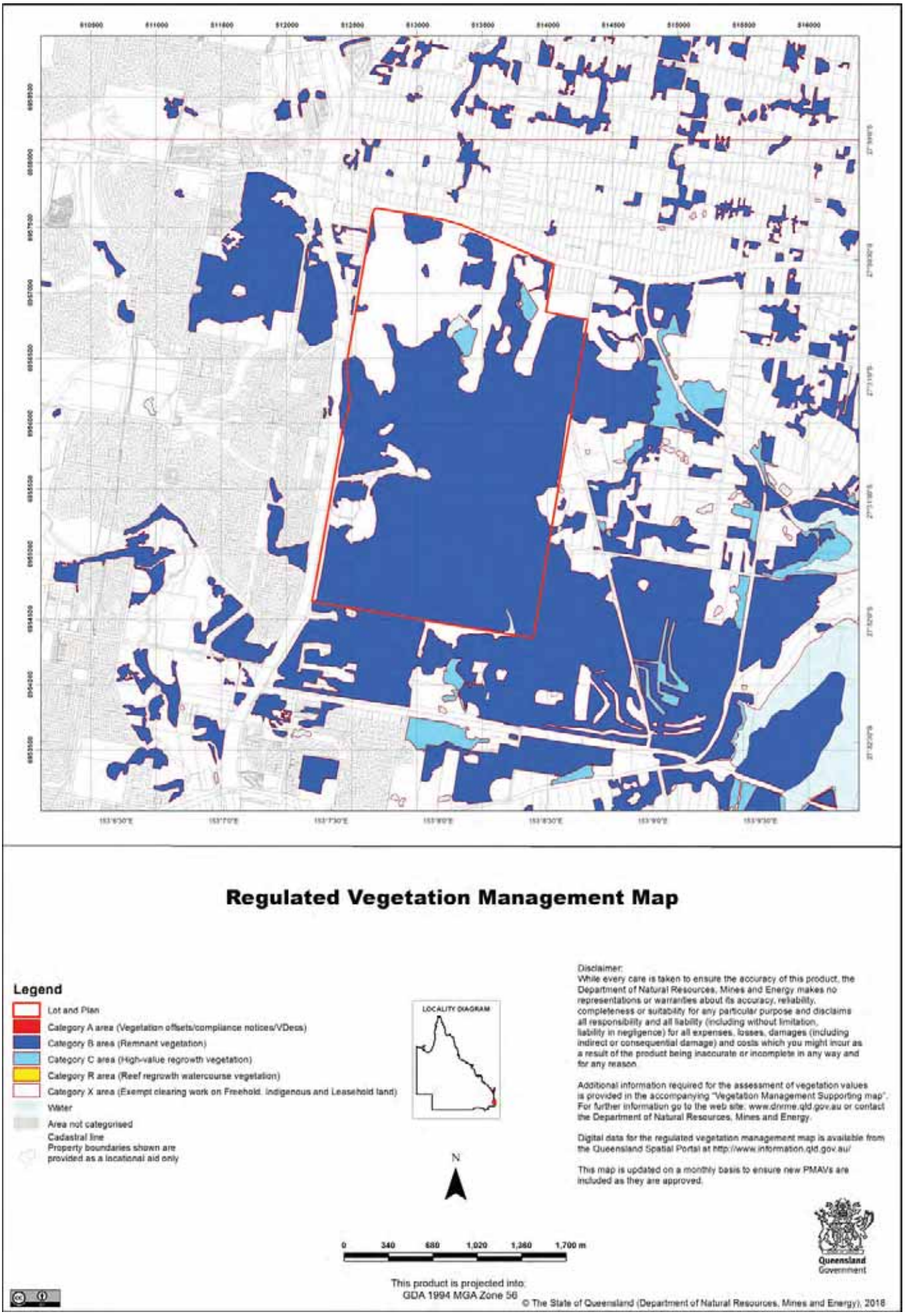
Coastal/non coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and the State Development Assessment Provisions (SDAP).

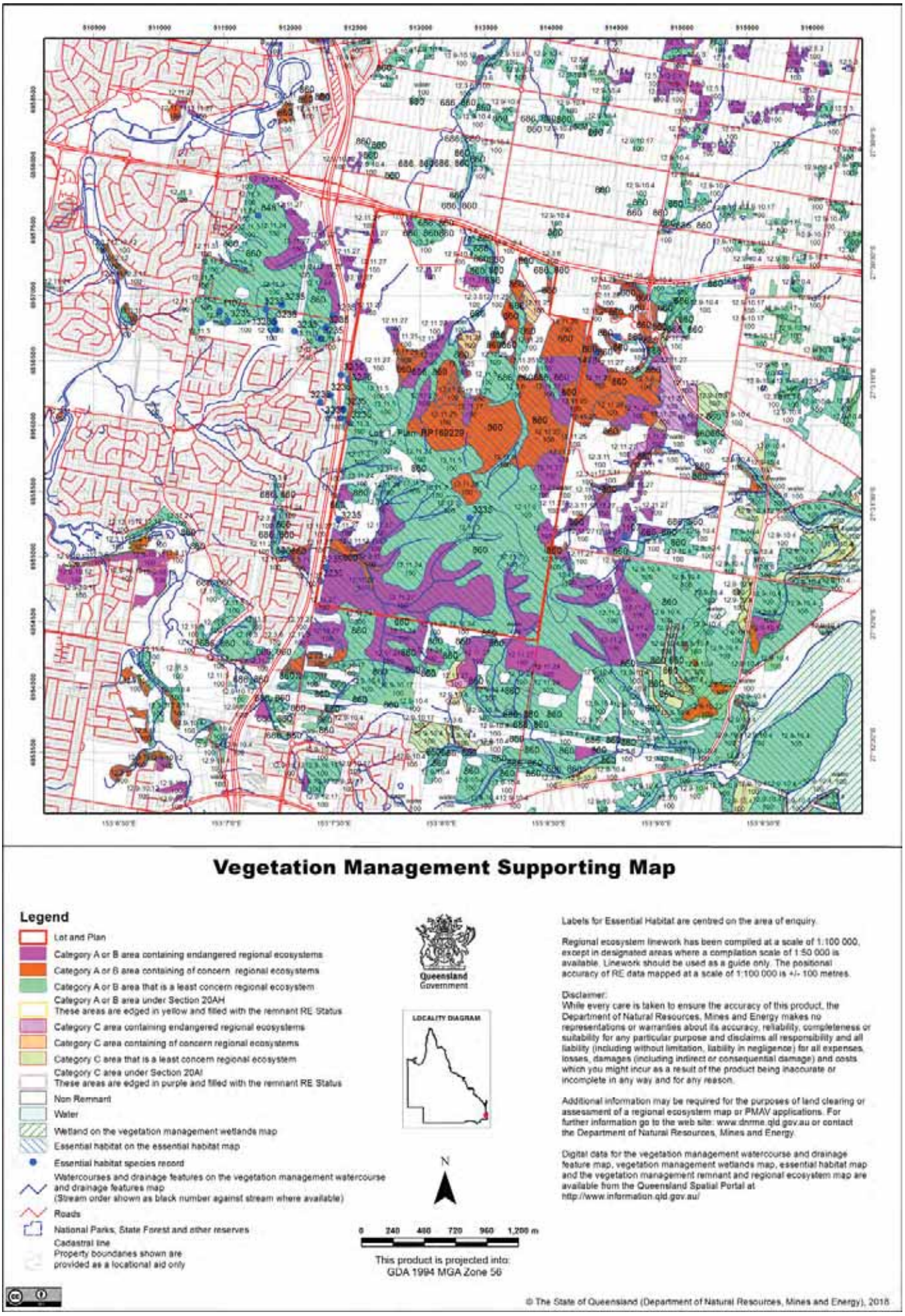
Protected plants map

The protected plants map shows areas where particular provisions of the *Nature Conservation Act 1992* apply to the clearing of protected plants.

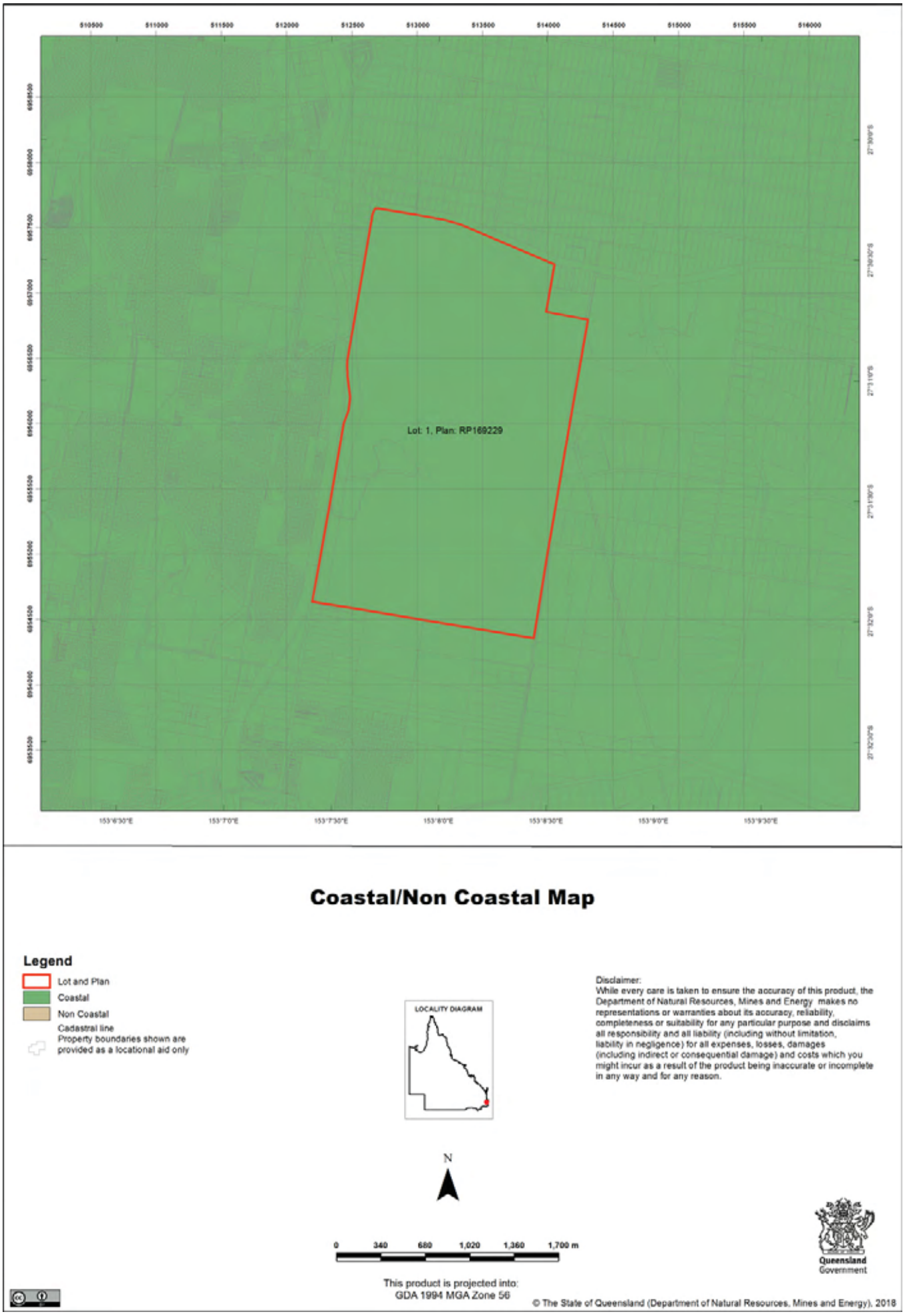
5.1 Regulated vegetation management map



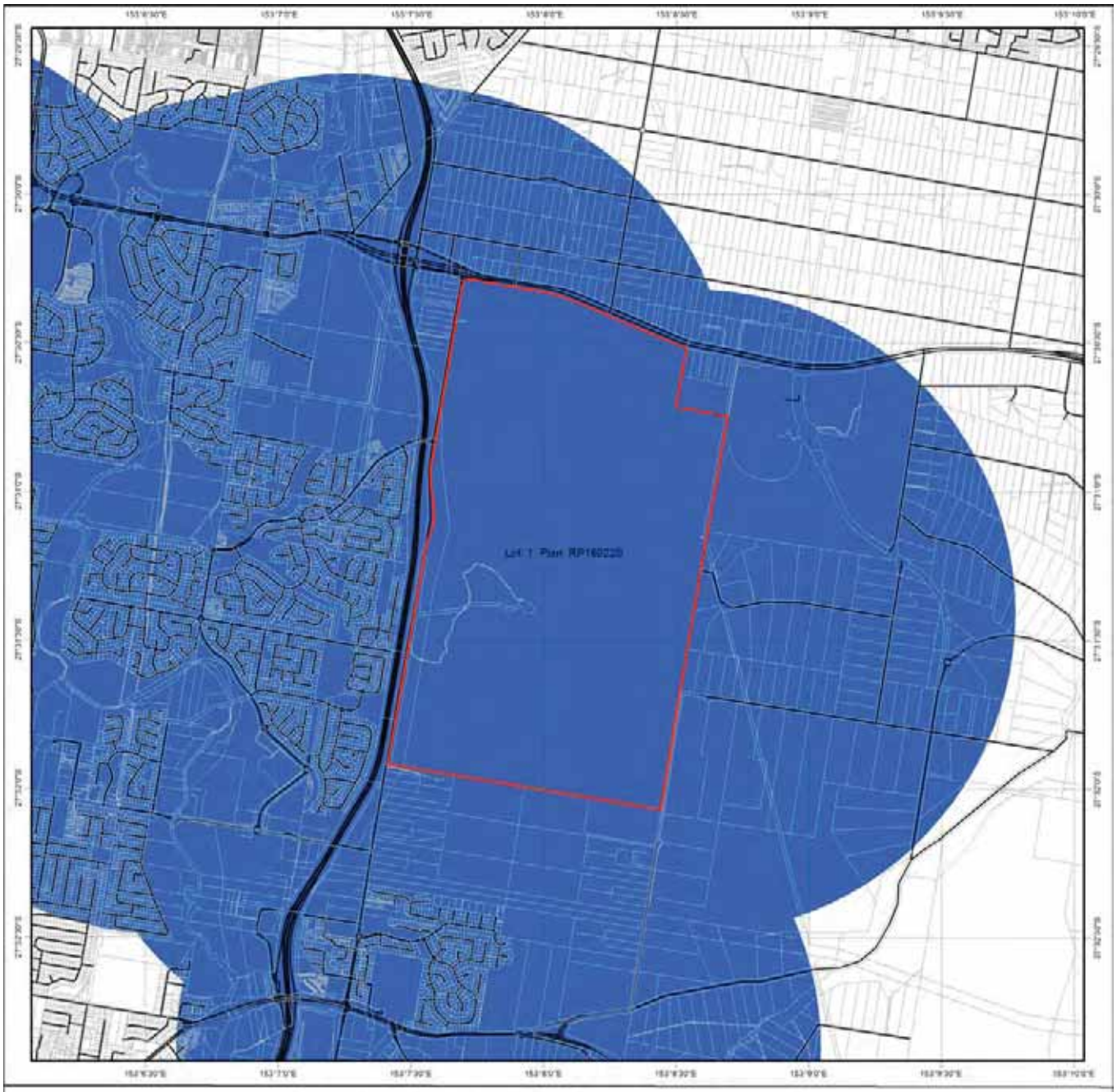
5.2 Vegetation management supporting map



5.3 Coastal/non coastal map



5.4 Protected plants map administered by DES



Protected Plants Flora Survey Trigger Map

Legend

- Lot and Plan
- High risk area
- Cadastral line
  Property boundaries shown are provided as a locational aid only
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@ehp.qld.gov.au

N

0 240 480 720 960 1,200 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

6. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
Interference with overland flow Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Natural Resources, Mines and Energy (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dnrme.qld.gov.au
Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Aboriginal and Torres Strait Islander Partnerships (Queensland Government)	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
Mining and environmentally relevant activities Infrastructure development (coastal) Heritage issues Protected plants and protected areas[1]	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992* *Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
Interference with fish passage in a watercourse, mangroves Forestry activities[2]	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Manufacturing, Infrastructure and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
Local government requirements	*Local Government Act 2009*	Department of Local Government, Racing and Multicultural Affairs (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office

1. In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992*, which endeavours to ensure that protected plants (whether whole plants or protected plants parts) are not illegally removed from the wild, or illegally traded. Prior to clearing, you should check the flora survey trigger map to determine if the clearing is within a high-risk area by visiting www.des.qld.gov.au. For further information or assistance on the protected plants flora survey trigger map for your property, please contact the Department of Environment and Science on 13QGOV (13 74 68) or email palm@des.qld.gov.au.

2. Contact the Department of Agriculture and Fisheries before clearing:

- Any sandalwood on state-owned land (including leasehold land)
- On freehold land in a 'forest consent area'
- More than five hectares on state-owned land (including leasehold land) containing commercial timber species listed in parts 2 or 3 of Schedule 6 of the Vegetation Management Regulation 2012 and located within any of the following local government management areas-Banana, Bundaberg Regional, Fraser Coast Regional, Gladstone Regional, Isaac Regional, North Burnett Regional, Somerset Regional, South Burnett Regional, Southern Downs Regional, Tablelands Regional, Toowoomba Regional, Western Downs Regional.

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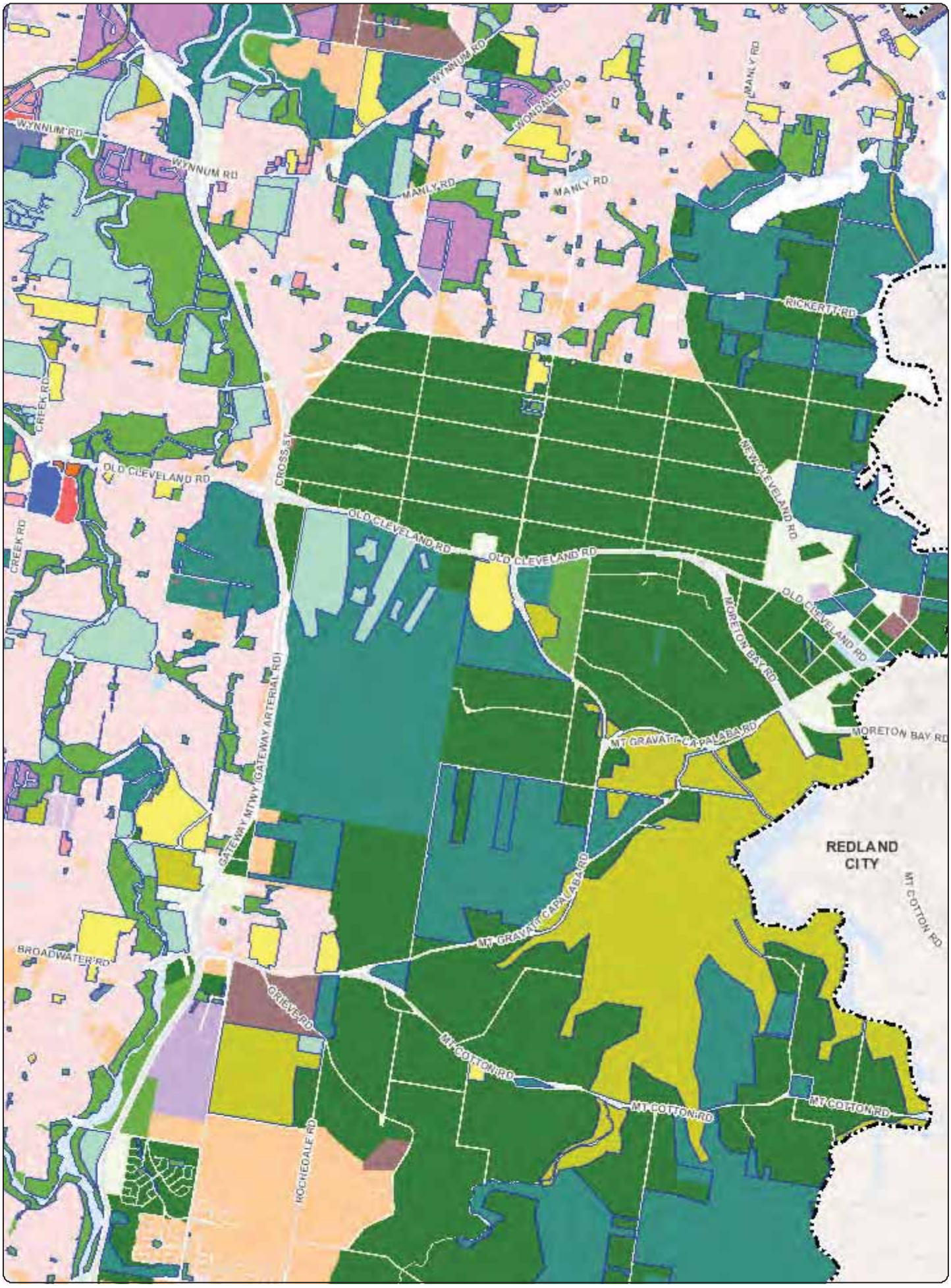
APPENDIX C

BRISBANE CITY COUNCIL ZONONG MAP



Brisbane City Plan 2014

BRISBANE CITY
Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:50,000

0 1,800

Metres

Date: 20/07/2018

Legend

- LGA Name
- LGA Boundary
- Labels - Major_Road - StreetPro
- LDR Low density residential
- CR1 Character residential (Character)
- CR2 Character residential (Infill housing)
- LMR1 Low-medium density residential (2 storey mix)
- LMR2 Low-medium density residential (2 or 3 storey mix)
- LMR3 Low-medium density residential (Up to 3 storeys)
- MDR Medium density residential
- HDR1 High density residential (Up to 8 storeys)
- HDR2 High density residential (Up to 15 storeys)
- TA Tourist accommodati...
- NC Neighbourhood centre
- DC1 District centre (District)
- DC2 District centre (Corridor)
- MC Major centre
- PC1 Principal centre (City centre)
- PC2 Principal centre (Regional centre)
- LII Low impact industry
- IN1 General industry A
- IN2 General industry B
- IN3 General industry C
- SI Special industry
- II Industry investigation
- SR Sport and recreation
- SR1 Sport and recreation (Local)
- SR2 Sport and recreation (District)
- SR3 Sport and recreation (Metropolitan)
- OS Open space
- OS1 Open space (Local)
- OS2 Open space (District)
- OS3 Open space (Metropolitan)
- EM Environmental management
- CN Conservation
- CN1 Conservation (Local)
- CN2 Conservation (District)
- CN3 Conservation (Metropolitan)
- EC Emerging community
- EI Extractive industry
- MU1 Mixed use (Inner city)
- MU2 Mixed use (Centre frame)
- MU3 Mixed use (Corridor)
- RU Rural
- RR Rural residential
- T Township
- Refer to Part 10 of the planning scheme
- CF1 Community facilities (Major health care)
- CF2 Community facilities (Major sports venue)
- CF3 Community facilities (Cemetery)
- CF4 Community facilities (Community purposes)
- CF5 Community facilities (Education purposes)
- CF6 Community facilities (Emergency services)
- CF7 Community facilities (Health care purposes)
- SC1 Specialised centre (Major education and research facility)
- SC2 Specialised centre (Entertainment and conference centre)
- SC3 Specialised centre (Brisbane Markets)
- SC4 Specialised centre (Large format retail)
- SC5 Specialised centre (Mixed industry and business)
- SC6 Specialised centre (Marina)
- SP1 Special purpose (Defence)
- SP2 Special purpose (Detention facility)
- SP3 Special purpose (Transport infrastructure)
- SP4 Special purpose (Utility services)
- SP5 Special purpose (Airport)
- SP6 Special purpose (Port)
- Railway Line
- Freeway, Highway
- Arterial Road
- Freeway, Arterial Road (Tunnels)
- Connector
- Local, Private Roads
- Airport Roads
- Waterbody
- Brisbane River, Creek
- Drainage Regions
- Drainage Centrelines (BCC Masked)
- Drainageline

Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

NOTES

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Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Date: 20/07/2018

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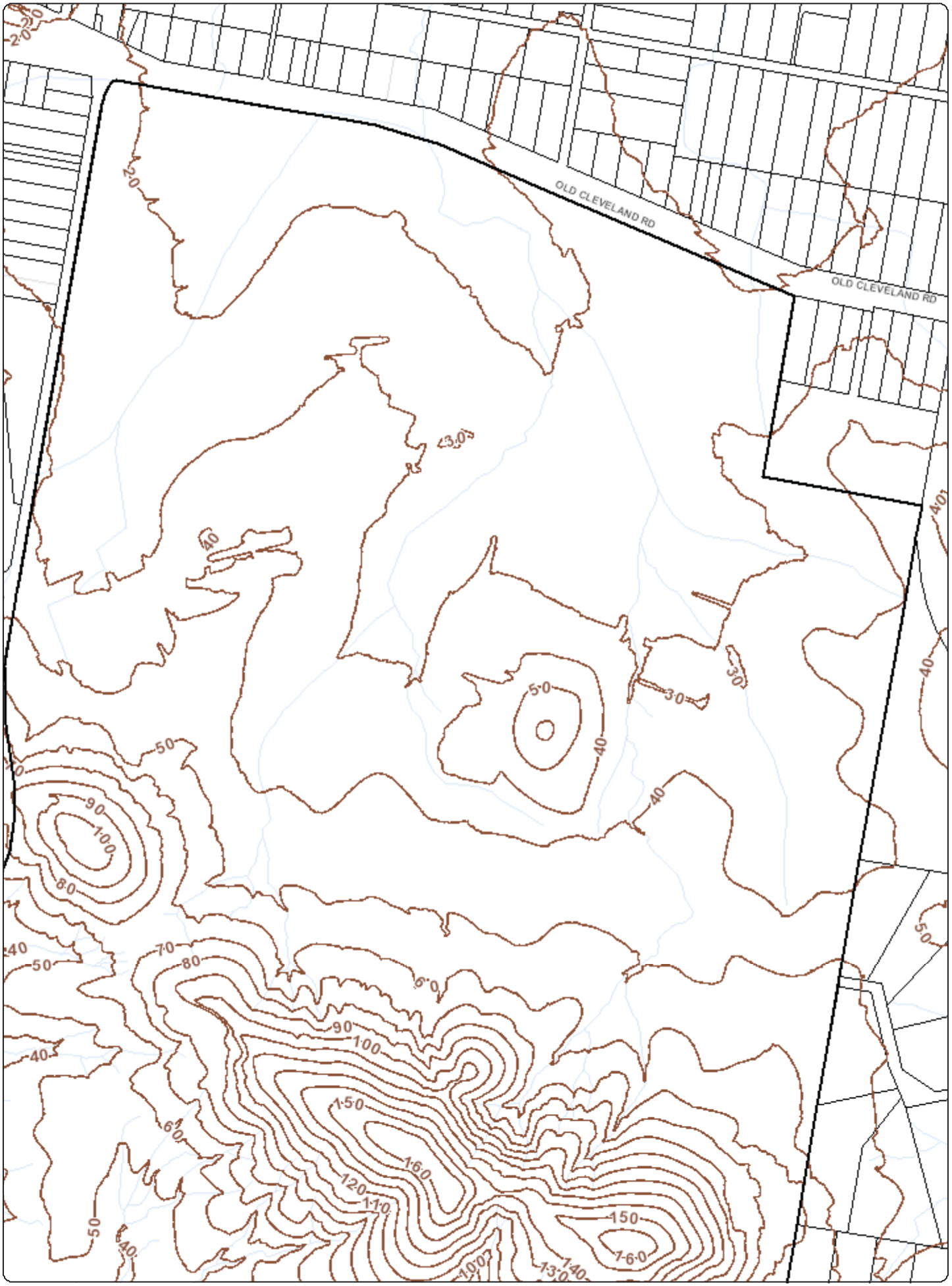
APPENDIX D

SITE TOPOGRAPHY



Brisbane City Plan 2014

BRISBANE CITY
Planning Scheme

NOTES

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Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:10,000

0 375

Metres

Date: 25/07/2018

Legend

- LGA Name
- LGA Boundary
- Labels - Major_Road - StreetPro
- Contours 10m
- Contours 5m
- Railway Line
- Airport Roads
- Waterbody
- Brisbane River, Creek
- Drainage Regions
- Drainage Centrelines (BCC Masked)
- Drainageline

Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Date: 25/07/2018

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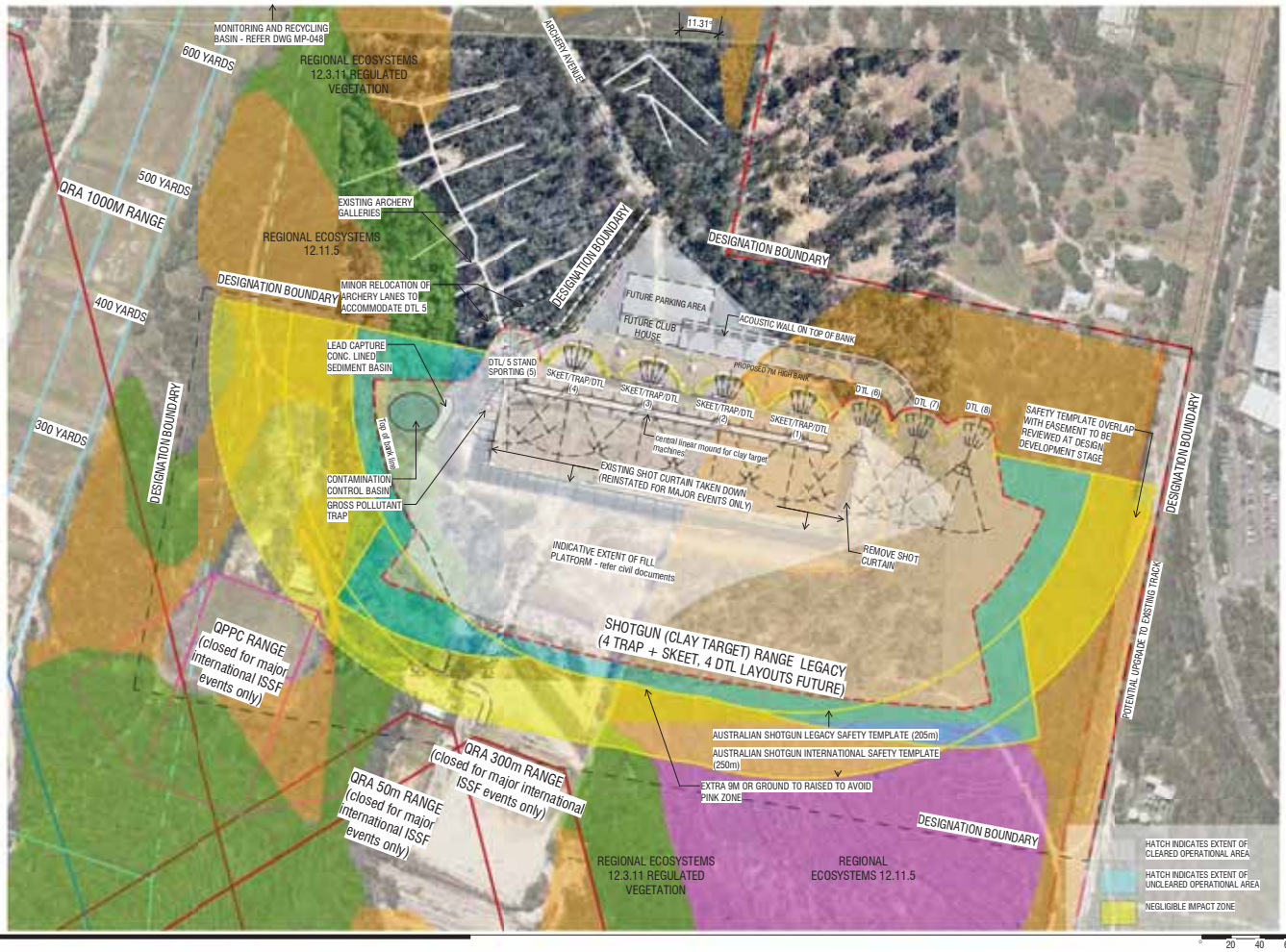
APPENDIX E

PROPOSED PERMANENT USE CLAY TARGET FACILITY



BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3846 0877
bne@modedesign.com.au

DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING INFRASTRUCTURE & PLANNING

BELMONT SHOOTING COMPLEX
1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT CLAY TARGET RANGE

20 40 60 80 100

Project No: 14479BNE
Date:
Scale: 1 : 2500@ A3
Drawn / Check: AutChecker

MP - 045F

03/07/2018 1:55:51 PM

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APPENDIX F

WILDLIFE ONLINE EXTRACT

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -27.5118
Longitude: 153.1410
Distance: 5
Email: joseph.t@lar.net.au
Date submitted: Monday 11 Dec 2017 09:14:58
Date extracted: Monday 11 Dec 2017 09:20:45

The number of records retrieved = 834

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			22
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		2
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		9
animals	amphibians	Hylidae	*Litoria wilcoxii*	eastern stony creek frog		C		1
animals	amphibians	Hylidae	*Litoria gracilenta*	graceful treefrog		C		6
animals	amphibians	Hylidae	*Litoria latopalmata*	broad palmed rocketfrog		C		1
animals	amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog		C		19
animals	amphibians	Hylidae	*Litoria nasuta*	striped rocketfrog		C		4
animals	amphibians	Limnodynastidae	*Adelotus brevis*	tusked frog		V		1
animals	amphibians	Limnodynastidae	*Limnodynastes peronii*	striped marshfrog		C		13
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		4
animals	amphibians	Limnodynastidae	*Limnodynastes tasmaniensis*	spotted grassfrog		C		1
animals	amphibians	Myobatrachidae	*Crinia signifera*	clicking froglet		C		7
animals	amphibians	Myobatrachidae	*Pseudophryne major*	great brown broodfrog		C		4/1
animals	amphibians	Myobatrachidae	*Pseudophryne raveni*	copper backed broodfrog		C		3
animals	amphibians	Myobatrachidae	*Crinia parinsignifera*	beeping froglet		C		9
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		29
animals	birds	Acanthizidae	*Chthonicola sagittata*	speckled warbler		C		4
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		4
animals	birds	Acanthizidae	*Acanthiza nana*	yellow thornbill		C		2
animals	birds	Acanthizidae	*Sericornis frontalis*	white-browed scrubwren		C		25
animals	birds	Acanthizidae	*Acanthiza pusilla*	brown thornbill		C		7
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		61
animals	birds	Acanthizidae	*Gerygone levigaster*	mangrove gerygone		C		9
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		2
animals	birds	Acanthizidae	*Gerygone mouki*	brown gerygone		C		2
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		7
animals	birds	Accipitridae	*Accipiter novaehollandiae*	grey goshawk		C		8
animals	birds	Accipitridae	*Accipiter cirrocephalus*	collared sparrowhawk		C		29
animals	birds	Accipitridae	*Hieraaetus morphnoides*	little eagle		C		8
animals	birds	Accipitridae	*Haliastur indus*	brahminy kite		C		25
animals	birds	Accipitridae	*Circus assimilis*	spotted harrier		C		1
animals	birds	Accipitridae	*Elanus axillaris*	black-shouldered kite		C		50
animals	birds	Accipitridae	*Pandion cristatus*	eastern osprey		SL		10
animals	birds	Accipitridae	*Circus approximans*	swamp harrier		C		3
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		25
animals	birds	Accipitridae	*Aviceda subcristata*	Pacific baza		C		27
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		24
animals	birds	Accipitridae	*Haliaeetus leucogaster*	white-bellied sea-eagle		C		12
animals	birds	Acrocephalidae	*Acrocephalus australis*	Australian reed-warbler		C		106
animals	birds	Acrocephalidae	*Acrocephalus orientalis*	oriental reed-warbler		SL		1
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		6
animals	birds	Alaudidae	*Mirafra javanica*	Horsfield's bushlark		C		2
animals	birds	Alcedinidae	*Ceyx azureus*	azure kingfisher		C		18
animals	birds	Anatidae	*Anas sp.*					2
animals	birds	Anatidae	*Malacorhynchus membranaceus*	pink-eared duck		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Anatidae	*Nettapus coromandelianus*	cotton pygmy-goose		C		1
animals	birds	Anatidae	*Tadorna tadornoides*	Australian shelduck		C		1
animals	birds	Anatidae	*Dendrocygna arcuata*	wandering whistling-duck		C		9
animals	birds	Anatidae	*Anas platyrhynchos*	northern mallard	Y			31
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		249
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		371
animals	birds	Anatidae	*Aythya australis*	hardhead		C		35
animals	birds	Anatidae	*Anas rhynchotis*	Australasian shoveler		C		1
animals	birds	Anatidae	*Cygnus atratus*	black swan		C		19
animals	birds	Anatidae	*Biziura lobata*	musk duck		C		3
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		19
animals	birds	Anatidae	*Anas castanea*	chestnut teal		C		23
animals	birds	Anhingidae	*Anhinga novaehollandiae*	Australasian darter		C		87
animals	birds	Anseranatidae	*Anseranas semipalmata*	magpie goose		C		16
animals	birds	Apodidae	*Apus pacificus*	fork-tailed swift		SL		2
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail		SL		29
animals	birds	Ardeidae	*Butorides striata*	striated heron		C		6
animals	birds	Ardeidae	*Egretta garzetta*	little egret		C		24
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		120
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		20
animals	birds	Ardeidae	*Egretta sacra*	eastern reef egret		C		1
animals	birds	Ardeidae	*Bubulcus ibis*	cattle egret		C		199
animals	birds	Ardeidae	*Ixobrychus dubius*	Australian little bittern		C		4
animals	birds	Ardeidae	*Ardea alba modesta*	eastern great egret		C		67
animals	birds	Ardeidae	*Ixobrychus flavicollis*	black bittern		C		1
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		171
animals	birds	Ardeidae	*Nycticorax caledonicus*	nankeen night-heron		C		31
animals	birds	Artamidae	*Artamus superciliosus*	white-browed woodswallow		C		2
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		425
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		3
animals	birds	Artamidae	*Cracticus sp.*					3
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		556
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		12
animals	birds	Artamidae	*Artamus cyanopterus*	dusky woodswallow		C		1
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		452
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		108
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		9
animals	birds	Cacatuidae	*Cacatua sp.*					3
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		368
animals	birds	Cacatuidae	*Cacatua sanguinea*	little corella		C		15
animals	birds	Cacatuidae	*Cacatua tenuirostris*	long-billed corella	Y	C		1
animals	birds	Cacatuidae	*Calyptorhynchus lathami lathami*	glossy black-cockatoo (eastern)		V		2
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		1
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		1
animals	birds	Cacatuidae	*Eolophus roseicapilla*	galah		C		293
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		572

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Campephagidae	*Coracina tenuirostris*	cicadabird		C		25
animals	birds	Campephagidae	*Lalage leucomela*	varied triller		C		15
animals	birds	Campephagidae	*Coracina maxima*	ground cuckoo-shrike		C		1
animals	birds	Campephagidae	*Lalage tricolor*	white-winged triller		C		2
animals	birds	Charadriidae	*Charadrius bicinctus*	double-banded plover		SL		9
animals	birds	Charadriidae	*Charadrius ruficapillus*	red-capped plover		C		27
animals	birds	Charadriidae	*Charadrius leschenaultii*	greater sand plover		V	V	18
animals	birds	Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		C		220
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		25
animals	birds	Charadriidae	*Erythrogonys cinctus*	red-kneed dotterel		C		5
animals	birds	Charadriidae	*Charadrius mongolus*	lesser sand plover		E	E	23
animals	birds	Charadriidae	*Charadrius veredus*	oriental plover		SL		1
animals	birds	Charadriidae	*Pluvialis fulva*	Pacific golden plover		SL		18
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		211
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		C		3
animals	birds	Cisticolidae	*Cisticola exilis*	golden-headed cisticola		C		168
animals	birds	Climacteridae	*Cormobates leucophaea metastasis*	white-throated treecreeper (southern)		C		19
animals	birds	Climacteridae	*Cormobates leucophaea*	white-throated treecreeper		C		5
animals	birds	Columbidae	*Columba livia*	rock dove	Y			38
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		79
animals	birds	Columbidae	*Columba leucomela*	white-headed pigeon		C		2
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		460
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		6
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		126
animals	birds	Columbidae	*Macropygia amboinensis*	brown cuckoo-dove		C		2
animals	birds	Columbidae	*Streptopelia chinensis*	spotted dove	Y			568
animals	birds	Columbidae	*Lopholaimus antarcticus*	topknot pigeon		C		1
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		190
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		736
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		2
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		85
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		97
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		C		55
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		C		70
animals	birds	Cuculidae	*Chalcites minutillus barnardi*	little bronze-cuckoo		C		12
animals	birds	Cuculidae	*Cuculus optatus*	oriental cuckoo		SL		2
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		9
animals	birds	Cuculidae	*Chalcites lucidus*	shining bronze-cuckoo		C		20
animals	birds	Cuculidae	*Chalcites osculans*	black-eared cuckoo		C		1
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		12
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		136
animals	birds	Dicruridae	*Dicrurus bracteatus bracteatus*	spangled drongo (eastern Australia)		C		1
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo		C		336
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		1
animals	birds	Estrildidae	*Lonchura punctulata*	nutmeg mannikin	Y			9
animals	birds	Estrildidae	*Neochmia temporalis*	red-browed finch		C		48

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Estrildidae	*Lonchura castaneothorax*	chestnut-breasted mannikin		C		46
animals	birds	Estrildidae	*Stagonopleura guttata*	diamond firetail		C		1
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		99
animals	birds	Eurostopodidae	*Eurostopodus mystacalis*	white-throated nightjar		C		8
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		7
animals	birds	Falconidae	*Falco subniger*	black falcon		C		2
animals	birds	Falconidae	*Falco longipennis*	Australian hobby		C		6
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		6
animals	birds	Falconidae	*Falco peregrinus*	peregrine falcon		C		6
animals	birds	Haematopodidae	*Haematopus longirostris*	Australian pied oystercatcher		C		30
animals	birds	Haematopodidae	*Haematopus fuliginosus*	sooty oystercatcher		C		1
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		177
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		543
animals	birds	Halcyonidae	*Todiramphus sp.*					1
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		1
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		263
animals	birds	Halcyonidae	*Todiramphus sordidus*	Torresian kingfisher		C		10
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		109
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow		C		322
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		33
animals	birds	Hirundinidae	*Cheramoeca leucosterna*	white-backed swallow		C		2
animals	birds	Jacanidae	*Irediparra gallinacea*	comb-crested jacana		C		56
animals	birds	Laridae	*Sterna hirundo*	common tern		SL		4
animals	birds	Laridae	*Thalasseus bergii*	crested tern		SL		17
animals	birds	Laridae	*Chlidonias hybrida*	whiskered tern		C		1
animals	birds	Laridae	*Chroicocephalus novaehollandiae*	silver gull		C		32
animals	birds	Laridae	*Sternula albifrons*	little tern		SL		6
animals	birds	Laridae	*Gelochelidon nilotica*	gull-billed tern		SL		13
animals	birds	Laridae	*Thalasseus bengalensis*	lesser crested tern		C		12
animals	birds	Laridae	*Hydroprogne caspia*	Caspian tern		SL		20
animals	birds	Maluridae	*Malurus sp.*					1
animals	birds	Maluridae	*Malurus cyaneus*	superb fairy-wren		C		84
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		197
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		250
animals	birds	Megaluridae	*Megalurus timoriensis*	tawny grassbird		C		106
animals	birds	Megaluridae	*Megalurus gramineus*	little grassbird		C		6
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		10
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		202
animals	birds	Meliphagidae	*Ptilotula penicillata*	white-plumed honeyeater		C		1
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		609
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		183/1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		88
animals	birds	Meliphagidae	*Anthochaera carunculata*	red wattlebird		C		1
animals	birds	Meliphagidae	*Anthochaera chrysoptera*	little wattlebird		C		6
animals	birds	Meliphagidae	*Gavicalis fasciogularis*	mangrove honeyeater		C		7
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		110

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animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		38
animals	birds	Meliphagidae	*Acanthorhynchus tenuirostris*	eastern spinebill		C		31
animals	birds	Meliphagidae	*Melithreptus lunatus*	white-naped honeyeater		C		8
animals	birds	Meliphagidae	*Manorina melanophrys*	bell miner		C		3
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		356
animals	birds	Meliphagidae	*Anthochaera phrygia*	regent honeyeater		E	CE	1
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		138
animals	birds	Meliphagidae	*Caligavis chrysops*	yellow-faced honeyeater		C		210
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		62
animals	birds	Meliphagidae	*Myzomela obscura*	dusky honeyeater		C		2
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		157
animals	birds	Monarchidae	*Monarcha melanopsis*	black-faced monarch		SL		19
animals	birds	Monarchidae	*Carterornis leucotis*	white-eared monarch		C		1
animals	birds	Monarchidae	*Symposiachrus trivirgatus*	spectacled monarch		SL		5
animals	birds	Monarchidae	*Myiagra cyanoleuca*	satin flycatcher		SL		1
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		4
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		614
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		31
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		8
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		64
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		12
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		204
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		202
animals	birds	Pachycephalidae	*Colluricincla megarhyncha*	little shrike-thrush		C		8
animals	birds	Pachycephalidae	*Pachycephala pectoralis youngi*	golden whistler (south-eastern Australia)		C		1
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		213
animals	birds	Pachycephalidae	*Pachycephala pectoralis*	golden whistler		C		80
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		450
animals	birds	Pardalotidae	*Pardalotus punctatus*	spotted pardalote		C		40
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		400
animals	birds	Passeridae	*Passer domesticus*	house sparrow	Y			19
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		77
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		1
animals	birds	Petroicidae	*Eopsaltria australis*	eastern yellow robin		C		31
animals	birds	Petroicidae	*Tregellasia capito*	pale-yellow robin		C		2
animals	birds	Petroicidae	*Petroica rosea*	rose robin		C		26
animals	birds	Phalacrocoracidae	*Phalacrocorax varius*	pied cormorant		C		25
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		158
animals	birds	Phalacrocoracidae	*Phalacrocorax carbo*	great cormorant		C		26
animals	birds	Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant		C		140
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		18
animals	birds	Phasianidae	*Coturnix pectoralis*	stubble quail		C		1
animals	birds	Phasianidae	*Pavo cristatus*	Indian peafowl	Y			1
animals	birds	Pittidae	*Pitta versicolor*	noisy pitta		C		1
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		63

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animals	birds	Podicipedidae	*Poliocephalus poliocephalus*	hoary-headed grebe		C		1
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		85
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		3
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		721
animals	birds	Psittacidae	*Platycercus adscitus palliceps*	pale-headed rosella (southern form)		C		3
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		136
animals	birds	Psittacidae	*Psephotus haematonotus*	red-rumped parrot		C		3
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		411
animals	birds	Psittacidae	*Alisterus scapularis*	Australian king-parrot		C		3
animals	birds	Psittacidae	*Platycercus eximius*	eastern rosella		C		6
animals	birds	Psittacidae	*Parvipsitta pusilla*	little lorikeet		C		48
animals	birds	Psittacidae	*Platycercus elegans*	crimson rosella		C		5
animals	birds	Psophodidae	*Psophodes olivaceus*	eastern whipbird		C		43
animals	birds	Ptilonorhynchidae	*Sericulus chrysocephalus*	regent bowerbird		C		1
animals	birds	Rallidae	*Fulica atra*	Eurasian coot		C		33
animals	birds	Rallidae	*Amaurornis moluccana*	pale-vented bush-hen		C		40
animals	birds	Rallidae	*Porphyrio melanotus*	purple swamphen		C		267
animals	birds	Rallidae	*Gallinula tenebrosa*	dusky moorhen		C		219
animals	birds	Rallidae	*Lewinia pectoralis*	Lewin's rail		C		5
animals	birds	Rallidae	*Porzana tabuensis*	spotless crake		C		2
animals	birds	Rallidae	*Porzana pusilla*	Baillon's crake		C		6
animals	birds	Rallidae	*Gallirallus philippensis*	buff-banded rail		C		55
animals	birds	Recurvirostridae	*Recurvirostra novaehollandiae*	red-necked avocet		C		6
animals	birds	Recurvirostridae	*Himantopus himantopus*	black-winged stilt		C		60
animals	birds	Rhipiduridae	*Rhipidura leucophrys leucophrys*	willie wagtail (southern)		C		1
animals	birds	Rhipiduridae	*Rhipidura rufiventris*	northern fantail		C		1
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		515
animals	birds	Rhipiduridae	*Rhipidura rufifrons*	rufous fantail		SL		15
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		225
animals	birds	Scolopacidae	*Limosa limosa*	black-tailed godwit		SL		4
animals	birds	Scolopacidae	*Tringa incana*	wandering tattler		SL		1
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew		E	CE	38
animals	birds	Scolopacidae	*Limosa lapponica baueri*	Western Alaskan bar-tailed godwit		V	V	46
animals	birds	Scolopacidae	*Calidris tenuirostris*	great knot		E	CE	26
animals	birds	Scolopacidae	*Gallinago hardwickii*	Latham's snipe		SL		30
animals	birds	Scolopacidae	*Calidris ruficollis*	red-necked stint		SL		26
animals	birds	Scolopacidae	*Xenus cinereus*	terek sandpiper		SL		25
animals	birds	Scolopacidae	*Tringa brevipes*	grey-tailed tattler		SL		34
animals	birds	Scolopacidae	*Calidris canutus*	red knot		E	E	18
animals	birds	Scolopacidae	*Tringa nebularia*	common greenshank		SL		22
animals	birds	Scolopacidae	*Numenius phaeopus*	whimbrel		SL		51
animals	birds	Scolopacidae	*Arenaria interpres*	ruddy turnstone		SL		31
animals	birds	Scolopacidae	*Calidris acuminata*	sharp-tailed sandpiper		SL		21
animals	birds	Scolopacidae	*Tringa stagnatilis*	marsh sandpiper		SL		1
animals	birds	Scolopacidae	*Calidris ferruginea*	curlew sandpiper		E	CE	32
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		26

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animals	birds	Strigidae	*Ninox connivens*	barking owl		C		2
animals	birds	Strigidae	*Ninox strenua*	powerful owl		V		3
animals	birds	Sturnidae	*Acridotheres tristis*	common myna	Y			314
animals	birds	Sturnidae	*Sturnus vulgaris*	common starling	Y			82
animals	birds	Sulidae	*Morus serrator*	Australasian gannet		C		1
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		90
animals	birds	Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		C		7
animals	birds	Threskiornithidae	*Plegadis falcinellus*	glossy ibis		SL		11
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		415
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		146
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		309
animals	birds	Timaliidae	*Zosterops lateralis cornwalli*	silvereye (eastern)		C		1
animals	birds	Turdidae	*Zoothera lunulata*	Bassian thrush		C		1
animals	birds	Turnicidae	*Turnix varius*	painted button-quail		C		1
animals	birds	Tytonidae	*Tyto delicatula*	eastern barn owl		C		2
animals	insects	Hesperiidae	*Hasora khoda haslia*	narrow-banded awl				1
animals	insects	Hesperiidae	*Telicota sp.*					1
animals	insects	Hesperiidae	*Trapezites eliena*	orange ochre				1
animals	insects	Hesperiidae	*Trapezites maheta*	northern silver ochre				1
animals	insects	Hesperiidae	*Cephrenes augiades sperthias*	orange palm-dart				1
animals	insects	Hesperiidae	*Suniana sp.*					1
animals	insects	Lycaenidae	*Psychonotis caelius taygetus*	small green-banded blue				1
animals	insects	Lycaenidae	*Prosotas felderi*	short-tailed line-blue				1
animals	insects	Lycaenidae	*Candalides absimilis*	common pencilled-blue				1
animals	insects	Lycaenidae	*Nacaduba berenice berenice*	large purple line-blue				1
animals	insects	Nymphalidae	*Hypocysta irius*	orange-streaked ringlet				1
animals	insects	Nymphalidae	*Euploea corinna*	common crow				3
animals	insects	Nymphalidae	*Danaus petilia*	lesser wanderer				1
animals	insects	Nymphalidae	*Melanitis leda bankia*	evening brown				3
animals	insects	Nymphalidae	*Tirumala hamata hamata*	blue tiger				3
animals	insects	Nymphalidae	*Junonia villida villida*	meadow argus				2
animals	insects	Nymphalidae	*Danaus plexippus*	monarch				3
animals	insects	Nymphalidae	*Phaedyma shepherdi shepherdi*	white-banded plane (southern subspecies)				1
animals	insects	Nymphalidae	*Hypolimnas bolina nerina*	varied eggfly				3
animals	insects	Papilionidae	*Papilio aegeus aegeus*	orchard swallowtail (Australian subspecies)				1
animals	insects	Papilionidae	*Graphium eurypylus lycaon*	pale triangle				1
animals	insects	Papilionidae	*Graphium choredon*	blue triangle				2
animals	insects	Pieridae	*Delias nigrina*	black jezebel				1
animals	insects	Pieridae	*Pieris rapae*	cabbage white				1
animals	insects	Pieridae	*Catopsilia pomona*	lemon migrant				1
animals	insects	Pieridae	*Appias paulina ega*	yellow albatross				1
animals	insects	Pieridae	*Cepora perimale scyllara*	caper gull (Australian subspecies)				1
animals	mammals	Acrobatidae	*Acrobates pygmaeus*	feathertail glider		C		1/1
animals	mammals	Canidae	*Vulpes vulpes*	red fox	Y			7

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Dasyuridae	*Sminthopsis murina*	common dunnart		C		1
animals	mammals	Felidae	*Felis catus*	cat	Y			1
animals	mammals	Leporidae	*Lepus europaeus*	European brown hare	Y			13
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby		C		6
animals	mammals	Macropodidae	*Macropus rufogriseus*	red-necked wallaby		C		2/1
animals	mammals	Miniopteridae	*Miniopterus australis*	little bent-wing bat		C		1
animals	mammals	Molossidae	*Mormopterus sp.*					1
animals	mammals	Molossidae	*Tadarida australis*	white-striped freetail bat		C		7
animals	mammals	Muridae	*Rattus rattus*	black rat	Y			5
animals	mammals	Muridae	*Rattus lutreolus*	swamp rat		C		2
animals	mammals	Muridae	*Hydromys chrysogaster*	water rat		C		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			4
animals	mammals	Peramelidae	*Perameles nasuta*	long-nosed bandicoot		C		1
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot		C		9
animals	mammals	Petauridae	*Petaurus australis australis*	yellow-bellied glider (southern subspecies)		C		1/1
animals	mammals	Petauridae	*Petaurus norfolcensis*	squirrel glider		C		12
animals	mammals	Petauridae	*Petaurus breviceps*	sugar glider		C		2
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		11
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	2252
animals	mammals	Pseudocheiridae	*Petauroides volans volans*	southern greater glider		V	V	1
animals	mammals	Pseudocheiridae	*Pseudocheirus peregrinus*	common ringtail possum		C		16
animals	mammals	Pteropodidae	*Pteropus poliocephalus*	grey-headed flying-fox		C	V	2
animals	mammals	Pteropodidae	*Pteropus alecto*	black flying-fox		C		6
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		1
animals	mammals	Pteropodidae	*Pteropus sp.*					2
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		SL		2
animals	mammals	Vespertilionidae	*Scoteanax rueppellii*	greater broad-nosed bat		C		1
animals	mammals	Vespertilionidae	*Myotis macropus*	large-footed myotis		C		1
animals	mammals	Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		C		1
animals	mammals	Vespertilionidae	*Nyctophilus gouldi*	Gould's long-eared bat		C		2
animals	mammals	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		C		2
animals	mammals	Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		C		2
animals	ray-finned fishes	Anguillidae	*Anguilla australis*	southern shortfin eel				7
animals	ray-finned fishes	Anguillidae	*Anguilla reinhardtii*	longfin eel				24
animals	ray-finned fishes	Cichlidae	*Oreochromis mossambica*	Mozambique mouthbrooder	Y			10
animals	ray-finned fishes	Clupeidae	*Nematalosa erebi*	bony bream				2
animals	ray-finned fishes	Eleotridae	*Gobiomorphus australis*	striped gudgeon				12
animals	ray-finned fishes	Eleotridae	*Hypseleotris compressa*	empire gudgeon				18
animals	ray-finned fishes	Eleotridae	*Hypseleotris klunzingeri*	western carp gudgeon				16
animals	ray-finned fishes	Eleotridae	*Mogurnda adspersa*	southern purplespotted gudgeon				6
animals	ray-finned fishes	Eleotridae	*Hypseleotris galii*	firetail gudgeon				18
animals	ray-finned fishes	Melanotaeniidae	*Rhadinocentrus ornatus*	ornate rainbowfish				1
animals	ray-finned fishes	Melanotaeniidae	*Melanotaenia duboulayi*	crimsonspotted rainbowfish				23
animals	ray-finned fishes	Mugilidae	*Mugil cephalus*	sea mullet				17
animals	ray-finned fishes	Plotosidae	*Tandanus tandanus*	freshwater catfish				24

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	ray-finned fishes	Poeciliidae	*Xiphophorus maculatus*	platy	Y			14
animals	ray-finned fishes	Poeciliidae	*Gambusia holbrooki*	mosquitofish	Y			30
animals	ray-finned fishes	Poeciliidae	*Xiphophorus hellerii*	swordtail	Y			23
animals	ray-finned fishes	Pseudomugilidae	*Pseudomugil signifer*	Pacific blue eye				1
animals	ray-finned fishes	Retropinnidae	*Retropinna semoni*	Australian smelt				1
animals	ray-finned fishes	Terapontidae	*Leiopotherapon unicolor*	spangled perch				1
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		19
animals	reptiles	Agamidae	*Pogona vitticeps*	central bearded dragon		C		1
animals	reptiles	Agamidae	*Diporiphora australis*	tommy roundhead		C		2
animals	reptiles	Agamidae	*Intellagama lesueurii*	eastern water dragon		C		11
animals	reptiles	Boidae	*Morelia spilota*	carpet python		C		34
animals	reptiles	Chelidae	*Chelodina expansa*	broad-shelled river turtle		C		3
animals	reptiles	Chelidae	*Chelodina longicollis*	eastern snake-necked turtle		C		1
animals	reptiles	Chelidae	*Emydura macquarii macquarii*	Murray turtle		C		3
animals	reptiles	Colubridae	*Dendrelaphis punctulatus*	green tree snake		C		23
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		6
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		3
animals	reptiles	Diplodactylidae	*Nebulifera robusta*	robust velvet gecko		C		1
animals	reptiles	Diplodactylidae	*Amalosia rhombifer*	zig-zag gecko		C		1
animals	reptiles	Elapidae	*Cacophis squamulosus*	golden crowned snake		C		1
animals	reptiles	Elapidae	*Demansia vestigiata*	lesser black whipsnake		C		1/1
animals	reptiles	Elapidae	*Cryptophis nigrescens*	eastern small-eyed snake		C		3
animals	reptiles	Elapidae	*Tropidechis carinatus*	rough-scaled snake		C		1
animals	reptiles	Elapidae	*Pseudechis porphyriacus*	red-bellied black snake		C		8/1
animals	reptiles	Elapidae	*Pseudechis australis*	king brown snake		C		1
animals	reptiles	Elapidae	*Pseudonaja textilis*	eastern brown snake		C		2
animals	reptiles	Elapidae	*Hemiaspis signata*	black-bellied swamp snake		C		1
animals	reptiles	Elapidae	*Cacophis harriettae*	white-crowned snake		C		1/1
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whipsnake		C		7
animals	reptiles	Gekkonidae	*Gehyra dubia*	dubious dtella		C		8
animals	reptiles	Gekkonidae	*Hemidactylus frenatus*	house gecko	Y			1
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		4
animals	reptiles	Scincidae	*Anomalopus verreauxii*	three-clawed worm-skink		C		4
animals	reptiles	Scincidae	*Lampropholis delicata*	dark-flecked garden sunskink		C		14
animals	reptiles	Scincidae	*Calyptotis scutirostrum*	scute-snouted calyptotis		C		2
animals	reptiles	Scincidae	*Cryptoblepharus pulcher pulcher*	elegant snake-eyed skink		C		7
animals	reptiles	Scincidae	*Ctenotus taeniolatus*	copper-tailed skink		C		3/1
animals	reptiles	Scincidae	*Carlia vivax*	tussock rainbow-skink		C		4
animals	reptiles	Scincidae	*Tiliqua scincoides*	eastern blue-tongued lizard		C		12
animals	reptiles	Scincidae	*Lygisaurus foliorum*	tree-base litter-skink		C		2
animals	reptiles	Scincidae	*Ctenotus sp.*					1
animals	reptiles	Scincidae	*Eulamprus quoyii*	eastern water skink		C		4
animals	reptiles	Scincidae	*Ctenotus spaldingi*	straight-browed ctenotus		C		3
animals	reptiles	Scincidae	*Concinnia martini*	dark bar-sided skink		C		1
animals	reptiles	Typhlopidae	*Anilios ligatus*	robust blind snake		C		1/1
animals	reptiles	Varanidae	*Varanus varius*	lace monitor		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	uncertain	Indeterminate	*Indeterminate*	Unknown or Code Pending		C		1
fungi	club fungi	Basidiomycota	*Tylopilus*			C		5/5
fungi	club fungi	Basidiomycota	*Stropharia rugosoannulata*			C		1/1
fungi	club fungi	Basidiomycota	*Leucoagaricus fimetarius*			C		1/1
fungi	club fungi	Basidiomycota	*Strobilomyces velutipes*			C		1/1
fungi	club fungi	Basidiomycota	*Panaeolus sphinctrinus*			C		1/1
fungi	club fungi	Basidiomycota	*Panus*			C		1/1
fungi	club fungi	Basidiomycota	*Amanita*			C		2/2
fungi	club fungi	Basidiomycota	*Boletus*			C		2/2
fungi	club fungi	Basidiomycota	*Lepiota*			C		2/2
fungi	club fungi	Basidiomycota	*Agaricus*			C		1/1
fungi	club fungi	Basidiomycota	*Conocybe*			C		1/1
fungi	club fungi	Basidiomycota	*Panaeolus*			C		1/1
fungi	club fungi	Basidiomycota	*Gymnopilus*			C		1/1
fungi	club fungi	Basidiomycota	*Leucocoprinus*			C		1/1
fungi	club fungi	Basidiomycota	*Pulveroboletus*			C		1/1
fungi	club fungi	Basidiomycota	*Suillus cothurnatus*			C		1/1
fungi	sac fungi	Arthoniaceae	*Arthonia*			C		1/1
fungi	sac fungi	Arthoniaceae	*Arthonia amoena*			C		1/1
fungi	sac fungi	Arthoniaceae	*Arthonia radiata*			C		1/1
fungi	sac fungi	Arthoniaceae	*Asteroporum punctuliforme*			C		1/1
fungi	sac fungi	Brigantiaeaceae	*Brigantiaea tricolor*			C		1/1
fungi	sac fungi	Candelariaceae	*Candelaria concolor*			C		1/1
fungi	sac fungi	Cladiaceae	*Cladia muelleri*			C		1/1
fungi	sac fungi	Cladoniaceae	*Cladonia rigida var. rigida*			C		1/1
fungi	sac fungi	Cladoniaceae	*Thysanothecium scutellatum*			C		1/1
fungi	sac fungi	Graphidaceae	*Ocellularia bicuspidata*			C		1/1
fungi	sac fungi	Graphidaceae	*Dictyographa*			C		2/2
fungi	sac fungi	Graphidaceae	*Ocellularia kalbii*			C		1/1
fungi	sac fungi	Graphidaceae	*Phaeographis*			C		3/3
fungi	sac fungi	Graphidaceae	*Graphis*			C		1/1
fungi	sac fungi	Graphidaceae	*Phaeographis lindigiana*			C		1/1
fungi	sac fungi	Graphidaceae	*Platythecium pertenellum*			C		1/1
fungi	sac fungi	Graphidaceae	*Asteristion leucophthalmum*			C		1/1
fungi	sac fungi	Graphidaceae	*Thelotrema subtile*			C		1/1
fungi	sac fungi	Haematommaceae	*Haematomma persoonii*			C		2/2
fungi	sac fungi	Lecanactidaceae	*Schismatomma shirleyanum*			C		1/1
fungi	sac fungi	Lecanoraceae	*Lecanora caesiorubella*			C		3/3
fungi	sac fungi	Lecanoraceae	*Lecanora argentata*			C		5/5
fungi	sac fungi	Lecanoraceae	*Lecanora helva*			C		1/1
fungi	sac fungi	Lecanoraceae	*Lecanora*			C		1/1
fungi	sac fungi	Lecideaceae	*Malcolmiella*			C		2/2
fungi	sac fungi	Lecideaceae	*Lecidea phaeocarpa*			C		1/1
fungi	sac fungi	Lichen	*Lichen*			C		1/1
fungi	sac fungi	Lobariaceae	*Crocodia aurata*			C		1/1
fungi	sac fungi	Lopadiaceae	*Lopadium brisbanense*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
fungi	sac fungi	Micareaceae	*Micarea*			C		4/4
fungi	sac fungi	Mycocaliciaceae	*Stenocybe*			C		2/2
fungi	sac fungi	Parmeliaceae	*Bulbothrix apophysata*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema reticulatum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema norsticticatum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Austroparmelina conlabrosa*			C		3/3
fungi	sac fungi	Parmeliaceae	*Parmotrema crinitum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Canoparmelia texana*			C		2/2
fungi	sac fungi	Parmeliaceae	*Bulbothrix tabacina*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema tinctorum*			C		11/11
fungi	sac fungi	Pertusariaceae	*Pertusaria*			C		2/2
fungi	sac fungi	Pertusariaceae	*Pertusaria undulata*			C		1/1
fungi	sac fungi	Pertusariaceae	*Pertusaria pertusella*			C		1/1
fungi	sac fungi	Pertusariaceae	*Pertusaria leioplacella*			C		2/2
fungi	sac fungi	Pertusariaceae	*Ochrolechia subpallescens*			C		3/3
fungi	sac fungi	Pertusariaceae	*Pertusaria elliptica var. elliptica*			C		1/1
fungi	sac fungi	Physciaceae	*Physcia minor*			C		3/3
fungi	sac fungi	Physciaceae	*Hyperphyscia adglutinata*			C		2/2
fungi	sac fungi	Physciaceae	*Dirinaria subconfluens*			C		1/1
fungi	sac fungi	Physciaceae	*Buellia sanguinariella*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia speciosa*			C		6/6
fungi	sac fungi	Physciaceae	*Buellia subcallispora*			C		3/3
fungi	sac fungi	Physciaceae	*Physcia tribacoides*			C		2/2
fungi	sac fungi	Physciaceae	*Dirinaria sekikaica*			C		11/11
fungi	sac fungi	Physciaceae	*Dirinaria confluens*			C		3/3
fungi	sac fungi	Physciaceae	*Dirinaria applanata*			C		15/15
fungi	sac fungi	Physciaceae	*Buellia*			C		2/2
fungi	sac fungi	Physciaceae	*Physcia*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia*			C		2/2
fungi	sac fungi	Physciaceae	*Buellia dissa*			C		5/5
fungi	sac fungi	Physciaceae	*Buellia dialyta*			C		1/1
fungi	sac fungi	Physciaceae	*Buellia curatellae*			C		3/3
fungi	sac fungi	Physciaceae	*Cratiria subtropica*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria aegialita*			C		2/2
fungi	sac fungi	Ramalinaceae	*Ramalina inflata subsp. perpusilla*			C		1/1
fungi	sac fungi	Teloschistaceae	*Caloplaca*			C		1/1
fungi	sac fungi	Teloschistaceae	*Protoblastenia*			C		1/1
fungi	sac fungi	Trichotheliaceae	*Porina*			C		1/1
fungi	sac fungi	Trichotheliaceae	*Porina eminentior*			C		1/1
fungi	sac fungi	Trichotheliaceae	*Porina mastoidea*			C		1/1
fungi	sac fungi	Usneaceae	*Usnea*			C		1/1
fungi	sac fungi	Usneaceae	*Usnea dasaea*			C		1/1
fungi	sac fungi	Usneaceae	*Usnea baileyi*			C		1/1
fungi	uncertain	Ascomycota	*Julella lactea*			C		1/1
plants	ferns	Adiantaceae	*Pellaea nana*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	ferns	Adiantaceae	*Pellaea paradoxa*	heart fern		C		1
plants	ferns	Adiantaceae	*Adiantum formosum*			C		1/1
plants	ferns	Adiantaceae	*Adiantum hispidulum*			C		1
plants	ferns	Adiantaceae	*Adiantum hispidulum var. hispidulum*			C		1/1
plants	ferns	Adiantaceae	*Pityrogramma calomelanos var. austroamericana*		Y			1/1
plants	ferns	Aspleniaceae	*Asplenium flabellifolium*	necklace fern		C		1/1
plants	ferns	Blechnaceae	*Doodia media*			C		1
plants	ferns	Blechnaceae	*Doodia caudata*			C		1/1
plants	ferns	Dennstaedtiaceae	*Pteridium esculentum*	common bracken		C		1
plants	ferns	Dicksoniaceae	*Calochlaena dubia*			C		1
plants	ferns	Gleicheniaceae	*Gleichenia dicarpa*	pouched coral fern		C		2/2
plants	ferns	Lindsaeaceae	*Lindsaea linearis*	screw fern		C		1/1
plants	ferns	Lindsaeaceae	*Lindsaea ensifolia*			C		2/1
plants	ferns	Lindsaeaceae	*Lindsaea ensifolia subsp. agatii x L.microphylla*			C		1/1
plants	ferns	Lindsaeaceae	*Lindsaea*			C		2/2
plants	ferns	Lindsaeaceae	*Lindsaea fraseri*			C		1/1
plants	ferns	Lindsaeaceae	*Lindsaea incisa*			C		1
plants	ferns	Lindsaeaceae	*Lindsaea ensifolia subsp. agatii*			C		1/1
plants	ferns	Marsileaceae	*Marsilea hirsuta*	hairy nardoo		C		1/1
plants	ferns	Salviniaceae	*Salvinia molesta*	salvinia	Y			3/3
plants	ferns	Schizaeaceae	*Lygodium japonicum*		Y			1/1
plants	ferns	Schizaeaceae	*Schizaea dichotoma*	branched comb fern		C		1/1
plants	ferns	Thelypteridaceae	*Christella dentata*	creek fern		C		1
plants	higher dicots	Acanthaceae	*Thunbergia fragrans*		Y			1/1
plants	higher dicots	Acanthaceae	*Harnieria hygrophiloides*	white karambal		C		1/1
plants	higher dicots	Acanthaceae	*Dyschoriste depressa*		Y			1/1
plants	higher dicots	Acanthaceae	*Hypoestes aristata*		Y			1/1
plants	higher dicots	Amaranthaceae	*Deeringia amaranthoides*	redberry		C		1/1
plants	higher dicots	Apiaceae	*Platysace ericoides*	heath platysace		C		2/2
plants	higher dicots	Apocynaceae	*Alyxia ruscifolia*			C		2/2
plants	higher dicots	Apocynaceae	*Parsonsia leichhardtii*	black silkpod		C		1/1
plants	higher dicots	Apocynaceae	*Parsonsia longipetiolata*			C		1/1
plants	higher dicots	Apocynaceae	*Hoya australis subsp. australis*			C		1/1
plants	higher dicots	Apocynaceae	*Parsonsia brisbanensis*	broad-leaved monkey vine		C		2/2
plants	higher dicots	Apocynaceae	*Carissa ovata*	currantbush		C		1/1
plants	higher dicots	Apocynaceae	*Parsonsia straminea*	monkey rope		C		1
plants	higher dicots	Araliaceae	*Hydrocotyle tripartita*			C		1/1
plants	higher dicots	Araliaceae	*Schefflera arboricola*		Y			1/1
plants	higher dicots	Araliaceae	*Astrotricha longifolia*	star hair bush		C		1/1
plants	higher dicots	Araliaceae	*Astrotricha umbrosa*			C		4/4
plants	higher dicots	Araliaceae	*Trachymene incisa subsp. incisa*			C		2/2
plants	higher dicots	Asteraceae	*Ageratina riparia*	mistflower	Y			1/1
plants	higher dicots	Asteraceae	*Solidago altissima subsp. altissima*	goldenrod	Y			1/1
plants	higher dicots	Asteraceae	*Crassocephalum crepidioides*	thickhead	Y			1/1
plants	higher dicots	Asteraceae	*Calotis cuneifolia*	burr daisy		C		1/1
plants	higher dicots	Asteraceae	*Picris angustifolia subsp. carolorum-henricorum*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Asteraceae	*Thymophylla tenuiloba var. tenuiloba*		Y			1/1
plants	higher dicots	Asteraceae	*Ageratina adenophora*	crofton weed	Y			1/1
plants	higher dicots	Asteraceae	*Ageratum houstonianum*	blue billygoat weed	Y			1/1
plants	higher dicots	Basellaceae	*Anredera cordifolia*	Madeira vine	Y			1/1
plants	higher dicots	Bignoniaceae	*Pandorea floribunda*			C		1/1
plants	higher dicots	Bignoniaceae	*Pandorea pandorana*	wonga vine		C		1
plants	higher dicots	Byttneriaceae	*Commersonia dasyphylla*			C		5/5
plants	higher dicots	Cactaceae	*Opuntia tomentosa*	velvety tree pear	Y			1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista nomame var. nomame*			C		1/1
plants	higher dicots	Campanulaceae	*Lobelia stenophylla*			C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia communis*	tufted bluebell		C		1/1
plants	higher dicots	Campanulaceae	*Lobelia gibbosa var. gibbosa*			C		2/2
plants	higher dicots	Capparaceae	*Capparis sarmentosa*	scrambling caper		C		1/1
plants	higher dicots	Capparaceae	*Capparis arborea*	brush caper berry		C		1/1
plants	higher dicots	Casuarinaceae	*Casuarina glauca*	swamp she-oak		C		1/1
plants	higher dicots	Celastraceae	*Denhamia celastroides*	broad-leaved boxwood		C		1/1
plants	higher dicots	Celastraceae	*Denhamia silvestris*			C		1/1
plants	higher dicots	Chenopodiaceae	*Suaeda australis*			C		1/1
plants	higher dicots	Chenopodiaceae	*Chenopodium album*	fat-hen	Y			1/1
plants	higher dicots	Chenopodiaceae	*Enchylaena tomentosa var. glabra*			C		1/1
plants	higher dicots	Convolvulaceae	*Polymeria calycina*	pink bindweed		C		2/2
plants	higher dicots	Cornaceae	*Alangium villosum subsp. tomentosum*			C		1/1
plants	higher dicots	Crassulaceae	*Bryophyllum proliferum*		Y			1/1
plants	higher dicots	Cucurbitaceae	*Momordica charantia*	balsam pear	Y			1/1
plants	higher dicots	Dilleniaceae	*Hibbertia diffusa*			C		3/3
plants	higher dicots	Dilleniaceae	*Hibbertia vestita*			C		1/1
plants	higher dicots	Dilleniaceae	*Hibbertia vestita var. vestita*			C		1/1
plants	higher dicots	Dilleniaceae	*Hibbertia aspera*			C		1/1
plants	higher dicots	Elaeocarpaceae	*Elaeocarpus obovatus*	blueberry ash		C		1/1
plants	higher dicots	Ericaceae	*Melichrus procumbens*	jam tarts		C		1/1
plants	higher dicots	Ericaceae	*Leucopogon biflorus*			C		1/1
plants	higher dicots	Euphorbiaceae	*Croton insularis*	Queensland cascarilla		C		2/2
plants	higher dicots	Euphorbiaceae	*Acalypha eremorum*	soft acalypha		C		1/1
plants	higher dicots	Euphorbiaceae	*Tragia novae-hollandiae*	stinging-vine		C		1/1
plants	higher dicots	Fabaceae	*Vicia hirsuta*	hairy vetch	Y			1/1
plants	higher dicots	Fabaceae	*Derris involuta*	native derris		C		1/1
plants	higher dicots	Fabaceae	*Hovea acutifolia*			C		8/8
plants	higher dicots	Fabaceae	*Pultenaea retusa*			C		1/1
plants	higher dicots	Fabaceae	*Crotalaria brevis*			C		1/1
plants	higher dicots	Fabaceae	*Dillwynia retorta*			C		1/1
plants	higher dicots	Fabaceae	*Dillwynia sieberi*			C		1/1
plants	higher dicots	Fabaceae	*Pultenaea euchila*	orange pultenaea		C		2/2
plants	higher dicots	Fabaceae	*Pultenaea villosa*	hairy bush pea		C		2/2
plants	higher dicots	Fabaceae	*Daviesia villifera*	prickly daviesia		C		1/1
plants	higher dicots	Fabaceae	*Hovea heterophylla*			C		3/3
plants	higher dicots	Fabaceae	*Jacksonia scoparia*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Fabaceae	*Kennedia rubicunda*	red Kennedy pea		C		1/1
plants	higher dicots	Fabaceae	*Pultenaea paleacea*			C		2/2
plants	higher dicots	Fabaceae	*Callerya megasperma*	native wisteria		C		1
plants	higher dicots	Fabaceae	*Podolobium scandens*			C		2/2
plants	higher dicots	Fabaceae	*Pultenaea myrtoides*			C		2/2
plants	higher dicots	Fabaceae	*Daviesia umbellulata*			C		1/1
plants	higher dicots	Fabaceae	*Isotropis filicaulis*			C		1/1
plants	higher dicots	Fabaceae	*Phyllota phylicoides*	yellow peabush		C		4/4
plants	higher dicots	Fabaceae	*Pultenaea petiolaris*			C		2/2
plants	higher dicots	Fabaceae	*Crotalaria grahamiana*		Y			1/1
plants	higher dicots	Fabaceae	*Indigofera circinella*		Y			1/1
plants	higher dicots	Fabaceae	*Pultenaea cunninghamii*	prickly pea		C		1/1
plants	higher dicots	Fabaceae	*Gompholobium latifolium*	broad wedge pea		C		1/1
plants	higher dicots	Fabaceae	*Podolobium aciculiferum*			C		1/1
plants	higher dicots	Fabaceae	*Crotalaria pallida var. obovata*		Y			1/1
plants	higher dicots	Fabaceae	*Galactia tenuiflora var. lucida*			C		1/1
plants	higher dicots	Fabaceae	*Macrotyloma axillare var. axillare*		Y			1/1
plants	higher dicots	Fabaceae	*Indigofera australis subsp. australis*			C		2/2
plants	higher dicots	Fabaceae	*Daviesia ulicifolia subsp. stenophylla*			C		3/3
plants	higher dicots	Goodeniaceae	*Velleia spathulata*	wild pansies		C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia bellidifolia subsp. argentea*			C		2/2
plants	higher dicots	Goodeniaceae	*Dampiera sylvestris*	blue dampiera		C		1/1
plants	higher dicots	Gyrostemonaceae	*Codonocarpus attenuatus*			C		1/1
plants	higher dicots	Haloragaceae	*Myriophyllum gracile var. gracile*			C		2/2
plants	higher dicots	Haloragaceae	*Haloragis heterophylla*	rough raspweed		C		1/1
plants	higher dicots	Lamiaceae	*Clerodendrum tomentosum*			C		1/1
plants	higher dicots	Lamiaceae	*Plectranthus verticillatus*		Y			1/1
plants	higher dicots	Lamiaceae	*Plectranthus amboinicus*	allspice	Y			1/1
plants	higher dicots	Lamiaceae	*Callicarpa pedunculata*	velvet leaf		C		2/2
plants	higher dicots	Lamiaceae	*Chloanthes parviflora*			C		1/1
plants	higher dicots	Lamiaceae	*Westringia eremicola*	slender westringia		C		8/8
plants	higher dicots	Lamiaceae	*Anisomeles moschata*			C		1/1
plants	higher dicots	Lamiaceae	*Gmelina leichhardtii*	white beech		C		1/1
plants	higher dicots	Loganiaceae	*Mitrasacme paludosa*			C		1/1
plants	higher dicots	Loganiaceae	*Orianthera pusilla*			C		2/2
plants	higher dicots	Loranthaceae	*Amyema congener subsp. congener*			C		2/2
plants	higher dicots	Loranthaceae	*Dendrophthoe vitellina*	long-flowered mistletoe		C		2/2
plants	higher dicots	Loranthaceae	*Amyema congener subsp. rotundifolia*			C		1/1
plants	higher dicots	Lythraceae	*Cuphea carthagenensis*		Y			1/1
plants	higher dicots	Malvaceae	*Hibiscus heterophyllus*			C		1/1
plants	higher dicots	Meliaceae	*Melia azedarach*	white cedar		C		1/1
plants	higher dicots	Menyanthaceae	*Nymphoides indica*	water snowflake		C		1
plants	higher dicots	Mimosaceae	*Acacia hispidula*			C		9/9
plants	higher dicots	Mimosaceae	*Acacia fimbriata*	Brisbane golden wattle		C		7/7
plants	higher dicots	Mimosaceae	*Acacia conferta*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia complanata*	flatstem wattle		C		1/1

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plants	higher dicots	Mimosaceae	*Acacia aulacocarpa*			C		1
plants	higher dicots	Mimosaceae	*Acacia juncifolia*			C		6/6
plants	higher dicots	Mimosaceae	*Acacia concurrens*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia leiocalyx subsp. leiocalyx*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia falcata*	sickle wattle		C		2/2
plants	higher dicots	Molluginaceae	*Mollugo verticillata*		Y			1/1
plants	higher dicots	Myrsinaceae	*Myrsine howittiana*			C		1/1
plants	higher dicots	Myrsinaceae	*Ardisia crenata*		Y			1/1
plants	higher dicots	Myrtaceae	*Eucalyptus siderophloia*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus tereticornis*			C		1
plants	higher dicots	Myrtaceae	*Melaleuca quinquenervia*	swamp paperbark		C		3/1
plants	higher dicots	Myrtaceae	*Leptospermum juniperinum*	prickly tea-tree		C		1/1
plants	higher dicots	Myrtaceae	*Leptospermum polygalifolium*	tantoon		C		3/3
plants	higher dicots	Myrtaceae	*Eucalyptus fibrosa subsp. fibrosa*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus racemosa subsp. racemosa*	scribbly gum		C		3/1
plants	higher dicots	Myrtaceae	*Melaleuca pachyphylla*			C		2/2
plants	higher dicots	Myrtaceae	*Lophostemon confertus*	brush box		C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus resinifera*	red mahogany		C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus helidonica*			C		1/1
plants	higher dicots	Myrtaceae	*Rhodamnia rubescens*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus curtisii*	Plunkett mallee		NT		7/7
plants	higher dicots	Myrtaceae	*Corymbia intermedia*	pink bloodwood		C		2/1
plants	higher dicots	Myrtaceae	*Melaleuca salicina*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus robusta*	swamp mahogany		C		1
plants	higher dicots	Myrtaceae	*Syzygium australe*	scrub cherry		C		1
plants	higher dicots	Myrtaceae	*Sannantha collina*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia citriodora subsp. variegata*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus seeana*	narrow-leaved red gum		C		4/3
plants	higher dicots	Myrtaceae	*Eucalyptus carnea*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca nodosa*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca sieberi*			C		1/1
plants	higher dicots	Ochnaceae	*Ochna serrulata*	ochna	Y			1
plants	higher dicots	Orobanchaceae	*Striga parviflora*			C		1/1
plants	higher dicots	Oxalidaceae	*Oxalis exilis*			C		1/1
plants	higher dicots	Passifloraceae	*Passiflora suberosa subsp. litoralis*		Y			1/1
plants	higher dicots	Phyllanthaceae	*Breynia oblongifolia*			C		1
plants	higher dicots	Phyllanthaceae	*Poranthera microphylla*	small poranthera		C		1/1
plants	higher dicots	Phyllanthaceae	*Glochidion sumatranum*	umbrella cheese tree		C		1/1
plants	higher dicots	Plantaginaceae	*Scoparia dulcis*	scoparia	Y			1/1
plants	higher dicots	Polygalaceae	*Polygala paniculata*		Y			1/1
plants	higher dicots	Polygalaceae	*Comesperma hispidulum*			C		3/3
plants	higher dicots	Polygalaceae	*Comesperma sphaerocarpum*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea banksii*			C		1/1
plants	higher dicots	Proteaceae	*Banksia integrifolia*			C		1
plants	higher dicots	Proteaceae	*Persoonia tenuifolia*			C		1/1
plants	higher dicots	Proteaceae	*Hakea florulenta*	three-nerved willow hakea		C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Proteaceae	*Banksia oblongifolia*	dwarf banksia		C		1
plants	higher dicots	Proteaceae	*Macadamia integrifolia*	macadamia nut		V	V	2/2
plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		1/1
plants	higher dicots	Rosaceae	*Rubus laudatus*		Y			1/1
plants	higher dicots	Rosaceae	*Rosa laevigata*	cherokee rose	Y			2/2
plants	higher dicots	Rubiaceae	*Opercularia diphylla*			C		1/1
plants	higher dicots	Rubiaceae	*Cyclophyllum coprosmoides var. coprosmoides*			C		1/1
plants	higher dicots	Rubiaceae	*Ixora beckleri*	brown coffeewood		C		1/1
plants	higher dicots	Rubiaceae	*Pomax umbellata*			C		1/1
plants	higher dicots	Rubiaceae	*Spermacoce remota*		Y			1/1
plants	higher dicots	Rutaceae	*Pentaceras australe*	bastard crow's ash		C		1/1
plants	higher dicots	Rutaceae	*Zieria furfuracea subsp. gymnocarpa*			E		28/28
plants	higher dicots	Rutaceae	*Acronychia imperforata*	beach acronychia		C		1/1
plants	higher dicots	Rutaceae	*Boronia polygalifolia*	dwarf boronia		C		1/1
plants	higher dicots	Rutaceae	*Acronychia pauciflora*	soft acronychia		C		2/2
plants	higher dicots	Rutaceae	*Zieria smithii*			C		2/2
plants	higher dicots	Santalaceae	*Exocarpos latifolius*			C		1/1
plants	higher dicots	Sapindaceae	*Cupaniopsis shirleyana*	wedge-leaf tuckeroo		V	V	1/1
plants	higher dicots	Sapindaceae	*Mischocarpus anodontus*	veiny pearfruit		C		1/1
plants	higher dicots	Sapindaceae	*Cupaniopsis parvifolia*	small-leaved tuckeroo		C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea triquetra*	large-leaved hop bush		C		2/2
plants	higher dicots	Sapotaceae	*Planchonella australis*			C		1/1
plants	higher dicots	Scrophulariaceae	*Myoporum acuminatum*	coastal boobialla		C		1/1
plants	higher dicots	Solanaceae	*Cestrum nocturnum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum nodiflorum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum stelligerum*	devil's needles		C		5/5
plants	higher dicots	Sparrmanniaceae	*Grewia latifolia*	dysentery plant		C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium tenerum*			C		1/1
plants	higher dicots	Symplocaceae	*Symplocos harroldii*	hairy hazelwood		NT		1/1
plants	higher dicots	Tropaeolaceae	*Tropaeolum majus*	garden nasturtium	Y			1/1
plants	higher dicots	Verbenaceae	*Lantana camara*	lantana	Y			1
plants	higher dicots	Verbenaceae	*Phyla canescens*		Y			1/1
plants	higher dicots	Verbenaceae	*Lantana montevidensis*	creeping lantana	Y			1/1
plants	higher dicots	Violaceae	*Hybanthus monopetalus*			C		1/1
plants	higher dicots	Violaceae	*Afrohybanthus stellarioides*			C		1/1
plants	higher dicots	Vitaceae	*Cayratia clematidea*	slender grape		C		1/1
plants	liverworts	Aneuraceae	*Riccardia graeffei*			C		1/1
plants	liverworts	Lejeuneaceae	*Lejeunea*			C		1/1
plants	lower dicots	Annonaceae	*Melodorum leichhardtii*			C		1
plants	lower dicots	Lauraceae	*Cassytha filiformis*	dodder laurel		C		1/1
plants	lower dicots	Lauraceae	*Cinnamomum camphora*	camphor laurel	Y			2/1
plants	lower dicots	Lauraceae	*Cryptocarya bidwillii*	yellow laurel		C		1/1
plants	lower dicots	Lauraceae	*Cassytha glabella forma glabella*			C		1/1
plants	lower dicots	Linderniaceae	*Artanema fimbriatum*			C		2/2
plants	lower dicots	Menispermaceae	*Pleogyne australis*	wiry grape		C		1/1
plants	lower dicots	Menispermaceae	*Stephania japonica var. discolor*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	lower dicots	Monimiaceae	*Wilkiea huegeliana*	veiny wilkiea		C		1/1
plants	lower dicots	Nymphaeaceae	*Nymphaea mexicana x N. unknown*			C		1/1
plants	lower dicots	Papaveraceae	*Fumaria officinalis subsp. officinalis*		Y			1/1
plants	lower dicots	Ranunculaceae	*Clematis glycinoides*			C		1/1
plants	lower dicots	Ranunculaceae	*Ranunculus sceleratus subsp. sceleratus*		Y			1/1
plants	monocots	Alismataceae	*Sagittaria platyphylla*	sagittaria	Y			2/2
plants	monocots	Alismataceae	*Echinodorus cordifolius*		Y			1/1
plants	monocots	Araceae	*Gymnostachys anceps*	settler's flax		C		1/1
plants	monocots	Asparagaceae	*Asparagus macowanii*		Y			1/1
plants	monocots	Colchicaceae	*Burchardia umbellata*			C		1/1
plants	monocots	Commelinaceae	*Murdannia graminea*	murdannia		C		1/1
plants	monocots	Commelinaceae	*Callisia repens*		Y			1/1
plants	monocots	Cyperaceae	*Eleocharis philippinensis*			C		1/1
plants	monocots	Cyperaceae	*Rhynchospora brownii*	beak rush		C		1/1
plants	monocots	Cyperaceae	*Schoenus apogon var. apogon*			C		1/1
plants	monocots	Cyperaceae	*Lepironia articulata*			C		2/2
plants	monocots	Cyperaceae	*Gahnia aspera*			C		1/1
plants	monocots	Cyperaceae	*Cyperus fulvus*			C		1/1
plants	monocots	Cyperaceae	*Scleria rugosa*			C		1/1
plants	monocots	Cyperaceae	*Cyperus lucidus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus pilosus*			C		1/1
plants	monocots	Cyperaceae	*Fuirena ciliaris*			C		1/1
plants	monocots	Cyperaceae	*Baumea articulata*	jointed twigrush		C		1/1
plants	monocots	Cyperaceae	*Baumea rubiginosa*	soft twigrush		C		2/2
plants	monocots	Cyperaceae	*Cyperus aquatilis*			C		1/1
plants	monocots	Cyperaceae	*Isolepis inundata*	swamp club rush		C		1/1
plants	monocots	Cyperaceae	*Ptilothrix deusta*			C		1/1
plants	monocots	Cyperaceae	*Cyperus aggregatus*		Y			1/1
plants	monocots	Cyperaceae	*Rhynchospora rubra*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis velata*			C		1/1
plants	monocots	Cyperaceae	*Chorizandra cymbaria*			C		1/1
plants	monocots	Cyperaceae	*Cyperus involucratus*		Y			1/1
plants	monocots	Dracaenaceae	*Sansevieria trifasciata*	mother-in-law's tongue	Y			1/1
plants	monocots	Eriocaulaceae	*Eriocaulon scariosum*			C		1/1
plants	monocots	Hemerocallidaceae	*Dianella longifolia var. stenophylla*			C		1/1
plants	monocots	Hemerocallidaceae	*Dianella caerulea var. vannata*			C		1/1
plants	monocots	Hemerocallidaceae	*Dianella revoluta*			C		1
plants	monocots	Hemerocallidaceae	*Dianella brevipedunculata*			C		1/1
plants	monocots	Hypoxidaceae	*Molineria capitulata*			C		1
plants	monocots	Iridaceae	*Patersonia glabrata*			C		1/1
plants	monocots	Iridaceae	*Aristea ecklonii*	blue stars	Y			1/1
plants	monocots	Iridaceae	*Sisyrinchium rosulatum*		Y			1/1
plants	monocots	Iridaceae	*Patersonia sericea var. sericea*			C		1/1
plants	monocots	Johnsoniaceae	*Tricoryne elatior*	yellow autumn lily		C		2/2
plants	monocots	Juncaceae	*Juncus planifolius*			C		1/1
plants	monocots	Juncaceae	*Juncus polyanthemus*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Juncaceae	*Juncus continuus*			C		1/1
plants	monocots	Juncaginaceae	*Cycnogeton microtuberosus*			C		1/1
plants	monocots	Laxmanniaceae	*Lomandra longifolia*			C		1
plants	monocots	Laxmanniaceae	*Eustrephus latifolius*	wombat berry		C		2/1
plants	monocots	Laxmanniaceae	*Lomandra filiformis*			C		1
plants	monocots	Marantaceae	*Thalia geniculata*		Y			1/1
plants	monocots	Orchidaceae	*Calochilus grandiflorus*	giant beard orchid		C		1/1
plants	monocots	Orchidaceae	*Geodorum densiflorum*	pink nodding orchid		C		1
plants	monocots	Orchidaceae	*Dendrobium speciosum*			C		1
plants	monocots	Orchidaceae	*Prasophyllum brevilabre*			C		2/2
plants	monocots	Orchidaceae	*Phaius australis*			E	E	2/1
plants	monocots	Orchidaceae	*Cymbidium suave*			C		2/1
plants	monocots	Orchidaceae	*Spiranthes australis*			C		2/2
plants	monocots	Orchidaceae	*Microtis parviflora*	slender onion orchid		C		1/1
plants	monocots	Philydraceae	*Philydrum lanuginosum*	frogsmouth		C		1/1
plants	monocots	Poaceae	*Eriochloa procera*	slender cupgrass		C		1/1
plants	monocots	Poaceae	*Eriachne glabrata*			C		2/2
plants	monocots	Poaceae	*Sorghum halepense*	Johnson grass	Y			1/1
plants	monocots	Poaceae	*Cenchrus purpureus*		Y			1/1
plants	monocots	Poaceae	*Digitaria diminuta*			C		1/1
plants	monocots	Poaceae	*Entolasia whiteana*			C		1/1
plants	monocots	Poaceae	*Sacciolepis indica*	Indian cupscale grass		C		1/1
plants	monocots	Poaceae	*Themeda triandra*	kangaroo grass		C		1/1
plants	monocots	Poaceae	*Leersia hexandra*	swamp rice grass		C		1/1
plants	monocots	Poaceae	*Panicum effusum*			C		1/1
plants	monocots	Poaceae	*Panicum simile*			C		2/2
plants	monocots	Poaceae	*Hordeum glaucum*		Y			1/1
plants	monocots	Poaceae	*Setaria parviflora*	slender pigeon grass	Y			1/1
plants	monocots	Poaceae	*Setaria sphacelata*		Y			2/2
plants	monocots	Poaceae	*Urochloa decumbens*		Y			1/1
plants	monocots	Poaceae	*Dichelachne montana*			C		3/3
plants	monocots	Poaceae	*Entolasia marginata*	bordered panic		C		3/3
plants	monocots	Poaceae	*Paspalidium distans*	shotgrass		C		2/2
plants	monocots	Poaceae	*Cymbopogon refractus*	barbed-wire grass		C		3/3
plants	monocots	Poaceae	*Digitaria longiflora*			C		1/1
plants	monocots	Poaceae	*Digitaria parviflora*			C		2/2
plants	monocots	Poaceae	*Digitaria violascens*	bastard summergrass	Y			1/1
plants	monocots	Poaceae	*Dichanthium annulatum*	sheda grass	Y			1/1
plants	monocots	Poaceae	*Aristida caput-medusae*			C		1/1
plants	monocots	Poaceae	*Paspalum scrobiculatum*	ditch millet		C		3/3
plants	monocots	Poaceae	*Eragrostis spartinoides*			C		1/1
plants	monocots	Poaceae	*Ehrharta erecta var. erecta*		Y			1/1
plants	monocots	Poaceae	*Megathyrsus maximus var. maximus*		Y			1/1
plants	monocots	Poaceae	*Aristida benthamii var. benthamii*			C		2/2
plants	monocots	Poaceae	*Calyptochloa gracillima subsp. gracillima*			C		1/1
plants	monocots	Poaceae	*Aristida queenslandica var. queenslandica*			C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Aristida queenslandica var. dissimilis*			C		1/1
plants	monocots	Poaceae	*Hemarthria uncinata var. spathacea*			C		1/1
plants	monocots	Poaceae	*Paspalum urvillei*	vasey grass	Y			1/1
plants	monocots	Potamogetonaceae	*Potamogeton octandrus*			C		1/1
plants	monocots	Smilacaceae	*Smilax glyciphylla*	sweet sarsaparilla		C		1/1
plants	monocots	Typhaceae	*Typha domingensis*			C		1
plants	monocots	Xanthorrhoeaceae	*Xanthorrhoea macronema*			C		1/1
protists	blue-green algae	Cyanophyceae	*Phormidium submembranaceum*			C		1/1
protists	green algae	Chlorophyceae	*Cephaleuros*			C		1/1
protists	green algae	Chlorophyceae	*Caulerpa taxifolia*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

APPENDIX G

EPBC PROTECTED MATTERS REPORT

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/07/18 15:15:58

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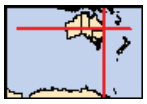
Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	38
Listed Migratory Species:	17

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	24
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	43
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Moreton bay	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat likely to occur within area
Corchorus cunninghamii Native Jute [14659]	Endangered	Species or species habitat likely to occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat may occur within area
Cupaniopsis shirleyana Wedge-leaf Tuckeroo [3205]	Vulnerable	Species or species habitat likely to occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat known to occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat may occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur

Name	Threatened	Type of Presence within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Leslie Harrison Dam	QLD
Mount Petrie Road	QLD

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat may occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus africanus Climbing Asparagus, Climbing Asparagus Fern [66907]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish		Species or species

Name	Status	Type of Presence
Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-27.51229 153.14134

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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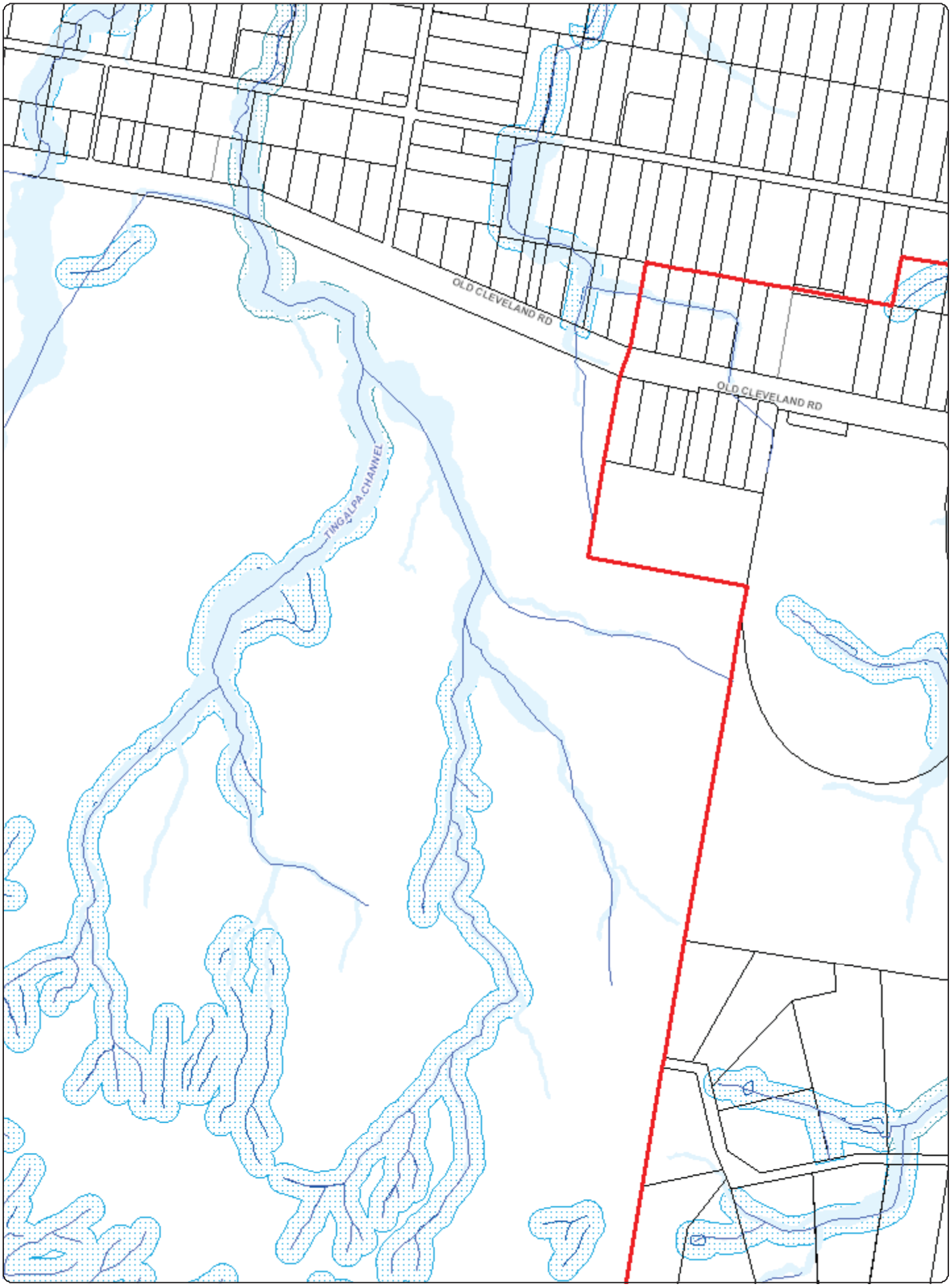
LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

APPENDIX H

BRISBANE CITY COUNCIL WATERWAYS AND FLOW PATHS



Brisbane City Plan 2014

BRISBANE CITY
Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:10,000

0 375

Metres

Date: 24/07/2018

Legend

- LGA Name
- LGA Boundary
- Labels - Major_Road - StreetPro
- Waterbody
- Waterway - Major
- Waterway
- Parcel
- Overland flow flood planning area
- Brisbane River corridor
- Citywide waterway corridor
- Local waterway corridor
- Brisbane River corridor - section boundary
- Waterway centreline
- Railway Line
- Airport Roads
- Waterbody
- Brisbane River, Creek
- Drainage Regions
- Drainage Centrelines (BCC Masked)
- Drainageline

Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Date: 24/07/2018

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APPENDIX I

RISK ASSESSMENT

Location	Activity / Work Packages	Key Environmental Value (KEV)	Environmental Factor	Unmitigated Impact Details	Likelihood	Consequence	Primary Consequence Category	Unmitigated Risk Rating	Acceptability	Management Controls	Likelihood	Consequense	Residual Risk Rating	Acceptability	GAP Analysis
Construction Activities	**Construction of the shot curtain, retaining wall and noise barrier wall**														
		Land	Soils (eg contamination)	Operation of machinery during site works for the establishment of the site has the potential to result in spills of fuels, oils, etc. It is not expected any chemiclas or hazardous materials including fuels) will be stored or used during construction activities. Any of these events have the potential to result in contamination of the site soils.	3	1	Environmental Impacts	4	A = acceptable	The following controls will be in place: * Hazardous substances and dangerous goods management -No fuel and oil will be stored on site. Mobile refueling wil be undertaken in designated areas with bunds, spill kits and other appropriate contraols in place. - No chemical or chemical substance shall be brought to site unless a Safety Data Sheet (SDS) has been supplied. - All personnel handling chemicals or hazardous substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the SDS. - A hazardous materials register shall be maintained in the storage area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - A copy of the SDS is to be kept onsite for easy access by personnel; - Permission is to be sought by Contractors from the client prior to mobilising Hazardous Substances and Dangerous Goods to site; - Contractors are required to provide a full list of all hazardous subsances and dangerous goods they propose to use or bring to site prior to mobilisation to site; - A register is to be developed for all hazardous substances and dangerous goods onsite; - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage); - Corrosive materials to be stored and handled in accordance with AS3780.8:2008 (Class 8 Substances – Corrosives); - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tankor in a self-bunded tank; - All fuel, oils and chemical containers must have their contents clearly labelled; - Spill clean-up kits including absorbent materials are to be kept at each storage facility and site of use; - All site personnel will be trained in the use of spill kits; - Drip trays or alternate method will be used to collect fluids and debris during mechanical or roadside repairs; - All employees will be trained in spill response. This will be included in site inductions. * Waste management - see waster management	2	1	2	A = acceptable	
		Land	Soils (physical)	Operation of construction machinery impacts soils structure.	5	3	Environmental Impacts	20	U = unacceptable	A Topsoil pile management strategy will be developed once topsoil and volumes required to be managed are understood. Dependng on the outcomes the following controls will be in place for access track upgrade: - top soil will be stockpiled and used during rehabiltiation post-construction; or - if it is not required for construction areas reused around the site in areas that require topsil and / a rehabilitation.	5	1	11	A = acceptable	
		Land	Flora and vegetation	Construction of infrastructure requires clearing of vegetation. Vegetation is required to be cleared for infrastructure foot print and construction space.	5	3	Environmental Impacts	20	U = unacceptable	The following will be implemented: - Clearing will be minimised through design (e.g. retainings walls instead of sloped batters) - Existing cleared areas will be utilised - All areas proposed to be cleared will be marked clearly to ensure risk of inadvertent clearing is kept to a minimum. - Inspect all vehicles entering the site for signs of weed and pests; treat appropriately if present. - Inspect all material leaving site for signs of weeds or pests; treat appropriately if present. - Undertake visual inspections monthly for weeds on site and implement appropriate actions if weeds are becoming established on site. - Mobile plant and equipment is to be restricted to designated routes. - A Topsoil pile management strategy will be developed once topsoil and volumes required to be managed are understood. Dependng on the outcomes the following controls will be in place for access track upgrade: - top soil will be stockpiled and used during rehabiltiation post-construction; or - if it is not required for construction areas reused around the site in areas that require topsil and / a rehabilitation. - Vehicles are to arrive clean and leave clean (develop a procedure that is appropriate for this site location to ensure any cleaning is undertaken prior to mobilising for site to minimise	2	2	5	A = acceptable	A flora survey may be required to further reduce risks. If not undertaken for the test pit it is likely to be required for future activities that expand the operation.
		Land	Fauna	The area has fauna present. Fauna surveys have not found the presence of any conservation significnat fauna, however the vegetation is koala habitat.	5	2	Environmental Impacts	16	U = unacceptable	The following will be implemented: - Any fauna habitat specifically to be retained will be pegged and marked. - Mobile plant and equipment is to be restricted to designated routes. - All vegetation to be cleared is to be inspected for fauna at the following intervals: - 2 days before clearing - 1 day before clearing - day of clearing. - Any fauna to be found is to be moved by a suitably qualified fauna spotter catcher. - A suitably qualified fauna spotter catcher is to be present during all clearing works.. - Ensure only qualified personnel are to engage with fauna. - Personnel will be educated not to feed, handle or interact with any fauna. - All injured or sick fauna are to be reported to environmental personnel. A wildlife carer will be engaged to care for the sick or injured animal. - Vehicle speeds to be minimised toreduce the risk of animal strike. - Consultation with landholder to be undertaken to discuss the opportunity to remove cattle from access road during construction period. - Consultation with landholder to be undertaken to develop site specific gate and fence management strategy. - Inspect all material leaving site for signs of weeds or pests; treat appropriately if present - Undertake visual inspections monthly for weeds on site and implement appropriate actions if weeds are becoming established on site. - Mobile plant and equipment is to be restricted to designated routes. - Inspect any open trenches daily for trapped fauna. - Ensure only qualified personnel are to engage with fauna. - Personnel will be educated not to feed, handle or interact with any fauna.	2	3	9	A = acceptable	A fauna survey may be required to further reduce risks. If not undertaken for the test pit it is likely to be required for future activities that expand the operation.
		Land	Weeds and Pests	Potential for construction activities to increase weeds in the vegetation and also to introduce fireants to the location.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - All vehicles to be free of dirt and seeds, and be clean before arrival. - All vehicles are to come clean and leave clean. - Vehicles to carry documentation stating they have been cleaned prior to mobilising to site. - Inspect all vehicles entering the site for signs of weed and pests; treat appropriately if present. - Reject any vehicles that are dirty and can't be treated appropriately before entering the site. - Inspect all material leaving site for signs of weeds or pests; treat appropriately if present. - Vehicle cleaning station to be provided to clean vehicles prior to leaving site. - Undertake visual inspections monthly for weeds on site and implement appropriate actions if weeds are becoming established on site. - Mobile plant and equipment is to be restricted to designated routes. - Weed inspections to be undertaken prior tothe commencement track upgrades, then pre and post wet season for the life of the project. - Management plan to list declared weeds known to be in area based on mapping or site specific assessment and attach specific controls measures for each species. - Fire ant control and management to be in accordance with policy and guidelines.	2	3	9	A = acceptable	
		Land	Flooding	Construction of infrastructure has the potential to increases localised flooding through changes to surface water management and infiltration rates.	5	3	Environmental Impacts	20	U = unacceptable	Water management will be managed through: - site design - erosion and sediment control plans will be prepared for road construction and maintenance activities - surface water monitoring program to be implemented	5	1	11		
		Land	Sedimentation and Erosion	Increased sedimentation and erosion into adjacent overland flowpath.	3	3	Environmental Impacts	13	U = unacceptable	Water management will be managed through: - designed into road plans - erosion and sediment control plans will be prepared for road construction and maintenance activities - surface water monitoring program to be implemented.	3	1	4	A = acceptable	
		Land	Waste Generation	Waste and litter from construction activities enters surrounding environment	3	2	Reputation or Credentials, including social	8	A = acceptable	The following will be implemented: * Waste management - Waste receptacles are to be provided by contractor. - Anyone caught littering may be ejected from site, at the discretion of the client - The Contractor is to keep the site clear of litter at all times. - Wastes requiring disposal will be transported by a licensed waste carrier to an appropriate licensed waste landfill and records kept. - Waste segregation will be undertaken, isolating general waste (packing timber, steel, wire, cables, aluminium, clay/sand/gravel, concrete, paper, cardboard, plastic, food waste) from regulated waste (waste oils, oil filters, oily rags, used absorbent, old chemical/paint/fuel/oil drums, batteries, acids, alkalis, welding rods, sewerage sludge, and used tyres) and separate recyclable material). - All waste will be collected and transported off site for disposal or recycling. - Recyclable wastes (include batteries, tyres, glass, paper, scrap metal, aluminium cans and timber) is to be transferred by a licensed waste carrier to an appropriate recycling facility where possible. - Waste must be stored neatly in appropriately labelled bins, containers or stockpiles; with hazardous wastes stored in such a manner that stormwater run-off does not come into contact with the waste. - Waste collection bins/areas will be located on site and minimise the amount of waste generated through avoidance, re-use and recycling strategies. - Records of the following will be kept: • Date of pickup of waste; • Description of waste; • Cross reference to the relevant waste transport documentation; • Quantity of waste; • Origin of waste; • Destination of waste; and • Intended fate of waste, e.g. type of waste treatment, reprocessing or disposal. Records of each waste transfer will be kept on site at all time until the completion of the Project. Monthly reports will be provided by the waste disposal contractor to the client detailing all waste transfers. - Used spill kit material will be disposed of in accordance with the requirements of the material cleaned up with the spill kit. - Temporary amenities will be implemented, including portable toilets. These amenities will be serviced by the service provider with all wastes to be removed and disposed of off-site, by a private contractor, in accordance with relevant legislation and local policies. All amenities will be isolated at the end of each shift to prevent overflow. - Portable ablutions facilities to be provided by contractor.	2	2	5	A = acceptable	
		Air	Noise	The nearest sensitive receptor is approximately 200m to the norht east. Construction activities will increase noise.	5	3	Environmental Impacts	20	U = unacceptable	The following will be implemented: *Noise management - The quietest plant and equipment that can be selected to undertake works will be used, where possible. - Where possible efficient noise suppression and muffling devices will be installed on equipment, and equipment will be maintained in good working order. - Plant, machinery and equipment maintenance records will be kept. - Noise levels from generators, compressors and other noise emitting plant and equipment shall be routinely monitored to ensure equipment is operating within realistic industry standards. - All noise complaints will be recorded and reported to the Client immediately following receipt of the complaint. - Consrtuction ativities will be limited to 7am-5pm Monday to Friday	5	2	16	A = acceptable	

Air	Dust	The nearest sensitive receptor is approximatley 200m to the north east. Construction activities will increase the risk of dust generation.	5	2	Environmental Impacts	10	U = unacceptable	Although there is not likely to be any significant consequence from dust generation the following will be implemented as best practise: *Air quality and emissions management - All employees to visually monitor dust generation during construction activities. - All dust complaints will be recorded and reported to the Client. - Materials or spoil transported in open trucks or bins to or from the site will be covered if there is potential for dust to be generated. - Dust is to be controlled (where applicable) by regular of unsealed work areas and stockpiles. - Mobile plant and equipment is to be restricted to designated routes. - All air quality management controls to be developed in consultation with workplace health and safety management plan to ensure cohesion between plans.	3	2	6	A = acceptable	ALARP
Air	Emissions	Emmmissions will be generated from the operation of construction equipment and manufacture of infrastructure materials.	5	1	Environmental Impacts	11	A = acceptable	Although air quality emissions are considered acceptable, the following will be implemented as best practise: *Air quality and emissions management - All employees to visually monitor dust generation from construction works. - All dust complaints will be recorded and reported to the client. - Materials or spoil transported in open trucks or bins and from the site will be covered if there is potential for dust to be generated. - Dust is to be controlled (where applicable) by regular watering of unsealed roads, work areas and stockpiles. - Mobile plant and equipment is to be restricted to designated routes. - All equipment used on site shall have fitted standard emission control exhaust systems. - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Minimise consumption of fuel, for example, through shutting down equipment, machinery and vehicles when not in use. - Consideration will be given when purchasing goods to ensure that goods do not contain ozone-depletion material. If a suitable replacement can be obtained, by reviewing cost and supply, these will be purchased in preference to ozone depleting substances. *Energy efficiency management - Educate personnel, through site induction and site wide notices, of the importance of energy efficiency. - Minimise printing. - Request minimal packaging from suppliers. - Reuse materials that may be fit for another purpose, considering other work groups. - Minimise consumption of fuel, for example, through shutting down equipment, machinery and vehicles when not in use. - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept.	5	1	11	A = acceptable	ALARP
Air	Odour	It is not expected any odour will be produced from construction activities.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP							
Air	Lighting	No light sensitive receptors have been identified. Additionally, it is not proposed to undertake nighttime activities.	1	1	Environmental Impacts	1	A = acceptable	ALARP							
Water	Surface water quality	A number of activities or associated with construction activities have the potential to affect surface water quality, these include, but are not limited to, poor stormwater management, use of chemicals and other hazardous materials (e.g. fuel in vehicles), generation of waste and spills, increased sedimentation and erosion	4	3	Environmental Impacts	17	U = unacceptable	The following will be implemented: - surface water monitoring program to be implemented *Water quality management - Spill kits will be located with plant, equipment and at hazardous material storage sites. - Chemicals, fuels and other contaminants will be stored in a bund to prevent uncontrolled spills. - All employees will be trained in spill response (in Project Specific Induction). - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Fuel tanks will be monitored regularly and maintained to prevent leakage. - Fuel tanks will have cut off valves. - Absorbents will be used to clean up spills. -Access track upgraded design to inlcude surface water management. * Hazardous substances and dangerous goods management - No fuel and oil will be stored on site. Mobile refueling will be undertaken in designated areas with bunds, spill kits and other appropriate controols in place. - No chemical or chemical substance shall be brought to site unless a Safety Data Sheet (SDS) has been supplied. - All personnel handling chemicals or hazardous substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the SDS. - A hazardous materials register shall be maintained in the storage area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - A copy of the SDS is to be kept onsite for easy access by personnel; - Permission is to be sought by Contractors from the client prior to mobilising Hazardous Substances and Dangerous Goods to site; - Contractors are required to provide a full list of all hazardous subsances and dangerous goods they propose to use or bring to site prior to mobilisation to site; - A register is to be developed for all hazardous substances and dangerous goods onsite; - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage); - Corrosive materials to be stored and handled in accordance with AS3780.8:2006 (Class 8 Substances – Corrosives); - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tanker in a self-bunded tank.	2	2	5	A = acceptable	Results of ongoing monitoring will determine if additional management actions are required.
Water	Groundwater quality	It is not expected construction activities increase the risk of impact to groundwater. Even if there is a spill (e.g. fuel) the risk and volume is likely to small enough that the risk is considered insignificant.	1	1	Environmental Impacts	1	A = acceptable	Although groundwater is not expected to be impacted, the following management strategies will provide additional protection: - groundwater monitoring program to be implemented *Water quality management - Spill kits will be located with plant, equipment and at hazardous material storage sites. - Chemicals, fuels and other contaminants on will be stored in a bund to prevent uncontrolled spills. - All employees will be trained in spill response (in Project Specific Induction). - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Fuel tanks will be monitored regularly and maintained to prevent leakage. - Fuel tanks will have cut off valves. - Absorbents will be used to clean up spills. - Sediment and erosion control management plan will be developed for the Project. * Hazardous substances and dangerous goods management - Contractors will liaise with the client regarding a suitable site location for the placement and storage of hazardous substances. - No chemical or chemical substance shall be brought on to the Project unless a Material Safety Data Sheet (MSDS) has been supplied. - All personnel handling these chemicals or chemical substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the MSDS. - A hazardous materials register shall be maintained in each Project area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - Permission to be sought prior to mobilising Hazardous Substances and Dangerous Goods to site; and - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage); - Corrosive materials to be stored and handled in accordance with AS3780.8:2006 (Class 8 Substances – Corrosives). - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tank. - All fuel, oils and chemical containers must have their contents clearly labelled. - Spill clean-up kits including absorbent materials are to be kept at each storage facility and site of use. - Drip trays or alternate method will be used to collect fluids and debris during demolition works.	1	1	1	A = acceptable	Results of ongoing monitoring will determine if additional management actions are required.
Water	Aquatic ecology / wetlands	Increased sedimentation or decreases in surface water quality have the potential to impact the health of the overland flow path adjacent to the construction areas.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - surface water quality controls - soil management controls - constructions activities will stay outside the overland flow path (except where design and construction activities specifically require). Design will minimise the need for construction to be in overland flow areas. - implement surface and groundwater monitoring pre-construction to provide baseline, during construction and ongoing during operation of facility - surface water management plan to be implemented.	2	2	5	A = acceptable	Ongoing monitoring will monitor the effectiveness of management controls. Additional management to be developed if initial controls not effective.
Social	Tourism	Construction activities have the potential to affect use of the neighbouring facilities.	3	2	Reputation or Credentials, including social	6	A = acceptable	ALARP - this is a short term potential impact that is expected to be outweighed by the benefits! he new facility will create.							
Social	Amenity	The site is within the Belmont Shooting Complex. Construction activities or the permanent use of the exitfrastructure is not expected to impact amenity.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP							
Social	Traffic	Construction traffic will access the site from Old Cleveland Rd. Construction activities will increase traffic to the site but it will be temporary and not expected to have a significant impact and traffic numbers (trucks, workers) will be relatively low.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP							
Social	Indigenous heritage	No heritage sites are known to exist within the construction areas. The mjority of the construction area has been previously modified.	1	2	Environmental Impacts	3	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should item of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					
Social	European heritage	No europeen heritage locations are recorded as occuring within the Project area.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should items of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					

Construction and establishment of the future clubhouse.

	Land	Soils (eg contamination)	Construction of the future clubhouse is not expected to have a significant risk of impact to soils.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however the following controls will be in place: * Hazardous substances and dangerous goods management - No fuel and oil will be stored on site. Mobile refueling will be undertaken in designated areas with bunds, spill kits and other appropriate controuls in place. - No chemical or chemical substance shall be brought to site unless a Safety Data Sheet (SDS) has been supplied. - All personnel handling chemicals or hazardous substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the SDS. - A hazardous materials register shall be maintained in the storage area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - A copy of the SDS is to be kept onsite for easy access by personnel; - Permission is to be sought by Contractors from the client prior to mobilising Hazardous Substances and Dangerous Goods to site; - Contractors are required to provide a full list of all hazardous substances and dangerous goods they propose to use or bring to site prior to mobilisation to site; - A register is to be developed for all hazardous substances and dangerous goods onsite; - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage); - Corrosive materials to be stored and handled in accordance with AS3780.8:2008 (Class 8 Substances – Corrosives); - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tankor in a self-bunded tank; - All fuel, oils and chemical containers must have their contents clearly labelled; - Spill clean-up kits including absorbent materials are to be kept at each storage facility and site of use; - All site personnel will be trained in the use of spill kits; - Drip trays or alternate method will be used to collect fluids and debris during mechanical or roadside repairs; - All employees will be trained in spill response. This will be included in site inductions. * Waste management - see waster management								
	Land	Soils (structure and health)	The site of the future clubhouse is currently a carpark. There is not considered a significant risk to site soils.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however a Topsoil pile management strategy will be developed once topsoil and volumes required to be managed are understood. Depending on the outcomes the following controls will be in place for access track upgrade: - top soil will be stockpiled and used during rehabilitation post-construction; or - if it is not required for construction areas reused around the site in areas that resaire topsoil and / a rehabilitation.								
	Land	Flora and vegetation	The site of the future clubhouse is currently a carpark. No further clearing of vegetation is proposed.	1	1	Environmental Impacts	1	A = acceptable	ALARP							
	Land	Fauna	The site of the future clubhouse is currently a carpark. No further clearing of vegetation is proposed. It is not considered construction of the future clubhouse will have an impact of fauna.	1	1	Environmental Impacts	1	A = acceptable	ALARP							
	Land	Weeds and Pests	Potential for construction activities to increase weeds in the vegetation and also to introduce firearms to the location.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - All vehicles to be free of dirt and seeds, and be clean before arrival. - All vehicles are to come clean and leave clean. - Vehicles to carry documentation stating they have been cleaned prior to mobilising to site. - Inspect all vehicles entering the site for signs of weed and pests; treat appropriately if present. - Reject any vehicles that are dirty and can't be treated appropriately before entering the site. - Inspect all material leaving site for signs of weeds or pests; treat appropriately if present. - Vehicle cleaning station to be provided to clean vehicles prior to leaving site. - Undertake visual inspections monthly for weeds on-site and implement appropriate actions if weeds are becoming established on site. - Mobile plant and equipment is to be restricted to designated routes. - Weed inspections to be undertaken prior tothe commencement track upgrades, then pre and post wet season for the life of the project. - Management plan to list declared weeds known to be in area based on mapping or site-specific assessment and attach specific controls measures for each species. - Fire ant control and management to be in accordance with policy and guidelines.	2	2	5	A = acceptable	General inspections to include for weeds. Any that are found to be present are to be controlled.
	Land	Flooding	The site of the future clubhouse is currently a carpark. No further clearing of vegetation is proposed.No increased surface area that would increase flooding risk is proposed.	1	1	Environmental Impacts	1	A = acceptable	Water management will be managed through: - site design - erosion and sediment control plans will be prepared for road construction and maintenance activities - surface water monitorinw proarsm to be imalemented.							Results of ongoing surface water monitoring program to indicated if additional management required.
	Land	Sedimentation and Erosion	Increased sedimentation and erosion into adjacent overland flowpath.	3	3	Environmental Impacts	13	U = unacceptable	Water management will be managed through: - designed into road plans - erosion and sediment control plans will be prepared for road construction and maintenance activities - surface water management plan to be implemented. - surface water monitorinw proarsm to be imalemented.	2	2	5	A = acceptable	Results of ongoing surface water monitoring program to indicated if additional management required.
	Land	Waste Generation	Waste and litter from construction activities enters surrounding environment	3	2	Environmental Impacts	8	U = unacceptable	The following will be implemented: * Waste management - Waste receptables are to be provided by contractor. - Anyone caught littering may be ejected from site, at the discretion of the client - The Contractor is to keep the site clear of litter at all times. - Wastes requiring disposal will be transported by a licensed waste carrier to an appropriate licensed waste landfill and records kept. - Waste segregation will be undertaken, isolating general waste (packing timber, steel, wire, cables, aluminium, clay/sand/gravel, concrete, paper, cardboard, plastic, food waste) from regulated waste (waste oils, oil filters, oily rags, used absorbent, old chemical/paint/fuel/oil drums, batteries, acids, alkalis, welding rods, sewerage sludge, and used tyres) and separate recyclable material). - All waste will be collected and transported off site for disposal or recycling. - Recyclable wastes (include batteries, tyres, glass, paper, scrap metal, aluminium cans and timber) is to be transferred by a licensed waste carrier to an appropriate recycling facility where possible. - Waste must be stored neatly in appropriately labelled bins, containers or stockpiles; with hazardous wastes stored in such a manner that stormwater run-off does not come into contact with the waste. - Waste collection bins/areas will be located on site and minimise the amount of waste generated through avoidance, re-use and recycling strategies. - Records of the following will be kept: • Date of pickup of waste; • Description of waste; • Cross reference to the relevant waste transport documentation; • Quantity of waste; • Origin of waste; • Destination of waste; and • Intended fate of waste, e.g. type of waste treatment, reprocessing or disposal. Records of each waste transfer will be kept on site at all time until the completion of the Project. Monthly reports will be provided by the waste disposal contractor to the client detailing all waste transfers. - Used spill kit material will be disposed of in accordance with the requirements of the material cleaned up with the spill kit. - Temporary amenities will be implemented, including portable toilets. These amenities will be serviced by the service provider with all wastes to be removed and disposed of off-site, by a private contractor, in accordance with relevant legislation and local policies. All amenities will be isolated at the end of each shift to prevent overflow. - Portable ablutions facilities to be provided by contractor.	2	2	5	A = acceptable	
	Air	Noise	The nearest sensitive receptor is approximately 200m to the north east. Construction activities will increase noise.	5	2	Reputation or Credentials, including social	16	A = acceptable	The following will be implemented: *Noise management - The quietest plant and equipment that can be selected to undertake works will be used, where possible. - Where possible efficient noise suppression and muffling devices will be installed on equipment, and equipment will be maintained in good working order. - Plant, machinery and equipment maintenance records will be kept. - Noise levels from generators, compressors and other noise emitting plant and equipment shall be routinely monitored to ensure equipment is operating within realistic industry standards. - All noise complaints will be recorded and reported to the Client immediately following receipt of the complaint. - Construction activities will be limited to 7am-6pm Monday to Friday	4	1	7	A = acceptable	ALARP
	Air	Dust	The nearest sensitive receptor is approximatley 200m to the north east. Construction activities will increase the risk of dust generation. Any impact is aejected to be short term in nature.	5	2	Environmental Impacts	16	U = unacceptable	Althought there is not likely to be any significant consequence from dust generation the following will be implemented as best practise: *Air quality and emissions management - All employees to visually monitor dust generation during construction activities. - All dust complaints will be recorded and reported to the Client. - Materials or spoil transported in open trucks or bins to or from the site will be covered if there is potential for dust to be generated. - Dust is to be controlled (where applicable) by regular of unsealed work areas and stockpiles. - Mobile plant and equipment is to be restricted to designated routes. - All air quality management controls to be developed in consultation with workplace health and safety management plan to ensure cohesion between plans.	4	1	7	A = acceptable	ALARP
	Air	Emissions	Emmmissions (excluding dust) will be generated from the operation of construction equipment and manufacture of infrastructure materials.	5	1	Environmental Impacts	11	A = acceptable	ALARP - although air quality emissions are considered acceptable, the following will be implemented as best practise: *Air quality and emissions management - All equipment used on site shall have fitted standard emission control exhaust systems. - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Minimise consumption of fuel, for example, through shutting down equipment, machinery and vehicles when not in use. - Consideration will be given when purchasing goods to ensure that goods do not contain ozone-depletion material. If a suitable replacement can be obtained, by reviewing cost and supply, these will be purchased in preference to ozone depleting substances. *Energy efficiency management - Educate personnel, through site induction and site wide notices, of the importance of energy efficiency. - Minimise printing. - Request minimal packaging from suppliers. - Reuse materials that may be fit for another purpose, considering other work groups. - Minimise consumption of fuel, for example, through shutting down equipment, machinery and vehicles when not in use. - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project.					
	Air	Odour	It is not expected any odour will be produced from construction activities.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP							
	Air	Lighting	No light sensitive receptors have been identified. Additionally, it is not proposed to undertake nighttime activities.	1	1	Environmental Impacts	1	A = acceptable	ALARP							

	Water	Surface water quality	A number of activities or associated with construction activities have the potential to affect surface water quality, these include, but are not limited to, poor stormwater management, use of chemicals and other hazardous materials (e.g. fuel in vehicles), generation of waste and spills, increased sedimentation and erosion	4	3	Environmental Impacts	17	U = unacceptable	The following will be implemented: - Surface water monitoring program to be implemented *Water quality management - Spill kits will be located with plant, equipment and at hazardous material storage sites. - Chemicals, fuels and other contaminants will be stored in a bund to prevent uncontrolled spills. - All employees will be trained in spill response (in Project Specific Induction). - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Fuel tanks will be monitored regularly and maintained to prevent leakage. - Fuel tanks will have cut off valves. - Absorbents will be used to clean up spills. - Access track upgraded design to inlcude surface water management. * Hazardous substances and dangerous goods management -No fuel and oil will be stored on site. Mobile refueling will be undertaken in designated areas with bunds, spill kits and other appropriate controols in place. - No chemical or chemical substance shall be brought to site unless a Safety Data Sheet (SDS) has been supplied. - All personnel handling chemicals or hazardous substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the SDS. - A hazardous materials register shall be maintained in the storage area. -All hazardous substances and dangerous goods shall be stored and used as per Australian standards - A copy of the SDS is to be kept onsite for easy access by personnel; - Permission is to be sought by Contractors from the client prior to mobilising Hazardous Substances and Dangerous Goods to site; - Contractors are required to provide a full list of all hazardous subcances and dangerous goods they propose to use or bring to site prior to mobilisation to site; - A register is to be developed for all hazardous substances and dangerous goods onsite; -Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage); - Corrosive materials to be stored and handled in accordance with AS3780.8:2008 (Class 8 Substances – Corrosives); - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tankor in a self-bunded tank.	2	2	5	A = acceptable	Results of ongoing surface water monitoring will determine if additional management actions required.
	Water	Groundwater quality	It is not expected construction activities increase the risk of impact to groundwater. Even if there is a spill (e.g. fuel) the risk and volume is likely to small enough that the risk is considered insignificant.	1	1	Environmental Impacts	1	A = acceptable	Although groundwater is not expected to be impacted, the following management strategies will provide additional protection: - groundwater monitoring program to be implemented *Water quality management - Spill kits will be located with plant, equipment and at hazardous material storage sites. - Chemicals, fuels and other contaminants on will be stored in a bund to prevent uncontrolled spills. - All employees will be trained in spill response (in Project Specific Induction). - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Fuel tanks will be monitored regularly and maintained to prevent leakage. - Fuel tanks will have cut off valves. - Absorbents will be used to clean up spills. - Sediment and erosion control management plan will be developed for the Project. * Hazardous substances and dangerous goods management - Contractors will liaise with the client regarding a suitable site location for the placement and storage of hazardous substances. - No chemical or chemical substance shall be brought on to the Project unless a Material Safety Data Sheet (MSDS) has been supplied. - All personnel handling these chemicals or chemical substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the MSDS. - A hazardous materials register shall be maintained in each Project area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - Permission is to be sought prior to mobilising Hazardous Substances and Dangerous Goods to site; and - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage); - Corrosive materials to be stored and handled in accordance with AS3780.8:2008 (Class 8 Substances – Corrosives). - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tank. -All fuel, oils and chemical containers must have their contents clearly labelled. - Spill clean-up kits including absorbent materials are to be kept at each storage facility and site of use. - Drip trays or alternate method will be used to collect fluids and debris during demolition works. - All employees will be trained in spill response. This will be included in site inductions.					Ongoing groundwater monitoring program will determine if there is an impact to groundwater (Note: constructionn activities are expected to be too short term to notice an impact on groundwater).
	Water	Aquatic ecology / wetlands	Increased sedimentation and decreases in surface water quality have the potential to impact the health of the overland flow path adjacent to the construction areas.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - surface water management plan to be implemented. - surface water quality controls - soil management controls - constructions activities will stay outside the overland flow path (except where design and construction activities specifically require). Design will minimise the need for construction to be in overland flow areas. - implement surface and groundwater monitoring pre-construction to provide baseline, during construction and ongoing during operation of facility	3	1	4	A = acceptable	An assessment of the waterways associated with the site may be required.
	Social	Tourism	Construction of the future clubhouse is not expected to impact tourism or use of neighbourine facilities.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP - this is a short term potential impact that is expected to be outweighed by the benefits tre new facility will create.							
	Social	Amenity	The site is within the Belmont Shooting Complex. Construction activities or the permanent use of the exit=strucutre is not expected to impact amenity.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP							
	Social	Traffic	Construction traffic will access the site from Old Cleveland Rd. Construction activities will increase traffic to the site but it will be temporary and not expected to have a significant impact and traffic numbers (trucks, workers) will be relatively low.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP							
	Social	Indigenous heritage	No heritage sites are known to exist within the future clubhouse area. The site of the future clubhouse is currently a carpark.	1	2	Environmental Impacts	3	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should items of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					
	Social	European heritage	No european heritage locations are recorded as occuring within the Project area. The site of the future clubhouse is currently a carpark.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should items of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					
Operational Activities	**Shooting**															
	Land	Soils (eg contamination)	Shooting lead shot is likely to result on contamination of soils.	5	3	Environmental Impacts	20	U = unacceptable	The following controls will be in place: - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develoca a rehabilitation strateies for end of life remediation	5	2	16	U = unacceptable	The outcomes of the ongoing monitoring programs will be monitoring for actual impact of lead on the receiving environment. Exceedences of site / activity specific trigger values will guide additional management strategies. Future technologies will be investigated to minimise the invasive remediation techniques currently available.
	Land	Soils (structure and health)	Shooting lead shot is likely to result on contamination of soils.	5	3	Environmental Impacts	20	A = acceptable	The following controls will be in place: - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develoca a rehabilitation strateies for end of life remediation	5	2	16	U = unacceptable	The outcomes of the ongoing monitoring programs will be monitoring for actual impact of lead on the receiving environment. Exceedences of site / activity specific trigger values will guide additional management strategies. Future technologies will be investigated to minimise the invasive remediation techniques currently available.
	Land	Flora and vegetation	Flora and vegetation is not expected to be adversely affected by lead shot.	1	2	Environmental Impacts	2	A = acceptable	ALARP - although ALARP, the following controls will be in place - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develoca a rehabilitation strategy for end of life remediation toht minimise the direct impact of flora and vegetation	1	2	3	A = acceptable	Rehabilitation activities are currently expected to require removal of vegetation to remediate soils in the overshoot area. As it is currently expected this is unavoidable offsets may be considered appropriate. To mitigate the future impacts these can be commenced now sot hat when remediation is required vegetation will have reached a mature stage providing an immediate (and prior) offset value.
	Land	Fauna	Birds and some other fauna will potentially ingest the lead shot. Indirectly soil cotamination has the potential to decrease surface water quality that has the potential to enter the overland flow area and adversely affect fauna in that environment. If the contamination became severe enough it has the potential to affect offsite fauna due to migration of contaminated water offsite.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - Surface and groundwater monitoring - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area	3	2	8	A = acceptable	The outcomes of the ongoing monitoring programs will be monitoring for actual impact of lead on the receiving environment. Exceedences of site / activity specific trigger values will guide additional management strategies. Future technologies will be investigated to minimise the invasive remediation techniques currently available.
	Land	Weeds and Pests	Shooting is unlikely to change the risk of weeds and pests.	1	1	Environmental Impacts	1	A = acceptable								
	Land	Flooding	Shooting is ulikely to increase the risk or impacts of flooding	1	1	Environmental Impacts	1	A = acceptable								
	Land	Sedimentation and Erosion	Shooting is not likely to increase the risk or impacts of sedimentation and erosion.	1	1	Environmental Impacts	1	A = acceptable								

		Land	Waste Generation	Waste from shooting (e.g. used cartridges) have the potential to increase litter in the area.	4	2	Environmental Impacts	12	U = unacceptable	The following will be implemented: * Waste management - Waste receptacles are to be provided by contractor. - Anyone caught littering may be ejected from site, at the discretion of site operators - All waste will be collected and transported off site for disposal or recycling. - Waste must be stored neatly in appropriately labelled bins, containers or stockpiles; with hazardous wastes stored in such a manner that stormwater run-off does not come into contact with the waste. - Waste collection bins/areas will be located on site and minimise the amount of waste generated through avoidance, re-use and recycling strategies. - Records of the following will be kept: • Date of pickup of waste; • Description of waste; • Cross reference to the relevant waste transport documentation; • Quantity of waste; • Origin of waste; • Destination of waste; and • Intended fate of waste, e.g. type of waste treatment, reprocessing or disposal.	3	1	4	A = acceptable	ALARP
		Air	Noise	The nearest sensitive receptor (residential) is approximately 200m to the north east. Shooting will increase noise.	5	2	Reputation or Credentials, including social	16	A = acceptable	The following will be implemented: *Noise management - The quietest plant and equipment that can be selected to undertake works will be used, where possible. - Where possible efficient noise suppression and muffling devices will be installed on equipment, and equipment will be maintained in good working order. - Plant, machinery and equipment maintenance records will be kept. - Noise levels from generators, compressors and other noise emitting plant and equipment shall be routinely monitored to ensure equipment is operating within realistic industry standards. - All noise complaints will be recorded and reported to the Client immediately following receipt of the complaint. - Consrtuction ativities will be limited to 7am-5pm Monday to Friday	4	2	12	A = acceptable	ALARP
		Air	Dust	The nearest sensitive receptor is approximaltey 200m to the north east. Shooting is not excpected to increase dust.	1	1	Environmental Impacts	1	A = acceptable	ALARP					
		Air	Emissions	Shooting does not generate significant emmissions.	1	1	Environmental Impacts	1	A = acceptable	ALARP					
		Air	Odour	It is not expected any odour will be produced from odour.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP					
		Air	Lighting	Shooting is not proposed for night time.	1	1	Environmental Impacts	1	A = acceptable	ALARP					
		Water	Surface water quality	Lead shot has the potential to decrease surface water quality. As it breaks down a portion goes into solution and carried in surface water flows.	5	3	Environmental Impacts	20	U = unacceptable	The following will be implemented: - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develop a rehabilitation strategy for end of life remediation	5	2	16	A = acceptable	The outcomes of the ongoing monitoring programs will be monitoring for actual impact of lead on the receiving environment. Exceedences of site / activity specific trigger values will guide addional management strategies. Future technologies will be invesitgated to minimise the invasive remediation techniques currently available.
		Water	Groundwater quality	Lead shot has the potential to decrease groundwater quality. As it breaks down a portion goes into solution and can be carried into the groundwater.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develop a rehabilitation strategy for end of life remediation	2	2	5	A = acceptable	The outcomes of the ongoing monitoring programs will be monitoring for actual impact of lead on the receiving environment. Exceedences of site / activity specific trigger values will guide addional management strategies. Future technologies will be invesitgated to minimise the invasive remediation techniques currently available.
		Water	Aquatic ecology / wetlands	Lead shot has the potential to decrease surface water quality. As it breaks down a portion goes into solution and carried in surface water flows. This has the potetnial to enter the overland flow area and imapct the ecology of this aquatic area.	3	3	Environmental Impacts	13	U = unacceptable	The following will be implemented: - surface water quality controls - constructions activities will stay outisde the overland flow path (except where design and cosntruction activities specifically require). Design will minimise the need for construction to be in overland flow areas. - implement surface and groundwater monitoring pre-construction to provide baseline, during construction and ongoing during operation of facility - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develop a rehabilitation strategy for end of life remediation	3	2	8	A = acceptable	The outcomes of the ongoing monitoring programs will be monitoring for actual impact of lead on the receiving environment. Exceedences of site / activity specific trigger values will guide addional management strategies. Future technologies will be invesitgated to minimise the invasive remediation techniques currently available.
		Social	Tourism	Shooting activities (operation of the faciltiy) has the potential to increase tourism. The is unlikely to be a negative impact.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP - potential increase in tourism					
		Social	Amenity	Althoug hthe site is within the Belmont Shooting Complex. Shooting activities have the potential to affect the amenity of nearby sensitive receptors.	4	2	Reputation or Credentials, including social	12	U = unacceptable	Implement controls for the impactrs that have the potential to impact nearby sensitive receptors (e.g. noise - sound barrier wall, scheduling of events).	3	2	8	A = acceptable	
		Social	Traffic	Increased traffic associated with shooting is not likely to have a significant impact on traffic. except for major events.	1	2	Reputation or Credentials, including social	3	A = acceptable	ALARP					
		Social	Indigenous heritage	No heritage sites are known to exist within the shooting area. The main shooting area is developed. Much of the overshoot area is heavily disturbed. Some of the area is less well known however given the past use of the site it is not expected a significant risk exists.	1	2	Environmental Impacts	3	U = unacceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should items of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					
		Social	European heritage	No heritage sites are known to exist within the shooting area. The main shooting area is developed. Much of the overshoot area is heavily disturbed. Some of the area is less developed however given the past use of the site it is not expected a significant risk exists.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should items of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					
Decomissioning Activities	**Site rehabilitation**														
		Land	Soils (eg contamination)	Rehabilitation activites may require removal of contaminated soils up to approximately 500mm below the surface in the area where most shot is likley to fall decreasing to the extrmeities of the overshoot area where there is likely to be less impact from lead. Topsoil will be impacted (removed) or the structure of the soil damaged from rehabitlaition activities. These activites are unlikley to contaminated the soil further.	1	1	Environmental Impacts	1	A = acceptable	Although ALARP, these activities will conform to the hazardous substances and dangerous goods management requirements and waste management plan.					
		Land	Soils (structure and health)	Currently rehabilitation technologies will require the destruction (by removal) of the topsoil). This will be required to remediate the overshoot area (as well as the shot gun range area)	5	3	Environmental Impacts	20	A = acceptable	Although ALARP a rehabilitation management plan will be prepared that will include a section for topsopil replacement / soil health and structure.					
		Land	Flora and vegetation	Vegetation may require complete removal to allow soil removal or other remediation strategies to be undertaken.	5	3	Environmental Impacts	20	A = acceptable	ALARP - although ALARP, the following controls will be in place to minimise the area requiring rehabilitation: - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develop a rehabilitation strategy for end of life remediation prior to commencement of the site becoming permanent infrastructure to to minimise the area likely to require remediation at end of life	5	2	16	A = acceptable	Rehabilitation activities are currently expected to require removal of vegetation to remediate soils in the overshoot area. As it is currently expected this is unavoidable offsets may be considered appropriate. To mitigate the future impacts these can be commenced now sot hat when remediation is required vegetation will have reached a mature stage providing an immediate (and prior) offset value.
		Land	Fauna	If vegetation is removed as part of rehabilitation activities all fauna habitat within the remediation area will be lost.	5	4	Environmental Impacts	23	A = acceptable	ALARP - although ALARP, the following controls will be in place to minimise the area requiring rehabilitation: - lead capture (shot curtain, sediment basin design) and collection strategies implemented and reduction in use of lead / increase in steel shot to reduce the amount of lead in the shotgun range and overshoot area - ongoing surface and groundwater quality monitoring programs to monitoring the impact of lead on the receiving environment - Develop a rehabilitation strategy for end of life remediation prior to commencement of the site becoming permanent infrastructure to to minimise the area likely to require remediation at end of life	5	2	16	A = acceptable	Rehabilitation activities are currently expected to require removal of vegetation to remediate soils in the overshoot area. As it is currently expected this is unavoidable offsets may be considered appropriate. To mitigate the future impacts these can be commenced now sot hat when remediation is required vegetation will have reached a mature stage providing an immediate (and prior) offset value.
		Land	Weeds and Pests	Potential for machinery and equipment used to bring weeds to site, including increasing the risk of fire ants.	4	3	Environmental Impacts	17	U = unacceptable	The following will be implemented: - All vehicles to be free of dirt and seeds, and be clean before arrival. - All vehicles are to come clean and leave clean. - Vehicles to carry documentation stating they have been cleaned prior to mobilising to site. - Inspect all vehicles entering the site for signs of weed and pests; treat appropriately if present. - Reject any vehicles that are dirty and can't be treated appropriately before entering the site. - Inspect all material leaving site for signs of weeds or pests; treat appropriately if present. - Vehicle cleaning station to be provided to clean vehicles prior to leaving site. - Undertake visual inspections monthly for weeds on site and implement appropriate actions if weeds are becoming established on site. - Mobile plant and equipment is to be restricted to designated routes. - Weed inspections to be undertaken prior tothe commencement track upgrades, then pre and post wet season for the life of the project. - Management plan to list declared weeds known to be in area based on mapping or site specific assessment and attach specific controls measures for each species. - Fire ant control and management to be in accordance with policy and guidelines.	2	2	5	A = acceptable	General inspections to include for weeds. Any that are found to be present are to be controlled.
		Land	Flooding	Rehabilitation activites have the potential to increase localised flooding due to vegetation removal reducing infiltration and water holding capacity.	5	3	Environmental Impacts	20	A = acceptable	Water management will be managed through: - site design - erosion and sediment control plans will be prepared for road construction and maintenance activities - rehabilitation monitoring (inlcuding for e.g. surface water, erosion, sediment basin etc) to be implemented.	4	2	12	A = acceptable	Results of rehabilitation monitoring to determine if additional management actions required.
		Land	Sedimentation and Erosion	Rehabilitation activites have the potential to increase localised sedimentation and erosion due to vegetation removal and any earthworks acitivites creating bare soil that will be ea\sily transported during rain events.	5	3	Environmental Impacts	20	U = unacceptable	Water management will be managed through: - site design - erosion and sediment control plans will be prepared for road construction and maintenance activities - rehabilitation monitoring (inlcuding for e.g. surface water, erosion, sediment basin etc) to be implemented.	4	2	12	A = acceptable	Results of rehabilitation monitoring to determine if additional management actions required.
		Land	Waste Generation	It is not expected any significant waste (excluding workers general waste) will be generated during rehabilitation activities.	1	1	Environmental Impacts	1	A = acceptable	Although ALARP - if contaminated soil requires disposal offsite this will be undertaken and managed through a remediation management plan. Contaminated soil disposed of offsite (i.e. to a landfill) currently requires tracking and records kept of disposal.					

Air	Noise	The nearest sensitive receptor is approximately 200m to the north east. Rehabilitation activities are likely to increase noise however it is likely to be relatively short term.	5	2	Reputation or Credentials, including social	16	A = acceptable	The following will be implemented: *Noise management - The quietest plant and equipment that can be selected to undertake works will be used, where possible. - Where possible efficient noise suppression and muffling devices will be installed on equipment, and equipment will be maintained in good working order. - Plant, machinery and equipment maintenance records will be kept. - Noise levels from generators, compressors and other noise-emitting plant and equipment shall be routinely monitored to ensure equipment is operating within realistic industry standards. - All noise complaints will be recorded and reported to the Client immediately following receipt of the complaint. - Rehabilitation activities will be limited to socially acceptable times	5	1	11	A = acceptable	ALARP
Air	Dust	The nearest sensitive receptor is approximately 200m to the north east. Rehabilitation activities are likely to create dust.	5	2	Environmental Impacts	16	U = unacceptable	Although there is not likely to be any significant consequence from dust generation the following will be implemented as best practice: *Air quality and emissions management - All employees to visually monitor dust generation during construction activities. - All dust complaints will be recorded and reported to the Client. - Materials or spoil transported in open trucks or bins to or from the site will be covered if there is potential for dust to be generated. - Dust is to be controlled (where applicable) by regular of unsealed work areas and stockpiles. - Mobile plant and equipment is to be restricted to designated routes. - All air quality management controls to be developed in consultation with workplace health and safety management plan to ensure cohesion between plans.	4	1	7	A = acceptable	ALARP
Air	Emissions	Emissions (excluding dust) associated machinery and equipment used for rehabilitation activities are not likely to be considered significant.	5	1	Environmental Impacts	11	A = acceptable	Although air quality emissions are considered acceptable, the following will be implemented as best practice: *Air quality and emissions management - All equipment used on site shall have fitted standard emission control exhaust systems. - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Minimise consumption of fuel, for example, through shutting down equipment, machinery and vehicles when not in use. - Consideration will be given when purchasing goods to ensure that goods do not contain ozone-depletion material. If a suitable replacement can be obtained, by reviewing cost and supply, these will be purchased in preference to ozone depleting substances. *Energy efficiency management - Educate personnel, through site induction and site wide notices, of the importance of energy efficiency. - Minimise printing. - Request minimal packaging from suppliers. - Reuse materials that may be fit for another purpose, considering other work groups. - Minimise consumption of fuel, for example, through shutting down equipment, machinery and vehicles when not in use. - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project.					
Air	Odour	The nearest sensitive receptor is 200m to the north east. Rehabilitation activities are not expected to generate odour.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP						
Air	Lighting	Rehabilitation activities are not expected to be undertaken at night time.	1	1	Environmental Impacts	1	A = acceptable	ALARP						
Water	Surface water quality	Rehabilitation activities have the potential to impact surface water quality through the potential increased levels of sediment during rain events.	5	3	Environmental Impacts	20	U = unacceptable	The following will be implemented: - surface water monitoring program to be implemented *Water quality management - Spill kits will be located with plant, equipment and at hazardous material storage sites. - Chemicals, fuels and other contaminants will be stored in a bund to prevent uncontrolled spills. - All employees will be trained in spill response (in Project Specific Induction). - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Fuel tanks will be monitored regularly and maintained to prevent leakage. - Fuel tanks will have cut off valves. - Absorbents will be used to clean up spills. -Access track upgraded design to inlcude surface water management. * Hazardous substances and dangerous goods management - No fuel and oil will be stored on site. Mobile refueling will be undertaken in designated areas with bunds, spill kits and other appropriate controls in place. - No chemical or chemical substance shall be brought to site unless a Safety Data Sheet (SDS) has been supplied. - All personnel handling chemicals or hazardous substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the SDS. - A hazardous materials register shall be maintained in the storage area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - A copy of the SDS is to be kept onsite for easy access by personnel; - Permission is to be sought by Contractors from the client prior to mobilising Hazardous Substances and Dangerous Goods to site; - Contractors are required to provide a full list of all hazardous substances and dangerous goods they propose to use or bring to site prior to mobilisation to site; - A register is to be developed for all hazardous substances and dangerous goods onsite. - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage). - Corrosive materials to be stored and handled in accordance with AS3780.9:2008 (Class 8 Substances – Corrosives); - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tankor in a self-bunded tank.	4	2	12	A = acceptable	Results of ongoing monitoring will determine if additional management actions are required.
Water	Groundwater quality	Rehabilitation activities are not expected to impact groundwater.	1	1	Environmental Impacts	1	A = acceptable	Although groundwater is not expected to be impacted, the following management strategies will provide additional protection: - groundwater monitoring program to be implemented *Water quality management - Spill kits will be located with plant, equipment and at hazardous material storage sites. - Chemicals, fuels and other contaminants on will be stored in a bund to prevent uncontrolled spills. - All employees will be trained in spill response (in Project Specific Induction). - All plant and machinery to be inspected and repaired as necessary prior to operation to identify any operational faults or leaks. - All plant and machinery to be inspected (daily), maintained and repaired as necessary throughout the project. - Plant, machinery and equipment maintenance records will be kept. - Fuel tanks will be monitored regularly and maintained to prevent leakage. - Fuel tanks will have cut off valves. - Absorbents will be used to clean up spills. - Sediment and erosion control management plan will be developed for the Project. * Hazardous substances and dangerous goods management - Contractors will liaise with the client regarding a suitable site location for the placement and storage of hazardous substances. - No chemical or chemical substance shall be brought on to the Project unless a Material Safety Data Sheet (MSDS) has been supplied. - All personnel handling these chemicals or chemical substances must be informed of the requirements for the safe transport, storage, use and emergency treatment, as detailed in the MSDS. - A hazardous materials register shall be maintained in each Project area. - All hazardous substances and dangerous goods shall be stored and used as per Australian standards - Permission is to be sought prior to mobilising Hazardous Substances and Dangerous Goods to site; and - Hazardous substances shall be stored under cover and in a manner that will prevent deterioration of goods and to prevent environmental contamination (e.g., bunded to capture any spillage or leakage). - Corrosive materials to be stored and handled in accordance with AS3780.9:2008 (Class 8 Substances – Corrosives); - Fuel, oils and chemicals in containers to be stored in impervious bunded area with capacity of at least 110% of largest container/tank. - All fuel, oils and chemical containers must have their contents clearly labelled. - Spill clean-up kits including absorbent materials are to be kept at each storage facility and site of use. - Drip trays or alternate method will be used to collect fluids and debris during demolition works. - All employees will be trained in spill response. This will be included in site inductions.	1	1	1	A = acceptable	Results of ongoing monitoring will determine if additional management actions are required.
Water	Aquatic ecology / wetlands	Rehabilitation activities have the potential to impact aquatic ecology in the overland flow path through the risk of increased sedimentation and decreased water quality.	5	3	Environmental Impacts	20	U = unacceptable	The following will be implemented: - surface water quality controls - soil management controls - construction activities will stay outside the overbnd flow path (except where design and construction activities specifically require). Design will minimise the need for construction to be in overland flow areas. - implement surface and groundwater monitoring pre-construction to provide baseline, during construction and ongoing during operation of facility - surface water management plan to be implemented.	4	2	12	A = acceptable	Ongoing monitoring will monitor the effectiveness of management controls. Additional management to be developed if initial controls not effective.
Social	Tourism	Rehabilitation activities are not likely to impact tourism. If the site is being rehabilitated is likely because it is being decommissioned (no longer being used for shooting activities) or for contamination management during use (to enable shooting activities to continue for longer).	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP						
Social	Amenity	The facility is not visible to the public - amenity os not expected to be impacted.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP						
Social	Traffic	Rehabilitation activities are not expected to have an impact on traffic.	1	1	Reputation or Credentials, including social	1	A = acceptable	ALARP						
Social	Indigenous heritage	Rehabilitation activities are not expected to have an impact on indigenous heritage.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should item of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					
Social	European heritage	No impacts to European heritage are expected.	1	1	Environmental Impacts	1	A = acceptable	ALARP - however, the following will be implemented: * Cultural Heritage Management Plan - All site personnel will be educated regarding cultural heritage should artefacts be encountered. - Should item of cultural significance be discovered, personnel will act according to the following: • Stop work in the vicinity of the item; • Notify the Project Manager who shall contact the Client's Environmental Representative; • Leave items where they were found; • If items are dislodged by machinery, make a note of where they came from; and • The Project Environmental Representative shall have Cultural Heritage Consultant on call to come to site to inspect artefacts and advise on what action to take.					

Appendix F

Site Based STromwater Management Plan

Department of Housing and Public Works

Queensland Government

STORMWATER MANAGEMENT PLAN

WOOD & GRIEVE ENGINEERS

MINISTERIAL INFRASTRUCTURE DESIGNATION CLAY TARGET RANGE BELMONT SHOOTING CENTRE

VITAL EXPERIENCE IN
acoustics / civil / electrical / ESD / fire / hydraulic / lifts / mechanical / property asset management / structural / underground power

MODE DESIGN

11 July 2018

Revision B

Prepared by Wood & Grieve Engineers Project Number: 27400-BRI-C
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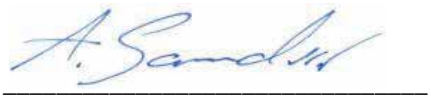
DOCUMENT CONTROL

REVISION	DATE	COMMENT	CHECKED	APPROVED BY
P1	19/01/2018	Draft Issue	KF	AKS
P2	25/06/2018	Revised Draft Issue		AKS
A	26/06/2018	Revision A	AKS	AKS
B	11/07/2018	Issued for Infrastructure Designation Approval	AKS	AKS

Stormwater Management Plan

Site Address:	1485 Old Cleveland Road, Belmont Q 4153
Real Property Description:	Lot 1 on RP 169229
Proposed Development:	Ministerial Infrastructure Designation Clay Target Range
Client:	Mode Design
Authority	Department of State Development Manufacturing Infrastructure and Planning
Authority Reference #:	N/A
Wood & Grieve Reference:	27400-BRI-C



Alex Saunders RPEQ 13360
For and on behalf of
Wood & Grieve Engineers

CONTENTS PAGE

1 Introduction

Wood & Grieve Engineers have been commissioned by Mode Design, on behalf of State of Queensland acting through the Major Projects Office (MPO) Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP), to prepare this Site Based Stormwater Management Plan (SBSMP) for the proposed development at 1485 Old Cleveland Road, Belmont. The site's real property description is Lot 1 on RP 169229. This SBSMP has been prepared to accompany a Ministerial Infrastructure Designation (MIP) submission for a designated site within the Belmont Shooting Centre (BSC) to be lodged with the DSDMIP.

The principles of Water Sensitive Urban Design (WSUD) and Total Water Cycle Management (TWCM) have been applied to protect environmental values and achieve required Standards.

The WSUD principles determined to be of higher importance, in the context of the development's purpose, and applied in this SBSMP were:

- protecting existing natural features of the natural drainage system including overland flow paths, waterways and water bodies and ecological processes where mapped;
- maintaining natural hydrologic behaviour of catchments and preserving the natural water cycle via minimising changes to the natural frequency, duration, volume and peak discharge of urban stormwater;
- management of contaminants generated through the operation of the facility through specialist advice;
- Protecting water quality environmental values of surface and ground waters.

2 Purpose & Constraints

2.1 Purpose

The purpose of this SBSMP is to evaluate the potential impacts on the quantity and quality of stormwater associated with the permanent use of the Clay Target Range Legacy facility; and demonstrate to the State that an appropriate stormwater management strategy can been adopted.

The SBSMP specifically addresses the following items for the Ministerial Infrastructure Designation, incorporating both the existing and proposed development:

- Stormwater quantity (changes in runoff characteristics);
- Stormwater quality (treatment measures); and
- Maintenance of water quality treatment devices.

Correct application of this document will achieve the following:

- Applicable stormwater standards will be met and maintained within the site,
- Pollution control will be achieved and maintained in accordance with specialist advice,
- Neighbouring properties will not be adversely affected, nor unduly disrupted by stormwater,
- The incorporation of controls and remediation for potential water contaminants, and
- Implementation of an appropriate stormwater management strategy.

2.2 Constraints

Key statutory requirements for the management of stormwater include the following:

- A duty of care is owed to property owners who receive stormwater flows, which may be altered by the development, to ensure that such properties are not adversely affected by hydraulic or water quality impacts during the construction, maintenance and operational phase of the development,
- Stormwater discharged from the site is to be of an acceptable water quality standard,
- Reasonable and practical measures must be taken to avoid misuse of any floodway or waterway,
- All reasonable and practical measures must be taken to minimise or prevent environmental harm,
- All proposed stormwater infrastructure design must have due regard for public safety.

2.3 Exclusions

This report does not model or quantitatively address pollutants generated as a result of shooting activities on the proposed clay target range or from adjoining ranges controlled by the Queensland Rifle Association. DSDMIP have separately commissioned Groundcorp Pty Ltd. as a specialist environmental consultant in this regard for contamination advice. Water quality treatment measures put forward within this report reflect the advice provided by Groundcorp Pty ltd as recommended stormwater treatment measures.

3 Existing Site Characteristics

3.1 Property Detail

Address:	1485 Old Cleveland Road, Belmont
Real Property Description:	Lot 1 on RP 169229
Total Property Area:	5,020,019 m2 (502 Ha)

The Ministerial Infrastructure Designation application covers only the area of the recently constructed Commonwealth Games Clay Target range facility, consisting of three trap and skeet housing structures, hardstand and the associated drainage and clay target curtain, and the proposed addition of a fourth skeet and trap housing structure and four additional adjoining 'down the line' ranges, additional pollutant control measures, earthworks and shot curtain modifications.

For the purpose of this report, the term 'Site' will refer to the designation area within Figure 2.

The greater Belmont Shooting Complex site is heavily vegetated with most shooting range development and facilities located in the north end of the site. The area of the works is shown in Figure 2 and is bounded by large lot residential uses toward the north-east, vegetated area and the Sleeman Sports Complex to the east, and the densely vegetated area and large lot residential to the south and South East. **Figure 1** and **Figure 2** show the development site and the existing temporary use clay target range development area respectively. Further, C01 in Appendix 1 shows the site plan.

Figure 1: Site Location Plan (Source: Near Map Australia, 2017)

Figure 2 Temporary Clay Target Range Area to be refurbished for permanent use (Source: Near Map Australia, 2017)

3.2 Commonwealth Games Temporary Works

The Temporary Clay Target Facility shown in Figure 2 was constructed for the 2018 Commonwealth Games (and test event) to comply with ISSF requirements. The site consists of a newly constructed Clay Target Range Facility including gravel carpark, range including three trap and skeet house structures, and a field of play, which has an 18m high shot curtain to the perimeter. The site has been treated with hydro-mulch and turf, which has been established for approximately 6 months at time of writing this report. As part of the temporary works a 100 year ARI stormwater diversion channel was constructed along the eastern and southern perimeter of the facility to divert upstream 'clean' natural runoff around the field of play containment area. There are also diversion drains, surfed swales and a sediment basin within the field of play containment area. The newly constructed temporary clay target range Facility was for the 2018 Commonwealth Games' Skeet, Trap and Double Trap shooting events.

3.3 Existing Site Conditions & Improvements

The property is subject to Brisbane Council's overlay mapping. The site contains overlays with respect to stormwater management which are:

- Flood (Overland flow planning area),
- Biodiversity (High ecological significance).

Other overlays apply to the larger Belmont Shooting Complex, however, are outside of the subject site area for this application and therefore have not been considered relevant except where the features adjoin the designation site require comment.

The Clay Target Range site also falls within Council's Conservation zone and is subject to the conservation zone code. The stormwater management strategy adopted by this SBSMP promotes conservation values consistent with the code. This includes the application of WSUD and TWCM principles through the adoption of Stormwater Quality Improvement Devices (SQIDS) that also assist in the removal of non-standard contaminants consequential to the purpose of the development.

3.4 Topography, Catchments and Site Drainage

3.4.1 Topography

The Belmont Shooting Centre allotment is 502 ha and densely vegetated. Mount Petrie is located in the centre of the site, dividing it into two large catchments. The BSC site itself is located in the northern catchment. It is high in the north, east and south, and generally falls to the valley in the west at an approximate grade of 3.8%.

3.4.2 Stormwater Catchments

Mount Petrie, located centrally within the site's allotment, divides the allotment into two large catchments, the Bulimba Creek Catchment in the north – flowing to the Brisbane River, and the Tingalpa Creek Catchment southeast – flowing to the Tingalpa Reservoir. The site, belonging to the greater northern catchment, divides into seven sub-catchments for the purpose of this report which includes the facility and direct upstream catchments. These total 14.1303 hectares:

- C1A – 0.4540 ha
- C1B - 0.6031 ha
- C2 – 2.0876 ha
- C3 – 7.6867 ha
- C4 – 0.7717 ha
- C5 – 2.0208 ha
- C6 – 0.5064 ha

The catchment plan CW07-A is provided in Appendix 1.

3.4.3 Existing Stormwater Discharge within the site

The recently constructed drainage works consists of a combination of swales, sub-soil drains, field inlets and pipes. Flows from the North, East, and South surrounding the clay target site fall toward the field of play and then flow westward. There are diversion drains - bunds and swale combinations that divert runoff from external catchments around the Clay Target range and its field of play containment area. There is rock scour protection in the South-West corner and to the West of the site beyond the contained area.

Further, there are varying depths of crushed concrete under some swales and the centre drainage area to provide pH management to assist in the minimisation of lead contaminants, as recommended by GroundCorp Pty Ltd.

There is a temporary wet sediment basin at the Western edge of the field of play to allow for the settlement and capture of pellet and coarse sediment. Overflow from this basin then flows North into the mapped overland flow path through the Belmont Shooting Complex towards Old Cleveland Road.

3.5 Soils & Erosion

3.5.1 Erosion and Sediment

WGE completed an erosion hazard assessment for the Clay Target Range site on 11 May 2016. The assessment identified the development of the site as high risk. This was primarily due to some slopes being greater than 15% and longer than

3m. Further, the development of the site would have also been considered high risk if the external catchment water was not diverted around the range.

WGE created a conceptual Erosion and Sediment Control (ESC) plan to manage the erosion risks associated with the construction works undertaken to date. The plan was prepared with reference to the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control.

The Contractor implemented their own construction management plan incorporating the erosion and sediment control measures set out in the ESC. Swale diversion drains divert external catchment flows from the north and east around the site. The Contractor installed and stabilised them with turf prior to other works in the area. Additional to the general construction phase ESC measures the Contractor installed a temporary sediment basin and treated exposed areas with hydro-mulch and turf.

3.5.2 Acid Sulphate Soils

Holocene sediments and depths below RL 5.0m AHD can contain Acid Sulphate Soils. The greater property is subject to Council's Potential and Actual Acid Sulphate Soils overlay mapping. However, the mapping indicates that the area of potential concern is North of and not near the disturbed area of the site. Further, the lowest portion of the site's disturbed area is at an approximate RL 25 m. Soil Surveys completed a geotechnical investigation and produced a report, dated April 2016. The report did not state potential or actual acid sulphate soils to be a concern.

4 Stormwater Quantity

4.1 Standards and Guidelines

This stormwater management strategy is governed by Council's Brisbane City Plan (2014), Council's Planning Scheme Policy 6, State Planning Policy, *Planning Act 2016*, Minister's Guidelines and Rules Under the *Planning Act 2016* (July 2017), and Queensland Urban Drainage Manual (2017) (QUDM).

4.1.1 Level of Serviceability

The following levels of serviceability are proposed to be provided within the stormwater drainage system.

Table 1: Stormwater Drainage Serviceability

Category	Design parameter	Design standard
Open Space and Sporting Facilities	Minor drainage system	Minimum 39% AEP (2 Yr ARI)
	Major drainage system	Minimum 1% AEP (100 Yr ARI)

4.2 Lawful Point of Discharge

It is a requirement that every development must have a lawful point of stormwater discharge. The overland flow path joins the local waterway corridor downstream within the Belmont Complex before leaving the property boundary at the existing point of discharge in the North. The existing clay target range facility and the proposed extension does not, and will not, affect the flow characteristics as it discharges from the site. Nor does it, or will it cause an actionable nuisance. It is considered that maintaining discharge to the mapped overland flow path thin the property ensures that there is no change to the lawful point of discharge from the current Belmont Shooting Centre site.

4.3 Pre Development Stormwater Condition

Prior to the construction of the temporary clay target facility, an existing south facing 300M overlapped the location of the new range. This range consisted of a shed, canopy structure. Significant clearing and earthworks had been undertaken for this range. The site could be classified as generally pervious (grassed)

The catchments to the East of this range were piped under the previous 300M range, approximately in the middle of the new field of play for the clay target range.

4.4 Post Development Stormwater Condition

The construction of the new temporary clay target range has seen the pipe removed and external catchments to the East managed via an overland diversion channel. Additional clearing has been undertaken. Surfaces are largely pervious (grassed). The small impervious surfaces such as trap houses and pathways all drain directly onto pervious surfaces.

The site changes are not significant from a stormwater volume perspective and will not substantially impact any of the following:

- Catchment hydrology: runoff volumes and peak flows, time of concentration and base flows within watercourses,
- The general form and alignment of the overland flow path and waterway corridors downstream of the facility,

As such, from a stormwater quantity perspective, we do not believe the proposed facility constitutes any material change. Further, the basins outlined within Section 5 as stormwater quality measures will further assist in mitigating runoff volumes from the site.

5 Stormwater Quality

5.1 Stormwater Management Strategy

The Queensland State Planning Policy 2017 identifies Water Quality as a State interest. Which, according to the *Planning Act 2016* (Qld), means that water quality is an interest that the Planning Minister considers:

- Affects an economic or environmental interest of the State or a part of the State
- Affects the interest of ensuring that the purpose of the Act is achieved.

The SPP State interest statement for water quality is:

- The environmental values and quality of Queensland waters are protected and enhanced.

The Ministerial Infrastructure Designation application involves disturbing a land area 2500m2 or greater in size when the works completed to date are included. In accordance with the SPP, this triggers the requirement to achieve the SPP assessment benchmarks – water quality for receiving waters as stated in the SPP.

The relevant SPP assessment benchmarks – water quality are:

- Development is located, designed, constructed and operated to avoid or minimise adverse impacts on environmental values arising from:
    - altered stormwater quality and hydrology
    - the release and mobilisation of nutrients and sediments.
- Development achieves the applicable stormwater management design objectives outlined in tables A and B (appendix 2)

This Ministerial Infrastructure Designation application aims to protect the environmental and water quality values through the adoption of locally appropriate and specialist advised solutions to avoid or minimise the impacts of stormwater discharge to receiving waters. This SBSMP demonstrates that the treatment process achieves the WQOs for the site, and is in accordance with the SPP.

It was not considered applicable or best practice to adopt standard Water Quality Objectives and treatment measures typically incorporated within the SPP and reference guidelines as these are targeted at urban development. Due to the specialist nature of the facility and potential contaminants, specialist advice from Groundcorp Pty Ltd has been used to set the proposed stormwater treatment train for the proposed permanent use Clay Target Range facility.

5.2 Integrated Contamination Management Strategy

Groundcorp Pty Ltd completed an environmental assessment and produced a report titled Contamination Report dated June 2018. The report's objective was to identify and assess the potential impacts of contamination for the Clay Target Range facility. The report identified the main sources of contamination as clay target pellets, gunshot residue, and pitch based clay targets; with lead being the contaminant of greatest concern.

The Groundcorp Pty Ltd report highlighted that lead can bind to clays in soil, impressing the importance of good vegetation cover and root systems to prevent erosion and the need to provide pH control of the soil to bind and stabilise lead. The report made the following recommendations relevant to surface stormwater management:

"Due to the nature of distribution of contaminants on a clay target range, it is unfeasible to structurally isolate sources of contamination from rainfall and stormwater runoff. It is however feasible to redirect, or substantially redirect external stormwater runoff around the source of potential contamination, it is feasible to reduce the generation of mobile contaminants, and it is feasible to incorporate measures to reduce the migration of contaminants in stormwater.

The following principles are adopted for the surface water quality management of the facility:

A. *Isolate potential sources of contamination from stormwater catchments;*
B. *Reduce stormwater migration of contaminants, including reducing corrosion and reducing the generation of more mobile forms of contamination;*
C. *Maintain low water levels in surface water basins, capturing, recycling and reusing captured site stormwater runoff onsite*
D. *Treat potentially impacted stormwater runoff prior to discharge from the Operational Area;*
E. *Monitor and manage the facility to achieve the WQOs*

In conjunction with regular monitoring and review, generally the following measures are considered necessary to protect surface water quality:

1. *Divert external catchments away from the Operational Area, and particularly away from the Cleared Operational Area;*
2. *Incorporate measures in the drainage paths and catchment to reduce corrosion, reduce runoff, reduce sediment migration, reduce pellet migration and reduce dissolved phase lead. It is anticipated that this would include measures such as geochemically engineered surface soils in the Operational Areas, recycled concrete in drainage paths, swales with geochemically engineered profiles and geochemically engineered contour banks;*
3. *Reduce erosion and sediment migration by establishing and maintaining vegetative ground cover in the Cleared Operational Area;*
4. *Establish and maintain a treatment / monitoring basin prior to surface water discharge from the Cleared Operational Area. It is anticipated that this would be designed to capture sediment and include measures such as geochemically engineered filter media and geochemically favourable construction materials. Subject to the catchment topography it may be practical to incorporate more than one basin;*
5. *Incorporate a sediment forebay prior to the treatment / monitoring basin(s) to capture migrating lead pellets;*
6. *Establish and maintain a dam that captures drainage from the Operational Area for the primary purpose of monitoring and water recycling, and the secondary purpose of surface water quality treatment;*
7. *Maintain low water levels in the treatment / monitoring basin(s) by means such as using the water in the Operational Area for irrigation;*
8. *Develop and implement procedures to manage risks that arise for regular maintenance requirements for the facility, which are anticipated to include appropriate monitoring, controls and protection for maintenance activities such as maintaining the treatment / monitoring basin(s) and forebays*
9. *Develop and implement procedures to manage risks that arise for irregular maintenance requirements for the facility, which are anticipated to include appropriate monitoring, controls and protection for irregular maintenance activities such as lead reclamation, and ensuring that lead reclamation activities are only implemented if it can be demonstrated that potential risks to the environment and human health are managed during lead reclamation, and fine fractions of contaminants are not mobilised"*

This SBSMP integrates these recommendations and other recommendations such as placing a layer of crushed concrete underneath swales, as appropriate. However, environmental advice, assessments and management plans are outside the scope of this SBSMP. Surface water, ground water, and soil monitoring programs should be undertaken in accordance with GroundCorp or other approved specialist contamination consultant recommendations.

5.3 Water Quality Treatment Train – Operational Phase

This SBSMP has adopted a stormwater management strategy, which takes account of safety, maintenance and visual amenity considerations, as well as the application of WSUD and TWCM principles. The proposed treatment train consists of diversion drains to divert flow from external catchments, recycled concrete trenches to help stabilise the lead particles through pH management, a concrete lined sediment forebay to screen coarse sediment and regulate flows, a gross pollutant trap to screen larger pollutant items, and an over overflow basin to further regulate flows. Some areas have rock scour protection.

Figure 3 shows the ultimate proposed treatment train. Some of these measures are now existing as a result of the Commonwealth Games and others are required legacy items to allow for the permanent use of the facility. Existing and proposed measures are identified as such.

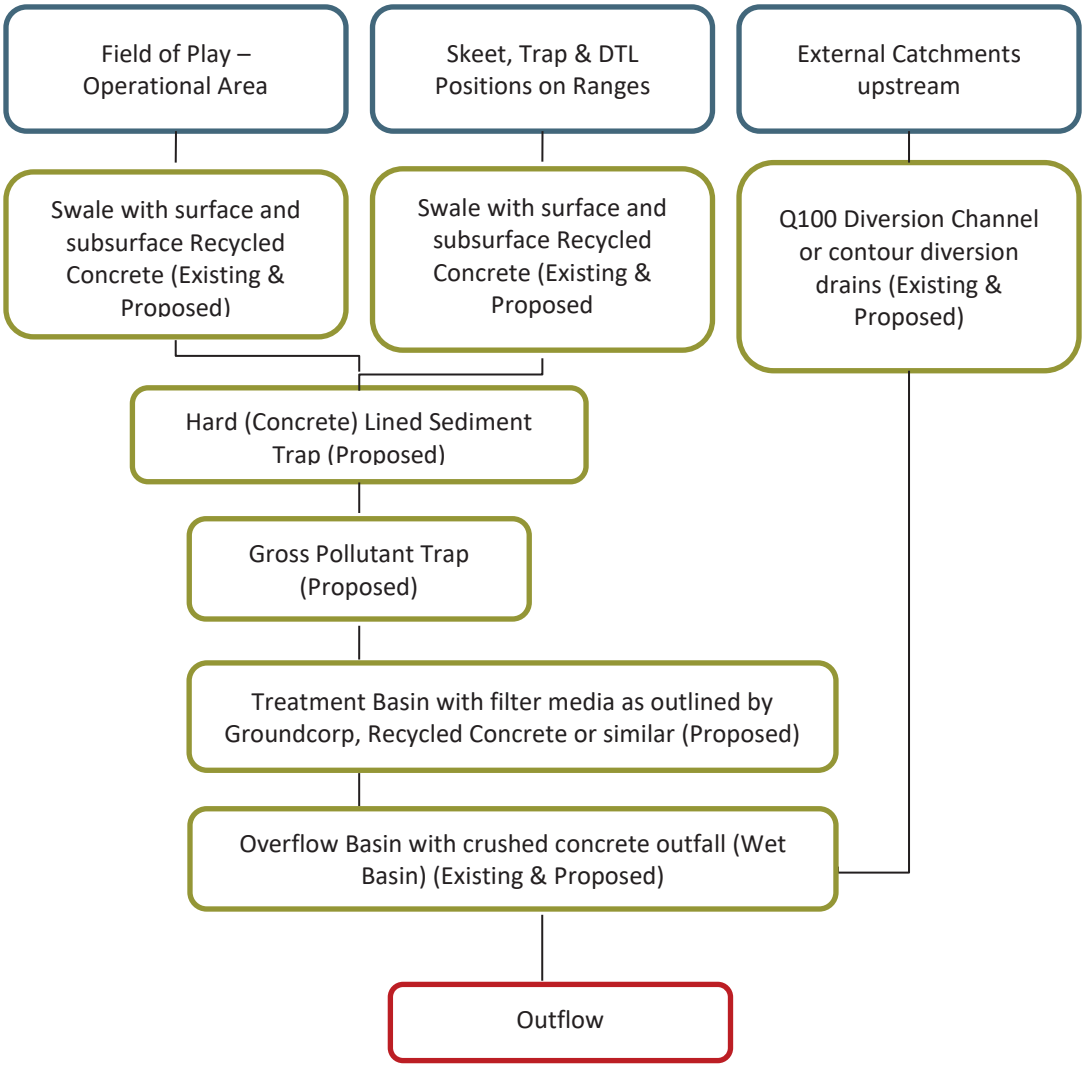


Figure 3: Proposed Treatment Train

5.4 Stormwater Quality Improvement Devices

5.4.1 Swales with Surface and Sub-surface Recycled Concrete

Swales are vegetated areas (of turf) that convey stormwater flow in lieu of conventional pipe drainage systems. They can have various sub-surface drainage profiles and assist in the removal of sediment and nutrients. The stormwater dissipates over the grass, seeping into the ground and infiltrating as base flow or discharges into the next element in the treatment train.

5.4.2 Hard (Concrete) Lined Sediment Trap

The concrete lined type 2 sediment trap is included for two functions: the removal of coarse sediment and the easy maintenance of washed pellet particles which were not captured by the swales.

5.4.1 Gross Pollutant Trap

A gross pollutant trap (GPT) is proposed to be included in the treatment train after the sediment trap. GPT's are classed as a primary water treatment device. It is typically a permanent underground structure and used filter and remove solid pollutants present in stormwater flows. The unit separates and retains gross pollutants by way of a trash rack and can be easily maintained.

The primary purpose of the GPT is to capture non-environmental plastic casing components if used which will float within the two previous devices as well as an additional lead and sediment capture device.

An example of a separator type GTP is the HumeCeptor system, which can also remove total suspended solids and hydrocarbons. Figure 4 shows an example of a HumeCeptor system.

Figure 4 HumeCeptor System (sourced HumeCeptor System Technical Manual Issue 5 2017)

5.4.1 Treatment Basin with filter media as outlined by Groundcorp, Recycled Concrete or similar (Proposed)

A treatment basin is proposed at the lower end of the field of play to treat with a filter media expected to comprise of recycled concrete or shells etc. Such a basin will operate in a similar way to a sand filter with the added intent of pH treatment. These types of filters operate in a similar manner to bioretention systems, with the exception that stormwater passes through a filter media that has no vegetation growing on the surface. Filters do not incorporate vegetation because the filter media does not retain sufficient moisture to support plant growth.

The size of the filter required will be determined during detailed design.

5.4.2 Diversion Drain with Surface Recycled Concrete Lining

The perimeter diversion drain which diverts external catchment flows around the field of play is proposed to have a 100mm min thick recycled concrete lining. This will assist in capturing any limited migrating lead pellet and managing pH associated with this overshot.

5.5 Water Quality Strategy - Construction Phase

5.5.1 Construction Associated with Permanent Use Works

The temporary works construction phase is complete, however, additional works are required for permanent use and these are yet to be undertaken and are expected to comprise:

- Remediation of the site post the 2018 Commonwealth Games
- Clearing to the north, south, east and west of the temporary works.
- Filling and Bulk Earthworks
- Site Drainage & treatment train implementation
- Landscaping and associated stabilisation
- Adjustments to the existing shot curtain.

Stormwater runoff that traverses exposed earthworks surfaces, during this new construction phase, will be managed though contamination diversion and retention mechanisms. Control mechanisms to be used include:

- Erosion controls such as sediment fences surrounding stripped earth,
- Sediment fences surrounding stockpiles of soil and debris,
- Construction of perimeter bunding at toe and/or top of earthworks batters,
- Catch drains, including check dams, though the site to catch direct runoff,
- The containment of site runoff in a temporary sediment basin during construction works,
- Diversion drains to re-direct clean water around the site.

5.5.2 Construction Phase Strategy

A detailed Erosion and Sediment Control (ESC) plan is to be prepared for the remaining construction works associated with permanent use. The ESC plan will be implemented during the construction phase. These should be prepared in accordance with the latest International Erosion Control Association (IECA) standards and applicable Council standards. A suitably qualified person will inspect construction works to ensure compliance.

Table 2: Summary of Design objectives for Construction Phase of the permanent use Development in Queensland

CONSTRUCTION PHASE STORMWATER DESIGN OBJECTIVES	DEVELOPMENT TYPE Large and medium scale construction sites Defined as disturbance area greater than 1 ha (large) or 2500m2 (medium density)
INTENT	To protect water EVs by minimising hydrologic disturbance and the loads of contaminants in runoff.
POLLUTANT/ISSUE	STORMWATER DESIGN OBJECTIVES
Coarse sediment	Retain coarse sediment on clay target range site.
Fine sediment	Take all reasonable and practicable measures to collect all runoff from disturbed areas and drain to a sediment basin—up to the design storm event. Site discharge

(Total suspended solids—TSS)	during sediment basin dewatering complies with a TSS concentration less than 50 mg/L up to the design event—flocculation as required. In storms greater than the design event take all other reasonable and practicable measures to minimize erosion and sediment export.
Turbidity	Released waters from the approved discharge point(s) have turbidity (NTU) less than 10% above receiving waters turbidity—measured immediately upstream of the site.
Nutrients (N and P)	Manage through sediment control.
pH	Acceptable site discharge pH range 6.5 to 8.5
Litter or other waste	Prevent litter/waste entering the site or the stormwater system or internal watercourses that discharge from the site—minimise on-site production, contain onsite and regularly clear bins.
Hydrocarbons and other contaminants	Prevent from entering the stormwater system or internal watercourses that discharge from the site—control storage, limit application and contain contaminants at source. Waste containing contaminants must be disposed of at authorized facilities. Store oil and fuel in accordance with Australian Standard AS1940—no visible oil or grease sheen on released waters.
Wash down water	Prevent from entering the stormwater system or internal watercourses that discharge from the site.
Cations and anions	As required under an approved Acid Sulfate Soil Management Plan, including aluminium, iron and sulfate
Stormwater drainage/flow management	Take all reasonable and practicable measures to minimize changes to the natural waterway hydraulics and hydrology from: peak flow for the 63% and 1% AEP events (respectively for aquatic habitat and flood protection) runoff frequency and volumes entering receiving waters uncontrolled release of contaminated stormwater.

5.5.3 Construction Phase for permanent use works Monitoring

During the construction phase associated with permanent uses and completion of the proposed clay target range, the maintenance and monitoring of erosion and sediment control measures remains the responsibility of the Contractor. If during the construction phase it is deemed required, monitoring can also be undertaken by qualified consultants to determine the impact of activities on the subject site only.

6 Maintenance of Treatment Devices

6.1 Maintenance Tasks & Responsibilities

The following maintenance schedules are proposed for the various Stormwater Quality Improvement Devices to ensure they continue to operate as planned.

Table 3: Summary of SQID Maintenance Responsibility

Stormwater Quality Improvement Devices	Maintenance Responsibility
Field of Play and Swales	Site Leaseholder
Concrete lined sediment trap	Site Leaseholder
Gross Pollutant Trap	Site Leaseholder
Sediment Basin (Wet Basin)	Site Leaseholder

6.2 Sediment Basins

The following long term maintenance plan is taken from the Healthy Waterways Technical Design Guide for Sediment Basins.

Sediment basins treat runoff by slowing flow velocities and promoting settlement of coarse to medium sized sediments. Maintenance focuses on ensuring inlet erosion protection is operating as designed, monitoring sediment accumulation and ensuring that the outlet is not blocked with debris. The outlets from sedimentation basins are to be designed such that access to the outlet does not require a water vessel. Maintenance of the vegetation including watering and weeding is also required, particularly during the plant establishment period (first two years).

Inspections of the inlet configuration following storm events should be made soon after construction to check for erosion. In addition, regular checks of sediment build up will be required as sediment loads from developing catchments vary significantly. The basins must be cleaned out if they are more than half full of accumulated sediment.

Similar to other types of WSUD elements, debris removal is an ongoing maintenance requirement. Debris, if not removed, can block inlets or outlets, and can be unsightly if deposited in a visible location. Inspection and removal of debris should be done regularly and debris removed whenever it is observed on the site.

Typical maintenance of sedimentation basins will involve:

- Routine inspection of the sedimentation basin to identify depth of sediment accumulation, litter and debris build up (after first 3 significant storm events and then at least every 3 months).
- Routine inspection of inlet and outlet points to identify any areas of scour, litter build up and blockages particularly after significant rain events.
- Removal of litter and debris. Removal and management of invasive weeds (both terrestrial and aquatic).
- Periodic (usually every 5 years or as determined by use) draining and desilting, which will require excavation and dewatering of removed sediment (and disposal to an approved location) and removal of lead.
- Regular watering of vegetation during plant establishment.

- Replacement of plants that have died (from any cause) with plants of equivalent size and species as detailed in the planting schedule.

All waste removed must be checked for contamination and disposed of in an appropriate manner. Works to remove sediment or waste containing lead must be strictly undertaken under controls provided by a specialist contamination consultant to prevent the risk of disturbance and contamination by lead within the sediment / waste.

In conjunction with any final design, a maintenance plan should be prepared. This is to assist the Contractor and the site's lessee to understand their obligations and responsibilities in regards to both the Construction and Operational Phases of the device.

6.3 Swales

The following long term maintenance plan is taken from the Healthy Waterways Technical Design Guide for Swales.

Stormwater treatment within swales relies upon good vegetation establishment and therefore it is important to ensure adequate vegetation growth is maintained. Swales have a stormwater conveyance role and as such, it is important that the right type and density of plant is selected to minimise complete clogging of stormwater flows.

The most intensive period of maintenance is during the plant establishment period (first two years) when weed removal and replanting may be required. It is also the time when large loads of sediments may impact on plant growth, particularly in developing catchments with an inadequate level of erosion and sediment control.

The potential for rilling and erosion along a swale needs to be carefully monitored, particularly during establishment phases of the system. Other components of the system that will require careful consideration are the inlet points (if the system does not have distributed inflows) and surcharge pits. The inlets can be prone to scour and build up of litter and occasional litter removal and potential replanting may be required.

Typical maintenance of swale elements will involve:

- Routine inspection of the swale profile to identify any areas of obvious increased sediment deposition, scouring of the swale invert from storm flows, rill erosion of the swale batters from lateral inflows or damage to the swale profile from vehicles.
- Periodic testing for and Removal of sediment and pellet particulate.
- Reprofiling of the swale and revegetating to original design specification.
- Repairing damage to the swale profile resulting from scour, rill erosion or vehicle damage.
- Regular watering/ irrigation of vegetation until plants are established and actively growing.
- Mowing of turf or slashing of vegetation (if required) to preserve the optimal design height and density of the vegetation.
- Removal and management of invasive weeds.
- Removal of plants that have died (from any cause) and replacement with plants of equivalent size and species as detailed in the plant schedule.
- Pruning to remove dead or diseased vegetation material and to stimulate new growth.
- Litter and debris removal.
- Vegetation pest monitoring and control.

Included in Appendix 4 are the Healthy Waterways Infiltration Measure Design, Construction and Maintenance Guidelines and Sign-Off Forms. These are included to assist the Contractor and the Site's Lessee to understand their obligations and responsibilities in regards to both the Construction and Operational Phases of the device.

6.4 Gross Pollutant Trap (GPT)

GPT's should be maintained in accordance with the manufacturers' specifications, but in general will include 3 to 6 monthly inspections with annual maintenance for full cleaning recommended. GPT's are generally (depending on model) cleaned as outlined below:

- Have a contamination consultant advise and confirm the GPT cleaning process.
- A vacuum truck lowers its suction hose to the surface of the water in the holding chamber and skims across the surface to capture the floating litter.
- Once this has been achieved then the hose should be lowered to the bottom of the holding chamber to remove sediments, organic matter and litter, which have sunk.
- It is sometimes appropriate to de-water the system before attempting to suck the pollutants out of the holding chamber. if required this must be done in a manner appropriate for the potential contaminants within the GPT.

All waste removed must be checked for contamination and disposed of in an appropriate manner so as to not inadvertently disturb lead that may be present within the trap.

Generally the need for maintenance can be determined easily by opening the unit from the surface and inspecting it. A dip stick to determine how much sediment and gross pollutants have been caught in the holding chamber.

7 Conclusion

This Stormwater Management Plan has been prepared for the proposed Ministerial Infrastructure Designation Application for the permanent use of the existing temporary Clay Target Range Facility within the Belmont Shooting Centre. The proposed development comprises the permanent use approval of works already constructed as well as additional construction of some additional elements. If unmitigated, the proposed development would have a detrimental impact on runoff water quality from the site if used as a permanent facility.

Stormwater management measures and treatment devices have been proposed in this report to minimise the impact the permanent use has on the external environment with specialist advice in relation to the management of contamination provided by Groundcorp Pty Ltd.

This report has demonstrated that the recommended measures can be incorporated into the design for the facility. As such we recommend that from a stormwater management perspective the application be supported.

8 Reference

Brisbane City Council & WBM Oceanics Australia, 2000. Site Based Stormwater Management Plan Case Studies. Brisbane City Council, Brisbane.

Groundcorp Pty Ltd, Contamination Report for Ministerial Infrastructure Designation, dated June 2018

Wetland mapping, Wetland Info, Department of Environment and Heritage Protection, Queensland, viewed 19 January 2018, <https://www.ehp.qld.gov.au/wetlandmaps>

Earthling Group (trading as 1000 Yards), draft Contamination Infrastructure Designation Report, dated December 2017
Soil Surveys, Geotechnical Investigation Report, dated April 2016.

Queensland Urban Drainage Manual 4th Edn. 2016, Institute of Public Works Engineering Australasia, Queensland Division.

State Planning Policy July 2017, Department of Infrastructure, Local Government and Planning. <www.dilgp.qld.gov.au>.

Schedule 6 Planning Scheme Policies Brisbane City Plan 2014, Brisbane city Council. <http://eplan.brisbane.qld.gov.au/>

WSUD Technical Design Guidelines for South East Queensland - Version 1 June 2006

Water By Design Bioretention Techncal Design Guidelines - Version 1.1 October 2014

International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (2008)

Queensland Government Environmental Protection Agency, 2006. Queensland Water Quality Guidelines 2006. Environmental Protection Agency, Brisbane

Appendix 1 – Plan Set

27400-BRI-C-ID-C01
27400-BRI-C-ID-CW01
27400-BRI-C-ID-CW02
27400-BRI-C-ID-CW03
27400-BRI-C-ID-CW04
27400-BRI-C-ID-CW05
27400-BRI-C-ID-CW06
27400-BRI-C-ID-CW07
27400-BRI-C-ID-CW08
27400-BRI-C-ID-CW09

CLAY TARGET - INFRASTRUCTURE DESIGNATION

DRAWING INDEX - INFRASTRUCTURE DESIGNATION		
DWG No.	REV	DESCRIPTION
27400-BRI-C-ID-C01	C	COVER SHEET
27400-BRI-C-ID-CW01	C	CLAY TARGET EARTHWORKS LAYOUT
27400-BRI-C-ID-CW03	C	CLAY TARGET EARTHWORKS DETAILS (1 OF 3)
27400-BRI-C-ID-CW04	C	CLAY TARGET EARTHWORKS DETAILS (2 OF 3)
27400-BRI-C-ID-CW05	B	TYPICAL RANGE DETAIL PLAN
27400-BRI-C-ID-CW06	C	OVERALL SITE SURFACES PLAN
27400-BRI-C-ID-CW07	C	CLAY TARGET STORMWATER LAYOUT
27400-BRI-C-ID-CW08	C	CLAY TARGET STORMWATER LAYOUT
27400-BRI-C-ID-CW09	B	CLAY TARGET STORMWATER DETAILS

GENERAL NOTES

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3. DRAWINGS ARE NOT INTENDED TO BE USED FOR TENDER, ESTIMATING OR CONSTRUCTION.

MODE

27400-BRI-C-ID-C01-C

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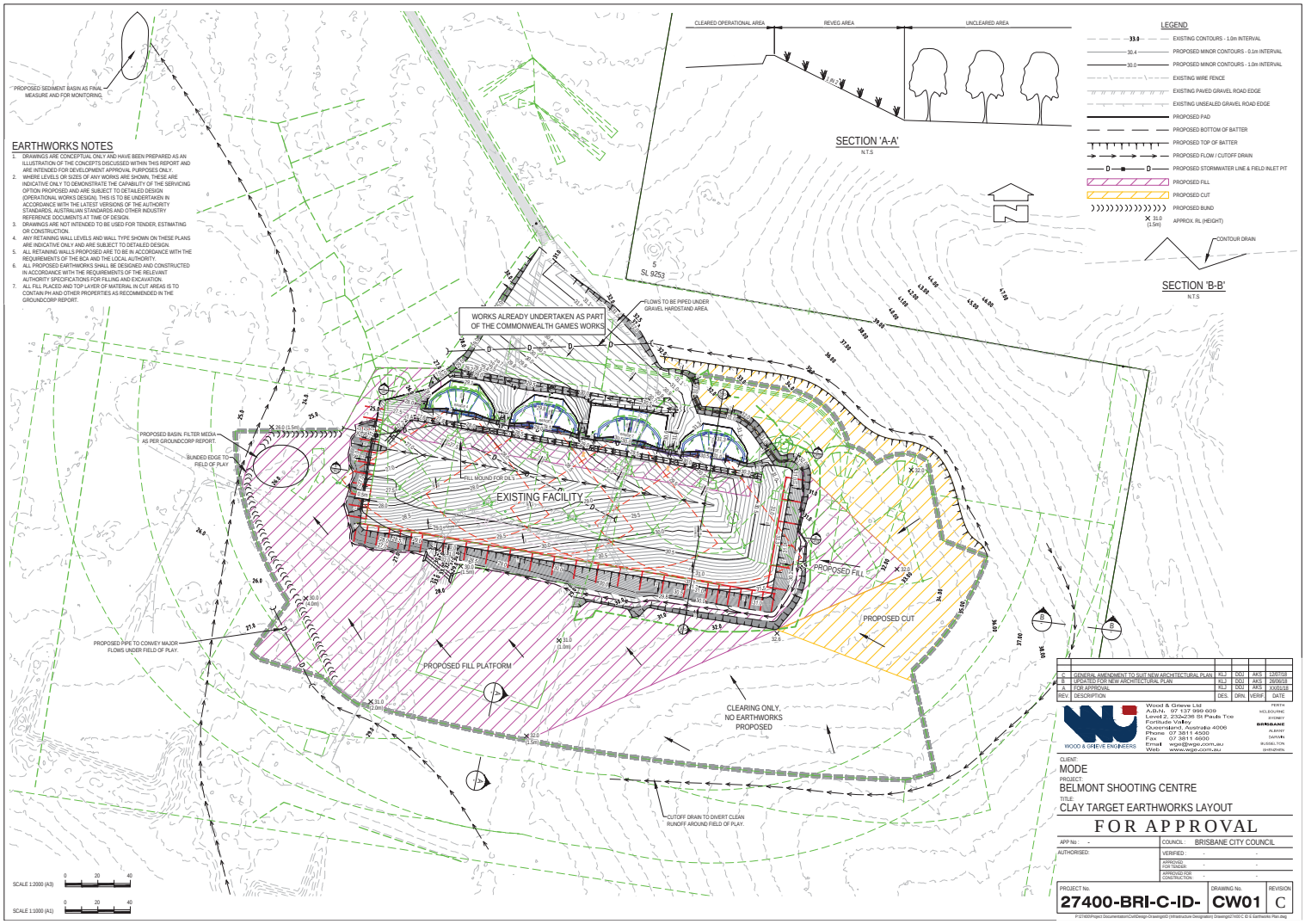
MANDURAH

APP No : -	COUNCIL :	BRISBANE CITY COUNCIL	
AUTHORISED:	VERIFIED :	AKS	12/07/18
	APPROVED FOR TENDER:	-	-
	APPROVED FOR CONSTRUCTION:	-	-



REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
C	GENERAL AMENDMENT TO SUIT NEW ARCHITECTURAL PLAN	KLJ	DDJ	AKS	12/07/18
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLJ	DDJ	AKS	28/06/18
A	FOR APPROVAL	KLJ	DDJ	AKS	23/05/18

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MELBOURNE
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BRISBANE
ALBANY
DARWIN
BUNDALTON
SHEPPARTON

CLIENT: MODE

PROJECT: BELMONT SHOOTING CENTRE

TITLE: CLAY TARGET EARTHWORKS LAYOUT

FOR APPROVAL

APP No.: -	COUNCIL: BRISBANE CITY COUNCIL
AUTHORISED:	VERIFIED: - -
	APPROVED FOR TENDER: - -
	APPROVED FOR CONSTRUCTION: - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW01	C

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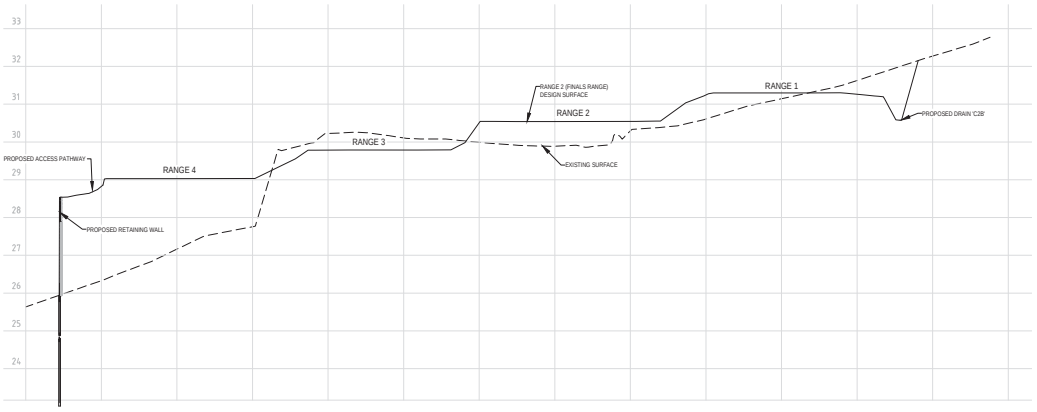
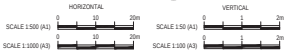
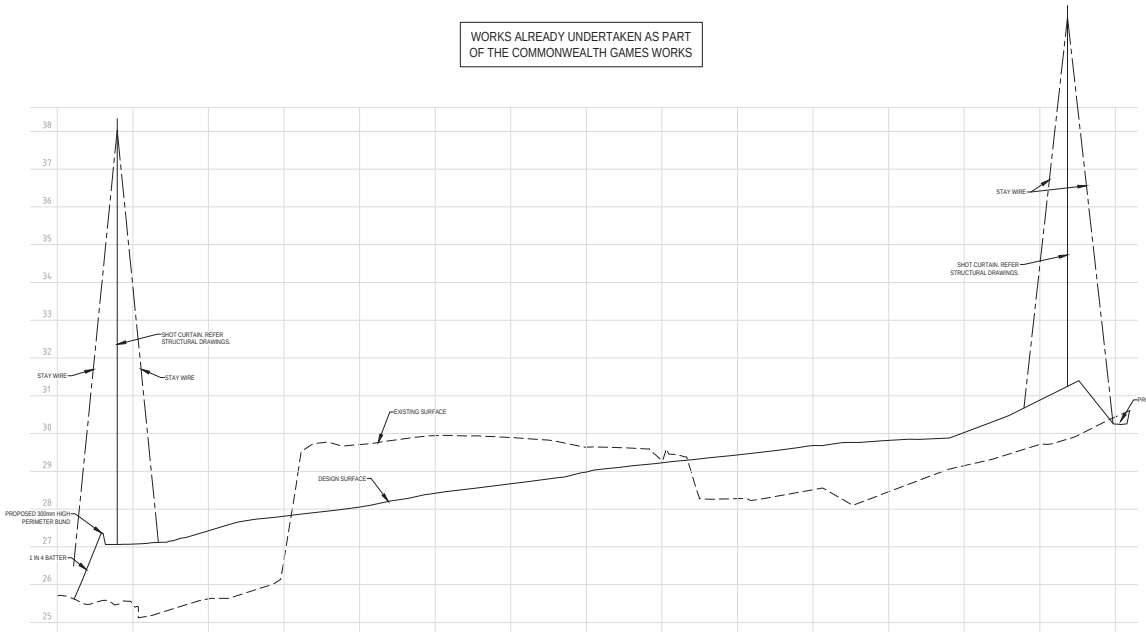


SECTION A-A CW01



WORKS ALREADY UNDERTAKEN AS PART OF THE COMMONWEALTH GAMES WORKS



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7. ALL FILL PLACED AND TOP LAYER OF MATERIAL IN CUT AREAS IS TO CONTAIN PH AND OTHER PROPERTIES AS RECOMMENDED IN THE GROUNDCORP REPORT.

SECTION B-B CW01

REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
C	NOTES ADDED	KLJ	DDJ	AKS	12/07/18
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLJ	DDJ	AKS	28/06/18
A	FOR APPROVAL	KLJ	DDJ	AKS	23/03/18

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ALBANY
DARWIN
BUNDALTON
SHERIDEN

CLIENT:
MODE

PROJECT:
BELMONT SHOOTING CENTRE

TITLE:
CLAY TARGET EARTHWORKS DETAILS (1 OF 3)

FOR APPROVAL

APP No: -	COUNCIL: BRISBANE CITY COUNCIL
AUTHORISED:	VERIFIED: - -
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PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW03	C

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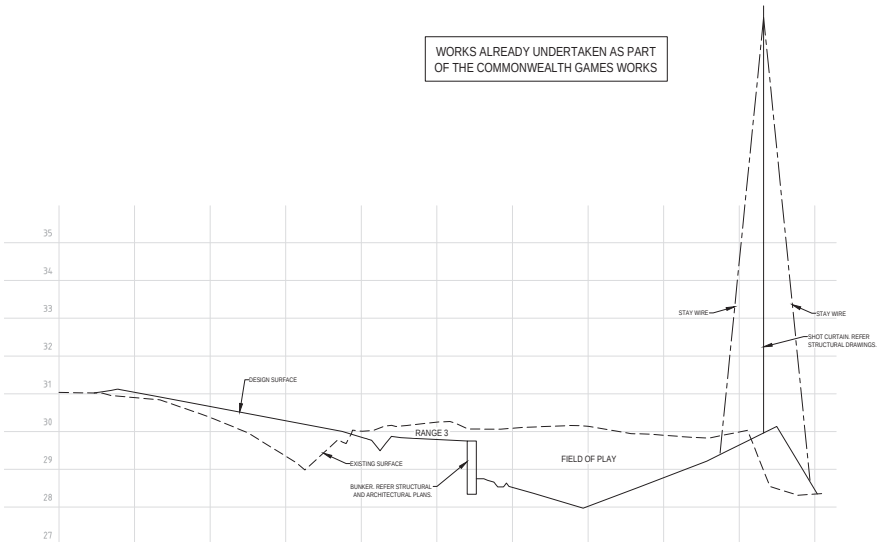
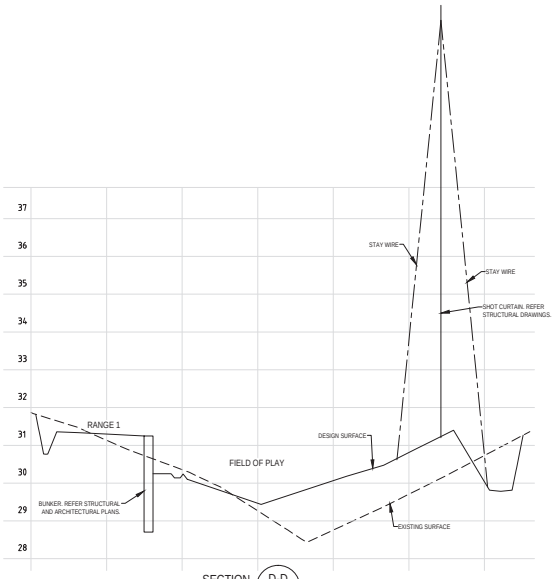
WORKS ALREADY UNDERTAKEN AS PART OF THE COMMONWEALTH GAMES WORKS



SECTION C-C CW01

HORIZONTAL
SCALE 1:500 (A1)
SCALE 1:1000 (A3)
VERTICAL
SCALE 1:50 (A1)
SCALE 1:100 (A3)



SECTION D-D CW01

HORIZONTAL
SCALE 1:500 (A1)
SCALE 1:1000 (A3)
VERTICAL
SCALE 1:50 (A1)
SCALE 1:100 (A3)

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REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
C	NOTES ADDED	KLJ	DDJ	AKS	12/07/18
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLJ	DDJ	AKS	28/06/18
A	FOR APPROVAL	KLJ	DDJ	AKS	23/03/18

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BUNDALTON
SHEPPARTON

CLIENT:
MODE

PROJECT:
BELMONT SHOOTING CENTRE

TITLE:
CLAY TARGET EARTHWORKS DETAILS (2 OF 3)

FOR APPROVAL

APP No.: -	COUNCIL: BRISBANE CITY COUNCIL
AUTHORISED:	VERIFIED: - -
	APPROVED FOR TENDER: - -
	APPROVED FOR CONSTRUCTION: - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW04	C

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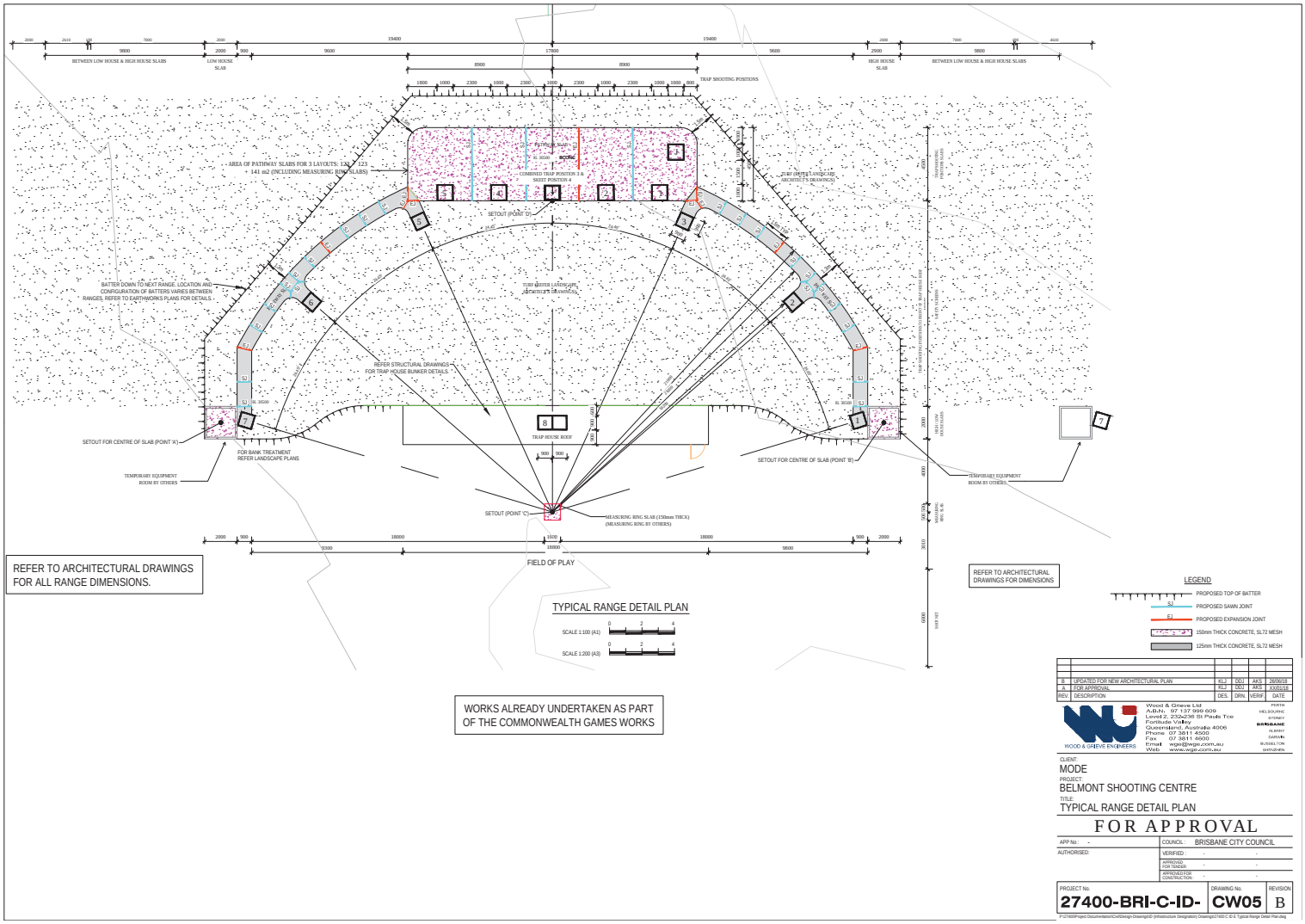

REFER TO ARCHITECTURAL DRAWINGS FOR ALL RANGE DIMENSIONS.

REFER TO ARCHITECTURAL DRAWINGS FOR DIMENSIONS

TYPICAL RANGE DETAIL PLAN

SCALE 1:100 (A1)

SCALE 1:200 (A3)

WORKS ALREADY UNDERTAKEN AS PART OF THE COMMONWEALTH GAMES WORKS

LEGEND

- SJ — PROPOSED SAWN JOINT
- EJ — PROPOSED EXPANSION JOINT
- 150mm THICK CONCRETE, SL72 MESH
- 125mm THICK CONCRETE, SL72 MESH

REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLJ	DDJ	AKS	28/06/18
A	FOR APPROVAL	KLJ	DDJ	AKS	23/02/18

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WOOD & GRIEVE ENGINEERS
PERTH MELBOURNE SYDNEY BRISBANE ALBANY DARWIN BUNDALTON GAWLER

CLIENT: MODE

PROJECT: BELMONT SHOOTING CENTRE

TITLE: TYPICAL RANGE DETAIL PLAN

FOR APPROVAL

APP No.: -	COUNCIL: BRISBANE CITY COUNCIL
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	APPROVED FOR TENDER: - -
	APPROVED FOR CONSTRUCTION: - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW05	B

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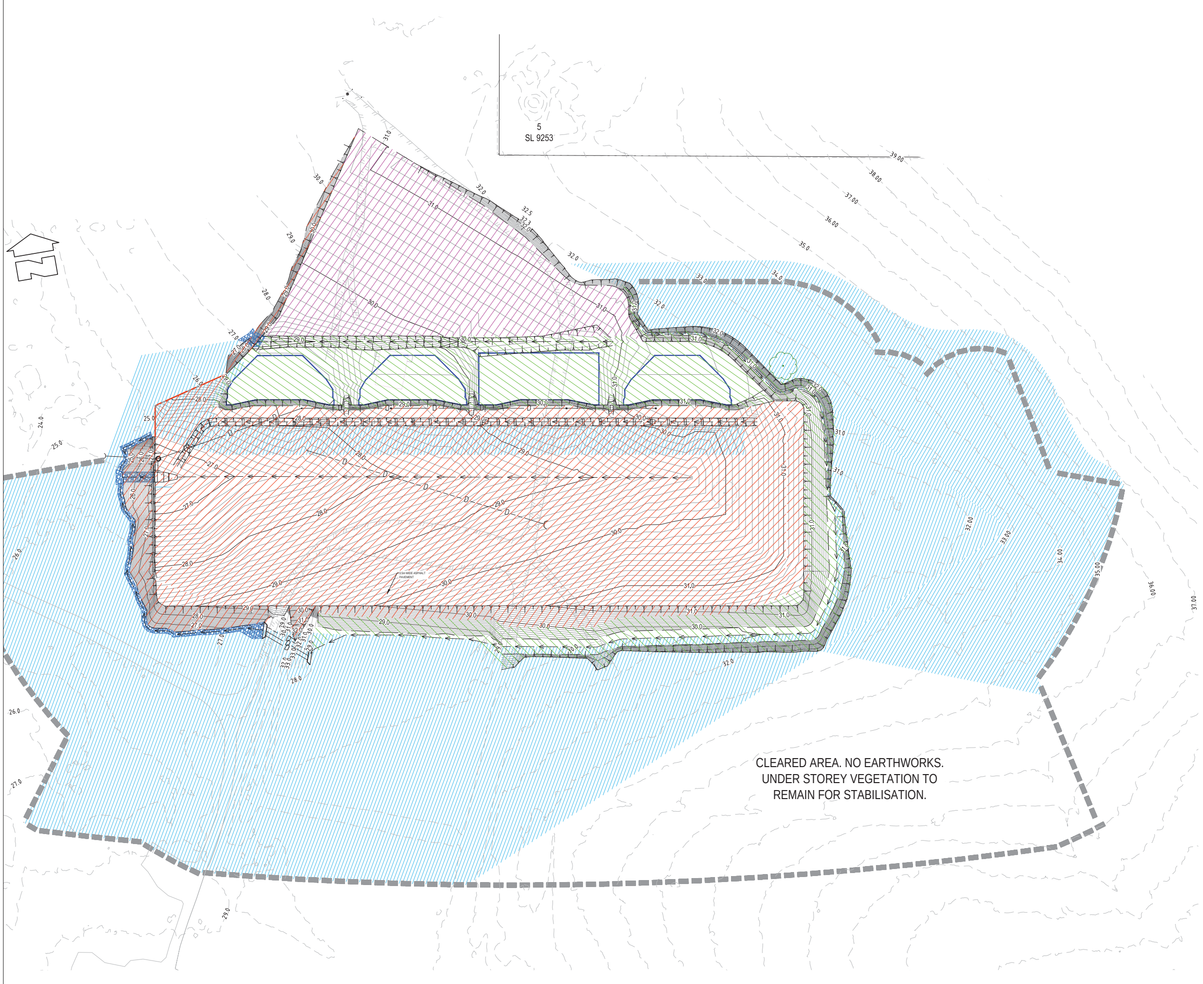

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LEGEND

- PROPOSED HYDROMULCH AREA - (EARTHWORKS COMPACTED TO 98% STD FOR FULL DEPTH) - REFER LANDSCAPING PLANS
- EXISTING HYDROMULCH AREA - (BCC MIX) - REFER LANDSCAPING PLANS
- EXISTING TURF AREA - REFER LANDSCAPING PLANS
- EXISTING UNSEALED GRAVEL PAVEMENT - REFER LANDSCAPING PLANS
- ROCK SCOUR PROTECTION - REFER LANDSCAPING PLANS
- 33.0 EXISTING CONTOURS - 0.1m INTERVAL
- 30.4 PROPOSED MINOR CONTOURS - 0.1m INTERVAL
- 30.0 PROPOSED MINOR CONTOURS - 1.0m INTERVAL
- PROPOSED RETAINING WALL
- EXISTING WIRE FENCE
- EXISTING PAVED GRAVEL ROAD EDGE
- EXISTING UNSEALED GRAVEL ROAD EDGE
- PROPOSED PAD
- PROPOSED BOTTOM OF BATTER
- PROPOSED TOP OF BATTER
- PROPOSED FLOW CHANNEL
- D D PROPOSED STORMWATER LINE & FIELD INLET PIT
- D FUTURE STORMWATER LINE & FIELD INLET PIT
- EXISTING TREES TO BE RETAINED
- EXISTING TREES TO BE REMOVED

SCALE 1:750 (A1) 0 15 30

SCALE 1:1500 (A3) 0 15 30

REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
C	HYDROMULCH AREA AMENDED	KLJ	DDJ	AKS	12/07/18
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLJ	DDJ	AKS	26/06/18
A	FOR APPROVAL	KLJ	DDJ	AKS	XX/01/18

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PERTH
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SYDNEY
BRISBANE
ALBANY
DARWIN
BUSSELTON
SHENZHEN

CLIENT:
MODE

PROJECT:
BELMONT SHOOTING CENTRE

TITLE:
OVERALL SITE SURFACES PLAN

FOR APPROVAL

APP No : -	COUNCIL : BRISBANE CITY COUNCIL
AUTHORISED:	VERIFIED : - -
	APPROVED FOR TENDER: - -
	APPROVED FOR CONSTRUCTION : - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW06	C

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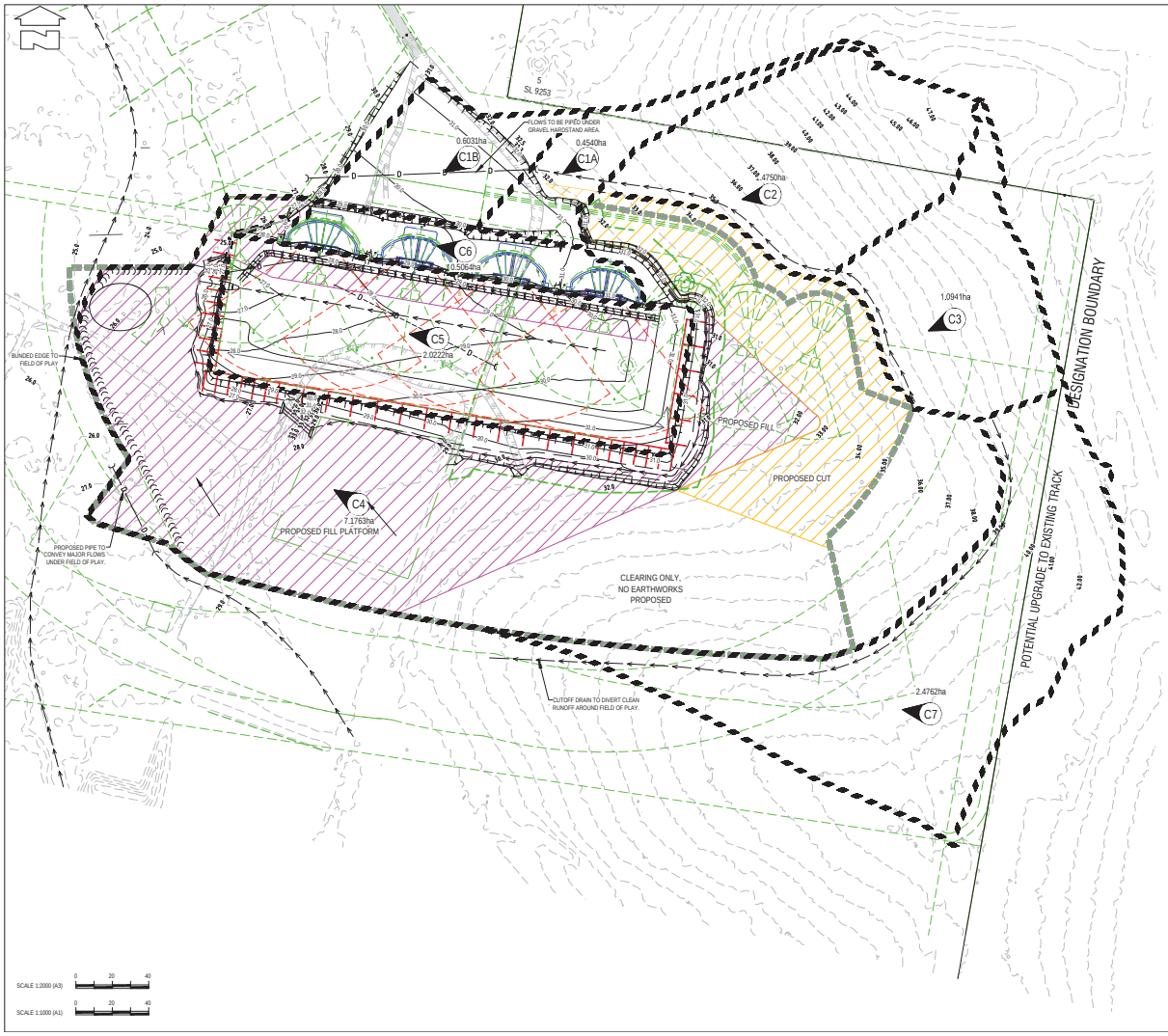

LEGEND

- EXISTING CONTOURS - 1m INTERVAL
- PROPOSED CONTOURS - 1m INTERVAL
- EXISTING WIRE FENCE
- EXISTING PAVED GRAVEL ROAD EDGE
- EXISTING UNSEALED GRAVEL ROAD EDGE
- PROPOSED BOTTOM OF BATTER
- PROPOSED TOP OF BATTER
- PROPOSED FLOW CHANNEL
- PROPOSED STORMWATER LINE & FIELD INLET PIT
- PROPOSED FILL
- PROPOSED CUT
- PROPOSED BUND
- STORMWATER CATCHMENT BOUNDARY
- 0.999 ha C1 CATCHMENT LABEL & AREA

REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
C	CATCHMENT BOUNDARY & AREA AMENDED	KLI	DDJ	AKS	12/07/18
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLI	DDJ	AKS	26/06/18
A	FOR APPROVAL	KLI	DDJ	AKS	24/05/18

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CLIENT: MODE

PROJECT: BELMONT SHOOTING CENTRE

TITLE: CLAY TARGET CATCHMENT PLAN

FOR APPROVAL

APP No.: - | COUNCIL: BRISBANE CITY COUNCIL

AUTHORISED: | VERIFIED: - - | APPROVED FOR TENDER: - - | APPROVED FOR CONSTRUCTION: - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW07	C

SCALE 1:2000 (A3) 0 20 40

SCALE 1:1000 (A1) 0 20 40

P:\27400\Project Documentation\Civil\Design Drawings\0 Infrastructure Designation\ Drawings\27400-C-CW Catchment Plan.dwg

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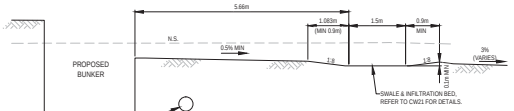
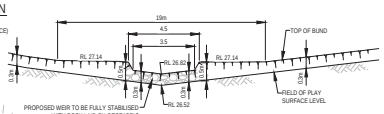


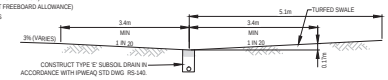
DRAIN 'C6' TYPICAL SECTION

(MIN. LONGITUDINAL GRADE 0.5%)
(DESIGN CAPACITY Q2 WITHOUT FREEBOARD ALLOWANCE)
N.T.S



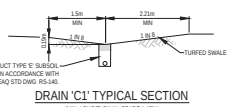
WEIR SECTION 'A-A'

(MIN. LONGITUDINAL GRADE 0.5%)
(DESIGN CAPACITY Q2 WITHOUT FREEBOARD ALLOWANCE)
N.T.S



DRAIN 'C1A' TYPICAL SECTION

(MIN. LONGITUDINAL GRADE 0.5%)
(DESIGN CAPACITY Q100 WITHOUT FREEBOARD ALLOWANCE)
N.T.S



DRAIN 'C1' TYPICAL SECTION

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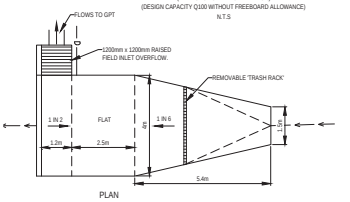
(DESIGN CAPACITY Q100 WITHOUT FREEBOARD ALLOWANCE)
N.T.S



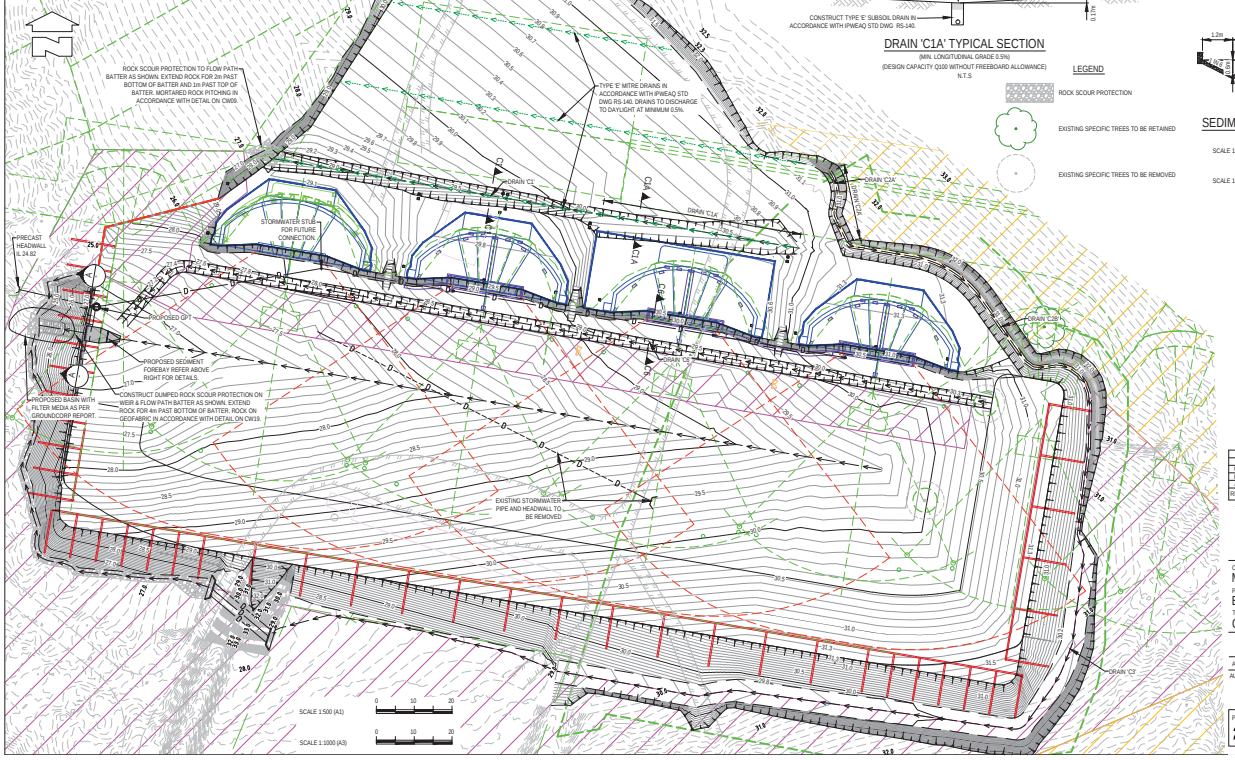
SEDIMENT FOREBAY DETAIL

SCALE 1:75 (A1)
SCALE 1:150 (A3)

LEGEND

ROCK SCOUR PROTECTION
EXISTING SPECIFIC TREES TO BE RETAINED
EXISTING SPECIFIC TREES TO BE REMOVED

LEGEND
- EXISTING CONTOURS - 0.1m INTERVAL
- PROPOSED MINOR CONTOURS - 0.1m INTERVAL
- PROPOSED MINOR CONTOURS - 1.0m INTERVAL
- PROPOSED RETAINING WALL
- EXISTING WIRE FENCE
- EXISTING PAVED GRAVEL ROAD EDGE
- EXISTING UNSEALED GRAVEL ROAD EDGE
- PROPOSED PAD
- PROPOSED BOTTOM OF BATTER
- PROPOSED TOP OF BATTER
- PROPOSED FLOW CHANNEL
- PROPOSED STORMWATER LINE & FIELD INLET PIT
- PROPOSED MITRE DRAIN
- FUTURE STORMWATER LINE & FIELD INLET PIT
- PROPOSED FILL
- PROPOSED CUT



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SCALE 1:1000 (A3)

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C	NOTE & BASIN ADDED AS PER GROUNDCORP REPORT	KLI	DDJ	AKS	12/07/18
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLI	DDJ	AKS	28/06/18
A	FOR APPROVAL	KLI	DDJ	AKS	24/03/18

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Level 2, 230-236 St Pauls Tce
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PERTH
MELBOURNE
SYDNEY
BRISBANE
ALBANY
DARWIN
SUGGESTION
SHANGHAI

CLIENT: MODE

PROJECT: BELMONT SHOOTING CENTRE

TITLE: CLAY TARGET STORMWATER LAYOUT

FOR APPROVAL

APP No : -
AUTHORISED:
COUNCIL : BRISBANE CITY COUNCIL
VERIFIED : - -
APPROVED FOR TENDER - -
APPROVED FOR CONSTRUCTION - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW08	C

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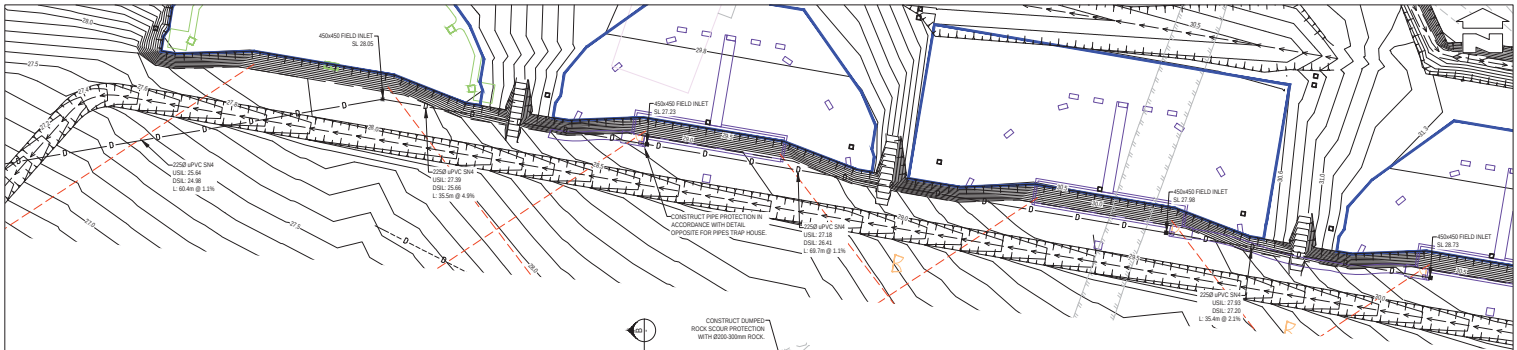
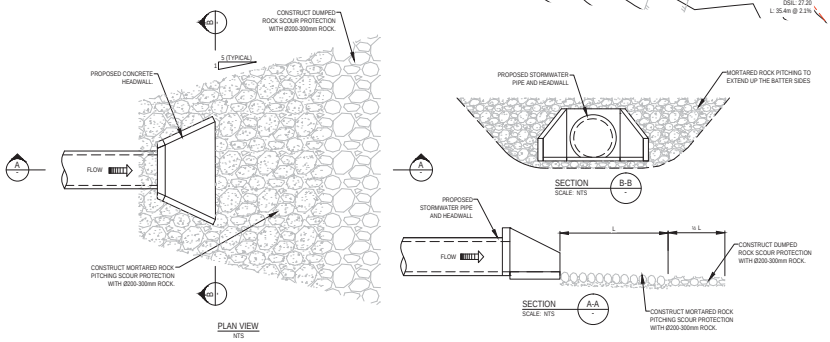


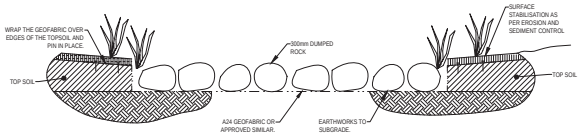
WORKS ALREADY UNDERTAKEN AS PART OF THE COMMONWEALTH GAMES WORKS



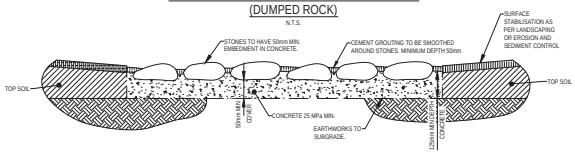
HEADWALL DETAIL WITH STONE PITCHING
N.T.S.

LEGEND

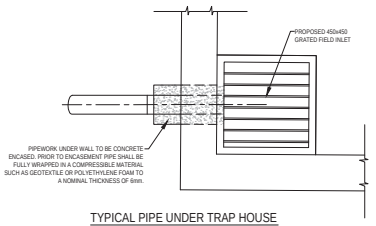
- EXISTING CONTOURS - 0.1m INTERVAL
- PROPOSED MINOR CONTOURS - 0.1m INTERVAL
- PROPOSED MINOR CONTOURS - 1.0m INTERVAL
- EXISTING WIRE FENCE
- EXISTING PAVED GRAVEL ROAD EDGE
- EXISTING UNSEALED GRAVEL ROAD EDGE
- PROPOSED PAD
- PROPOSED BOTTOM OF BATTER
- PROPOSED TOP OF BATTER
- PROPOSED FLOW CHANNEL
- PROPOSED STORMWATER LINE & FIELD INLET PIT
- FUTURE STORMWATER LINE & FIELD INLET PIT
- ROCK SCOUR PROTECTION



TYPICAL ROCK NATURAL TREATMENT DETAILS (DUMPED ROCK)
N.T.S.



TYPICAL MORTARED ROCK PITCHING DETAILS
N.T.S.



TYPICAL PIPE UNDER TRAP HOUSE
N.T.S

REV.	DESCRIPTION	DES.	DRN.	VERIF.	DATE
B	UPDATED FOR NEW ARCHITECTURAL PLAN	KLI	DDJ	AKS	26/06/18
A	FOR APPROVAL	KLI	DDJ	AKS	24/05/18

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CLIENT: MODE

PROJECT: BELMONT SHOOTING CENTRE

TITLE: CLAY TARGET STORMWATER DETAILS

FOR APPROVAL

APP No.: -
AUTHORISED:
COUNCIL: BRISBANE CITY COUNCIL
VERIFIED: - -
APPROVED FOR TENDER - -
APPROVED FOR CONSTRUCTION - -

PROJECT No.	DRAWING No.	REVISION
27400-BRI-C-ID-	CW09	B

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Appendix 2 – Treatment Recommendations

Appendix 3 – Product Information

GPT Product and Supplier

Secondary treatment

HumeCeptor® hydrodynamic separator

The HumeCeptor® system is a patented hydrodynamic separator, specifically designed to remove hydrocarbons and suspended solids from stormwater runoff, preventing spills and minimising non-point source pollution entering downstream waterways.

Right: HumeCeptor® system

The HumeCeptor® system is an underground, precast concrete stormwater treatment solution that utilises hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from runoff. First designed as an 'at source' solution for constrained, commercial and industrial sites it has been improved and expanded to service large catchments, mine and quarry sites, inundated drainage systems, and capture large volume emergency spill events. The system is ideal for hardstands/wash bays, car parks, shopping centres, industrial/commercial warehouses, petrol stations, airports, major road infrastructure applications, quarries, mine sites and production facilities.

Independently tested, and installed in over 30,000 projects worldwide, the HumeCeptor® system provides effective, and reliable secondary treatment of stormwater for constrained sites.

- **The system reliably removes a high level of TSS and hydrocarbons**
  The HumeCeptor® system was developed specifically to remove fine suspended solids and hydrocarbons from stormwater, and has been certified to achieve high pollutant removal efficiencies for TSS (>80%) and Total Nutrients (TN) (>30%) on an annual basis.
- **It captures and retains hydrocarbons and TSS down to 10 microns**
  Each system is specifically designed to maintain low treatment chamber velocities to capture and retain TSS down to 10 microns. It also removes up to 98% of free oils from stormwater.
- **Each device is sized to achieve the necessary Water Quality Objectives (WQO) on an annual basis**
  Utilising the latest build-up and wash-off algorithms, PCSWMM software for the HumeCeptor® system ensures that the device chosen achieves the desired WQO (e.g. 80% TSS removal) on an annual basis.
- **Its performance has been independently verified**
  The HumeCeptor® system's technology has been assessed by independent verification authorities including the New Jersey Department of Environmental Protection (NJDEP), The Washington Department of Environment (USA), and by the Canadian Environmental Technology Verification program (ETV).

- **The system is proven**
  The HumeCeptor® system was one of the first stormwater treatment devices introduced to Australia, and now after 30,000 installations worldwide, its popularity is testament to its performance, quality and value for money.
- **High flows won't scour captured sediment**
  The unique design of the HumeCeptor® unit ensures that as flows increase and exceed the treatment flow, the velocity in the storage chamber decreases.
- **Nutrients are captured along with the sediment**
  The effective capture of TSS results in the capture of particulate nutrients shown to be >30% of TN and Total Phosphorous (TP).
- **Designs allow for emergency spill storage, directional change, multiple pipes and tidal inundation**
  A new range of HumeCeptor® systems are now available, built specifically to manage emergency spills (50,000 L storage), change of pipe directions, the joining of multiple pipes, or to manage high tail water levels as a result of tides or downstream water bodies.
- **Fully trafficable to suit land use up to Class G**
  The HumeCeptor® system is a fully trafficable solution, it can be installed under pavements and hardstands to maximise above ground land use.

System operation

The HumeCeptor® system slows incoming stormwater to create a non-turbulent treatment environment (refer to Figure 3 below), allowing free oils and debris to rise and sediment to settle. Each HumeCeptor® system maintains continuous positive treatment of TSS, regardless of flow rate, treating a wide range of particle sizes, as well as free oils, heavy metals and nutrients that attach to fine sediment.

The HumeCeptor® system's patented scour prevention technology then ensures pollutants are captured and contained during all rainfall events. For more detail on the operation of the HumeCeptor® system refer to the technical manual.

Figure 3 – HumeCeptor® system operation during design flow condition

Independent verification testing

The HumeCeptor® system has been extensively researched by more than 15 independent authorities to validate its performance; it has now gained Environmental Technology Verification (ETV) certificates from ETV Canada, New Jersey Department of Environment Protection (NJDEP) and Washington Department of Environment (WDOE).

A number of agencies have conducted independent studies; their results from these studies (over 100 test events) have been summarised in Table 4.

Table 4 – HumeCeptor® systems performance summary

Pollutant	Average removal efficiency	Details
TSS	80%	Laboratory and field results, stable, hardstand, roads, commercial and industrial sites
TN	53%	Field results
TP	37%	Field results
Chromium	44%	Field results
Copper	29%	Field results
TPH	65%	<10 ppm inflow concentration
	95%	10 ppm - 50 ppm inflow concentration (typical stormwater)
	99%	>500 ppm inflow concentration (emergency spills)

Note: Detailed reports are presented in the HumeCeptor® system technical manual.

Options

There are a number of HumeCeptor® systems available to meet the requirements of various WQO maintaining catchments and local hydrology. The standard range is detailed in Table 5 below.

Table 5 – HumeCeptor® model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert* (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 2 (inlet)	100 - 600	1,200	1.70	1	350	1,740
STC 3	100 - 1,350	1,800	1.68	2	1,020	3,410
STC 5			2.13	3		4,550
STC 7			3.03	5		6,820
STC 9		2,440	2.69	6	1,900	9,090
STC 14			3.69	10	2,980	13,640
STC 18		3,060	3.44	14		18,180
STC 23			4.04	18		22,730
STC 27		3,600	3.84	20	4,290	27,270

Note: *Depths are approximate.

Variants

Continual improvement over the last 14 years of HumeCeptor® systems installation has provided a number of enhancements to address specific treatment and design requirements.

- **HumeCeptor® STC 2 (inlet) model**
  This model features a grated inlet to directly capture runoff from hardstand areas, replacing the need for a stormwater pit (refer to Figure 4).
- **AquaCeptor™ model**
  This model has been designed with a weir extension and high level secondary inlet to increase the level at which flows bypass the treatment chamber, and accommodate downstream tail water levels or periodic inundation (e.g. tidal situations). Figure 5 displays the AquaCeptor™ model - these are available in the same sizes as the standard HumeCeptor® units (refer to Table 5 on page 10).
- **MultiCeptor™ model**
  The MultiCeptor™ model was developed to facilitate the replacement of junction pits while still providing the treatment abilities of the original HumeCeptor® system and reducing time and costs during installation. The MultiCeptor™ model is available in the same sizes as the standard HumeCeptor® units (refer Table 6 below) and a 2,400 mm diameter MultiCeptor™ unit is also available to accommodate drainage networks up to 1,800 mm diameter.

Figure 4 – HumeCeptor® STC 2 (inlet) model

Figure 5 – AquaCeptor™ model

Table 6 – MultiCeptor™ model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
MI3	100 - 1,350	1,800	1.68	2	1,020	3,410
MI5			2.13	3		4,550
MI7			3.03	5		6,820
MI9		2,440	2.69	6	1,900	9,090
MI14			3.69	10	2,980	13,640
MI18		3,060	3.44	14		18,180
MI23			4.04	18		22,730
MI27		3,600	3.84	20	4,290	27,270
MI9 - MI27 (2,400)	100 - 1,800	2,400	2.69 - 3.84	6 - 20	1,900 - 4,290	9,090 - 27,270

- **DuoCeptor™ model**
  The DuoCeptor™ model has been developed to treat larger catchments (2 Ha – 6 Ha) as some constrained developments can only accommodate a single, large device instead of several smaller devices. Figure 6 displays the DuoCeptor™ model and Table 7 details the range of capacities available.
- **HumeCeptor EOS™ model**
  The HumeCeptor EOS™ (Emergency Oil Spill) system provides you with the maximum protection against hydrocarbon spills at petrol stations, highway interchanges and intersections. It combines the passive, always-operating functions of the HumeCeptor® system, with additional emergency storage to capture the volume of spill required by your road authority.
- **HumeCeptor MAX™ model**
  The HumeCeptor MAX™ model was developed to meet the market need for a single, large, end-of-pipe solution for TSS removal. Utilising the HumeCeptor® system's proven capture and scour prevention technology, it is ideal for very large commercial and industrial sites (>6 Ha) that need to achieve at least 50% TSS removal and hydrocarbon capture. The HumeCeptor MAX™ model can be expanded to almost any capacity required.

For more details on the variants and their application refer to the HumeCeptor® system technical manual.

Figure 6 – DuoCeptor™ model

Table 7 – DuoCeptor™ model range and details

DuoCeptor™ model	Pipe diameter (mm)	Device footprint (L x W)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 40	600 - 1,350	7,750 x 3,500	3.41	27	10,585	42,370
STC 50			4.01	35	10,585	50,525
STC 60		9,150 x 4,200	3.89	42	11,560	60,255

Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, the catchment area and the hydrology. Refer to the HumeCeptor® system technical manual for further details.

MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs and hydrodynamic separators.

Considering these against the independent research results, and PCSWMM modelling used to size a HumeCeptor® unit, the following conservative removal efficiencies (refer to Table 8) are recommended on an annual basis (i.e. no bypass).

Table 8 – MUSIC inputs for the HumeCeptor® system

Pollutant	Removal efficiency
TSS	80%
TN	30%
TP	30%

Installation

Installation procedures

The installation of the HumeCeptor® unit should conform in general to local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

Construction sequence

The HumeCeptor® unit is installed in sections as follows:

1. Prepare the geotextile and aggregate base.
2. Install the treatment chamber base section.
3. Install the treatment chamber section/s (if required).
4. Prepare the transition slab (if required).
5. Install the bypass chamber section.
6. Fit the inlet drop pipe and decant pipe (if required).
7. Connect inlet and outlet pipes as required.
8. Prepare the transition slab.
9. Install the maintenance access chamber section. (if required).
10. Install the frame and access cover/grate.

Maintenance

The design of the HumeCeptor® system means that maintenance is generally conducted with a vacuum truck which avoids entry into the unit.

SITE BASED STORMWATER MANAGEMENT PLAN

VITAL EXPERIENCE IN
acoustics / civil / electrical / ESD / fire / hydraulic / lifts / mechanical / property asset management / structural / underground power

WOOD & GRIEVE ENGINEERS

Appendix G

EMR / CLR Search

Department of Environment and Heritage Protection (EHP)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454 Brisbane QLD 4001 AUSTRALIA
www.ehp.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

Transaction ID: 50421603 EMR Site Id: 380 24 November 2017
This response relates to a search request received for the site:
Lot: 1 Plan: RP169229

EMR RESULT

The above site IS included on the Environmental Management Register.
Lot: 1 Plan: RP169229
Address: 1485 OLD CLEVELAND ROAD
BELMONT QLD 4153

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.
GUN, PISTOL OR RIFLE RANGE - operating a gun, pistol or rifle range.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if EHP has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if EHP has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

Appendix H

Noise Report

Department of Housing and Public Works

Queensland Government

Belmont Shooting Complex - Clay Target Range

1485 Old Cleveland Road, Belmont

Acoustic Report

7255R03V02.docx
24/10/2018

Prepared for

Mode Design

ASK Consulting Engineers Pty Ltd

ABN: 55 622 586 522 - ACN: 128 491 967
PO Box 3901, South Brisbane. QLD. 4101.

P: 07-3255-3355 **W:** www.askconsulting.com.au **E:** mail@askconsulting.com.au

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Document Ref	**Date of Issue**	**Status**	**Author**	**Reviewer**
7255R03V01	02/07/2018	Final	SP	BE
7255R03V02	24/10/2018	Revision – comment on koala access through barrier	SP	BE

Document Approval	
Approver Signature	
Name	Stephen Pugh
Title	Director

Contents

1 Introduction

ASK Consulting Engineers Pty Ltd (ASK) was commissioned by MODE Design as a sub-consultant to provide acoustic consultancy services for a Clay Target Range at the Belmont Shooting Complex, 1485 Old Cleveland Road, Belmont, Queensland. This Temporary Clay Target Range was constructed for the 2018 Commonwealth Games and is proposed to be extended for post Games permanent use.

The Belmont Shooting Complex was the venue for the shooting competition during the Gold Coast 2018 Commonwealth Games.

The proposed new Clay Target Range is located over the end of the former 300 metre range, which itself has been shortened as a result of the new range. It is also noted that there is an existing Clay Target Range at the Complex which does not comply with international sporting regulations and could not be modified to meet the requirements of the 2018 Commonwealth Games. It is envisaged that the Brisbane Gun Club (BGC), who are using the existing range, will relocate to the new facility in the future.

The purpose of this report is to evaluate the potential impacts of making the new Clay Target Range a permanent use location as follows:

- Outline the relevant project noise criteria.
- Present the results of noise monitoring. It is noted that this revised report includes results from monitoring conducted (in order):
    - prior to the range construction
    - after range construction
    - during the test event (championships) for the Games
    - during the Games
    - after the Games.
- Predict and assess the potential noise impact from the new Clay Target Range in permanent usage.
- Describe minimum noise reduction requirements to meet legislative requirements.
- Describe an example noise mitigation design to meet the minimum noise reduction requirements.

To aid in the understanding of the terms in this report a glossary is included in **Appendix A**.

2 Site Description

The Belmont Shooting Complex (BSC, or 'the site') and surrounds are shown in **Figure 2.1** (source: Google Earth Pro and Queensland Globe). The BSC site is located at 1485 Old Cleveland Road, Belmont Queensland.

The BSC site adjoins Old Cleveland Road to the north, Mt Petrie Road to the west, and is in close proximity to the Gateway Motorway to the west. The BSC site is heavily vegetated with most shooting range development and facilities located in the north end of the site.

Receivers that surround the designation site are split into seven groups as shown by Receiver groups R1 to R7 on **Figure 2.1**. It should be noted that the labels on **Figure 2.1** represent the general area in which multiple receivers exist, and not a specific receiver. Receiver groups considered include R1 to the north, R2 to R4 to the west, R5 and R7 to the east, and R6 to the north-east. Receiver group R7 includes temporary use motel style accommodation for athletes visiting the Complex to use the facilities on short term durations only.

The location of the proposed new Clay Target Range is indicated in **Figure 2.1**. The Range was located in the north-eastern portion of the site in a small valley. The range is accessed via the main entrance off Old Cleveland Road. The nearest receiver groups are R5, R6 and R7.

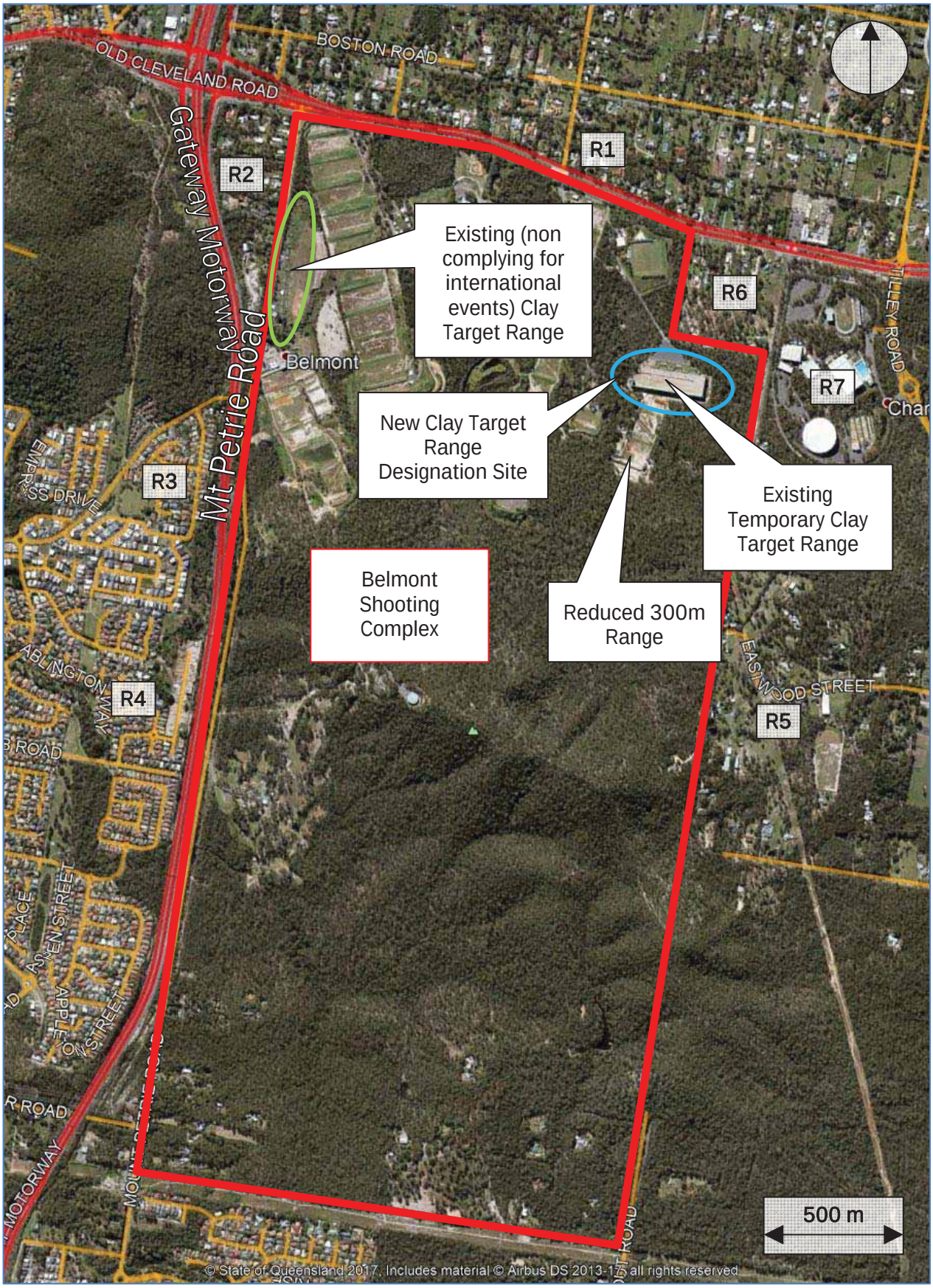

Figure 2.1 Location of New Clay Target Range and Nearby Receiver Groups R1 to R7

An aerial photo of the constructed temporary range is included in **Figure 2.2** (source: Google Earth Pro and Queensland Globe). **Figure 2.2** shows the three current and one future Skeet/Trap/DTL (STD) ranges (numbered 1 to 4 from east to west, and formerly numbered A to D from east to west, or T1 to T4 from west to east).

Figure 2.2 **Aerial Photo of Existing Temporary Clay Target Range**

3 Project Description

The proposed permanent use Clay Target Range is designed to allow for the future relocation of the existing BGC facility, and is located in the north-eastern portion of the Belmont site, to the rear and using a portion of the former 300m range. The proposal is to have the temporary range made permanent to accommodate Skeet, Trap and Down the Line (DTL) events.

The proposed permanent use Clay Target Range is shown in **Figure 3.1** and includes:

- 4 x Skeet/Trap/DTL (STD) ranges (numbered 1 to 4 from east to west, and formerly numbered A to D from east to west, or T1 to T4 from west to east). Currently ranges STD1 to 3 are built. The proposed events on these ranges are as follows:
    - Skeet events will include shots fired from multiple locations around a semicircle (numbered P1 to P7, east to west) and location P8 in the centre of the semicircle. Shots may be fired down the range or at angles to the east and west, depending on the source of the clay target and the shooting position.
    - Trap events will include shots generally fired in a Southern direction down the range.
    - Double trap events are similar to trap events but with two targets and two shots.
    - DTL events will include shots generally fired in a southern direction down each range shooting position, which is how the trap events have been modelled. Thus the Trap and DTL predicted noise levels are the same.
- 4 x Down the line (DTL) ranges (numbered DTL5 at the western end of the existing range, and DTL6 to DTL8, west to east, at the eastern end of the existing range. These ranges will only be used for DTL events. DTL5 and DTL6 will be used on a regular basis, but DTL7 and DTL8 are only approved for use only twice per year over 3 days per event (National and State Championships).
- Future clubhouse and/ or amenities for shooters use.
- Future parking.
- Noise bund and barrier option to the northern side of the STD and DTL ranges, which is to shield the regularly used ranges (i.e. STD1 to 4, DTL5 and DTL6) from the residence to the north-east.

It is understood that the DTL will be the most frequently used discipline (approximately 5 ranges per week) and skeet will be the least used discipline (approximately 1 range per week).

For the purpose of noise modelling, trap, double trap and DTL events are considered to involve shooting in a southerly direction down the range, whereas skeet events include much greater side angles but these positions are used less frequently.

Existing vegetation is to be cleared to the extent shown by the white shaded area with red dashed border on **Figure 3.1**.

The design ground levels for these ranges are understood to be as follows (from west to east):

- DTL5: RL 29.15
- STD4: RL 29.15 m
- STD3: RL 29.85 m
- STD2: RL 30.62 m
- STD1: RL 31.35 m
- DRL6: RL 31.35m
- DTL7: RL 31.60m
- DTL8: RL 32.00m

The modelling and report assumes the ranges are to be built to these levels, or lower.

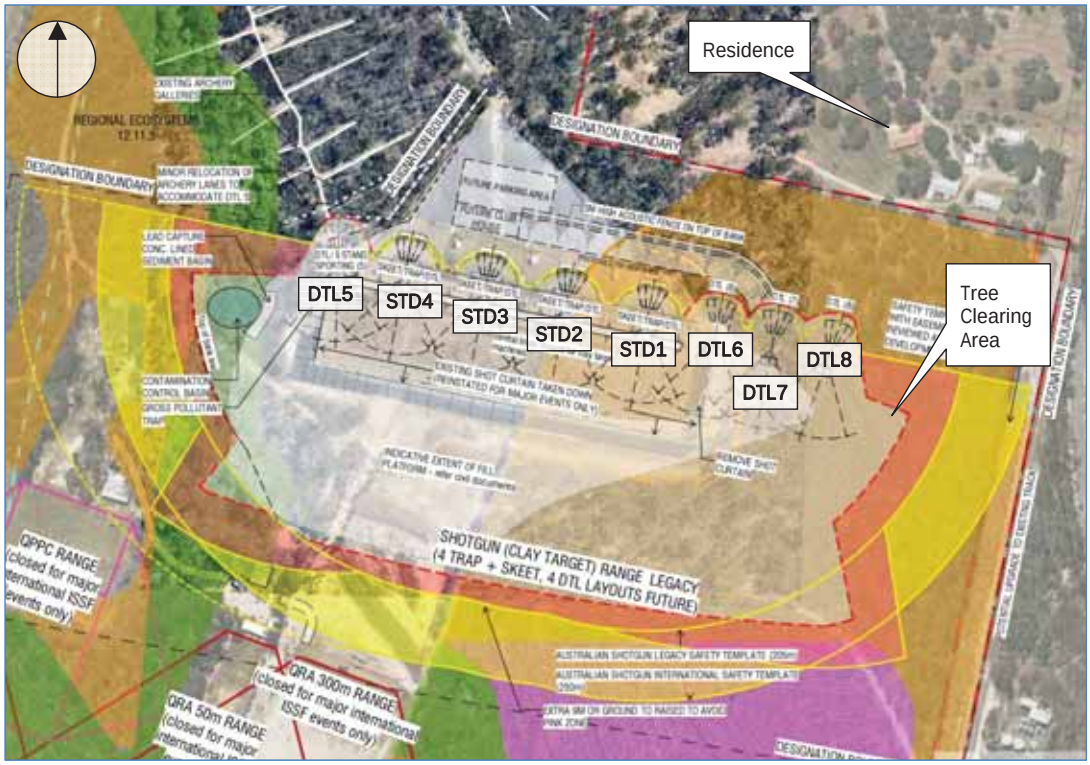

Figure 3.1 Proposed 8 Range Layout

4 Acoustic Criteria

4.1 Queensland Noise Policy

Environmental noise criteria applicable to shooting noise in Queensland are contained in the Queensland Environmental Protection Act 1994. Criteria which specifically refer to shooting noise are contained in Section 440ZC:

440ZC Outdoor shooting ranges

(1) A person must not operate, or permit the operation of, an outdoor shooting range, between 6a.m. and 6p.m. on any day, if the noise from the operation is more than–

(a) for a range that is normally used at least 5 days a week–95dB Z Peak Hold; or
(b) for a range that is normally used 4 days a week–100dB Z Peak Hold; or
(c) for a range that is normally used no more than 3 days a week–105dB Z Peak Hold.

(2) A person must not operate, or permit the operation of, an outdoor shooting range, between 6p.m. and 10p.m. on any day, if the noise from the operation is more than–

(a) for a range that is normally used at least 5 evenings a week–85dB Z Peak Hold; or
(b) for a range that is normally used 4 evenings a week–90dB Z Peak Hold; or
(c) for a range that is normally used no more than 3 evenings a week–95dB Z Peak Hold.

(3) For this section, noise from an outdoor shooting range is measured by working out the arithmetic average of the noise levels of whichever of the following happens first during the measurement period–

(a) at least 40 individual gunshots;
(b) at least 20 individual gunshots in any 30 minute period.

(4) In this section–used means used for an activity that includes shooting.

Examples of a range being used–

1. *a shooting match conducted at the range*
2. *a defence personnel or police officer training session, that includes shooting, conducted at the range.*

A number of problems and inadequacies, as perceived by ASK, associated with the above criteria have been previously presented to the stakeholders of the Belmont Shooting Complex and to the previous Queensland Department of Environment and Heritage Protection (DEHP) now known as the Queensland Department of Environment and Science (DES). Application in this instance remains the same as those previously applied and accepted by the Stakeholders and DES.

In the application of the above noise limits from the Act, the following assumptions are proposed:

- There are no limit or offence criteria for shooting ranges used between 10pm and 6am. Shooting noise at any residences outside the Complex during this time shall therefore be required to be inaudible.
- Residences, accommodation or temporary stay persons (camping and caravans and the like) within the Belmont Shooting Complex will be exempt from these noise limits.
- The Management of Sport and Recreation, now within the Department of Housing and Public Works (DHPW), and DES have the view that noise emissions from the Complex will be assessed by treating the whole Complex as a single range by definition in the Act. ASK is unaware of Brisbane City Council's view on this point.
- Exemptions to interpretation of these noise limits will be considered on a case by case basis by agreement between DHPW and DES, i.e for major events.

- The criteria are to be applied to consecutive shots heard from all ranges in the Complex. In the assessment of individual ranges during controlled testing within the Complex selective shots shall be measured.
- Noise from shots which are heard but do not have sufficient emergence from road traffic and other ambient noise are not to be included in the assessment. Sufficient emergence is defined as the noise level from the shots being clearly distinguishable from the ambient noise when plotted on a noise level versus time trace, or as read from the screen of the sound level meter.
- A shot is taken to be the loudest event out of the three noises (muzzle, projectile shockwave and metallic target hit when they are used) occurring when a gun is fired.
- It is acknowledged that the nominated criteria in Section 440ZC of the Act do not account for intensity of shooting during any day. The 40 shots used for assessment can occur rapidly (in a matter of seconds) or over an extended period and are assessed in the same manner.
- The nominated criteria in Section 440ZC of the Act have been found to be significantly (e.g. 10dB to 20dB) higher than noise limits applied in other Australian states or for another recent new range in the south-east Queensland area. Section 440ZC does also not take consideration of assessing noise levels from an existing or a new range. In circumstances where a new range is proposed it is reasonable to consider that lower noise criteria should be used, and/or that noise impacts are reduced from the current scenario. In circumstances where the site is an existing range or at the site of an existing range as occurs in this instance, then it may be reasonable to apply the higher Section 440ZC criteria.

4.2 Noise Management Plans

The Queensland Rifle Association (QRA) has a noise management plan for the overall Complex. This document details the responsibilities of the various organisations and clubs working on the Complex. The intention of the document is to formalise and provide a record of noise management measures undertaken by each club. It also provides details of complaint handling, proposed intensification of uses on the site and provides a reporting structure for QRA to provide information back to the lessor (Sport and Recreation within DHPW)

In addition to the overall Complex noise management plan, individual noise management plans are required for the individual clubs that operate on the Complex. These documents are similar to the overall noise management plan, however, they go into specific noise control measures and firearms utilised by each club on their ranges and hours of operation.

5 Noise Measurements

5.1 Overview

Noise measurements were conducted on two occasions for the new Clay Target range as follows:

1. 30th October 2015 – controlled measurements conducted prior to the development of the Clay Target range in its new location.
2. 31st October to 6th November 2017 – measurements conducted during Commonwealth and Oceania Shooting Federation (CSF & OSF) Championships held on the newly constructed temporary range to obtain realistic noise levels typical during competition/shooting use.
3. 9th and 16th April 2018 – measurements during the 2018 Commonwealth Games used to obtain realistic noise levels typical during competition/shooting use.
4. 14th May 2018 – controlled measurements used to confirm noise levels from specific shooting positions and orientations.

5.2 Receiver Locations

The nearest sensitive receivers to the Belmont Shooting Complex are split into seven groups as shown by Receiver groups R1 to R7 on **Figure 2.1**. Receiver group R1 is to the North, R2 to R4 to the West, R5 to the East, R6 to the North-East and R7 to the East. Receiver groups R1, R5, R6 and R7 were considered relevant for the new Clay Target range.

The receivers used in the measurements and predictions are as follows in **Table 5.1**, and shown in **Figure 5.1** and **5.2**.

Table 5.1 Receiver Locations

Zone	ID	Description
R1 (Old Cleveland Road)	R1d	Midway along the southern boundary of the residential property 1637 Old Cleveland Road.
R5 (East)	R5a	Near to the north-western corner of the residential property 177 Eastwood Street.
	R5b	Approximately 40m east of the north-western corner of the residential property 163 Eastwood Street.
R6 (North-East)	R6a	Midway along the southern boundary of the residential property 1637 Old Cleveland Road, which adjoins the site.
	R6b	Approximately 24m south of the north-western corner of the residential property 1637 Old Cleveland Road, which adjoins the site.
	R6c	At the western facade of the two storey brick residence on the hill at 1637 Old Cleveland Road.
	R6d	At the southern facade of the two storey brick residence on the hill at 1637 Old Cleveland Road. Location is 1m from the facade.
	R6e	At the southern side of the two storey brick residence on the hill at 1637 Old Cleveland Road. Location is in the free-field at 8m from the facade.
R7 (Velodrome)	R7a	Inside new Chandler Velodrome, at the southern end of the area inside the track.

In addition to the above locations, measurements in 2015 were conducted at distances of 50 metres in front of the shooting positions.

Figure 5.1 Receiver Locations in Areas R5, R6 and R7

Figure 5.2 Receiver Locations R6a, R6c, R6d & R6e

5.3 Test 1: Controlled Measurements in October 2015

5.3.1 Shooting Positions

Noise levels were measured with three shooting positions, referred to as A, B and C, and described as follows:

- Shooting Position A: Shooting from dirt road/track to the north-east of the 300m range clearing.
- Shooting Position B: Shooting from the clearing on the eastern side of the shed at the northern end of the 300m range clearing.
- Shooting Position C: Shooting from the middle of the 300m line on the 300m range.

Shooting at Position A and B was with the Clay Target (12 gauge, Winchester Club Load ammunition), and thus included an approximate source height of 1.8 metres above ground (end of Clay Target), and multiple shooting orientations, approximately as follows:

- South (firing down the 300m range).
- West (firing approximately 55 degrees west of the southern shooting orientation).
- East (firing approximately 55 degrees east of the southern shooting orientation).
- East2 (firing approximately 90 degrees east of the southern shooting orientation).

Shooting at Position C was undertaken with a 0.308 calibre rifle (Winchester SuperX 155GR Palma Match ammunition) and thus included an approximate source height of 0.5 metres above ground (end of rifle, whilst laying on ground). All shots were fired in a southern direction down the 300m range.

5.3.2 Instrumentation and Measurement Procedure

Noise level measurements were conducted with three (3) ASK staff members with handheld sound level meters and two noise loggers. The three handheld meters consisted of 2 x Norsonic 140 Type 1 meters, and 1 x Rion NL22 Type 2 meter. The two noise loggers consisted of 2 x Larson Davis LD831 Type 1 meters. All instrumentation has current laboratory calibration and was field calibrated.

The number of instruments and ASK staff enabled multiple positions to be measured simultaneously, however, the measurement process was required to be repeated to enable all six (6) receiver positions to be measured.

The measurement locations were as follows:

- Loggers (1st and 2nd set of measurements):
  - 50m from shooting position A, B and C (the instrument was moved for each shooting position).
  - R6a, on boundary towards the north-east.
- Handheld
  - (1st set of measurements)
    - R6a, on boundary towards the north-east.
    - R5a, near Eastwood residence to the south-east.
    - R7a, in Velodrome.
  - (2nd set of measurements)
    - R6b, to the north.
    - R5b, near Eastwood residence to the south-east.
    - R1d, beside Old Cleveland Road

Whilst ASK staff were at each position, between 2 and 8 shots were fired in each shooting position and orientation. The number of shots varied depending on the quality of the measurement results, i.e. if noise was below ambient noise levels then fewer shots were fired, but if results were clearly audible but variable then additional shots were fired.

5.3.3 Measurement Results

From the measurement survey it was found that noise from the shots were inaudible at the Velodrome (R7a) and on Old Cleveland Road (R1d) and thus no levels were recorded at those locations. It was found that not all shots were audible and above ambient noise levels at three other receivers (R5a, R6b and R5b). Shots were always audible and measurable above ambient noise levels at the location to the north-east (R6a).

A summary of the measurement results is included in **Table 5.2**. Where the shot was inaudible or not measurable due to other environmental noise (e.g. road traffic) then the result was labelled '< ambient' in **Table 5.2**.

From **Table 5.2** it can be seen that the results measured at Location R6a with the two separate sound level meters are very similar, i.e. within 1 dB in each instance.

5.3.4 Weather

During the noise measurements the wind direction was recorded as generally from the East or North, and hence was not favourable to noise propagation from the shooting position to the measurement positions. This wind effect was required to be addressed in the noise modelling.

The weather was otherwise fine and warm and acceptable for noise monitoring.

5.4 Test 2: Measurements at Championships in October/November 2017

5.4.1 Shooting Positions

Shooting was understood to be occurring at the three constructed ranges (i.e. ranges STD1 to STD3 in **Figures 2.2** and **3.1**). No records were taken of the active ranges, firearm specification, shooting angle or other such data.

5.4.2 Instrumentation and Measurement Procedure

Noise level measurements were conducted with three (3) ASK staff members with handheld sound level meters and noise loggers. The three handheld meters consisted of 3 x Larson Davis LD831 Type 1 meters. The noise loggers consisted of 3 x B&K 2250 Type 1 meters and 1 x Larson Davis LD831 Type 1 meter. All instrumentation has current laboratory calibration and was field calibrated.

The number of instruments and ASK staff enabled multiple positions to be measured simultaneously. Not all noise loggers were recording for the entire monitoring period.

The measurement locations were as follows:

- Loggers:
  - R5a, near Eastwood residence to the south-east.
  - R6a, on boundary towards the north-east.
  - R6d, at 1m from the southern facade of the residence.
  - R6e, at 8m from the southern facade of the residence.
- Handheld
  - R5a, near Eastwood residence to the south-east.
  - R6a, on boundary towards the north-east.
  - R6d, at 1m from the southern facade of the residence.

Handheld measurements were undertaken for one event, but it was established that noise levels could be better determined from noise loggers due to the number of shots occurring.

5.4.3 Measurement Results

The noise criteria are based on the average of 40 consecutive shots (refer **Section 4.1**). As more than 40 shots were analysed for each shooting event, it was possible to determine a running 40 shot average. The presented results are the maximum and average of the running 40 shot averages.

A summary of the measurement results is included in **Table 5.3**.

From **Table 5.3** it can be seen that:

- Noise levels measured on the northern boundary (R6a) were within 2 dB of measurements of levels at the house (R6d & R6e).
- Limited measurements were conducted simultaneously at the two house locations (R6d & R6e) but the results indicate a marginal 1dB increase in noise levels at R6e. It was expected that noise levels would be lower at R6e due to less noise reflection of the house facade, but this was not the result. The result may be a statistical anomaly due to the lack of comparative data. It is proposed that future measurements be conducted at R6e, in the free-field, as it is understood that free-field measurements are preferred for shooting noise.
- Noise levels varied significantly at R5a to the south-east, most likely due to wind direction changes. The noise levels were significantly higher than previous controlled measurements in **Table 5.2** at R5a and R5b.
- The 95 dBZ limit was exceeded for the trap event at the house to the north-east (R6e) by up to 2 dB for one event in terms of the average shot noise levels, or up to 4 dB in terms of the maximum 40 shot average noise levels. The noise levels were compliant for the double trap event.
- The 95 dBZ limit was exceeded at the property to the south-east (R5a) by 1 dB for one skeet event in terms of the maximum 40 shot average noise levels, but was compliant for other events (skeet and trap) and was compliant for all events in terms of the average noise levels.

5.4.4 Weather

During the noise measurements of the test event the wind direction was recorded as generally from the North (WNW to NE), and hence may not represent worst-case noise propagation from the shooting position to the measurement positions to the north-east at the house (i.e. R6a, R6d and R6e), but is likely to include worst-case noise propagation from the shooting position to the measurement position to the south-east (i.e. R5a). This wind effect can be addressed in the noise modelling.

The weather was otherwise fine and warm and acceptable for noise monitoring.

5.5 Test 3: Measurements at Commonwealth Games in April 2018

5.5.1 Shooting Positions

Shooting was understood to be occurring at the three constructed ranges (i.e. ranges STD1 to STD3 in **Figures 2.2** and **3.1**). No records were taken of the active ranges, firearm specification, shooting angle or other such data.

5.5.2 Instrumentation and Measurement Procedure

Noise level measurements were conducted with three (3) ASK staff members with handheld sound level meters. The three handheld meters consisted of 3 x Larson Davis LD831 Type 1 meters. All instrumentation has current laboratory calibration and was field calibrated.

The number of instruments and ASK staff enabled multiple positions to be measured simultaneously. The measurement locations were as follows:

- R5a, near Eastwood residence to the south-east.
- R6a, on boundary towards the north-east.
- R6e, at 8m from the southern facade of the residence.

5.5.3 Measurement Results

The noise criteria are based on the average of 40 consecutive shots (refer **Section 4.1**). As more than 40 shots were analysed for each shooting event, it was possible to determine a running 40 shot average. The presented results are the maximum and average of the running 40 shot averages.

A summary of the measurement results is included in **Table 5.4**.

From **Table 5.4** it can be seen that:

- There were less shot events recorded on day 2. This occurred because it was found that there was significant noise from other ranges which ultimately resulted in noise levels being stopped after approximately 35 minutes. Where noise levels were clearly from other ranges, it was not intended that these noise levels be included in the analysis.
- Noise levels measured on the northern boundary (R6a) were generally 2 dB higher than levels at the house (R6e).
- Noise levels varied significantly (13 to 14 dB) at R5a to the south-east, most likely due to wind direction changes. The noise levels were similar to previous controlled measurements during the CSF & OSF finals in November 2017 in **Table 5.3**.
- The 40 shot average noise level varied significantly to the north at R6a and R6b. The average level was some 9 to 10 dB lower than the maximum 40 shot average noise level. Previous measurements had significantly smaller variations. Further analysis indicated that the 40 shot average noise levels exceeded the 95 dBZ limit for 30% of the 1 hour measurement period.
- The 95 dBZ limit was exceeded at the house to the north-east (R6e) by 2 to 7 dB in terms of the maximum 40 shot average noise levels, but was compliant in terms of the average shot noise levels.
- The 95 dBZ limit was exceeded at the property to the south-east (R5a) by 1 dB for the trap event in terms of the maximum 40 shot average noise levels, but was compliant for the skeet event and was compliant for both events in terms of the average noise levels. It is noted that compliance appears highly reliant on wind directions at this location.

5.5.4 Weather

On the second day of measurements (trap) the weather at commencement was warm, clear and calm. During the measurements there were significant wind direction changes and the wind speed increased up to approximately 2 m/s.

On the second day of measurements (trap) the weather at commencement was warm, 100% overcast and the wind was calm. During the measurements there were significant wind direction changes and the wind speed increased up to approximately 3 m/s. Results would indicate that there was more north-westerly wind direction on this day resulting in increased noise levels at R5a to the south-east.

The weather was otherwise fine and warm and acceptable for noise monitoring.

5.6 Test 4: Controlled Measurements in May 2018

5.6.1 Shooting Positions

Two measurements were undertaken as follows:

- Shooting was conducted at the three constructed STD ranges and one future STD range (i.e. ranges STD1 to STD4 in **Figures 2.2** and **3.1**). Five (5) shots were undertaken the following shooting positions and approximate orientations (total 60 shots, i.e. 4 ranges x 3 positions x 5 shots):
    - P4 shooting South
    - P7 shooting East
    - P7 shooting South-East
- Shooting was conducted at range STD2, for each position (P1 to P7, but not P8) for two typical firing orientations. A total of 14 shots were taken.

5.6.2 Instrumentation and Measurement Procedure

Noise level measurements were conducted with three (3) ASK staff members with handheld sound level meters. The three handheld meters consisted of 3 x Larson Davis LD831 Type 1 meters. All instrumentation has current laboratory calibration and was field calibrated.

The number of instruments and ASK staff enabled multiple positions to be measured simultaneously. The measurement locations were as follows:

- R5a, near Eastwood residence to the south-east.
- R6a, on boundary towards the north-east.
- R6e, at 8m from the southern facade of the residence.

5.6.3 Measurement Results

The results are presented as follows:

- **Table 5.5**: The average noise levels for the four ranges and three shooting positions/orientations.
- **Table 5.6**: The shot noise levels at range STD2 for each position.

From **Table 5.5** it can be seen that:

- Noise levels measured on the northern boundary (R6a) were generally 1 to 2 dB higher than levels at the house (R6e).
- The results in **Table 5.5** represent the average noise levels, but the individual measurement results show that noise levels can vary by several decibels between consecutive shots. The variation is considered most likely to be due to wind variations.
- The 95 dBZ limit was exceeded at the house to the north-east (R6e) by 3 to 5 dB based on the calculated skeet and trap average shot noise levels.
- The 95 dBZ limit was not exceeded to the south-east as noise levels were relatively low, likely due to wind directions on the day.

From **Table 5.6** it can be seen that:

- Limited shots were performed (2 per firing position) and thus analysis of the data should be taken with care.
- The average noise level measured on the northern boundary (R6a) was the same as measured at the house (R6e).
- Noise levels were relatively similar between positions P2 to P6, but were noticeably lower at P1 when shooting towards the west, and noticeably higher for the first P7 shot which was shooting towards the east.

5.6.4 Weather

During the noise measurements the wind was variable, occasionally easterly or south-westerly or calm. Results would indicate that there was less north-westerly wind direction on this day resulting in decreased noise levels at R5a to the south-east.

The weather was otherwise fine and warm and acceptable for noise monitoring.

Table 5.2 Summary of October 2015 Noise Measurement Results (During Controlled Testing and Prior to Construction of New Temporary Clay Target Range)

Firearm	Shooting Position	Shooting Orientation	Average Peak Noise Levels L_{Zpeak} dBZ						
			R6a (North East) – Logger	R6a (North East) - Attended	R6b (North)	R5a (South-East)	R5b (South East)	R7a (Velodrome)	R1d (Old Cleveland Road)
Clay Target	A	S	93	92	79	76	< ambient	< ambient	< ambient
		E	98	98	80	72	73	< ambient	< ambient
		W	93	92	83	78	< ambient	< ambient	< ambient
		E2	102	102	< ambient	74	< ambient	< ambient	< ambient
	B	S	89	88	75	71	< ambient	< ambient	< ambient
		E	93	94	76	75	71	< ambient	< ambient
		W	89	88	< ambient	< ambient	< ambient	< ambient	< ambient
308 Rifle	C	S	86	86	80	77	72	< ambient	< ambient

Table 5.3 Summary of October/November 2017 Noise Measurement Results (During CSF & OSF Championships)

Event	Date	Time Period Analysed	Maximum (Average) 40 Shot Average Peak Noise Levels L_{Zpeak} dBZ				# of Shots Recorded
			R6a (North East Boundary)	R6d (1m from House)	R6e (8m from House)	R5a (South-East)	
Skeet OSF Finals	31/10/2017	2:11pm to 3:12pm	95 (94)	97 (96)	-	84 (82)	113
Skeet CSF Finals	1/11/2017	1:45pm to 2:30pm	93 (92)	-	-	96 (94)	142
D-Trap CSF Finals	3/11/2017	2:30pm to 3:30pm	-	-	94 (93)	-	270
Trap Training	4/11/2017	9:30am to 9:49am	97 (96)	98 (96)	99 (97)	95 (90)	150
Trap CSF Finals	6/11/2017	3:00pm to 3:45pm	90 (89)	-	-	93 (90)	166

Table 5.4 Summary of April 2018 Noise Measurement Results (During Commonwealth Games)

Event	Date	Time Period Analysed	Maximum (Average) 40 Shot Average Peak Noise Levels L_{Zpeak} dBZ			# of Shots Recorded
			R6a (North East Boundary)	R6e (8m from House)	R5a (South-East)	
Skeet	9/04/2018	9:55am to 11:04am	104 (94)	102 (93)	82 (80)	330 to 415
Trap	16/04/2018	9:58am to 11:00am	99 (97)	97 (95)	96 (93)	250 to 364

Table 5.5 Summary of May 2018 Noise Measurement #1 Results (During Controlled Testing at Each Range)

Range	Firing Position / Angle	Average Shot Noise Level L_{Zpeak} dBZ		
		R6e (8m from House to North-East)	R6a (North East Boundary)	R5a (South-East)
STD1	P4 (South)	100	101	81
	P7 (East)	108	108	75
	P7 (South-East)	102	103	78
STD2	P4 (South)	101	100	81
	P7 (East)	107	106	76
	P7 (South-East)	97	101	79
STD3	P4 (South)	95	99	79
	P7 (East)	105	107	78
	P7 (South-East)	108	112	76
STD4	P4 (South)	98	99	82
	P7 (East)	97	98	81
	P7 (South-East)	107	106	82
ALL	Skeet - average all positions	102	103	79
ALL	Trap - average P4 positions	98	100	81

Table 5.6 Summary of May 2018 Noise Measurement #2 Results (During Controlled Testing at Range STD2)

Range	Firing Position (angle as per normal shooting*)	Shot Noise Levels L_{Zpeak} dBZ		
		R6e (8m from House to North-East)	R6a (North East Boundary)	R5a (South-East)
STD2	P1	92, 84	89, 86	73, 76
	P2	100, 99	100, 102	75, 75
	P3	100, 98	97, 95	72, 73
	P4	98, 96	97, 99	76, 77
	P5	100, 101	100, 100	78, 78
	P6	99, 99	98, 98	77, 78
	P7	108, 99	106, 99	74, 77
	Average	98	98	-

Note: * ASK instructed the shooter to shoot at angles representative of a normal competition event.

5.7 Comparison of Results

The measurement results at the nearest receiver, R6e at the house to the north-east, were as follows in terms of the maximum 40 shot average (and average 40 shot average):

- Double trap 94 (93) L_{Zpeak} dBZ
- Trap 99 (97) L_{Zpeak} dBZ
- Skeet 102 (93) L_{Zpeak} dBZ
- Trap 97 (95) L_{Zpeak} dBZ

From the above results it can be seen that there was regular exceedance of up to 7 dB at R6e based on a review of the maximum 40 shot average, but only one occasion where an exceedance of 2dB occurred based on the average 40 shot average noise level.

The results at R5a adjacent the residential property to the south-east, were as follows in terms of the maximum 40 shot average (and average 40 shot average):

- Skeet 84 (82) L_{Zpeak} dBZ
- Skeet 96 (94) L_{Zpeak} dBZ
- Trap 95 (90) L_{Zpeak} dBZ
- Trap 93 (90) L_{Zpeak} dBZ
- Skeet 82 (80) L_{Zpeak} dBZ
- Trap 96 (93) L_{Zpeak} dBZ

From the above results it can be seen that there was two exceedances of 1 dB at R5a based on a review of the maximum 40 shot average, but no occasions where an exceedance occurred based on the average 40 shot average noise level.

It can also be seen that noise levels are highly variable and this is considered to be mostly due to wind conditions. The variation was 8 dB at Location R6e to the north-east and 14 dB at Location R5a to the south-east.

Given the assessment is against offence limits, versus assessment against amenity limits, it is proposed that the maximum 40 shot average noise level should be the determining parameter to assess for compliance. This differs from earlier versions of this report which proposed assessment using the average 40 shot average noise level. The reason for the change in approach is the significant variations between maximum and average 40 shot noise levels experienced through more recent onsite noise measurements.

5.8 Discussion of Results

The modelling and assessment in this report will be heavily based on the site measured noise level data to improve accuracy of the modelling. The measured noise levels were undertaken during both competition shooting events and controlled testing.

A brief visit by ASK staff during a competition suggested that the events may have favoured the eastern end of the range, but this is not confirmed. If this was the case, the noise levels may have resulted in higher noise levels at the residents than could occur if the shooting was managed to preference the western ranges before the eastern ranges.

6 Noise Modelling

6.1 General

Noise modelling has been undertaken with the SoundPLAN computer software. This software package is widely used by acoustic consultants and is accepted by both State and Local Authorities as approved noise modelling software.

The noise model was setup with detailed 3D terrain data supplied to ASK. Coordinates for measurement shooting positions, measurement receiver positions and nearby dwellings was determined from Google Earth including the Queensland Globe overlay, and the range layouts. Two noise models were setup

- The existing 3 or 4 range layout shown in the aerial photo in **Figure 2.2**.
- The proposed eight range layout shown in **Figure 3.1**.

The noise model was run with the ISO 9613 algorithms in the SoundPLAN software, which assumes adverse (downwind) meteorological conditions for all receivers.

Noise levels were modelled using four shooting positions and orientations (P1-South, P4-South, P7-South & P7-East) for each of the skeet/trap/DTL ranges, and a southerly shooting direction for the DTL only ranges. These shooting positions were discussed in **Section 3**.

The noise level used to assess compliance is calculated as "*the arithmetic average of the noise levels of whichever of the following happens first during the measurement period—*

(a) at least 40 individual gunshots;
(b) at least 20 individual gunshots in any 30 minute period."

During typical competition use, there would be more than 40 individual shots in a 30 minute period, and hence the noise from the new Clay Target range is calculated from the average of 40 shots.

Following discussion with the project team, the typical worst-case Skeet noise level for 40 shots was determined as the average of the predicted Skeet noise levels across the 4 Clay Target ranges for the following shooting positions and approximate orientations:

- P4 shooting South
- P7 shooting East
- P7 shooting South-East

A typical noise scenario for Trap or DTL events was calculated as the average of the noise levels across the 4 Clay Target ranges with the P4 (South) shooting position and orientation.

6.2 Calculations

Calculation results include adjustments such that predictions more accurately match the worst-case measured results. The adjustment was considered reasonable and appropriate as ASK is unsure as to the accuracy of the ISO 9613 algorithms to accurately represent the attenuation of the eucalypt forest. The adjustments in the model are -3 dB for receivers to the south-east, 0 dB for the receiver on the northern-side boundary, and + 1 dB for receivers to the north-east at the house.

Noise levels have been calculated at the measurement locations for various range uses as follows:

- 4 range skeet on STD1 to STD4
- 4 range trap on STD1 to STD4
- 6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6

The predicted noise levels, without any barriers or shielding are shown in **Table 6.1**.

Table 6.1 Clay Target Noise Predictions Without Barrier

Event	Calculated Maximum 40 Shot Average Peak Noise Levels L_{Zpeak} dBZ		
	R6a (Property Boundary to North East)	R6e (8m from House to North-East)	R5a (Property Boundary South-East)
4 range skeet on STD1 to STD4	102	101	95
4 range trap on STD1 to STD4	100	98	95
6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6	100	98	95

From **Table 6.1** it can be seen that the predicted noise levels are excessive by 3 to 6 dB at the house to the north-east (R6e) and compliant at the property boundary to the south-east (R5a).

Modelling results in **Table 6.1** have determined a level of 95 dBZ at R5a to the south-east, whereas in **Section 5.7** it was reported that noise levels of up to 96 dBZ were measured at R5a. The 1 dB difference is due to the measured events using the three eastern ranges (STD 1 to 3) whereas the modelling results on the top two calculation rows in **Table 6.1** are based on the future use with all four STD ranges (STD1 to 4) being used equally.

Noise levels have not been assessed at houses to the south-east because there have been no noise measurements at those houses that could be used to verify the model at that location. The noise levels at the houses to the south-east would likely be similar to those in **Table 6.1** for Location R5a.

Noise levels have subsequently been predicted with the following mitigation measures in place (refer **Figure 6.1**), with the results shown in **Table 6.2**:

- 4m high clubhouse
- 5m high acoustic fence atop a 7m high mound for a 12m total height. The levels at the ends of the barrier are as follows:
    - Western end: Ground RL 29.33, Top of Fence RL 41.33
    - Eastern end: Ground RL 33.54, Top of Fence RL 45.54

Note: The proposed barrier is to be designed to allow for koala movement through the line of the barrier. This could be achieved with appropriately designed openings.

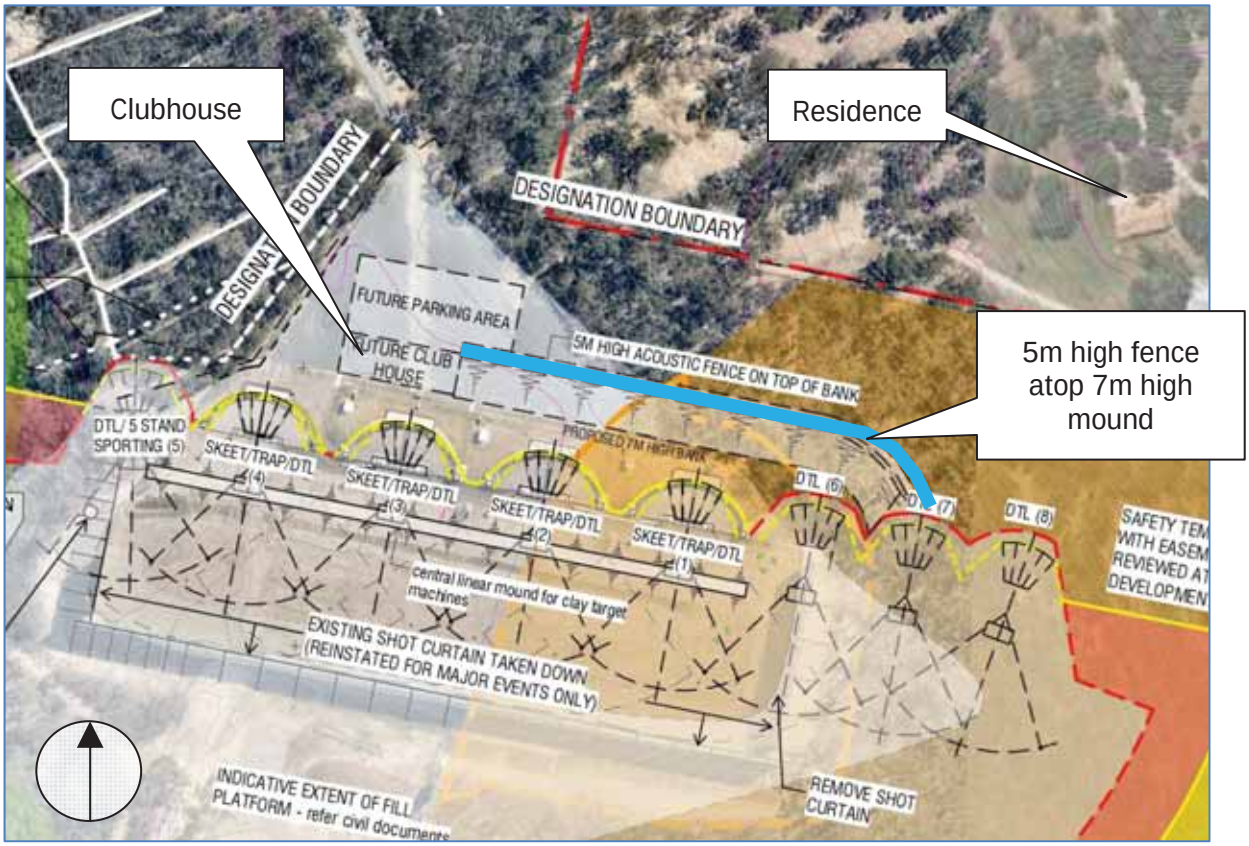

Figure 6.1 Noise Barrier Location

Table 6.2 Clay Target Noise Predictions With 12m High Barrier (5m fence atop 7m mound)

Event	Calculated Maximum 40 Shot Average Peak Noise Levels L_{Zpeak} dBZ		
	R6a (Property Boundary to North East)	R6e (8m from House to North-East)	R5a (Property Boundary South-East)
4 range skeet on STD1 to STD4	95	95	95
4 range trap on STD1 to STD4	92	92	95
6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6	93	93	95

From **Table 6.2** it can be seen that the predicted noise levels are compliant, albeit marginally, at the house to the north-east (R6e) and property to the south-east (R5a).

7 Review

7.1 Clay Target Range

Based on use as a 4 range venue, the predicted 40 shot average noise levels in **Table 6.2** are calculated to be up to 102 dBZ L_{Zpeak} without a barrier, and 95 dBZ L_{Zpeak} with the 12m high barrier (5m fence atop 7m mound).

The average noise level without a barrier (96 dBZ) exceeds the 95 dBZ L_{Zpeak} limit as required for 5 days per week (for the entire Belmont Shooting Complex) daytime operation of 6am to 6pm. The calculated exceedance is 1 dB.

The noise levels with the barrier comply with the noise limit of 95 dBZ L_{Zpeak}.

An alternative to the extensive noise barrier treatment may be to implement noise controls at the dwelling, and this could include glazing upgrades, insulation, and air-conditioning. These controls would not affect non-compliance with a 95 dBZ limit but could provide benefits to the residents. This approach to noise control is used by road authorities where extensive barriers could be required to mitigate noise to isolated dwellings. The regulatory aspects of alternative mitigation treatments with shooting noise would require legal advice.

It is noted that alternative barrier designs would be possible to achieve the required attenuation. Given the substantial height of the barrier, a staged approach to construction should also be recommended, e.g. remeasure the noise levels after the mound is built but before the construction of the acoustic fence.

To minimise noise emissions it is recommended to prioritise use of the western ranges. It is also required that the two eastern DTL7 and DTL8 ranges are limited in use, as their noise levels are predicted to exceed criteria at nearby residences. The DTL7 and DTL8 ranges are therefore only approved for use only twice per year over 3 days per event (National and State Championships).

7.2 Comparison of Proposed Clay Target and the Former 300m Range

The predicted noise levels from the new Clay Target Range have been compared with the noise levels from the use of a 0.308 calibre rifle on the former 300m Range.

The calculated noise levels for both ranges are summarised in **Table 7.1**.

Table 7.1 Comparison of Noise Levels from New Clay Target and Previously Existing 300m Ranges

Receiver	Range Noise Level L_{Zpeak} (40 shot average) dBZ		
	New Clay Target Range (4 range skeet/trap or 6 range DTL)		Former 300m Range
	No Barrier	With 12m Barrier	
R6a (Boundary to North-East)	100 to 102	92 to 95	85 to 95[1]
R6c (House to North-East)	98 to 101	92 to 95	82 to 92[1]
R5a (Near House to South-East)	95	95	83 to 93[2]

Note: 1 The noise levels at can change significantly with wind changes, and therefore it is possible that noise levels could be higher or lower than previously measured levels. A notional noise level range of +/- 5 dB has included in the table.

2 The previously measured noise level was 83 dBZ, but measurement results in **Table 5.2** indicate that noise levels from a 308 rifle at the 300m range (Location C) could be as high as noise levels from shotgun usage on the Clay Target Range (Locations A and B), and thus

could be up to 95 dB as predicted for the shotgun. A 12 dB variation is in keeping with the 14 dB variation recorded at monitoring location R5a with shotguns (refer **Section 5.7**), which was considered to be due to wind variations.

The 300m range has since been shortened due to the new Clay Target Range, and thus it is expected that noise levels from the shortened range would be marginally lower to the north, and similar or marginally higher to the south-east.

This comparison indicates the noise impacts at nearby residents from the proposed new Clay Target range can be considered as similar to the noise impacts at residents near to the former 300m range.

7.3 Comparison of Existing Clay Target Range on Western Side of Belmont Shooting Complex (BGC) and Proposed New Permanent Use Clay Target Range

Noise measurements have previously been undertaken at the existing Brisbane Gun Club Clay Target Range on Mt Petrie Road. At this existing range there are several houses immediately behind the range, to the west, on Mt Petrie Road (refer **Figure 7.1**) and residences further to the south-west (refer receiver area R3 on **Figure 2.1**).

The previous noise measurement results indicated noise levels of 91 to 97 dBZ peak at the residence at 51 Mt Petrie Road (refer **Figure 7.1**) with a 12 gauge shotgun, i.e. the same or similar type of gun used in the testing for the new Clay Target Range. In broad terms, these noise levels are similar to those predicted from the new Clay Target Range as shown in **Table 6.2**.

A comparison of residential receivers at the existing (Brisbane Gun Club (BGC)) and new range can be performed based on their location with respect to the shooting positions.

At the new range, the closet residence to the north-east (R6e) is approximately 120 metres behind and 70 metres to the side of the nearest shooting position. Overall this residence is approximately 135 metres from the shooting position of the nearest regularly used range (i.e. DTL6). The next nearest residences are approximately 300m behind the new shooting positions, and 800 metres in front of the shooting positions.

At the existing range there is a residence approximately 60 metres behind the shooting positions (51 Mt Petrie Road, as noted above), a residence approximately 90 metres behind the shooting positions (43 Mt Petrie Road), and other residences further from the site. Overall, there appears to be 4 residences closer to the existing range shooting positions (51, 43, 35 & 29 Mt Petrie Road), than the nearest residence (R6e) to the new Clay Target range.

Based on the above analysis, there are fewer residences close to the proposed new Clay Target Range, than the existing (BGC) range.

It is noted that to achieve compliance for noise levels from the existing BGC range would require a large noise barrier behind the range, and that based on the basic geographical properties of the existing and new Clay Target ranges, this barrier would likely of a similar scale to the barriers modelled for the new Clay Target range.

This comparison indicates the noise impacts at nearby residents from the proposed new Clay Target range can be considered as similar or less than the noise impacts at residents near to the existing BGC target range on Mt Petrie Road.

Figure 7.1 Existing Clay Target Range (BGC) on Mt Petrie Road.

8 Conclusion

This report outlines the noise assessment of the impacts of the proposed permanent use of the new temporary Clay Target Range constructed within the Belmont Shooting Complex for the Commonwealth Games use.

Noise levels have been predicted for three range scenarios:

- 4 range skeet on STD1 to STD4
- 4 range trap on STD1 to STD4
- 6 range down-the-line (DTL) on DTL 5, STD1 to STD4 and DTL6

Noise levels have been assessed without a barrier, and with a 12m high barrier (5m acoustic fence atop 7m high mound) and clubhouse as per **Figure 6.1**. Note: The proposed barrier is to be designed to allow for koala movement through the line of the barrier. This could be achieved with appropriately designed openings.

The two eastern most ranges (DTL7 and DTL8) are proposed to be limited in use and have been excluded from the barrier treatment and assessment. The DTL7 and DTL8 ranges are therefore only approved for use only twice per year over 3 days per event (National and State Championships).

Based on the proposed 4 range venue, with no barrier, the predicted 40 shot average noise levels were calculated as up to 100 to 102 dBZ peak, which exceeds the noise limit of 95 dBZ peak as proposed for 5 days per week (for the entire Belmont Shooting Complex) daytime operation of 6am to 6pm. With the barrier, the resulting average noise level is compliant with the noise limit of 95 dBZ peak.

To minimise noise emissions from the new Clay Target Range it is recommended that the western ranges be prioritised over eastern ranges due to their reduced noise impacts at nearby residences.

A comparison of noise levels from the new Clay Target Range and the former 300m Range indicate that noise levels could be considered relatively similar at residences to the north-east and south-east.

A comparison of the existing and new Clay Target Ranges indicates that there are more (4) residences closer to the existing range than the nearest residence (R6e) to the new range. It is also noted that a barrier would be required for the existing Clay Target Range to achieve compliance, and this required barrier is likely to be similar to that required for the new Clay Target Range.

Given the modelled barrier is relatively high, it is recommended that further development and optimisation of barrier options be considered. A staged approach to barrier construction should also be considered, e.g. re-measure shotgun noise levels after the mound is built to refine the acoustic fence requirements.

An alternative to the extensive noise barrier treatment may be to implement noise controls at the dwelling, and this could include glazing upgrades, insulation, and air-conditioning. These controls would not affect non-compliance with a 95 dBZ limit but could provide benefits to the residents. This approach to noise control is used by road authorities where extensive barriers could be required to mitigate noise to isolated dwellings. The regulatory aspects of alternative mitigation treatments with shooting noise would require legal advice.

Appendix I

Contamination Report

Clay Target Facility, Belmont Shooting Complex

Ministerial Infrastructure Designation, Contamination Report (October 2018)

Prepared for Department of State Development, Manufacturing, Infrastructure and Planning

Ground Corp Pty Ltd
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Clay Target Facility, Belmont Shooting Complex

Ministerial Infrastructure Designation, Contamination Report (October 2018)

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Definitions and Terms

BSC / Belmont Shooting Complex	The Belmont Shooting Complex located at 1,485 Old Cleveland Road, Belmont, with real property description Lot 1 on RP 169229.
CG Facility	The temporary clay target shooting venue that was constructed for the 2018 Commonwealth Games, and which will be transformed into a larger permanent facility as part of the Proposed Development. The CG Facility comprises 3 clay target shooting ranges and is located within the broader Belmont Shooting Complex.
Cleared Operational Area	Part of the Operational Area that will be initially cleared during construction of the Proposed Development
CoPC	Contaminants of Potential Concern
Designation Site	The site that is proposed to be designated as part of the Ministerial Infrastructure Designation, which forms part of the Belmont Shooting Complex.
DES	The Queensland Department of Environment and Science (formerly DEHP)
DSDMIP	The Queensland Department of State Development, Manufacturing, Infrastructure and Planning
Ministerial Designation	Subject to determination by the Minister, the Ministerial statement ultimately designated as part of the Ministerial Infrastructure Designation process
NEPM	National Environmental Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013
Operational Area	Part of the Designation Site that will be used for the ongoing operation of the proposed facility
Operational Guidelines	Guidelines elsewhere in the MID (not in this report), that outline and summarise requirements for operation of the Proposed Development
The Proposed Development	The proposed development that is the subject of the Ministerial Infrastructure Designation, which comprises an 8 range permanent clay target facility, that is located within the broader Belmont Shooting Complex.
Uncleared Operational Area	Part of the Operational Area that will not initially be cleared during construction of the Proposed Development, but which may be cleared if necessary in order to take reasonable measures to protect human health and the environment
Uncleared Safety Zone	Part of the Designation Site that falls within a firearm safety template and that appears to present a negligible risk to human health and the environment in relation to contamination.

1 Introduction

1.1 Overview

Ground Corp Pty Ltd was commissioned by the Queensland Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) to provide advice in relation to potential contamination impacts associated with the proposed clay target shooting facility located on part of the Belmont Shooting Complex ('**BSC**') located at 1485 Old Cleveland Road, Belmont. The BSC has a real property description of Lot 1 on RP169229.

The proposed clay target shooting facility is intended to serve as one of two elite, world class facilities in Australia that are capable of hosting major events such as the Commonwealth Games, Olympics and the World Cup.

Clay target shooting typically involves the use of hazardous materials that are a source of potential contamination. Examples of hazardous materials typically used during clay target shooting include pellets that are predominantly made of lead, and clay targets that contain Polycyclic Aromatic Hydrocarbons.

1.2 Purpose

Consistent with the requirements of the *Environmental Protection Act 1994*, reasonable steps must be taken to protect the environment and human health from impacts that may arise from the development and ongoing use of the facility. Practical measures exist to enable the risks associated with contamination on clay target shooting ranges to be suitably managed.

The purpose of this report is to evaluate the potential impacts of sources of contamination that may arise from the permanent use of the Shotgun Range Legacy facility; and demonstrate that an appropriate contamination management strategy can been adopted.

The report specifically addresses the following items for the Ministerial Infrastructure Designation, associated with contamination arising from the existing and proposed development:

- Protection of human health within the Operational Area of the facility;
- Protection of ecological receptors that may enter the Operational Area of the facility; and
- Protection of human health and ecological receptors outside the Operational Area of the facility.

Correct application of this document will achieve the following in relation to risks associated with sources of contamination in the Operational Area:

- Applicable stormwater, groundwater, soil and air quality standards will be achieved and maintained;
- To the extent it is reasonable to do so, impacts to environment will be minimised;
- A world class facility will be able to be developed; and
- A practical and appropriate contamination management strategy, that is socially, economically and environmentally sustainable will be implemented.

Tasks performed as part of the assessment include the following:

- Assessing the potential sources of contamination, including:
  - Collating and analysing information about proposed shooting activities, relevant to the nature of contamination and the potential primary distribution of contamination
  - identifying the key contaminants of concern from clay target shooting activities
- ascertaining the potential environmental receptors
- assessing key migration paths, including:
  - performing analysis of the field of play soil
  - assessing the depth to groundwater
  - analysing surface water and runoff from the site of the proposed facility

- conducting analysis of the existing facility during the Commonwealth Games clay target event

— reviewing environmental site investigations from numerous shooting ranges across Australia

— performing a detailed shotgun pellet distribution assessment to analyse potential distribution of lead pellets and options available to reasonably reduce the potential extent of the primary source of contamination

— incorporating specialist ballistics analysis to assess the potential firearm safety risks to an easement located on the eastern side of the proposed facility and which overlaps the ISSF safety template

— recommending best practice measures to be adopted to manage potential contamination. These include both physical and operational controls

— assessing the potential extent of sources of contamination with the recommended measures to deal with the impacts identified

For clarity, this report considers the impact of the proposed Designation Site clay target range, and does not consider potential impacts arising from external activities such as other ranges within the Belmont Shooting Complex.

2 Assessment benchmarks and regulatory framework

Contaminated land in Queensland is principally managed and regulated by the Department of Environment and Science ('DES') under the Environmental Protection Act 1994 ('EP Act').

Amongst other things, under the EP Act, all persons (including entities) have a general environmental duty ('GED') to not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.

All of the relevant guidelines, legislation and standards are quite extensive, and include the following:

— The EPA Act and its subordinate legislation including regulations and policies, including the *Environmental Protection (Water) Policy 2009*

— Queensland Department of Environment and Heritage Protection guidelines and handbooks

— National Environmental Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM 1999, amended in 2013)(NEPM 2013), and its associated schedules

— AS4482.1–2005 Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds. (Australian Standards, 2005)

In Queensland, the administering authority has adopted the National Environmental Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013 (NEPM 2013) for the assessment of contaminated land, and the generally accepted process for assessment of site contamination is that outlined in Schedule A of NEPM 2013.

Where Queensland waters including groundwater are affected by the contamination, the assessment must also be guided by the *Environmental Protection (Water) Policy 2009*, which includes scheduled environmental values and prescribed water quality objectives to protect these values for all Queensland waters.

The administering authority also requires consideration of best practice in environmental management. In addition to the guidelines and standards above, this assessment has been performed with consideration given to international best management practices for lead usage at outdoor shooting ranges, including the US EPA best management practices (July 2005)(US BMP), the Finnish Environment Best Available Techniques Management of the Environmental Impact of Shooting Ranges (2014)(Fin BAT), world best and state of the art environmental practices for shooting ranges.

3 Existing contamination

The site of the proposed clay target range forms part of the broader Belmont Shooting Complex which is listed on the Environmental Management Register due to being used for shooting activities. Shooting

activities have been performed at the Designation Site, and at the time of preparing this document a source of contamination exists in the parts of the proposed Operational Area that is generally bounded by the existing shotgun curtain and the shooting positions. This source of contamination is related to the Commonwealth Games event at the Designation Site, and it is intended to either remove this source of contamination if the Proposed Development does not proceed, or to manage this source of contamination as part of site development and operation activities if the Proposed Development does proceed.

Analysis indicates that surface water receptors and groundwater receptors are not impacted by the sources of contamination arising from the Commonwealth Games at the Designation Site.

A Belmont Shooting Complex masterplanning exercise has identified that the Proposed Development presents an opportunity to consolidate shooting ranges at Belmont Shooting Complex, and there is an opportunity to relocate the Brisbane Gun Club to the Proposed Development, which is designed to achieve best practice standards.

4 Site characteristics

This section outlines relevant characteristics of the Designation Site, including potential sources of contamination, the likely nature of the sources of contamination, environmental receptors and exposure paths. Section 5 provides an overview of the management measures required to facilitate protection of human health and the environment arising from potential sources of contamination in the Operational Area.

4.1 Site layout and proposed shooting activities

The site of the proposed development incorporates the 2018 Commonwealth Games temporary clay target shooting venue. An operational area for the Proposed Development (the '**Operational Area**') consists of areas to be cleared during construction of the facility and monitored during operations ('**Cleared Operational Area**') and areas proposed to be monitored during operations and initially not cleared ('**Uncleared Operational Area**').

Relevant to the management of contamination are the following key characteristics of the shooting activities:

- There are a number of shooting disciplines that will use the facility, and there are 8 proposed shooting ranges. To limit cleared area and environmental impacts restrictions on the use of the 8 ranges are proposed (refer Operational Guidelines, and **Section 5.3.3** below)
- The facility is proposed to be of world class, and it is proposed to primarily use lead shotgun pellets which are essentially required to be used for elite shooting disciplines. This may change in future as technology advances and rules change
- Analysis of potential measures available to reduce the distribution of lead pellets from shooting has been performed and reasonable measures are proposed for incorporation in a Ministerial Designation

A conceptual layout of the proposed permanent use facility is depicted in Mode Drawing MP-045F, dated 18/6/18. This contamination impact assessment has been based on this drawing, and the operational controls proposed to be implemented.

4.2 Contaminants of potential concern

Generally, on a clay target range the primary contamination sources can be separated into projectiles, clay targets and gunshot residue. Secondary contamination distribution can arise from migration or movement of contaminated materials, or other activities on the site such as fuel storage and batteries for mobile trap throwers that can give rise to potential contamination.

4.2.1 Shotgun pellets

Although alternatives (such as steel, bismuth, tungsten and polymer pellets) exist, for various reasons lead pellets are the predominant form that is used for clay target shooting by amateurs and elite world sporting organisations. Discussion the reasons associated with the predominant use of lead pellets is provided in **Section 5.3.2** below.

Lead pellets comprise around 97% lead, 1-3% antimony, and <0.1-0.5% arsenic (Sara Kajander and Asko Parri (Eds), August 2014). Clay target shooting typically results in significant concentrations of lead on the ground surface in the fallout zone where spent shot accumulates. While antimony, arsenic and some of the substances in the clay targets can be hazardous to human health and the environment, the greatest contaminant of concern on shooting ranges is typically considered to be lead due to its range of severe toxic effects and the vulnerability of children (CRC Care, 2013), and environmentally particularly in the aquatic environment where it is a bioaccumulant with proven toxic and mutagenic effects on benthic organisms.

4.2.2 Clay targets

The typically used clay targets contain tar binders with Polynuclear Aromatic Hydrocarbon (PAH) components that have low solubility in water. This means that the compounds typically remain bonded with the material of the clay target and thus leaching of the compounds into the soil is minor (ECan 2006 and Sara Kajander and Asko Parri Op Cit). Thus any residual vertical and horizontal leaching of PAHs through the soil profile to leave the Operational Area or contaminate groundwater is likely to be minimal.

4.2.3 Gunshot residue

Gunshot residue ('GSR') is produced in relatively small quantities when shots are fired and is very fine in size. GSR contains a number of potential contaminants. Inorganic compounds include barium, antimony and lead, and may also include trace quantities of arsenic, bismuth, cadmium, copper, silver, tin, titanium, zinc, and strontium compounds. Organic compounds originating from the powder consist mostly of propellants such as nitro-glycerine and nitrocellulose as well as stabilisers such as diphenylamine and methyl centralite. The organic analytes are vaporised during the firing process and then re-condense (Firearms ID, June 2016). Lead dust in indoor shooting ranges has been linked with high lead blood levels (Ontario Agency for Health Protection and Promotion (Public Health Ontario), 2014).

Typically GSR is considered to present a low risk to human health and the environment on outdoor shooting ranges, however consideration of GSR (along with other potential dust containing contaminants) is prudent in managing club rooms and areas accessed by visitors and shooters.

4.2.4 Other Sources

During the operation of a clay target facility there can also be other secondary sources of contamination. These include fuel storage and handling, batteries and contaminated materials that have been relocated during operations.

Fuel can be a source of contaminants such as hydrocarbons, benzene, toluene, ethyl benzene, xylene, and batteries commonly comprise lead and acids.

Typically secondary sources of contamination on shooting ranges are considered to present a relatively low risk and are generally manageable with practically management measures.

4.2.5 Contaminants of Potential Concern

In summary, the greatest contaminant of concern on shooting ranges is considered to be the lead in shotgun pellets, however the contaminants of potential concern (COPC) include the following:

- SIGNIFICANT: Shotgun pellets: Lead, antimony, arsenic
- MINOR: Clay targets: Polynuclear aromatic hydrocarbons
- MINOR: Gunshot residue:
  - barium, antimony and lead, and may also include trace quantities of arsenic, bismuth, cadmium, copper, silver, tin, titanium, zinc, and strontium compounds
  - nitro-glycerine and nitrocellulose as well as stabilisers such as diphenylamine and methyl centralite
- MINOR: Secondary sources:
  - fuel storage (hydrocarbons, benzene, toluene, ethyl benzene, xylene) and batteries for mobile trap throwers (lead)

4.3 Soils

Soil and geomorphology

Soil mapping indicates that the following soil types are present in the Designation Site region (**Table 4-1**).

Table 4-1: Regional soil landscape mapping for the Designation Site

Landscape types	Description
Beenleigh	Red-yellow podzolic soils, with lithosols, some gleyed podzolic soils on low hills of greywacke, shale etc. Red-yellow podzolic soils are dominant, red profiles being more common on hill crests and on some upper slopes, and the mottled or yellow profiles on lower slopes (Fig. 10). Lithosols (Um2.12) with loam textures are common on many hill crests and on some of the steeper slopes. Most of these soils have hard-setting surfaces

The soils and Land Use in the Beenleigh-Brisbane Area, South East Queensland, G.G. Beckman, 1967, identifies the topsoils as having the geochemical characteristics outlined below.

- pH: 5.3 to 5.7
- N%: 0.05 to 0.20
- Total P: 0.005 to 0.048
- Available P (ppm): <1 to 6
- K (meq/100g): 0.06 to 0.70
- K (% of total metal ions): 9 to 28
- Ca (meq/100g): 0.1 to 2.4
- Ca (% of total exchangeable cations): 1 to 11
- Major element deficiencies: N, P (extreme)
- Minor element deficiencies: Mo, Cu, Zn
- Drainage restricted by relatively impermeable subsoil

Site investigations in the Designation Site indicate soils are generally consistent with the regional soil mapping, however that areas of fill also exist. Filled areas have also comprised relatively proportions of fines content, relatively low CEC, and slightly acidic soils.

4.4 Human receptors

Potential human receptors that may be exposed to Site-derived Contaminants of Potential Concern ('**CoPC**') are considered to include the following:

- On-Site human health receptors
- range staff and maintenance workers
- (recreational) users and visitors of the range
- construction workers
- Off-Site human health receptors
- recreational users of downstream creeks and streams
- receptors of dust
- groundwater users

Regarding the potential exposure pathways, inhalation of muzzle vapours, airborne particulate lead and dust can occur during both shooting and maintenance activities such as sweeping and mowing.

Direct inhalation of muzzle vapours can expose shooters and bystanders to lead at the firing line. Exposure to lead-containing dust particles can occur anywhere on the range but is mostly a concern for maintenance workers performing duties in the area of impact.

Small particles of lead may become airborne due to wind action, foot traffic or maintenance activities, which disturb contaminated soils. Airborne particles smaller than 10 microns can be inhaled, and fine particles less than 250 microns in diameter can be incidentally ingested.

Incidental ingestion occurs from repeated hand-to-mouth actions. For example, lead particles generated by the discharge of a firearm can collect on the hands of a shooter, or lead contaminated soil or dust can be picked up during maintenance activities. These particles can be ingested if shooters eat or smoke prior to washing their hands after shooting.

Typically, the risks to human health on outdoor shooting ranges from direct inhalation of muzzle vapours and airborne lead particles is low due to the available ventilation and airflow.

Generally practical management measures are available for these risks. To adequately protect human health on a facility such as that proposed requires appropriate management measures to be developed and implemented. Consideration of management measures is given in Section 5.

which will be summarised in Section 5 below and which will be incorporated into the design and operational requirements.

4.5 Terrestrial environmental receptors and exposure pathways

Generally speaking, potential terrestrial environmental receptors that may be exposed to CoPC arising from a clay target range include the following:

- Plants and trees can uptake lead and other contaminants and introduce it into the food chain.
  - Once lead has decomposed into a more soluble form, it can enter certain types of plants from the soil through their roots.
  - While lead from shot in the soil that has weathered can be absorbed by plants and may accumulate in roots, leaves, seeds, and other parts that may be eaten by birds or animals, this pathway has not been demonstrated to be a major risk to most wildlife (Eisler, 1988). This is consistent with analysis performed by Ground Corp in regards to uptake of lead by “koala trees”. Whilst not Designation Site specific, Ground Corp has performed analysis of the potential lead uptake from soil into leaves of “koala trees” on clay target shooting ranges, and the findings have indicated low rates of uptake
  - Most of the potential effects of lead in vegetation will involve the lead pellet fallout area which is part of the Operational Area.
- Wildlife and habitats
  - Spent lead may be available to wildlife and, when it is, may result in detrimental effects. Direct ingestion of lead shot is the most important exposure pathway for wildlife. Birds may consume lead shot as grit for the gizzard, or it may be mistaken for small seeds and eaten. This can occur whether birds are feeding on land or in the water. Waterfowl are particularly susceptible to lead poisoning, which has resulted in bans on lead shot for waterfowl hunting in numerous administrative areas within countries and parts of Australia.
  - Lead shot may also be mistakenly eaten by birds and animals feeding on earthworms, soil insects, fallen seeds, and other foods at the surface of the soil. Range soils with elevated lead levels may also be inadvertently ingested by wildlife while feeding or when animals are cleaning their fur or feathers. The soil ingestion exposure pathway is generally considered a secondary risk for most animals; however, this exposure pathway may be more significant for terrestrial invertebrates and/or aquatic benthic organisms and for small mammals that may have a significant portion of their territories on the shot fall or impact area of a range than for larger mammals or birds that use larger areas.
- Generally, risks to wildlife at clay target ranges are as follows:
  - Waterfowl, ducks, and egrets: Numerous studies have documented the risk to waterfowl. The risk is especially high if spent shot falls into wetlands or water where waterfowl may feed. However, waterfowl may also be at risk if their foraging range incorporates shot fall areas.

- Small, ground-feeding, seed-eating birds: Few studies have been conducted on this exposure; however, they are believed to be at a low to moderate risk. Internationally, mourning doves have been documented to ingest spent shot in heavily hunted areas. Because ranges represent only a fraction of a population's distribution, any exposure is likely is relatively localised and consideration is required to be given to foraging ranges.
- Small mammals: Most studies generally have identified small mammals as being at risk at ranges; however, they conclude that the exposure is only at the local level and consideration is required to be given to foraging ranges.
- Ground-feeding, worm- or insect-eating birds. These birds have a potential risk through inadvertent ingestion of soil associated with worms or subterranean insects. Because ranges represent only a fraction of a population's distribution, any impact is relatively localised and consideration is required to be given to foraging ranges.
- Medium-sized and larger mammals. Generally studies consider this exposure risk to be relatively insignificant, however due consideration is required to be given to the potential risks. It is feasible for example for wallabies to ingest lead pellets if pellets are present in areas they are grazing
- Fish-eating wading birds, fish, reptiles, amphibians, and invertebrates. Localised elevated lead levels may pose a risk where lead-contaminated runoff or shot is allowed migrate or fall into wetlands or water, mitigation measures for which are outlined in Section 5.

Searches of public records has identified the presence of high ecological significance habitats and regional ecosystems with biodiversity status of concern in close proximity to the Operational Area.

Lambert and Rehbein have performed an ecological survey of the Designation Site and preliminary desktop study of the region, and in the region of the Designation Site have identified various species including a number of waterfowl, koalas, birds and wallabies. Detailed studies have not been performed to assess the potential species that may forage into the Operational Area.

To protect these environmental values a facility such as that proposed requires appropriate management measures to be developed and implemented. Consideration of management measures is given in Section 5.

4.6 Aquatic environmental receptors and exposure pathways

Generally, contaminated soil, lead particulates and spent lead pellets have the potential to migrate to waterways, whereby they either sink into the sediments or remain on the bed of a water body (such as ponds, lakes, marshes, reservoirs and rivers) unless they are carried elsewhere by currents.

Invertebrates and fish can be exposed to waterborne contaminants by adsorption to the exoskeleton or integument, absorption by gills, and through ingestion of sediment, particulates, and food items. Elevated concentrations of lead and biological effects are well documented in aquatic biota near mining sites, smelting sites, and metal finishing industries (Eisler 2000).

Searches of public records has identified that there are no designated watercourses within the Designated Site area, however designated waterways exist downstream of the Site. The risks to the environmental values of these waterways requires consideration.

The location of the downstream designated watercourse is depicted on Figure A-1. (appended).

To protect these downstream environmental values a facility such as that proposed requires appropriate management measures to be developed and implemented. Consideration of management measures is given in Section 5.

4.7 Groundwater

Investigations at the Designation Site identified groundwater levels in the lower areas to the west of the Operational Area at around 3m below ground. This level was taken in early April, and likely represents the upper range of seasonal fluctuations being at the end of the wetter part of the year, with a 'wet season' typically between January and March.

It is considered likely that the groundwater gradient for the Operational Area will be in sympathy with the topography because shallow groundwater tables typically are in sympathy with, and have less pronounced grades than local topography. Consequently, the groundwater levels in the higher elevation parts of the site are likely to be consistent with or deeper than (with respect to ground level) the groundwater levels observed in the lower parts of the site.

The soil profile in the area of the site has substantial fines content. Geotechnical drilling performed for the Commonwealth Games facility to depths of up to 7.5m at a similar time did not encounter groundwater or seepage. It is likely that the geotechnical drilling did not wait sufficient time for the groundwater to seep into the hole in which case these findings do not necessarily provide an indication of the depth of groundwater table, however given the geotechnical drilling was at a relatively similar time, it is reasonable to assume that the groundwater level was relatively consistent in which case present the absence of any observed seepage or groundwater is consistent with a substantial fines content in the soil profile, and relatively low permeability

Broad-scale mapping has identified the potential for groundwater dependent ecosystems to exist at the Site. Potential risks to the environmental values of the groundwater requires consideration.

Registered bores exist in relatively close proximity to the Operational Area. These bores are generally in the sub-artesian aquifer which is relatively deep (ie. >40m bgl), however the potential risks to the groundwater table and it's environmental values requires due consideration.

To protect these environmental values a facility such as that proposed requires appropriate management measures to be developed and implemented. Consideration of management measures is given in Section 5.

The location of the nearby registered bores are depicted on Figure A-1.

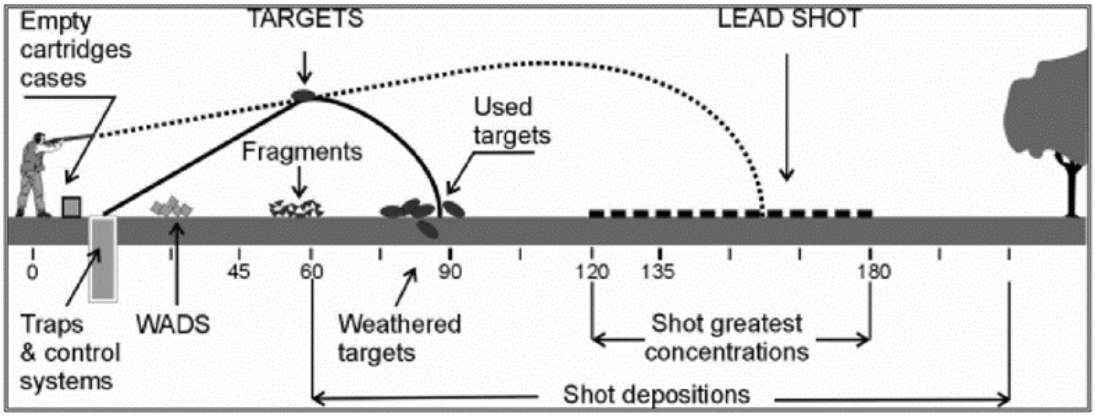
4.8 Extent of contamination sources

The extent of clay target range contamination sources is primarily influenced by shotgun pellet distribution and clay target distribution. This depends on a number of factors, including the shooting disciplines deployed at the facility. There are numerous different shooting disciplines and each has different clay target trajectories, and therefore different potential pellet trajectories and distribution of pellets and spent clay targets.

Generally, contamination sources can be separated into projectiles, clay targets and gunshot residue. Secondary contamination distribution can arise from migration or movement of materials. Measures will be implemented to control movement of materials, and as such a secondary source of contamination arising from movement of materials does not require further consideration in this report.

An indication of the typical fallout profile for a clay target shooting range is depicted in Figure 1 below.

Figure 1: Flight paths of different materials involved in clay target shooting (lengths in metres)



Source: http://www.itrcweb.org/GuidanceDocuments/SMART-2.pdf

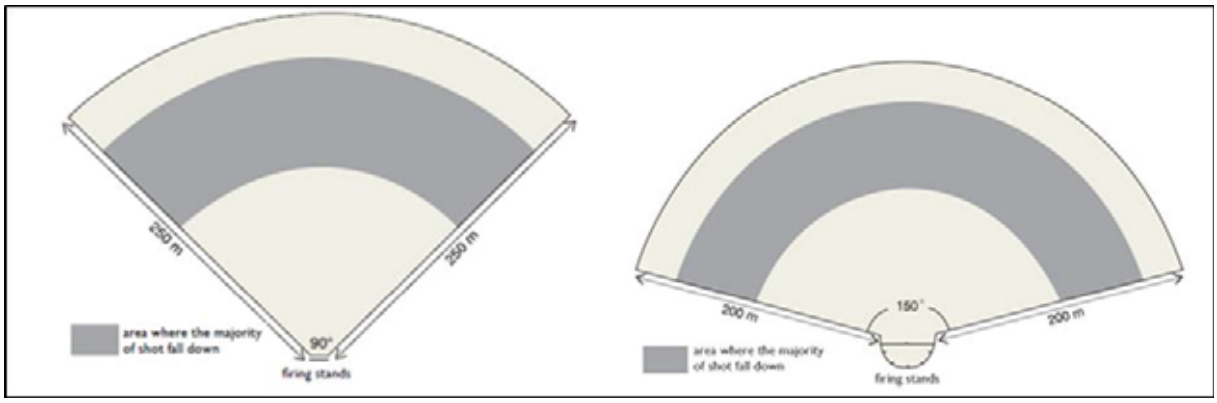
The extent of the scatter area and distribution of surface deposition of contaminants also depends on the design of the ranges, the nature of shooters (ie. elite vs amateur) and the manner in which the facility is operated (ie. certain ranges are not used as frequently as others).

There are a number of proposed shooting disciplines at the facility that comprise:

- Skeet - ISSF and American
- ISSF Trap
- ISSF Double Trap (which is likely to be phased out)
- Universal Trench (trap)
- Down the line (trap)
- Sporting Clays (trap)

Of these disciplines, trap shooting has a narrower area of distribution than skeet, both laterally and vertically. Trap shooting uses larger pellets however than skeet, so the pellets can go further. An indication of the extent of unimpeded shot pellet distribution from a trap range and a skeet range is depicted in Figure 2 below.

Figure 2: Unimpeded indicative shot pellet distribution (Left: Trap Shooting; Right: Skeet Shooting)



Source: Finnish Environment, Best Available Techniques Management of the Environmental Impact of Shooting Ranges

The distribution of pellets at the range is an important consideration in assessing the potential impacts of the range, and determining requirements for appropriately managing contamination. Detailed analysis of potential pellet distribution has been performed to assess potential lead deposition controls for the facility.

Among other things the pellet distribution analysis included consideration of the following aspects:

- The estimated number of shots over the design life, and breakdown of each shooting discipline
- Observed pellet and lead distribution during the Commonwealth Games
- Analysis of clay target trajectories for each discipline
- Various configurations of shotgun curtain to restrict the distribution of shot
- Analysis of the range of shots and shotgun pellet trajectories for each discipline and for each target
- Topography, excavation / filling and impact of wind impacts on clays and shot pellets
- Observed pellet and lead distribution on a number of representative ranges
- Observed reaction times over a number of shooting events and shooters
- The nature of each shooting discipline and nature of potential shooters (ie. shooting early in the clay target trajectory or late in the trajectory)
- The variability in the size of shotgun pellets
- The design life of the range
- Firearm safety regulations, including that by law shooting must be aimed at targets, and that for firearm safety reasons this is stringently enforced by range operators

The pellet distribution analysis has primarily been focussed on assessing the following aspects:

- The potential risks to the environment
- The options available to enable reasonable measures to be taken to reduce the potential impact to the environment
- The likely distribution of shotgun pellets (and clay targets) that will require management
- The potential distribution of shotgun pellets that may require management and prudently should be allowed for adopting the precautionary principle

Further discussion on recommended measures incorporated to reduce the deposition of shotgun pellets is provided in Section 5.3.

4.9 Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The development of a CSM is an essential part of assessing and managing sources of contamination, and provides the framework for identifying how potential receptors may be exposed to contamination.

A conceptual site model has been developed for the proposed facility, and the primary sources of contamination are depicted in Figure A-2 (appended).

5 Management Measures

5.1 The nature of lead pellets

On a shooting range lead generally exists in three forms:

1. Metallic lead (ie. the form that comes out of the gun)
2. Fine solid corrosion by-products either in lead compounds or bound to soil
3. Dissolved phase lead

Fortunately, shooting range pollutants do not usually cause immediate or short-term environmental impacts (Sara Kajander and Asko Parri (Eds), August 2014). The initial processes of corrosion and subsequent chemical and electrostatic binding of the secondary lead compounds to organic material and clay complexes (particularly those of iron and manganese) in the soil can be relatively rapid however very localised. After initial corrosion the process generally slows down as the metallic lead in the pellet becomes surrounded by, and protected by, more stable fractions. This helps reduce the rate that lead changes from metallic form to the other more mobile forms. The complete corrosion of lead pellets can be relatively slow and a shotgun pellet can take hundreds to thousands of years to completely dissolve into secondary lead compounds (Jorgensen and Willems, 1987).

5.1.1 Metallic phase

Metallic lead is very heavy and generally doesn't physically migrate very far, and practical measures such as basins, swales and berms can readily trap metallic phase lead. The primary concerns are around how to manage the other forms of lead (fine and dissolved).

5.1.2 Fine and dissolved phase

The abundant mineral complexes in organic topsoils and clays have a high ionic exchange capacity and thus readily bind environmental lead. This results in lead corrosion by-products being generally contained near the surface of the topsoil (Rooney and McLaren 2000).

Groundwater movement in clay is relatively slow, which increases the contact time for lead to be bound to the mineral complexes. Low permeability reduces the amount of leaching and increases the probability of the presence of basic (pH-increasing) minerals that can precipitate out of solution in groundwater or cause the lead to bond to the clay. (US EPA).

The corrosion rate of lead is however strongly influenced by site conditions, and for example soil acidity and mineral composition impact the rate of corrosion. At pH below 5.5, lead is at its most soluble as the divalent Pb2+ ion. Above this pH lead like most heavy metals is highly insoluble and readily precipitated out in the environment in the form of its hydroxides and carbonates (Stuckey and Boland 2010). In typical circumstances over time lead will generally continue to slowly corrode, however in pH neutral environments with fine grained soils and favourable geochemistry the rate of corrosion into higher risk fine and dissolved forms can be significantly reduced.

It is Ground Corp's experience from assessing and assisting with the management of over 25 Australian shooting ranges that misconstruing these risks can lead to practices that cause more harm than good. Due to the nature of the contamination, ground disturbance can cause the finer fractions to become less stable and significant mobilisation of contaminants can occur through poorly managed retrieval processes.

The effective management of contamination on shooting ranges that use lead pellets should give priority to creating favourable geochemical conditions (to promote stable fractions of lead and sorption to soils), and maintaining vegetation cover to bind soil particles and minimise erosion of soil bound lead. With appropriate vegetation and favourable geochemical conditions Ground Corp's investigations on other ranges have identified that clay target ranges can operate for up to 100 years without detectable migration of contaminants to nearby surface water drainage paths or shallow groundwater.

These factors have been given due consideration in assessing the potential risks, and in recommending suitable controls for this facility. An overview of the requirements to protect the environment and human health during the life of this facility is outlined in Section 5 below.

5.2 Overall Philosophy

Consistent with the requirements of the *Environmental Protection Act 1994*, the overarching management philosophy for the proposed facility is to protect the environment and human health by, to the extent that is reasonable to do so, and to take reasonable steps to develop and implement measures to:

1. Avoid / minimise generating a source of potential contamination
2. Understand the nature of potential sources of contamination and it's potential impacts
3. Where the activity generates a source of potential contamination, implement management measures to reduce impacts at the source
4. Reduce the migration of contaminants and manage potential offsite impacts
5. Manage the performance of the mitigation measures

A qualitative risk assessment of the potential risks to the environment and human health has been performed with consideration to the management measures proposed, and is outlined in Appendix A.

5.2.1 Designation Site Management Areas

For practical reasons, it is prudent to manage different areas of the Designation Site in different ways. This is associated with the nature of the management required in the areas, for example some areas require soil disturbance so the mineral composition of the soils will stop lead migrating, and other areas will not. A key consideration is whether clearing of vegetation is required.

To help describe the management measures proposed we have defined these areas.

The different areas and some insight the nature of differing management requirements for each of them is outlined below:

- Cleared Operational Area:
    - This area will certainly require clearing for it's practical management. Management measures which will incorporate soil treatment, the installation of surface water treatment measures, diversion of external surface water and filling.

- An Uncleared Operational Area:
  - This area may not require clearing for it's practical management, however given the variables associated with clay target shooting there is a moderate risk clearing may be required at some stage during the facility's operation to manage contamination. Maintaining consistency with the precautionary principle, allowance should be made for this eventuality. However to allow for the possibility of clearing not ultimately being required to protect human health and the environment, a reasonable approach, that maintains certain environmental values, is to not clear this area unless monitoring indicates it is necessary to do so
- An Uncleared Safety Zone:
  - This is an area of the Designation Site that falls within a firearm safety template however appears to present a negligible risk to human health and the environment in relation to contamination.

Discussion about the management techniques that are applied that give rise to these different areas, and that require application within these areas is provided in the sections following. To provide context, these management areas are depicted in MODE's figure MP-045F included in Appendix B.

5.3 Avoid / reduce source generation

5.3.1 Clay Targets

As outlined above traditional clay targets incorporate tar binders that contain Polynuclear Aromatic Hydrocarbons (PAHs), however vertical and horizontal leaching of PAHs through the soil profile to leave the Operational Area or contaminate groundwater is likely to be minimal.

Our analysis indicates that reasonable measures can generally be implemented to manage most key risks associated with using PAH containing targets, such as sediment control, utilising PPE and monitoring of potential inhalation during mowing.

For ongoing management of a clay target shooting facility however, the continual deposition of clay targets in the fallout zone can become a visual impediment and can impede maintaining a sound cover of vegetation which is necessary to reduce mobilisation of other sources of contamination such as pellet corrosion by-products. Ongoing recovery and disposal of PAH containing clay targets can also become a financial burden for a club.

Clay targets containing PAHs are being progressively phased out in favour of targets without PAHs, including some based on a biodegradable soy protein binder. Several alternative clay targets do not contain PAHs, however the composition of some of them can lead to substantial lowering of the pH value of soils (White Flyer, 2016) which could potentially mobilise lead, which is to be avoided.

Anecdotally we are aware that there are concerns associated the performance of PAH free clay targets, and generally speaking the shooting fraternity is still awaiting development of a PAH free target that performs as well as a PAH containing clay target. This may be a relevant consideration given the facility is proposed to be established to be one of two elite, world class facilities in Australia that are capable of hosting major events such as the Commonwealth Games, Olympics and the World Cup.

To minimise ongoing management requirements and potential risks to human health and the environment, it is prudent to:

1. Use PAH free clay targets that don't negatively impact the pH to the extent it is feasible to do so
2. If clay targets containing PAHs are utilised, adequate measures must be taken to protect human health and the environment, including appropriate disposal to licenced facility and managing human health risks during maintenance

5.3.2 Alternative shotgun pellet materials

Alternatives to lead shot exist such as steel / iron, tungsten, bismuth or polymer composites. Typically lead is used for clay target shooting throughout the world for major and elite competitions. Reasons for the ongoing use of lead include the current international competitive shooting rules, performance and cost.

"Steel" is considered by the Victorian Game Authority and Tasmanian Game Authority to be "non-toxic", and steel has been successfully adopted as the sole pellet type on only a few clay target ranges in Australia. "Steel" shot however does not comply with requirements of the International Shooting Sport Federation Official Statutes, Rules and Regulations (ISSF 2017), which requires lead or other ISSF approved shot to be used for their events. Reasons for this include that the density and hardness of pellet materials influence performance during shooting. For example a harder pellet would break a clay target better than a softer pellet, and a more dense pellet would break a clay target better than a lighter pellet. During intercontinental events and events such as the Olympics, magnets are used to check whether steel pellets are present because steel shot is not permitted (lead is not magnetic), and the ISSF has recently advised that they do not support the use of steel.

ISSF rules apply to elite clay target shooting events such as the Commonwealth Games, World Titles, and Olympics, and elite clay target shooters practice and shoot ISSF disciplines. This is particularly relevant to the proposed facility, because the facility is being established to be one of two facilities in Australia that are capable of hosting teams to practice these disciplines and host world class events. For the facility to be capable of hosting world class events, shooting in accordance with ISSF regulations is fundamental.

The current best alternatives with similar ballistic properties to lead are tungsten and bismuth based pellets.

Whilst literature generally recommends that further assessment is performed, Tungsten has been linked to cancer, and it appears to be more mobile in the environment than lead. Some shooting ranges in the US that elected to shoot tungsten as opposed to lead (for environmental reasons) have found tungsten migrated to the groundwater table and have been required by the US EPA to stop shooting tungsten (US EPA 2014).

Literature also generally recommends that further assessment is performed to confirm the potential human health and environmental risks from the use of bismuth, however bismuth is generally considered to be a safer alternative for humans and the environment than lead. Concerns exist however in regards to the significant cost of bismuth projectiles and its brittleness. Bismuth is more brittle than lead and concerns are raised about it potentially having a lesser breaking ability.

Bismuth and tungsten shotgun pellets are significantly more expensive (ie. 5 to 25 times the price) than lead shotgun pellets.

Analysis has been performed to assess the potential reduction in environmental impact that can be achieved by using steel shot for non-elite shooting activities. The analysis has indicated that the aereal extent of the source of lead contamination arising from elite shooting would be relatively consistent and similar environmental management protocols would be required. An additional consideration is that costs recovered from the appropriate reclamation and recycling of lead (further discussed in Section 5.4(2)) can assist with funding of environmental management and reclamation costs. Workplace health and safety concerns exist with the use of steel in relation to high ricochet potential, and significant additional costs can be involved to limit ricochet risk if steel is used.

5.3.3 Control lead shot deposition

The project team performed analysis of a considerable number of options to retain the shotgun curtain in permanent deployment, and to reduce the disturbance required to protect human health and the environment beyond the extent of the existing shotgun curtain. Analysis included conducting an ecological risk assessment, engaging with stakeholders in relation to potential options, and developing what appears to be a state of the art pellet distribution model to assess the extent, nature and options available to manage the distribution and disturbance required to facilitate protection of human health and the environment beyond the existing shotgun curtain.

Shotgun Curtain Analysis

A shotgun curtain was installed for the Commonwealth Games that significantly reduces the distribution of shot, however due to the nature of clay target shooting the shotgun curtain does not capture all of the shot, and over the proposed life of the facility it is clearly apparent that substantial disturbance of the area beyond the existing curtain would be required to manage the amount of lead shot deposited beyond.

Analysis of the ongoing viability of retaining the shotgun curtain primarily identified that:

- With the nature of shooting required for the facility to be sustainable and economically viable, the amount of lead pellets distributed beyond the shotgun curtain is significant enough to require substantial disturbance of the area beyond to facilitate protection of the environment and human health
- Even if shooting with lead pellets was only performed during elite practice and elite events, substantial disturbance beyond the existing shotgun curtain would be required to facilitate protection of the environment and human health
- Maintaining the shotgun curtain for permanent deployment incurs substantial cost and appears to be financially unviable for sustainable management of the facility

Analysis has indicated that maintaining the curtain for permanent deployment is likely to be unsustainable and does not enable substantial disturbance of the area beyond to be avoided.

Range Design and Operational Management

Analysis has identified that management procedures can be implemented to reduce the distribution of lead shot, and limit disturbance beyond the existing shotgun curtain required to facilitate protection of the environment and human health. This can be achieved by managing the nature of shooting and the design and operation of the facility with consideration given to this objective.

Measures to be adopted include:

1. Limiting shooting disciplines of each shooting layout as outlined in the following table;
2. Designing the facility to angle some of the shooting positions inwards, and
3. Reducing the distribution by raising the height of the fallout zone relative to shooting positions.

Table 5-1: Range Use Overview

Layout	Day to day use	Event Use
DTL 8	Nil	60 x State / National Title type events for DTL (6 days per year)
DTL 7	Nil	60 x State / National Title type events for DTL (6 days per year)
DTL 6	DTL	Unrestricted DTL
Skeet 1	DTL	Unrestricted
Skeet 2	ISSF trap, skeet, DTL	Unrestricted
Skeet 3	DTL	Unrestricted DTL 4 x World Cup for Skeet and ISSF Trap
Skeet 4	DTL	Unrestricted DTL 4 x World Cup for Skeet and ISSF Trap
DTL 5	Sporting Clays restricted to a fallout zone that essentially overlaps with the DTL fallout zone from Skeet 4	Day to day Sporting Clays use. 60 x State / National Title type events for DTL (6 days per year)

Further to the detailed analysis that has been performed, including as outlined in Section 4.8, it is considered that with the measures proposed it is feasible that the Uncleared Operational Area may not require substantial clearing or disturbance to facilitate protection of the environment and human health from

impacts arising from the operation of the facility. Consequently it is recommended that this area remains uncleared and monitoring is performed to assess potential impacts. If monitoring indicates that concentrations of hazardous materials in the Uncleared Operational Area are likely to cause harm to environmental receptors that inhabit the Uncleared Operational Area, implement measures such as those for the Cleared Operational Areas to protect the environmental receptors.

5.4 Within the Operational Area

Due to the nature of the lead pellets, clay targets and the proposed activity, there are risks to users and operators of the facility arising from the hazardous materials, and measures are required to protect human health and the environment from these risks.

Risks to external receptors also exist due to the use of hazardous materials, and are influenced by management within the Operational Area. Proposed measures to protect human health and the environment outside the Operational Area from these risks are outlined in the following Section.

To manage the potential risks to users and operators of the facility arising from the hazardous materials, the following is required:

1. It will be necessary to have a suitably qualified and experience entity develop an Environmental Management Plan to manage risks to users of the Operational Area. Consideration should be given to each human health exposure risk and appropriate practical measures adopted accordingly. To address all of the requirements detailed consideration will be required, and measures may include restricting general access to the field of play, restricting access to the shooting positions, controls for maintenance and intrusive works, suitably qualified and experienced maintenance workers, no smoking in contaminated areas, cleaning hands, migration of contaminated material on machinery, cleaning facilities regularly with wet methods, dust control and monitoring during high risk works, hazardous materials requirements for fuel storage or batteries, appropriate work procedures and disposal of waste materials such as sediment buildup in the basins.
2. Measures included in the EMP will also include controls for any pellet / target reclamation activities and maintenance / treatment activities. Reclamation activities may be implemented as part of a treatment program if monitoring and assessment indicates such actions are required, and to assist generate income for the facility (eg. through reclamation, recycling and resale of shotgun pellets). Shotgun pellets typically form a relatively stable corrosion by-product coating (often seen as a white coating on the pellets), and measures will be implemented to promote stabilisation of these by-products and reduce corrosion and leaching.

   Over time however there is potential for dissolved and fine fraction lead to build up and “saturate” soils and cause increased leaching of contaminants. In addition to other management controls (such as surface water treatment), regular monitoring will be implemented to measure performance against applicable criteria, and in the instance of a potential breach of criteria actions will be triggered such as investigation, treatment, additional management measures or remediation.

   Pellet / target reclamation activities present a high risk and if not controlled appropriately can mobilise contaminants and cause unacceptable risks to users / workers and nearby receptors, because the otherwise relatively stable corrosion by-products can be disturbed and become less stable, dust containing high concentrations of contaminants can be generated, and management controls such as vegetation can require removal to facilitate the activities. Reclamation, maintenance and treatment activities will only occur with appropriate controls to protect human health and the environment during the activities, and with measures to reinstate any existing management controls that are disturbed during the activities.

   To minimise potential disturbance and mobilisation of contaminants, consideration will be given to incorporating any required ongoing maintenance / treatment measures with reclamation activities, and reclamation / treatment activities will be conducted under a Construction Environmental Management Plan approval by a suitably qualified consultant that incorporates the following:

   - An overview of the proposed treatment / reclamation works.

- Details of the proposed contractor, including any relevant licences;
- Details of existing management controls that will be disturbed during the works, including but not limited to removal of vegetation and the disturbance of fine fractions of lead sorbed and / or complexed within the soil matrix;
- Measures that will be implemented to reinstate or upgrade existing controls after harvesting is completed;
- The potential risks that may arise during harvesting, including but not limited to the potential generation of dust containing contaminants, the potential for migration of sediment bound / fine particulate contaminants and the potential for migration of dissolved phase contaminants;
- Mitigation measures required to be implemented during harvesting operations to protect human health and the environment, including addressing each of the identified potential risks, monitoring requirements and compliance criteria;
- A Health and Safety Plan, prepared by a person with appropriate qualifications and experience, addressing the potential risks to workers during harvesting works, including the potential for inhalation of dust containing lead;
- Requirements for transport, handling and disposal of any hazardous materials or materials removed from the Site;
- Details of the relevant legislative requirements.

Risks arise associated with the Operational Area's connectivity to the adjacent environment, for example environmental receptors that could potentially have a foraging range that incorporates the Operational Area.

For such receptors this risk is proposed to be managed as follows:

3. Perform an ecological risk assessment to determine the potential risk to fauna from the adjacent habitat, including fauna that has a foraging range that may include the Operational Area. Consideration should be given to the findings of the Lambert and Rehbein ecological survey, and include wallabies, koalas and waterfowl. If receptors are presented with an unacceptable risk, implement measures to reduce the risk to these receptors. This is envisaged to require measures such as netting over standing water that contains pellets for ducks and waterfowl) and assessment of risks to other fauna that may have a foraging range that overlaps the Operational Area
4. Develop and adopt site specific criteria for protection of environmental receptors within the Uncleared Operational Area and perform regular monitoring. If monitoring indicates that concentrations of hazardous materials in the Uncleared Operational Area are likely to cause harm to environmental receptors that inhabit the Uncleared Operational Area, implement measures such as those for the Cleared Operational Areas to protect the environmental receptors

5.5 Outside the Operational Area

5.5.1 Surface Water

Due to the nature of distribution of contaminants on a clay target range, it is unfeasible to structurally isolate sources of contamination from rainfall and stormwater runoff. It is however feasible to redirect, or substantially redirect external stormwater runoff around the source of potential contamination, it is feasible to reduce the generation of mobile contaminants, and it is feasible to incorporate measures to reduce the migration of contaminants in stormwater.

The following principles are recommended to be adopted for the surface water quality management of the facility:

A. Isolate potential sources of contamination from surrounding stormwater catchments;

B. Reduce stormwater migration of contaminants contained within Cleared Operational Areas, including reducing corrosion and reducing the generation of more mobile forms of contamination;

C. Maintain low water levels in surface water basins that are incorporated within the stormwater quality treatment train, capturing, recycling and reusing captured site stormwater runoff onsite;

D. Treat potentially impacted stormwater runoff prior to discharge from the Operational Area;

E. Implement Water Quality Objectives consistent with regulatory requirements

F. Monitor and manage the facility to achieve the Water Quality Objectives

In conjunction with regular monitoring and review, generally the following site design and operation measures are considered necessary to protect surface water quality of downstream ecological receptors:

1. Divert external catchments away from the Operational Area, and particularly away from the Cleared Operational Area. This will facilitate isolation of the Cleared Operational Area and facilitate treatment of the runoff from this high risk area;
2. Incorporate measures in the Designation Site drainage paths and catchment to reduce corrosion, reduce runoff, reduce sediment migration, reduce pellet migration and reduce dissolved phase lead. It is anticipated that this would include measures such as geochemically engineered surface soils in the Operational Areas, recycled concrete in drainage paths, swales with geochemically engineered profiles and geochemically engineered contour banks;
3. Reduce erosion and sediment migration by establishing and maintaining vegetative ground cover in the Cleared Operational Area;
4. Establish and maintain a treatment / monitoring basin prior to surface water discharge from the Cleared Operational Area. It is anticipated that this would be designed to capture sediment and include measures such as geochemically engineered filter media and geochemically favourable construction materials. Subject to the catchment topography it may be practical to incorporate more than one basin;
5. Incorporate a sediment forebay prior to the treatment / monitoring basin(s) to capture migrating lead pellets and allow for easy removal;
6. Establish and maintain a basin that captures drainage from the Operational Area for the primary purpose of monitoring and water recycling, and the secondary purpose of surface water quality treatment. This dam will include both runoff from the treated Cleared Operational Area, and also the Uncleared Operational Area;
7. Maintain low water levels in the treatment / monitoring basin(s) by means such as using the water in the Operational Area for irrigation. It is recommended that target water levels be established during the design development phase so that reasonable measures are taken to ensure WQOs are not exceeded. Consideration should be given to observations made during surface water monitoring, and the ability to suitably adjust the water levels accordingly included;
8. Develop and implement procedures to manage risks that arise for regular maintenance requirements for the facility, which are anticipated to include monitoring, assessment of compliance against WQOs, controls and protection for maintenance activities such as maintaining the treatment / monitoring basin(s) and forebays. Whilst the immediate downstream discharge point is not a designated watercourse, initially it would be considered appropriate to adopt a WQOs for a moderately disturbed aquatic ecosystem for discharge water quality, monitoring at least at each outlet from the Designation Site with due consideration given to seasonal fluctuations in the frequency of monitoring
9. Develop and implement procedures to manage risks that arise for irregular maintenance requirements for the facility, which are anticipated to include appropriate monitoring, controls and protection for irregular maintenance activities such as lead reclamation, and ensuring that lead reclamation activities are only implemented if it can be demonstrated that potential risks to the environment and human health are managed during lead reclamation, and fine fractions of contaminants are not mobilised (refer Section 5.4(2))

A schematic diagram of these measures is provided in Figure A-3 (appended).

5.5.2 Ground Water

The following principles are adopted for the groundwater quality management of the facility:

A. Promote isolation of potential sources of contamination from groundwater receptors and avoid any groundwater impact;

B. Monitor and manage the facility to achieve the GWQOs. Monitoring frequency should be established based on the potential groundwater connectivity that may arise from surface water basin design. If there is a high potential connectivity and limited means to otherwise monitor potential migration of contaminants towards the groundwater table at least annual monitoring is recommended

As outlined in Section 5.1 typically there is a low likelihood of impacting groundwater on a clay target range because of the high propensity for lead to sorb to soil particles, however site characteristics influence this risk and impacts to groundwater can occur.

Recapping, the following characteristics increase the risk to groundwater:

- A groundwater table in close proximity to the ground surface (subject to the soil profile a groundwater table around 3m or more below ground level typically presents a relatively low risk);
- A sandy soil profile;
- An aggressive soil profile, such as highly acidic soils; and
- The concentration of contaminants in any standing water body

As outlined in Section 4.7, the groundwater table has been measured as being more than 3m below ground, and the soil profile had high fines content. The site and Operational Area generally have characteristics that suggest a relatively low risk to groundwater, however it is prudent to take reasonable precautions.

In conjunction with regular monitoring and review, generally the following measures are considered prudent to manage the ground water quality:

1. Treat the Cleared Operational Area to reduce potential corrosion and to promote stable forms of hazardous materials;
2. Maintain a soil profile that has a relatively high proportion of fines;
3. In surface water treatment trains, take reasonable measures to minimise potential infiltration of contaminants towards the groundwater table
4. Install monitoring wells to monitor the potential migration of contaminants to the shallow groundwater table and nearby receptors. This will need to include consideration of any potentially ponded surface water, the likely groundwater gradient and proximity to the nearest registered bore

5.5.3 Dust

Lead pellets corrode when they are exposed to the elements, and even though controls will be implemented to reduce corrosion, measures still need to be implemented to address risks that may arise from dust. Given the controls that are to be implemented to manage stormwater and groundwater risks, during normal use there is considered to be a low risk to human health and the environment arising from dust. This is substantially due to dust generation being effectively mitigated by establishing and maintaining vegetative ground cover in the Cleared Operational Area. The Uncleared Operational Area is not anticipated to receive sufficient quantities of lead to cause a dust risk, and measures are proposed to monitor the deposition of lead in these areas.

Analysis indicates that risks from dust that arise during maintenance can be reasonably managed, however procedures will need to be developed and implemented, including for mowing and for proposed lead reclamation activities. Lead reclamation activities have the potential to generate dust with lead concentrations sufficient enough to cause harm if not appropriately managed (refer Section 5.4(2)).

In conjunction with regular monitoring and review, generally the following measures are considered necessary to protect human health and the environment from risks associated with dust:

1. Develop and implement procedures to manage risks that arise during the regular operation and maintenance of the facility, which are anticipated to include appropriate monitoring, controls and

protection for regular maintenance activities such as mowing, and a regular cleaning regime that uses moist methods to clean, water coolers sited away from sources of dust, basins for shooters to wash hands prior to entry into clubhouse

2. Develop and implement procedures to manage risks that arise for irregular maintenance requirements for the facility, which are anticipated to include appropriate monitoring, controls and protection for irregular maintenance activities such as lead reclamation, and ensuring that lead reclamation activities are only implemented if appropriate controls are to be implemented, including reinstatement of vegetative cover, erosion and sediment controls, and dust monitoring, and fine fractions of contaminants are not mobilised

5.6 Administration

Shooting ranges require ongoing management to ensure protection of the environment and human health. It is also necessary to ensure the necessary measures are implemented during the design and construction phases.

From an administration perspective, to enable suitable design, construction, operation, maintenance and ultimate decommissioning of the facility, the following measures will be taken:

1. During design, construction, operation, maintenance and if required decommissioning of the facility, a consultant or entity that is considered a suitably qualified person in regards to managing contamination, and that is suitably experienced in the management techniques required and being implemented (a suitably qualified entity), will be required to advise on implementation and / or perform tasks as reasonably required to ensure protection of human health and environment at the facility;
2. Have a suitably qualified entity develop an environmental management plan outlining management requirements, timing for implementation, performance criteria and non-compliance actions for protection of human health and environment during the operation and maintenance of the facility, including requirements outlined herein.
3. Perform monitoring to maintain an understanding of the source of potential contamination. As a minimum measures should include keeping and reviewing records of the number of shots per discipline per range, monitoring the potential leaching of contaminants of potential concern both in aereal extent and through the soil horizon, monitoring build-up of pellets in the Operational Area, assessing the feasibility of reclaiming recyclable materials in a manner that does not cause unacceptable risks to human health and the environment (refer Section 5.4(2)), and implementing ongoing management measures as required to protect human health and the environment.
4. Perform treatment and / or reclamation works in accordance with a works specific Construction Environmental Management Plan prepared by a suitably qualified consultant.
5. Develop and implement a strategy to ensure end-of-facility cleanup obligations can be achieved, which may include a sinking fund.
6. Perform monitoring to assess compliance with the stormwater water quality objectives (WQOs), and implement ongoing management measures as required to achieve the WQOs.
7. Perform monitoring to assess compliance with the groundwater WQOs, and implement ongoing management measures as required to achieve the WQOs.
8. Perform monitoring to assess compliance with the air quality objectives, and implement ongoing management measures as required to achieve the AQOs.
9. Incorporate requirements into the range standing orders, including restrictions on shooting disciplines, restrictions on Sporting Clays template and restrictions on each of the 8 shooting ranges in the facility
10. Establish and implement measures to ensure adequate funding is available to implement measures necessary to protect human health and the environment during the reasonable operation, maintenance and ultimate decommissioning of the facility

6 Energex Easement – Firearm Safety

An Energex easement overlaps the outer extremity of the ISSF template for international Skeet by around 15m 90 degrees to the east of Skeet Range 1. The overlap reduces until there is no overlap around 95m south. Based on our analysis, there is a very low likelihood that projectiles will cause an unacceptable risk to safety in the Energex Easement arising from this overlap.

In regards to potential firearm safety impacts associated with this overlap, key considerations include the following:

- The Energex easement falls outside firearm safety templates that are typically adopted for clay target ranges by Queensland Police (and other Australian authorities). The ISSF safety template is considered to be a conservative template, and is generally adopted as an added precaution for major events only (with four allowable in the life of the range) and it assumes a flat cleared site
- Skeet, which is the discipline that causes the ISSF safety template overlap has a maximum pellet size of Number 7.5 which, based on a number of assumptions, the National Rifle Association of the United States considers has a maximum trajectory of 205m which is outside of the easement
- Given the nature of projectile trajectories, projectiles go a lesser distance if fired uphill. The relevant shooting position, Skeet Range 1, has an elevation of RL 32m and the ground level in the easement at the ISSF safety template overlap is at RL 42m. It is understood that the Energex powerlines are above-ground, and are therefore at a higher elevation than RL 42m
- At this late stage of the pellet trajectory there will be very little kinetic energy in the pellets and leaves, branches and trunks, if impacted will serve to halt the pellets. Trees are within the flight path towards the ISSF safety template overlap, have a canopy height of approximately 20m in this area, and would further serve to halt any pellets.
- The angles of fire for ISSF skeet typically fall within an arc 80 degrees left and right of centre, which is less than the 90 degrees left and right of centre that is adopted for the ISSF template

For reasons including those outlined above it is considered that there is a negligible risk to infrastructure in the Energex corridor, and that there is likely to be a negligible firearm safety risk to any users of the Energex easement.

It is recommended that:

1. the safety template be reviewed during the design development phase, with a view to assessing any potential risk to occupiers or users of the Energex easement, managing any risks accordingly and reducing the firearm safety template applicable to ISSF skeet given the topography impacts which would physically reduce the maximum pellet trajectory length

7 Summary

A qualitative risk assessment of the risks to human health and the environment with the measures proposed is provided in Appendix A.

With the measures proposed, it is considered that the facility can be managed so that there is an acceptable risk to the environment and human health in relation to sources of contamination that arise during the facility's proposed shooting activities.

8 Limitations

This document has been prepared by Ground Corp Pty Ltd (Ground Corp) for the Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) and may only be used and relied upon by DSDMIP for the purpose agreed between Ground Corp and DSDMIP and as set out in this document.

Ground Corp accepts no duty of care or liability to any third parties who may use or rely on this document, other than as expressly agreed by Ground Corp. Without limiting the foregoing sentence in any way, in no circumstances will Ground Corp be liable to any third party whether that liability arises in contract, tort (including negligence or breach of statutory duty) or otherwise for any loss whatsoever arising out of or in any way related to our services on this project.

The services undertaken by Ground Corp in connection with preparing this document were limited to those specifically detailed in the document and are subject to the scope limitations set out in the document. Contaminated land guidelines require considerably more detailed investigations and / or assessments to be performed for a contaminated site, which has not been requested by DSDMIP and this document is prepared in the absence of such information. Ground Corp accepts no liability for DSDMIP's election to limit its assessments to less than those required by applicable guidelines.

This document includes opinions, assumptions, conclusions and recommendations that are based on conditions encountered and / or information reviewed at the date of preparation of the document. This includes information provided by third parties. It is assumed by Ground Corp that all relevant information and documents have been provided and that such information provided is accurate. Circumstances (including the presence of hazardous substances and/or site contamination) may change after the date of this Document or since information reviewed was prepared. Ground Corp does not accept responsibility arising from, or in connection with, any change to the relevant factors, site conditions or inaccuracies of information relied upon.

Ground Corp is not responsible for updating this document if the site conditions or available information changes.

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Any advice, opinions or recommendations contained in this document should be read and relied upon only in the context of the document as a whole and are considered current to the date of this document. Ground Corp believes that its opinions are reasonably supported by the testing and analysis that have been done and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at this time for the services performed.

That standard of care may change and new methods and practices of exploration, testing, analysis and remediation may develop in the future, which might produce different results. Ground Corp professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or testing and analysis during any future assessment or remedial activities.

This document is subject to copyright and includes Ground Corp's confidential information and intellectual property.

Figures

Figures

Site Layout

Shotgun Facility, Contamination
Ministerial Infrastructure Designation
Belmont Shooting Complex
(June 2018)

Figure A-1

0m 75m
Approx

N
W E
S

Legend

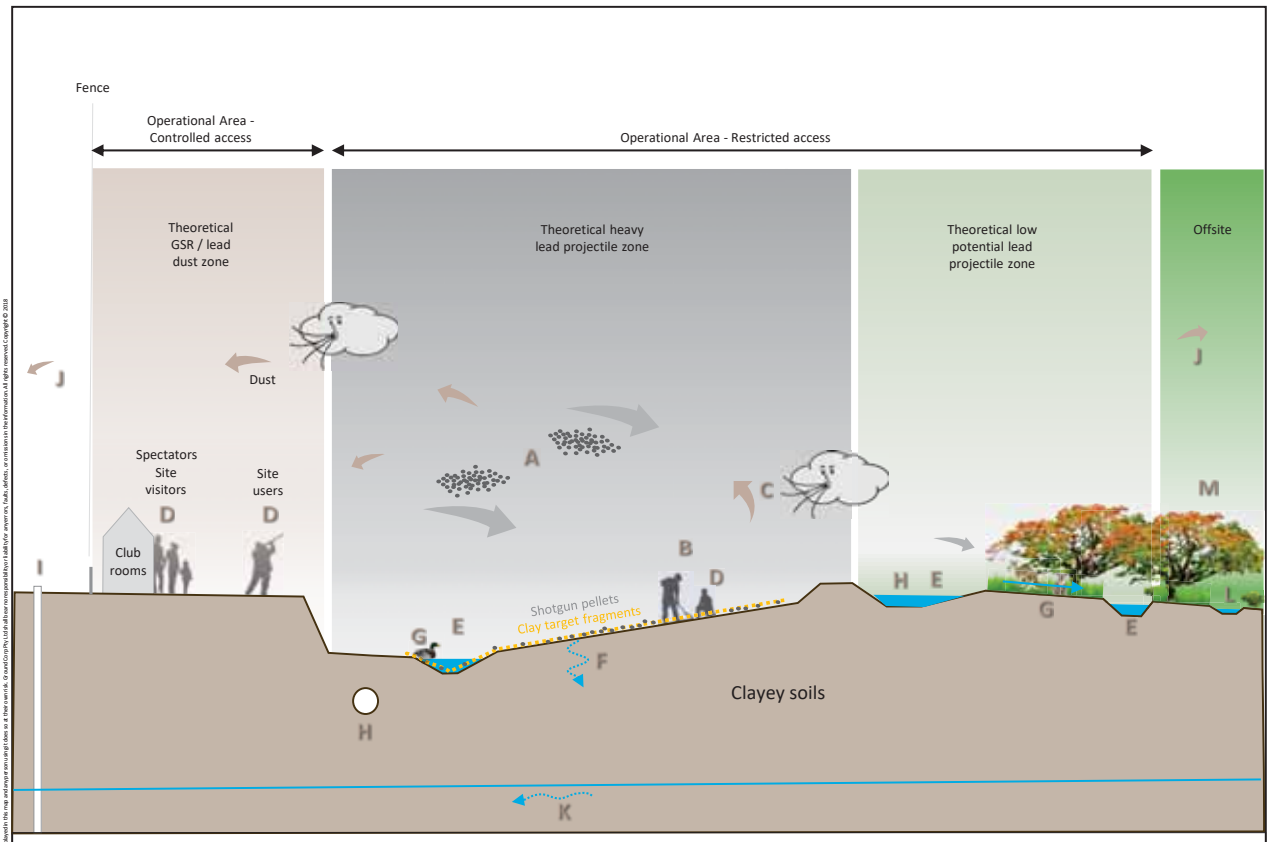
- Watercourse (EPP 2009)
- Registered Bore
- White infill — Indicative Cleared Operational Area
- Indicative Operational Area

Data sources: Queensland State Government

Client: Department of State Development, Manufacturing, Infrastructure and Planning

Project number:	J18001
Drawn by:	JLL
Approved by:	BJL
Date approved:	

ground corp



A Deposition of lead pellets / PAH targets
B Contact / ingestion by workers
C Onsite migration of dust
D Contact / ingestion of dust
E Surface water monitoring, treatment and migration
F Potential leaching of contaminants
G Foraging fauna
H Clean water diversion / piping
I Offsite groundwater use
J Offsite migration of dust
K Migration of groundwater
L Offsite watercourse
M Offsite ecological receptors

Conceptual Site Model

Shotgun Facility, Contamination
Ministerial Infrastructure Designation
Belmont Shooting Complex
(June 2018)

Figure A-2

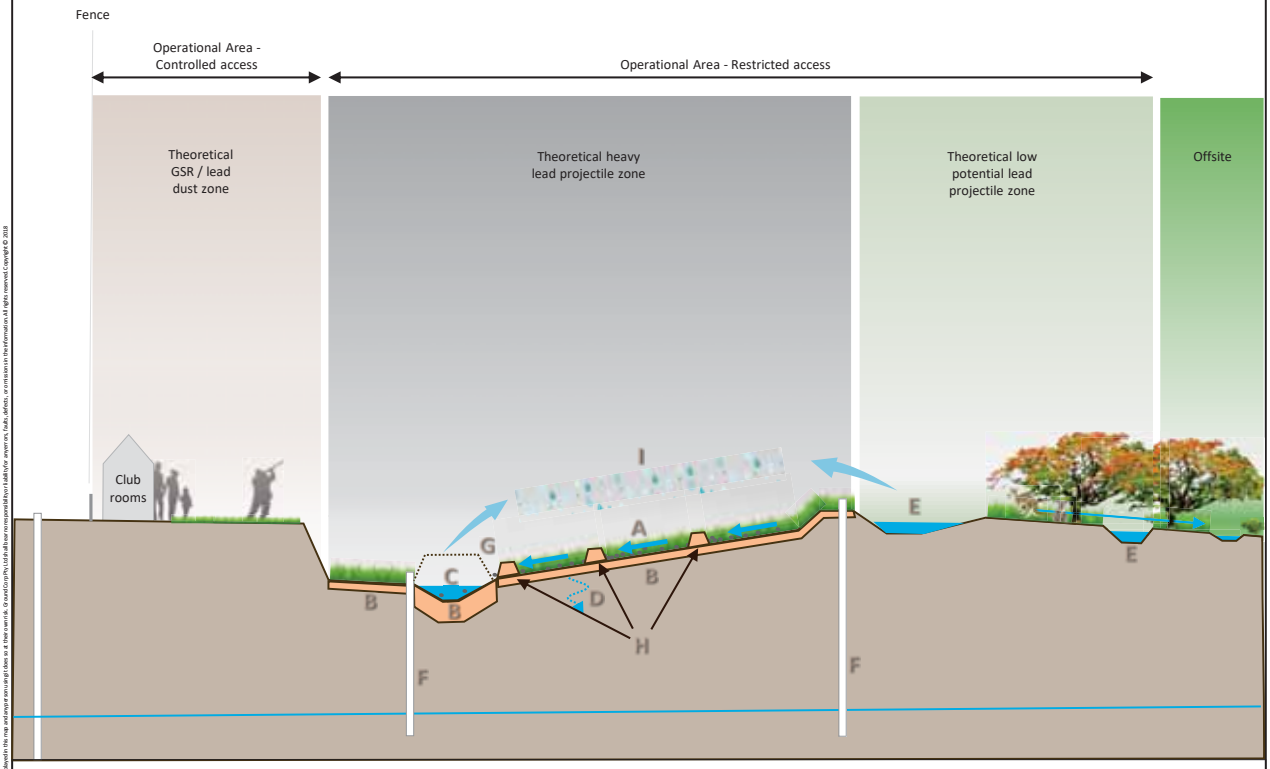
Indicative only, not to scale

Data sources:

Client: Department of State Development, Manufacturing, Infrastructure and Planning

Project number:	J18001
Drawn by:	JLL
Approved by:	BJL
Date approved:	28/6/18

ground corp



Legend

- A Vegetative ground cover
- B Geochemical treatment / measures
- C Capture, treatment, monitoring and recycling
- D Monitoring
- E Capture, monitoring and recycling
- F Groundwater monitoring
- G Fauna deterrent
- H ESC / treatment devices
- I Irrigation and vegetation management

Water Schematic Diagram

Shotgun Facility, Contamination
Ministerial Infrastructure Designation
Belmont Shooting Complex
(June 2018)

Figure A-3

Indicative only, not to scale

Data sources:

Client: Department of State Development, Manufacturing, Infrastructure and Planning

Project number:	J18001
Drawn by:	JLL
Approved by:	BJL
Date approved:	28/6/18

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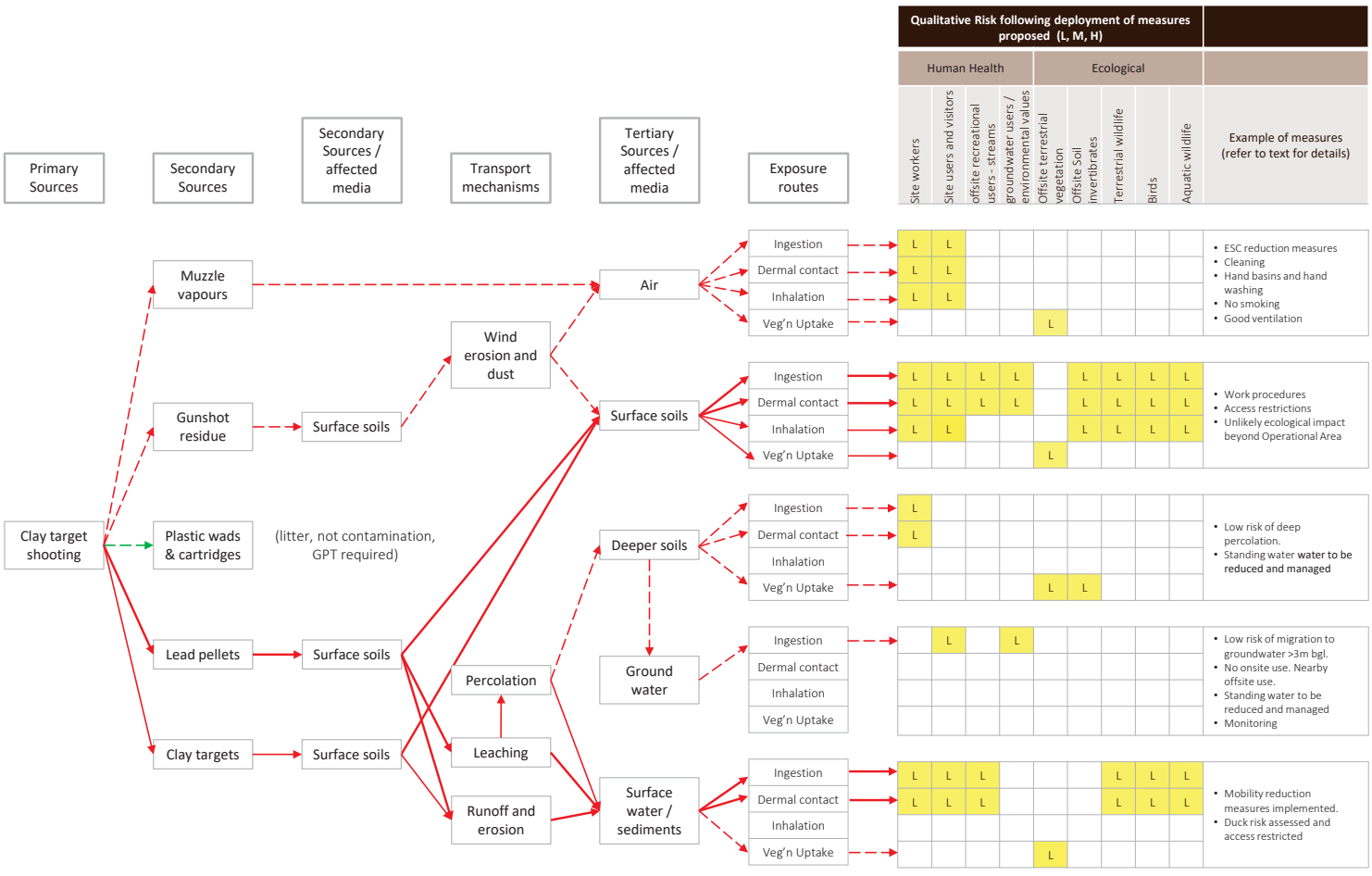
Appendix A

Qualitative Risk Assessment

Qualitative Risk Assessment

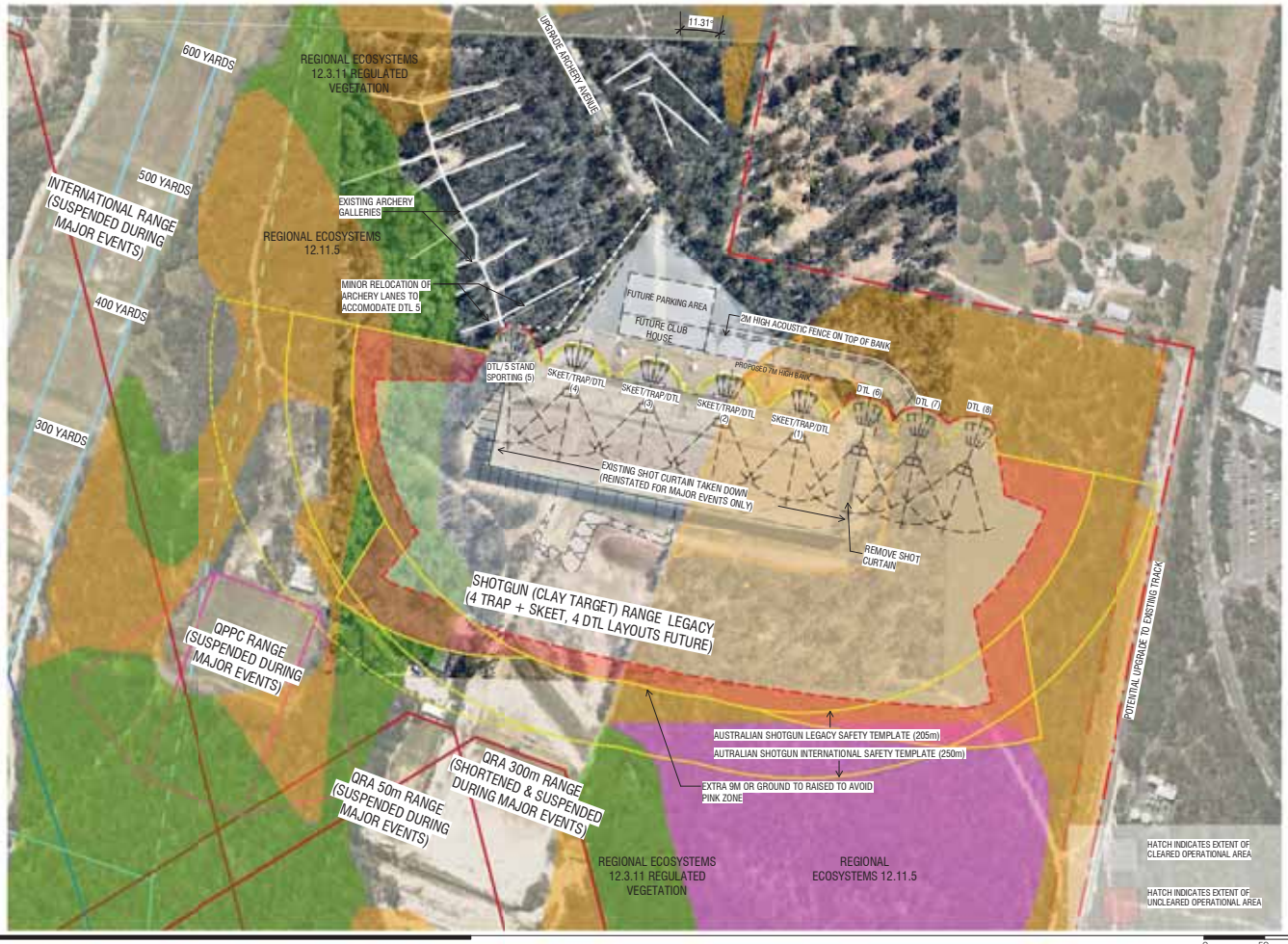
Belmont Shotgun Range – Ministerial Infrastructure Designation

June 2017



Appendix B

MODE's Figure MP-045F



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DEPARTMENT OF STATE DEVELOPMENT

BELMONT SHOOTING CENTRE SHOTGUN ID
1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

SHOTGUN (CLAY TARGET) FUTURE-OPTION F

0 50 100 150

Project No: 14479BNE
Date:
Scale: 1 : 2500@ A3
Drawn / Check: AutChecker

MP - 045F

18/06/2018 10:12:03 AM

Appendix J

Floodwise Property Report

Department of Housing and Public Works

Queensland Government

Brisbane City Council

FloodWise Property Report

Report Reference
1511395013652
23/11/2017 09:56:53

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

To find out more about how the contents of this report may affect building or development on this property, please visit www.brisbane.qld.gov.au/planning-building.For more general information about understanding your flood risk and how to prepare your property, family or business for potential flooding visit www.brisbane.qld.gov.au/beprepared

THIS IS A REPORT FOR:

Rateable Address: 1485 OLD CLEVELAND RD, BELMONT QLD 4153

Lot Details: L.1 RP.169229

This property has flags for building or development purposes only

Brisbane City Council has not assigned flood level information for this property for building or development purposes. However, mapping indicates that it is affected by one or more flood or property development flags. Please refer below for details.

For professional advice or detailed assessment of a property contact a Registered Professional Engineer of Queensland.

For general information on your flood risk and how to prepare your home or business for potential flooding visit www.brisbane.qld.gov.au/beprepared.

FLOOD AND PLANNING DEVELOPMENT FLAGS

DEVELOPMENT FLAG(S)

This property may also be affected by one or more flood or property development overlays or flags. These include: OVERLAND FLOW PATH,LARGE ALLOTMENT,WATERWAY CORRIDOR

Please review the technical summary over page and refer to Council's planning scheme for further information.

Brisbane City Council

FloodWise Property Report

Report Reference
1511395013652
23/11/2017 09:56:53

Dedicated to a better Brisbane

TECHNICAL SUMMARY

This section of the FloodWise Property Report contains more detailed flood information for this property so surveyors, builders, certifiers, architects and engineers can plan and build in accordance with Council's planning scheme. For more information about building and development in Brisbane please visit www.brisbane.qld.gov.au/planning-building or talk to a Development Assessment Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

THIS IS A REPORT FOR:

Rateable Address: 1485 OLD CLEVELAND RD, BELMONT QLD 4153

Lot Details: L.1 RP.169229

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

FLOOD OVERLAY CODE

The Flood overlay code of Council's planning scheme uses the following information to provide guidelines when developing properties. The table below summarises the Flood Planning Areas (FPAs) that apply to this property. Development guidelines for the FPAs are explained in Council's planning scheme, which is available from www.brisbane.qld.gov.au/planning-building.

FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
		Applicable

COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.

PROPERTY DEVELOPMENT FLAGS

Overland Flow Path - Mapping indicates this property may be located within an overland flow path. Overland flow flooding usually occurs when the capacity of the underground piped drainage system is exceeded and/or when the overland flow path is blocked. It is recommended you consult a Registered Professional Engineer of Queensland to determine this property's habitable floor level and flooding depth. Please refer to Council's planning scheme for further information.

Waterway Corridor - This property may also be located within a mapped waterway corridor as identified in the waterway corridors overlay map of Council's planning scheme. Please consider this in conjunction with Council's planning scheme requirements.

Large Allotment - This property is either a Large Allotment of over 1000 square metres or is located within a Large Allotment. Flood levels may vary significantly across allotments of this size. Further investigations may be warranted in determining the variation in flood levels and the minimum habitable floor level across the site. For more information or advice, it is recommended you engage a Registered Professional Engineer of Queensland.

Brisbane City Council

FloodWise Property Report

Report Reference
1511395013652
23/11/2017 09:56:53

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Useful Definitions

Australian Height Datum (AHD) - The reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.

Annual Exceedance Probability (AEP) – The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance.

Defined Flood Level (DFL) - The DFL for Brisbane River flooding is a level of 3.7m AHD at the Brisbane City Gauge based on a flow of 6,800 m^3/s.

Maximum and Minimum Ground Level – Highest and lowest ground levels on the property based on available ground level information. A Registered Surveyor can confirm exact ground levels.

Minimum Habitable Floor Level – The minimum level in metres AHD at which habitable areas of development (generally including bedrooms, living rooms, kitchen, study, family and rumpus rooms) must be constructed.

Council's Planning Scheme - The City Plan (planning scheme) has been prepared in accordance with the Sustainable Planning Act as a framework for managing development in a way that advances the purpose of the Act. In seeking to achieve this purpose, the planning scheme sets out the Council's intention for future development in the planning scheme area, over the next 20 years.

Residential Flood Level (RFL) – Residential flood level (RFL) for Brisbane River flooding equates to the flood level applicable to the extent of January 2011 floods as depicted by mapping on the Queensland Reconstruction Authority website or the Council's defined flood level (DFL) for the Brisbane River, whichever is higher.

Rateable Address - A Lot or Property may have more than one street address. The address shown on this report is the address used by Council for the Lot or property selected.

Property - A property will contain 1 or more lots. The *Multiple Lot Warning* is shown if you have selected a property that contains multiple lots.

2017 Brisbane River Catchment Flood Study (BRCFS) – The BRCFS is a project led by the Queensland Government. The flood study was released in 2017. The 1% AEP flood levels from the flood study is yet to be adopted for application in planning schemes and is for information only. Other % AEPs will be updated with new information from the flood study as part of any relevant changes to City Plan 2014 as soon as is practicable.

Brisbane City Council's Online Flood Tools

Council provides a number of online flood tools:

- to guide planning and development
- to help residents and businesses understand their flood risk and prepare for flooding.

Planning and Development Online Flood Tools

Council's online flood tools for planning and development purposes include:

- FloodWise Property Report
- Flood Overlay Code

For more information on Council's planning scheme and online flood tools for planning and development:

- phone 07 3403 8888 to talk to a Development Assessment Customer Liaison Officer
- visit www.brisbane.qld.gov.au/planning-building
- visit a Regional Business Centre.

Helping residents and businesses be prepared for flooding

Council has a range of free tools and information to help residents and businesses understand potential flood risks and how to be prepared. This includes:

- Flood Awareness Maps
- Flooding in Brisbane – A Guide for Residents
- Flooding in Brisbane – A Guide for Business
- Early Warning Alert Service. Visit www.brisbane.qld.gov.au/earlywarning to register for email, home phone or SMS severe weather alert updates.

Note: The Flood Awareness Maps show four levels of flood likelihood from high likelihood (flooding is very likely to occur) through to very low likelihood (very rare and extreme flood events).

For more information on Council's online flood tools for residents and business:

- Visit www.brisbane.qld.gov.au/beprepared
- Phone (07) 3403 8888.

Brisbane City Council

FloodWise Property Report

Report Reference
1511395013652
23/11/2017 09:56:53

Dedicated to a better Brisbane

Disclaimer

1. Defined Flood Levels and Residential Flood Levels, and the Minimum Habitable Floor Levels are determined from the best available information to Council at the date of issue. These flood levels, for a particular property, may change if more detailed information becomes available or changes are made in the method of calculating flood levels.
2. Council makes no warranty or representation regarding the accuracy or completeness of a FloodWise Property report. Council disclaims any responsibility or liability in relation to the use or reliance by any person on a FloodWise Property Report.

Appendix K

Bushfire Hazard Assessment

Department of Housing and Public Works

Queensland Government

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

DATE 1 November 2018

CONTACT JOSEPH TOON

OUR REF B15016ER011

Clay Target Facility: Bushfire Management Plan

For Mode Design

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BCC BUSHFIRE HAZARD MAP

APPENDIX B

VEGETATION MANAGEMENT PROPERTY REPORT

APPENDIX C

CONTOURS

APPENDIX D

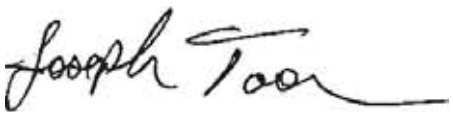
PROPOSED DEVELOPMENT

APPENDIX E

BUSHFIRE HAZARD OVERLAY CODE

Revision	Date	Description	Author	Verifier	Approver
A	25/10/18	Draft	TZ	JT	JT
B	26/10//18	Final	TZ	JT	JT
C	01/11/2018	Revised	TZ	JT	JT

Authorised by: Joseph Toon



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Position: Division Manager - Environmental

1.0 INTRODUCTION

A Clay Target Facility has been constructed at the Belmont Shooting Centre, located on Lot 1 RP169229 at 1485 Old Cleveland Road, Belmont (Belmont Shooting Centre) **(Figure 1)**. The Clay Target Facility was constructed as a temporary facility for the 2018 Gold Coast Commonwealth Games. It is now proposed the Clay Target Facility become permanent use infrastructure. Approval to retain the Clay Target Facility is proposed to be undertaken through the Infrastructure Designation (ID) process.

An extension to the Clay Target Facility is part of the design and planning included in the ID process. The extension will include the construction of fourth skeet and trap assembly, four additional down the line layouts and a new noise barrier to the north east of the range. Two existing archery galleries are also to be relocated to accommodate the extension to the Clay Target Facility.

Mode Design commissioned Lambert and Rehbein (L&R) to conduct a Bushfire Hazard Assessment (BHA) for the Clay Target Facility. While the entire Shooting Centre property comprises 502 ha, the site referred to in this report is bound by the 1200m range and the Queensland Police Pistol Club to the west, Tilley Road to the east, Old Cleveland Road and adjacent properties to the north and north-east, and extending south to include all of the operational area, as shown in **Figure 1**. This area includes the north and west facing vegetated slopes leading towards the Clay Target Facility, which are most likely to represent the path of hazardous bushfires potentially impacting the Clay Target Facility. The focus of this report is the Clay Target Facility itself, rather than other infrastructure located within the site (e.g. Mt Petrie Bowmen complex) and adjacent areas.

The existing Brisbane City Council (BCC) Planning Scheme Bushfire Overlay Map indicates most of the site marked as medium hazard, and smaller isolated areas as high hazard (**Appendix A**). While this BCC mapping has a city-wide focus, the present BHA provides a site-specific assessment to determine the exact nature of the hazard on the site.

2.0 METHOD

This BHA has been undertaken in accordance with the methods outlined in the BCC SC6.4 Bushfire Planning Scheme Policy (the "Policy"). It involved desktop assessment, field inspection, and derivation of bushfire hazard classes and mapping, as outlined below.

2.1 DESKTOP ASSESSMENT

As per the Policy, derivation of bushfire hazard classes includes determination of vegetation community type, slope, and aspect and their corresponding hazard scores.

2.1.1 VEGETATION COMMUNITY TYPE

Vegetation provides fuel to sustain bushfires. Vegetation types vary in their capacity to provide fuel, with the denser, more shrubby communities generally providing greater levels of available fuel than the more open, grassy communities. The Policy provides a list with vegetation community types found within the BCC boundaries, together with a hazard score ranging from 0 to 10 for each type. However, the BCC does not provide a vegetation map showing the distribution of the listed community types across the city, and community descriptions are sometimes difficult to interpret for conditions encountered with in the Brisbane City boundaries. Assistance is provided by a "Veg code" for each Policy vegetation type which corresponds with codes provided under the "Supplementary Description" heading of the RE details available on-line (https://environment.ehp.qld.gov.au/regional-ecosystems/details/?re=12.5.11). In general, shrubby open forest communities are given a hazard score of 8, while grassy and more open woodland communities are given a score of 6. This is similar to the now lapsed Queensland State Planning Policy (SPP) 1/03 (DLGP and DES 2003), in which eucalypt open forest with dry-shrub ladder fuels receive a hazard score of 8, and grassy eucalypt and acacia forest and wallum heath receive and score of 6. Thus, while the Policy provides hazard scores only for Regional Ecosystems (i.e. remnant vegetation), the SPP is more general and covers both remnant and non-remnant vegetation, with more explicit bushfire relevant structural descriptions of the vegetation community types than that provided by the Policy.

For this report, community types present on the site were determined based on comparison with the Regional Ecosystems (RE) shown on the Vegetation Management Supporting Map of the Vegetation Management Property Report for the site (**Appendix B**) and field inspection (see below). Hazard scores for the vegetation encountered were assigned based on the considerations outlined above, with scores for remnant vegetation derived from the Policy and scores for non-remnant vegetation from the SPP.

2.1.2 SLOPE AND ASPECT

Given that heat generally rises, fire fronts accelerate upslope and decelerate downslope. Aspect modifies this trend to some extent, with sunny north and west facing slopes providing additional

heat and dry fuels to promote bushfires, whereas shady south facing slopes retain greater level of moisture for longer, thus impeding bushfires. Slope and aspect were assessed from contour maps in representative locations of the site, and hence their respective hazard scores (as per the Policy).

2.1.3 TOTAL HAZARD SCORE

Total hazard scores were obtained by adding the hazard scores for vegetation, slope, and aspect with one another. Hazard score classes were subsequently mapped to display the severity of bushfire hazard in terms of “high”, “medium”, and “low”.

Safety buffers were mapped around medium and high bushfire hazard polygons. The width of safety buffers is 50m around medium -, and 100 m around high bushfire hazard polygons.

2.2 FIELD INSPECTION

A field inspection was conducted to verify the range of bushfire hazard elements, particularly vegetation. As noted above, while the Vegetation Management Supporting Map provides information on the structure and composition of the remnant vegetation on site, no information on these parameters is provided for non-remnant vegetation. Field inspection therefore focussed on verification of the mapped REs on the site and on the assessment of structure and composition of the non-remnant vegetation in representative locations across the site. Assessment included estimation of height and cover, identification of dominant species, and presence of substantial fallen timber and other fuels on the ground.

3.0 SITE-SPECIFIC BUSHFIRE HAZARD ASSESSMENT

Following the Policy, the preparation of the BHA involves a number of steps, as described below.

3.1 STEP 1: ASSESSMENT OF VEGETATION COMMUNITIES

The Vegetation Management Supporting Map for the site is presented in **Appendix B.** REs mapped for the site include:

- 12.3.5 – *Melaleuca quinquenervia* open forest on coastal alluvium (Least Concern)
- 12.3.6 – *Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains (Least Concern)
- 12.11.25 – Corymbia henryi and/or Eucalyptus fibrosasubsp. fibrosa *+/-* E. crebra*, E. carnea, E. tindaliae* woodland on metamorphics +/- interbedded volcanics (Of Concern) (remnant and regrowth)
- 12.11.27 – *Eucalyptus racemosa* subsp. *racemosa* and/or *E. seeana* and *Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics (Endangered)

Although no specific Quaternary Regional Ecosystem Assessment sites were established during site surveys, the underlying geology, site observations of soils, and the vegetation associations recorded indicate that the vegetation on site is similar to the mapped REs (Lambert & Rehbein, 2016). Field inspection largely confirmed the RE boundaries mapped for the site. RE 12.3.5 and 12.3.6 occur along the drainage line dissecting the site diagonally from the south-east to the north-west, with RE 12.11.25 in most of the remaining locations. Notable differences include differences between the mapped and observed boundaries of the endangered RE 12.11.27 in the south-eastern area of the investigation area, and an area behind the eastern half of the shot curtain more closely resembling the least concern RE 12.11.5 (*Corymbia citriodora* subsp. *variegata* woodland to open forest +/- *Eucalyptus siderophloia*/*E. crebra*, *E. carnea*, *E. acmenoides*, *E. propinqua* on metamorphics +/- interbedded volcanics). An area dominated by *Allocasurina littoralis* also exists to the east of the clay target facility. Vegetation community types encountered in the field are mapped on **Figure 2**.

Height of the canopy varied according to the position in the landscape, with canopy tree on the lower slopes generally taller (20-25 m) than those on the elevated slopes along the eastern boundary of the site (occasionally 10-15 m for mature trees).

Canopy species in the terrestrial vegetated areas were diverse, although *Corymbia trachyphloia* and *Eucalyptus fibrosa* were among the more common species **(Photograph 1)**. The understorey varied, with a dense tall shrub layer of *Allocasuarina littoralis* and/or *Melaleuca nodosa* particularly in the non-remnant areas of the archery galleries **(Photograph 2)**. Ground cover was relatively open and grassy in nature. Some fallen timber occurred throughout, except in the regrowth shrubland surrounding the archery galleries which was control burned to 70-80%

mosaic burn over the 2016-2017 period (Graham Wells - QFES, pers. comm. 18 December 2017). Slightly more on-ground timber occurs east of the Clay Target Facility **(Photograph 3)**.

The dominant canopy species along the watercourse was *Melaleuca quinquenervia*, particularly around several pools of standing water. *Lantana camara** was a common shrub in this area, while ground cover elsewhere was generally grassy, including large areas dominated by *Ottochloa gracillima*, as well as small areas by *Brachiaria decumbens** **(Photograph 4)**.

Other habitats include essentially cleared habitat with remnant scattered trees on private land beyond the north-eastern boundaries of the site **(Photograph 5)** and the landscaped, cleared, or weed infested land associated with the Mt Petrie Bowmen complex in the northern part of the site **(Photograph 6)**. These parts do not contain native vegetation except for scattered remnant or planted trees.

Photograph 1: Open forest near eastern boundary of site

Photograph 2: Shrubland around archery galleries

Photograph 3: Open forest east of Clay Target Facility with timber on ground

Photograph 4: Watercourse vegetation

Photograph 5: Cleared understorey on neighbouring land north-east of the site

Photograph 6: Cleared land around Mt Petrie Bowmen complex

Based on the above assessment, equivalent communities together with corresponding hazard scores listed in the Policy are presented in **Table 1**.

Table 1 Vegetation communities and associated hazard scores

Structural Description	Regional Ecosystem	Veg Code (from Policy)	Hazard score
1. *Melaleuca quinquenervia* open forest on coastal alluvium	12.3.5	C2	8
2. *Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains	12.3.6	C4	8
3. Corymbia henryi and/or Eucalyptus fibrosasubsp. fibrosa +/- E. crebra, *E. carnea, E. tindaliae* woodland on metamorphics +/- interbedded volcanics	12.11.25	H39k	6
4. *Eucalyptus racemosa* subsp. *racemose* and/or *E. seeana* and *Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics (Endangered)	12.11.27	H39j	8
5. Open forest with *Corymbia trachyphloia, Eucalyptus fibrosa*	RE12.11.5	H21, H39	8
6. Regrowth dense shrubland composed of *Allocasuarina littoralis* and *Melaleuca nodosa* with scattered trees	-	-	8
7. Landscaped or weed infestations with scattered trees	-	-	5

3.2 STEP 2: ASSESSMENT OF SLOPE

A contour map for the site is presented in **Appendix C**, while a slope map is shown in **Figure 3**. As can be seen from these figures, slopes are undulating, with relatively flat slopes in the northern and western part of the site, and slopes between 5 and 10% east and south-east of the Clay Target Facility and in the area of the archery galleries.

3.3 STEP 3: ASSESSMENT OF ASPECT

A map showing aspect is presented in **Figure 4**. Given the reduced influence of aspect on nearly flat slopes, slopes less than 5 % are given a hazard score of 0 for this variable, as per the Policy. Hence, only the 5-10 % slopes east of the Clay Target Facility and in the archery gallery area receive a positive score. The highest scores are for the north to north-west facing area directly south-east of the Clay Target Facility (score 3.5) and the north-west to west facing slopes adjacent to these (score 3). The slopes north-east of the Clay Target Facility and in the area of the archery galleries are facing west to south, resulting in a hazard score of 2.

3.4 STEP 4: ASSESSMENT OF BUSHFIRE HAZARD

Bushfire Hazard classes under existing circumstances are shown in **Figure 5**. Most vegetated areas represent medium bushfire hazard, with high bushfire hazards only within the *E.racemosa* dominated community on the undulating and north to west facing slopes south–east of the Clay Target Facility. Those slopes are, however, rising away from the Clay Target Facility, and the path of a fire front here is likely to be away from the Clay Target Facility, in a generally easterly direction. Thus, although this area is marked as a high bushfire hazard, this is a hazard potentially presented to assets to the east, such as the Sleeman Sporting Complex, rather than the Clay Target Facility. Clearing of vegetation as part of the proposed development would reduce some of the bushfire hazard ratings, as discussed in **Section 4.1**.

4.0 BUSHFIRE MANAGEMENT PLAN

Given that the Range is surrounded by vegetation potentially susceptible to bushfire, a range of management measures are required to ensure the fire safety of the Range, its users, and adjoining properties, as discussed in the headings below. However, given that there is currently no proposed development layout with details regarding roads, buildings, and other land-uses (see below), some of the detailed prescriptions for the contents of a BMP in Brisbane City Plan's SC6.4 Bushfire Planning Scheme Policy (the 'Policy') are largely redundant at this stage. The BMP below therefore provides general recommendations on the management of bushfire hazard on the site in the context of future development options.

Given that the site contains wildlife habitat and protected vegetation that require protection from uncontrolled bushfires, the BMP also outlines bushfire management measures that are sympathetic with these values.

It is recommended that this BMP also be incorporated into the Bushfire Management Plan for the whole of the Belmont Shooting Complex. This will assist to ensure management and mitigation strategies are not developed in isolation.

4.1 PROPOSED DEVELOPMENT AND IMPACTS ON FIRE HAZARD

As noted in **Section 1.0**, it is proposed that the Clay Target Facility be extended with a fourth skeet and trap assembly, four additional down the line layouts and a new noise barrier to the north east of the range. Two existing archery galleries are also to be relocated to accommodate the extension to the Clay Target Facility. Several other elements may also be added, such as club house, parking areas and other supporting infrastructure. The location of these elements has not been finalised, although a maximum operational area, including additional clearing of vegetation required for lead management (from shot guns) has been nominated. An additional area in which the tree canopy is kept, but the understorey is cleared ("uncleared operational area"), has also been defined. **Appendix D** shows the extent of these areas, together with the potential locations for some of the other planned infrastructure.

The proposed clearing results in a substantial cordon of land with very low fuel south, east, and west of the Range. Clearing would also result in widths of remaining forested vegetation of 100 m or less in easterly and westerly directions, while also extending the narrow width of forested vegetation to the north-east of the Range further eastwards. Given this narrow width, the high bushfire hazard polygon for RE 12.11.27 mapped east of the Range (**Figure 5**) is more appropriately re-classified as medium-low once the operational area has been cleared, as are the other strips of vegetation that are 100 m or less wide. This is because there will be insufficient vegetation in these narrow areas to allow a running fire front from reaching its potential (Leonard *et al*. 2014). As noted in **Section 3.4**, given the downslope position of the Range, woodland east

of the Range, at any rate, poses less of a hazard to the Range itself than to areas to the east. Yet, the presence of the 25 m wide cleared powerline easement along the eastern boundary of the site provides a substantial fire break and access for fire fighting between the remaining RE 12.11.27 and areas further to the east to minimise the risk of fire spreading eastwards.

4.2 PREVENTION MEASURES

While clearing as proposed reduces the bushfire hazard rating around parts of the Clay Target Facility, residual bushfire hazard remains in these areas, while more extensive woodland areas with concomitant bushfire hazard levels remain to the north-west and south of the Range. Preventive measures as outlined below are designed to manage the risk posed by these hazards.

4.2.1 BUFFER ZONES

To prevent radiant heat from burning vegetation attacking any buildings and bushfire susceptible infrastructure, open spaces are to be created between the two, where heat from fires can dissipate. As per the Policy, buffer zones are to include a 10 m wide inner buffer zone (near buildings)(IBZ) and a 10 m wide outer buffer zone (away from buildings)(OBZ). Trees occurring within this buffer zone (20 m) should not overhang buildings and be at a distance of 1.5 times their height away from buildings.

The IBZ is to be maintained in a very low fuel state to be achieved by installing paving, lawn, or gravel ground cover and maintain a non-continuous tree canopy such that there is a horizontal and vertical separation between trees of at least 2 m.

The OBZ is to be maintained in a reduced fuel state, where trees may occur in small clumps, but ensuring a discontinuous canopy cover through horizontal and vertical separation with other plants.

Species used for landscaping within the buffer zones should be of low flammability (e.g. low fleshy, thick leaved species). The buffer zones should be kept tidy and free of flammable mulch or vegetative litter such as fallen branches or significant leaf litter.

Irrespective of the above considerations, buildings and development lay-out are to be developed in accordance with Australian Standard AS 3959-2009 Construction of Buildings in Bushfire Prone Areas (the Standard). This Standard provides for various levels of construction standards designed to minimise building damage from the effects of bushfire. It provides for the calculation of distances required between vegetation and buildings, taking into account, inter alia, the level of construction proposed for the building. The lower the level of construction, the lower the Bushfire Attack Level (BAL) it can withstand, and the longer the distance required between flammable vegetation and building.

BAL values obtained corresponds with specific cleared distances (buffer zones) recommended between buildings and surrounding hazardous vegetation. The lower the BAL, the less relevant

bushfire hazard mitigation prescriptions are. Conversely, under progressively higher BAL, more stringent measures are prescribed. The highest BAL is the BAL Flame Zone (BAL - FZ).

The method has the following steps:

- Step 1 – Determine the relevant Fire Danger Index (FDI). The FDI is determined on a State or regional basis. The FDI for all areas within Queensland is 40;
- Step 2 – Determine the classified vegetation type(s);
- Step 3 – Determine the distance of the site from the classified vegetation type;
- Step 4 – Determine the effective slope(s) under the classified vegetation type(s);
- Step 5 – Determine the BAL from the appropriate tables within the AS 3959-2009; and
- Step 6 – Determine the appropriate construction requirements (outside the scope of this BHA).

Thus, AO 17.2 in Section C of the Bushfire Overlay Code states that development ensures that the BAL of the nominated development footprint does not exceed 12.5 in an urban category. For all upslopes and flat land, this requires a distance of 28m between buildings and forest, or 27m for shrubland. Longer distances are required where vegetation is located downslope of buildings, increasing in proportion to the steepness of the slope, as specified by slope category and vegetation type in the Standard.

As per the Policy, a perimeter road is the preferred option to separate bushland from proposed developments. It allows for ready access or egress for firefighting during bushfire emergency. To this end it is recommended that maintained track around the perimeter of the Clay Target Facility Area (see also **Section 4.4**) (**Figure 6**).

4.2.2 FUEL REDUCTION

To ensure that fuel does not build up in the surrounding vegetation, periodic fuel reduction should be undertaken. This should be addressed in whole of Belmont Shooting Complex Bushfire Management Plan. Fuel reduction may be done mechanically, using machinery to remove or reduce fuel, or this may be done using fire.

As described in **Section 3.1**, remnant vegetation on the site includes a number of Regional Ecosystems. Recommended fire regimes for the maintenance of the natural characteristics of Regional Ecosystems (and concomitant wildlife values) are provided in the Regional Ecosystem descriptions (Queensland Government 2018), as reproduced below:

4.2.2.1 Watercourse Open Forest

- RE 12.3.5 (*Melaleuca quinquenervia* open forest on coastal alluvium): SEASON: Late summer to mid-winter (after rain). INTENSITY: Planned and occasional unplanned burns

(typically of higher intensity) influence the ecology of melaleuca ecosystems. INTERVAL: Heath 8-12 years, Sedge 12-20 years, Mixed grass/shrub 6-20 years. STRATEGY: Aim for a 25-70% burn mosaic (in association with surrounding ecosystems, as melaleuca ecosystems often just occur in patches or along natural drainage lines). Fires may, depending on the conditions and type of vegetation, burn areas larger than just the melaleuca ecosystem. Ensure secure boundaries from non fire-regime adapted ecosystems. Consider the needs of melaleuca ecosystems based on understorey (i.e., heath dominated, sedge dominated or mixed grass/shrub) when planning burns. High soil moisture (or presence of water on the ground) is required, as avoidance of peat-type fires must be maintained. ISSUES: Fire regimes for melaleuca ecosystems require further fire research. Melaleuca forests are fire-adapted, but too high an intensity or frequent fire will slow or prevent regeneration and lead to lower species richness (since these communities contain numerous obligate seed regenerating species that require sufficient fire intervals to produce seed). High intensity fires may kill trees and lead to whipstick regeneration. Too frequent fire may result in a net loss of nutrients over time from an already nutrient poor system. Fire associations are significantly influenced by understorey composition. Melaleuca communities with a heath understorey should burn in a similar way to coastal heath (8-12 years). Sedge understorey communities will burn in association with the surrounding ecosystems (so will often burn with them but sometimes not, such that these communities have a slightly less fire frequency). Mixed understorey communities burn in a similar way to dry sclerophyll, in association with the surrounding dry sclerophyll, though somewhat less frequently due to the additional moisture present in melaleuca communities.

- RE 12.3.6 (*Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains): SEASON: Late summer to mid-winter (after rain). INTENSITY: Planned and occasional unplanned burns (typically of higher intensity) influence the ecology of melaleuca ecosystems. INTERVAL: Heath 8-12 years, Sedge 12-20 years, Mixed grass/shrub 6-20 years. STRATEGY: Aim for a 25-70% burn mosaic (in association with surrounding ecosystems, as melaleuca ecosystems often just occur in patches or along natural drainage lines). Fires may, depending on the conditions and type of vegetation, burn areas larger than just the melaleuca ecosystem. Ensure secure boundaries from non-fire-regime adapted ecosystems. Consider the needs of melaleuca ecosystems based on understorey (i.e., heath dominated, sedge dominated or mixed grass/shrub) when planning burns. High soil moisture (or presence of water on the ground) is required, as avoidance of peat-type fires must be maintained. ISSUES: Fire regimes for melaleuca ecosystems require further fire research. Melaleuca forests are fire-adapted, but too high an intensity or frequent fire will slow or prevent regeneration and lead to lower species richness (since these communities contain numerous obligate seed regenerating species that require sufficient

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4.2.2.2 Woodland

- RE 12.11.25 (Corymbia henryi and/or Eucalyptus fibrosa subsp. fibrosa +/- E. crebra, E. carnea, E. tindaliae woodland on metamorphics +/- interbedded volcanics): SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.
- RE 12.11.27 (Eucalyptus racemosa subsp. racemosa and/or E. seeana and Corymbia intermedia woodland on metamorphics +/- interbedded volcanics): SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.
- RE 12.11.5 (Corymbia citriodora subsp. variegata woodland to open forest +/- Eucalyptus siderophloia/E. crebra, E. carnea, E. acmenoides, E. propinqua on metamorphics +/- interbedded volcanics): SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is

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Fuel reduction burning should be undertaken in coordination with the Queensland Fire and Emergency Services (QFES).

Vegetation along the verges of the access road should be regularly slashed or mown to minimise the risk of fires originating along the road.

4.3 BUSHFIRE PREPAREDNESS AND CONTROL

Firefighting requirements for the Clay Target Facility will depend on the nature of any future developments and will need to be determined as part of development proposals. Fire hydrants and water storages will be required as per the Brisbane City Plan Bushfire Overlay Code. Electricity supply to buildings shall be underground. Hazardous material should, in principle, not be stored near areas of potential bushfire attack (i.e. along the forest edge).

Buildings and infrastructure will be maintained in fire risk-free state. Flammable materials and fuels will be appropriately stored, gutters and roofs will be cleared of leaves and fuel prior to the fire season, and any landscaping within the bushfire safety buffers will be maintained to minimise combustible materials.

Clay Target Facility staff should be made aware of the site's bushfire risk, in particular of key fire ignition sources, weather conditions, and events, and they should be familiar with bushfire mitigation strategies and requirements for property management, and of appropriate risk avoidance behaviour and emergency response in the event of a bushfire.

In the event of a bushfire, people present on site should follow guidance provided by the Clay Target Facility Site Manager or QFES personnel. People present on site should not attempt to control or fight the fire, unless they are qualified and authorised to do so. Active firefighting should only be done by qualified and experienced people, such as members of QFES.

4.4 ACCESS AND EGRESS IN THE EVENT OF A BUSHFIRE

PO 16 in Section C of the Bushfire Overlay Code states that development 'does not materially increase number of people working in the Bushfire Overlay area.' While there are currently no employment details available, it is likely that there will be an increase in the number of people working at the site from time to time. As workers as well as the more numerous visitors could potentially be exposed to bushfire and its effects (e.g. smoke) within the vegetation surrounding

the Clay Target Facility, measures are to be in place to allow efficient egress from the site, while also allowing access for fire fighting crews and equipment.

The site has ready access to firefighting services. The nearest QFES station is at Capalaba (9.0 km, 10 minutes distance). Other QFES stations are located at Camp Hill (9.3 km, 15 minutes) and Cannon Hill (10.6 km, 18 minutes).

The main existing access to the site is from Old Cleveland Road to the north of the site (**Figure 6**). The Lee Sampson Way, an unsealed track which extends around the Clay Target Facility from near the entrance to the Clay Target Facility access road to the south-east of the Clay Target Facility, could potentially form another access/egress. The Lee Sampson Way runs upslope in easterly direction towards a 25 m wide powerline easement forming the eastern boundary of the Belmont Shooting Complex, from which point Old Cleveland Road to the north can be reached along about 750 m of easement along a relatively level gradient. The Sleeman Complex Ring Road can also be reached at a short distance from the intersection. Towards the south, the easement connects to Eastwood Street at a distance of 600m. The Lee Sampson Way also connects to the extensive low fuel zone represented by the1200 Range west of the site.

Access to the Shooting Range, including buildings and other places frequented by people, should be from at least two points to allow for access or egress should one entry be blocked or otherwise be inaccessible. Such alternative access is potentially provided by the Lee Sampson Way, which connects with the proposed cleared area to the east as well as the west (see above). A recommended road around the perimeter of the cleared operational area would connect the Lee Sampson Way with the main access road and visitor areas on the north side of the Clay Target Facility. The main access, perimeter road, and Lee Sampson Way, as well as connections to the Lee Sampson Way to the east and west are to be maintained, upgraded, or constructed in accordance with Table 8.2.5.3.C (Road design requirements for emergency vehicle access) of the Brisbane City Plan's Bushfire Overlay Code. Thus, safe evacuation for the proposed uses can be provided such that the premises are not exposed to unacceptable risk during a bushfire event.

In addition, the current gravel tracks along the north-eastern boundary of the site, and between the archery galleries and remnant vegetation to the west should be maintained as fire trails to allow for fuel reduction and maintenance burning (**Figure 6**).

It should be noted that, given the substantial size of the low/no fuel zone represented by the Clay Target Facility itself and the surrounding cleared area, the interior of this area will be a considerable distance (well over 100 m) from any fire front. As most of the various constructed elements of the Clay Target Facility are non-combustible, in the unlikely event that the Clay Target Facility is entirely surrounded by bushfire, the interior of the facility would provide protection to trapped workers and visitors under most circumstances.

The development has been assessed against Brisbane City Council's Bushfire Hazard Overlay Code (**Appendix E**).

5.0 REFERENCES

- DLGP and DES - Department of Local Government and Planning and Department of Emergency Services (2003) State Planning Policy 1/03: Guideline Mitigating the Adverse Impacts of Flood, Bushfire and Landslide.
- Leonard, J., O.Kimberley, G.Newnham, R. Blanchi (2014) A New Methodology for State-wide Mapping of Bushfire Prone Areas in Queensland. CSIRO.
- Queensland Government (2018) Regional Ecosystem Description Database. https://environment.ehp.qld.gov.au/regional-ecosystems/

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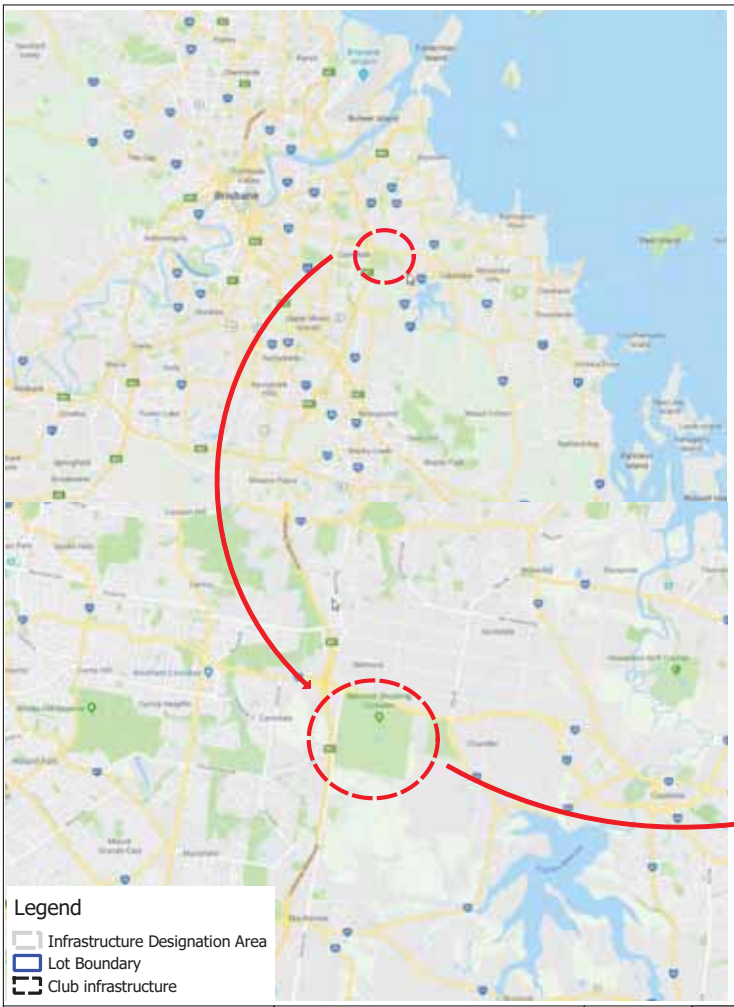
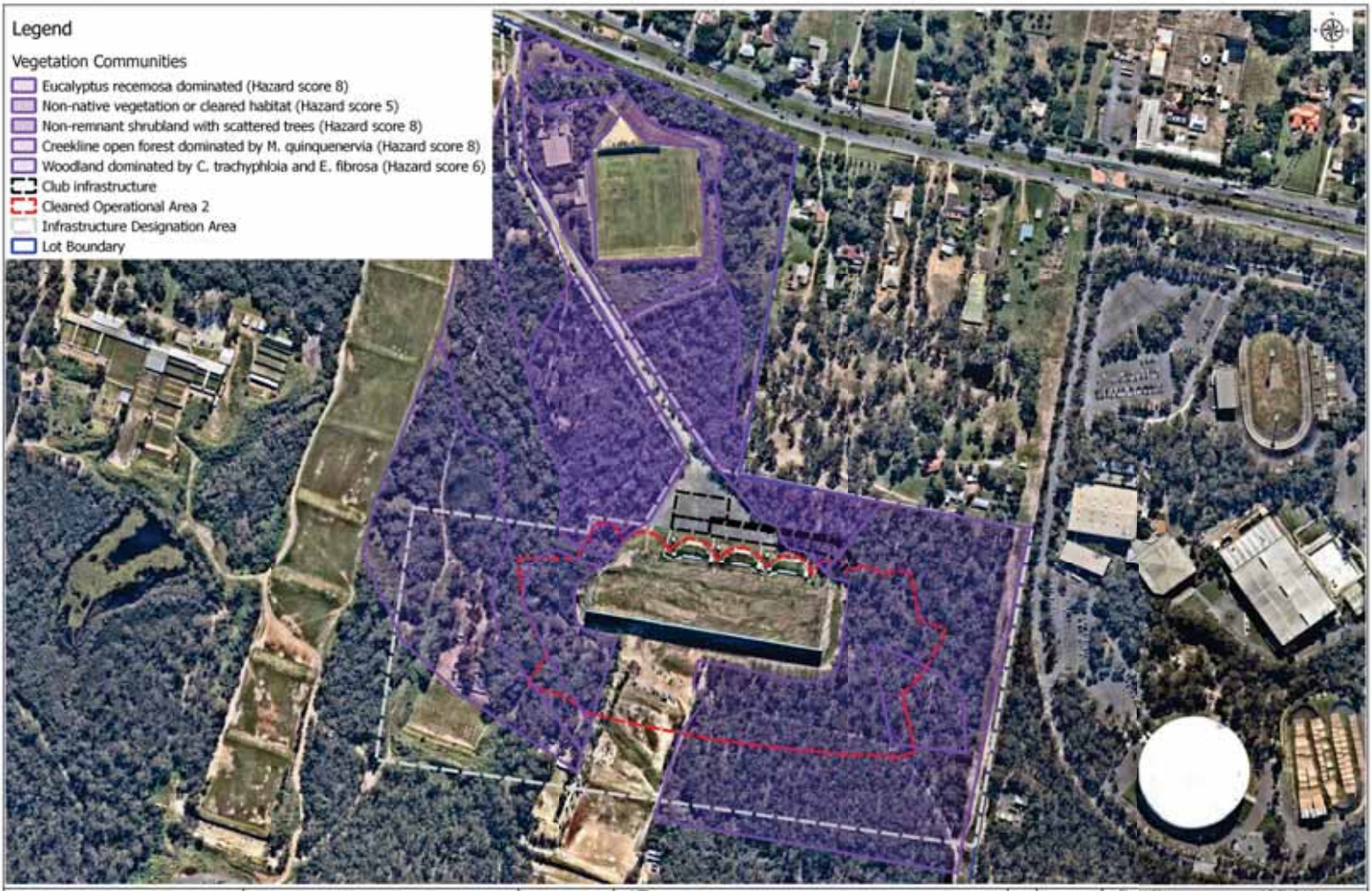
FIGURES



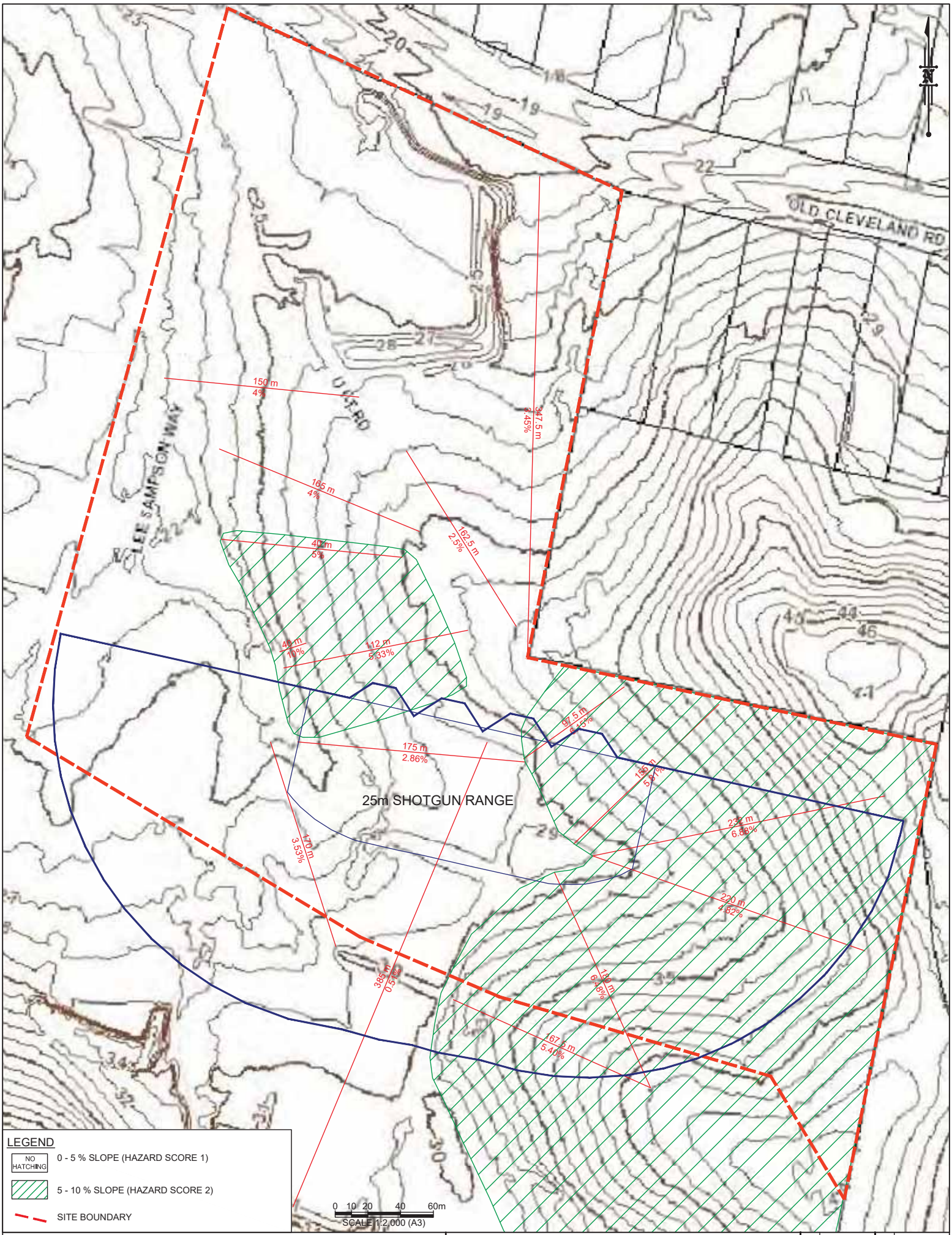
Legend

- Infrastructure Designation Area
- Lot Boundary
- Club infrastructure

Project **Clay Target Ministerial Infrastructure Designation** **Bushfire Hazard Assessment and Management Plan**	Client: Mode Design Title Site Location	Drawn J.T Checked T.Z Approved J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS CBD HOUSE LEVEL 3, 120 WICKHAM STREET FORTITUDE VALLEY QLD 4006 TELEPHONE (07) 3250 9000 FACSIMILE (07) 3250 9001 EMAIL mail@lar.net.au A.C.N. 010 451 902 The Association of Consulting Engineers Australia	REV DATE	Figure No: AS SHOWN Figure 1 Scale: NTS File Ref:	A3 Sheet size



Project **Clay Target Ministerial Infrastructure Designation** **Bushfire Hazard Assessment and Management Plan**	Client: Mode Design Title Vegetation Mapping	Drawn J.T Checked T.Z Approved J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS	REV / DATE	Figure No: AS SHOWN Figure 2 Scale: NTS File Ref: A3



Project:
BELMONT CLAY TARGET RANGE
BUSHFIRE HAZARD ASSESSMENT

Title:
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Rev.	Date	Rev.	Date
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Drawn: SM
Checked: JT
Approved: JT

Figure No:
FIGURE 3

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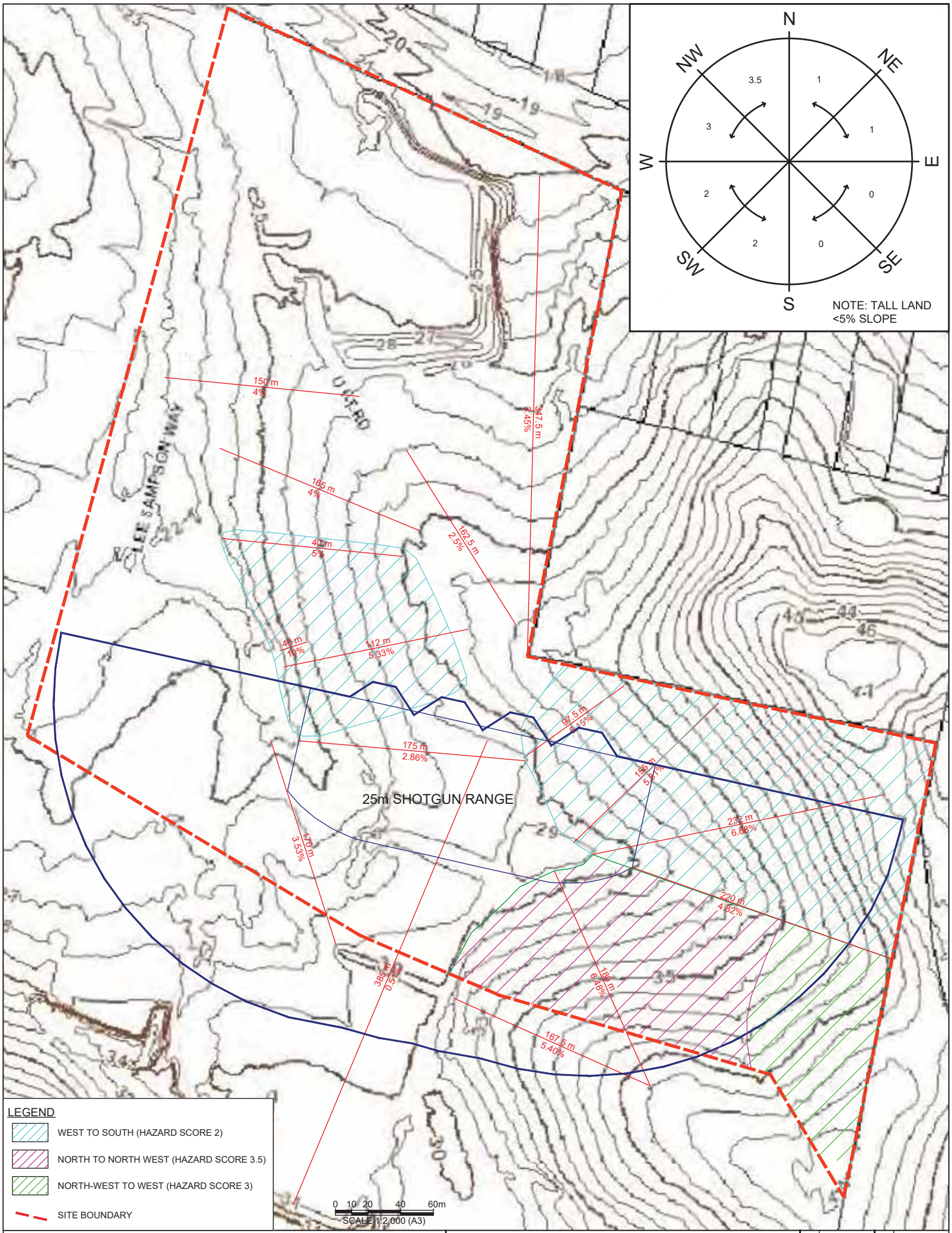

Project:
BELMONT CLAY TARGET RANGE
BUSHFIRE HAZARD ASSESSMENT

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ASPECT

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Rev.	Date	Rev.	Date
A	17.01.18		

Drawn: SM
Checked: JT
Approved: JT

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FIGURE 4

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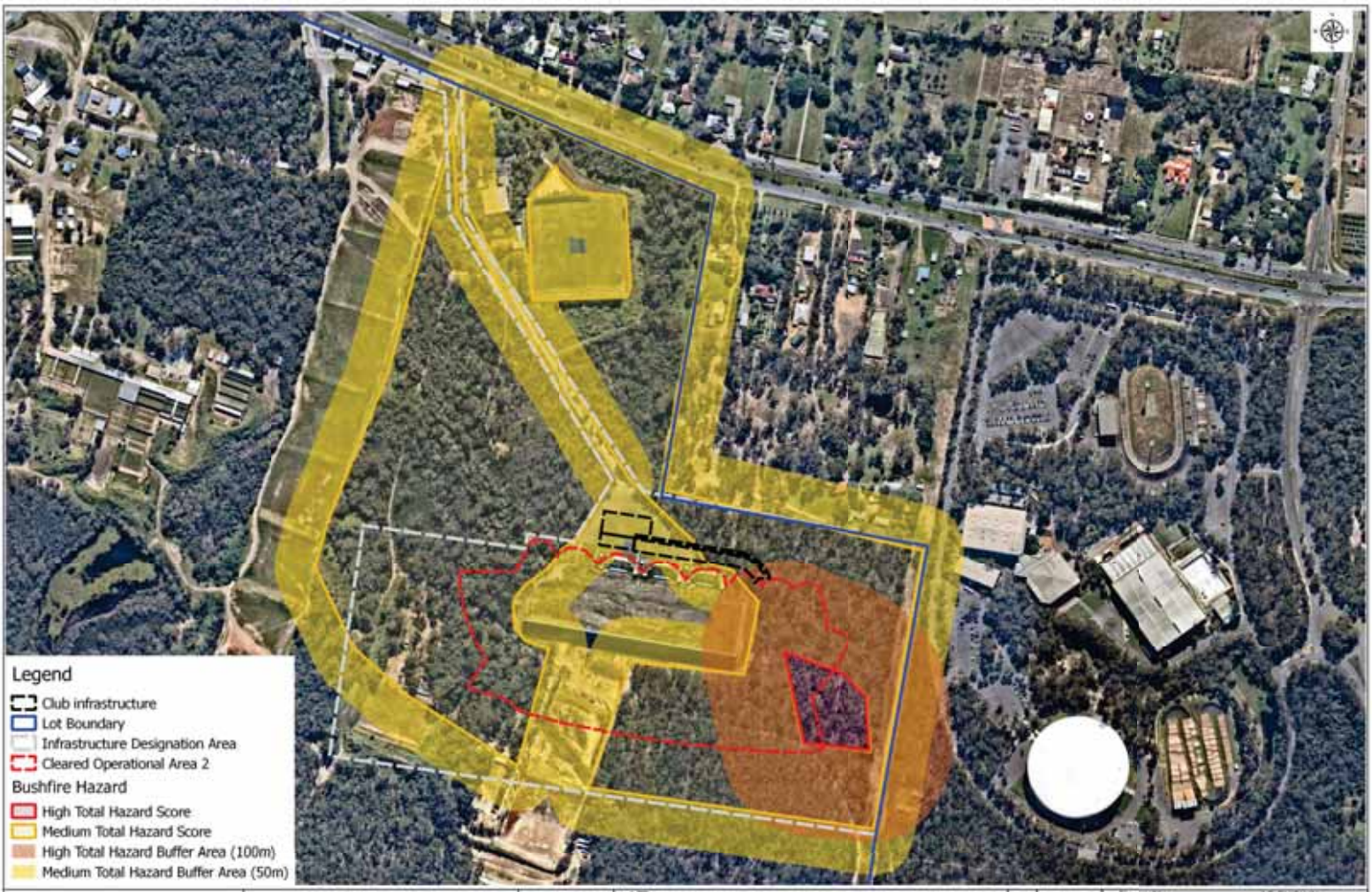

Project **Clay Target Ministerial Infrastructure Designation** **Bushfire Hazard Assessment and Management Plan**	Client: Mode Design	Drawn J.T	LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS	REV	DATE	Figure No: A5 SHOWN Figure 5
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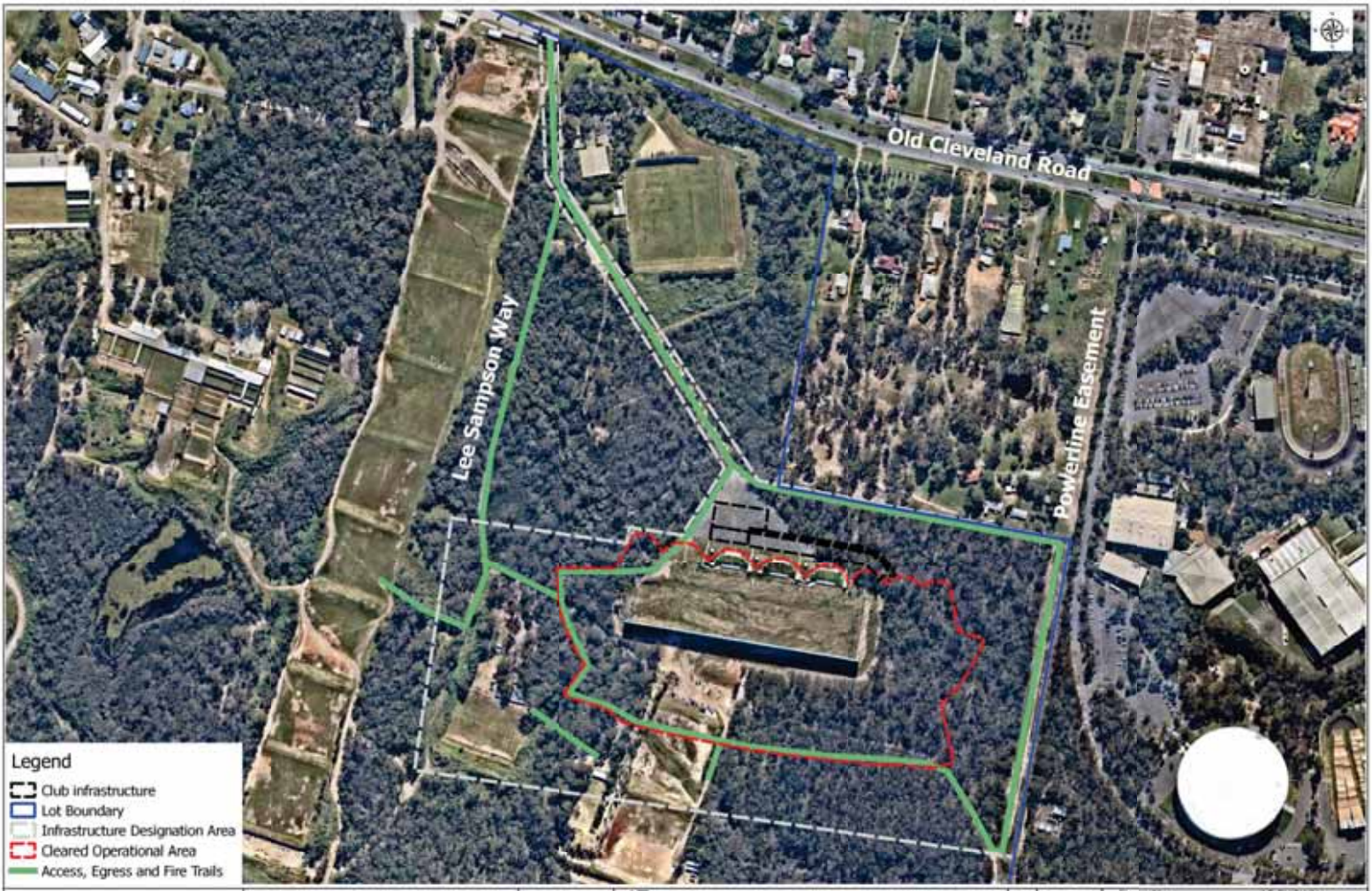
		Approved J.T				A3



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	Title Access, Egress and Fire Trails	Checked T.Z			Figure 6	
		Approved J.T		REV DATE	Scale: NTS	A3
					File Ref:	

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APPENDIX A

BCC BUSHFIRE HAZARD MAP

Brisbane City Plan 2014

BRISBANE CITY
Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

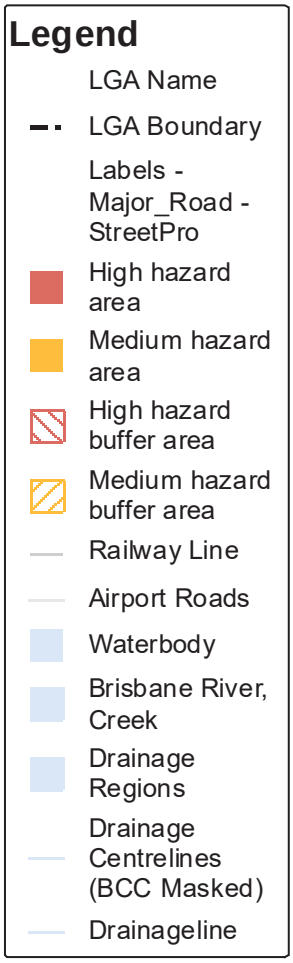
Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:10,000

0 375

Metres

Date: 24/10/2018



Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

NOTES

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Date: 24/10/2018

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

APPENDIX B

VEGETATION MANAGEMENT PROPERTY REPORT

Department of Natural Resources, Mines and Energy

Vegetation management report

For Lot: 1 Plan: RP169229

Current as at 18/07/2018

Queensland Government

This publication has been compiled by Operations Support, Department of Natural Resources, Mines and Energy.

Recent changes

New vegetation clearing laws

New vegetation management laws were passed by the Queensland Parliament on 3 May 2018 and may affect the clearing you can undertake on your property.

For more information, read about the new vegetation management laws (https://www.dnrme.qld.gov.au/land-water/initiatives/vegetation-management-laws/) or call 135VEG (13 58 34) between 8.30am and 4.30pm Monday to Friday.

Updated mapping

The Regulated Vegetation Management Map and Supporting Map was updated in March 2018 to reflect the most up to date information available in relation to regional ecosystems, essential habitat and wetland mapping (Version 10).

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

- *Vegetation management framework* - an explanation of the application of the framework.
- *Property details* - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s), catchment(s), coastal or non coastal status, and any applicable area management plans associated with your property.
- *Vegetation management details for the specified Lot on Plan* - specific information about your property including vegetation categories, regional ecosystems, watercourses, wetlands, essential habitat, and protected plants.
- *Contact information.*
- *Maps* - a series of colour maps to assist in identifying regulated vegetation on your property.
- *Other legislation contact information.*

This information will assist you to determine your options for managing vegetation, which may include:

- exempt clearing work
- accepted development vegetation clearing code
- an area management plan
- a development approval.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as Queensland's Protected Plants framework or the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 6 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

Table of Contents

1. Vegetation management framework

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

1.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify DNRME or obtain an approval. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 5.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval. For all other land tenures, contact DNRME before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/vegetation/exemptions/.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Contact DNRME prior to clearing in any of these areas.

1.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/vegetation/codes/

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify DNRME before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

1.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

As a result of the new laws, AMPs for fodder harvesting, managing thickened vegetation and managing encroachment will continue for 2 years. New notifications cannot be made for these AMPs.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an area management plan applies to your property for which you can make a new notification, it will be listed in Section 2.2 of this report. Before clearing under one of these AMPs, you must first notify the DNRME and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/vegetation/area-plans/

1.4 Development approvals

If your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/vegetation/applying/

2. Property details

2.1 Tenure

All of the lot, plan and tenure information associated with property Lot: 1 Plan: RP169229, including links to relevant Smart Maps, are listed in Table 1. The tenure of the property (whether it is freehold, leasehold, or other) may be viewed by clicking on the Smart Map link(s) provided.

Table 1: Lot, plan and tenure information for the property

Lot	Plan	Tenure	Link to property on SmartMap
1	RP169229	Freehold	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=1\RP169229
E	SP242313	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=E\SP242313
G	SP242313	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=G\SP242313
AA	SP246243	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=AA\SP246243
B	RP170328	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=B\RP170328
A	RP171885	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=A\RP171885
F	SP242313	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=F\SP242313
P	SP163158	Easement	http://globe.information.qld.gov.au/cgi-bin/SmartMapgen.py?q=P\SP163158

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

2.2 Property location

Table 2 provides a summary of the locations for property Lot: 1 Plan: RP169229, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Brisbane City

Bioregion(s)	Subregion(s)
Southeast Queensland	Burringbar - Conondale Ranges

Catchment(s)
Logan-Albert
Brisbane

For the purposes of the accepted development vegetation clearing codes and the State Development Assessment Provisions (SDAP), this property is regarded as*
Coastal

*See also Map 5.4

Area Management Plan(s): Nil

3. Vegetation management details for Lot: 1 Plan: RP169229

3.1 Vegetation categories

Vegetation categories are shown on the regulated vegetation management map in section 5.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 501.72ha

Vegetation category	Area (ha)
Category B	359.3
Category C	5.37
Category Water	2.15
Category X	134.9

Table 4

Category	Colour on Map	Description	Requirements / options
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact DNRME to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing is considered accepted development on freehold land, indigenous land and leasehold land for agriculture and grazing purposes. Contact DNRME to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

This report does not confirm if a Property Map of Assessable Vegetation (PMAV) exists on a lot. To confirm whether or not a PMAV exists on a lot, please check the PMAV layer on the Queensland Globe2, or contact DNRME on 135VEG (135 834).

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 5.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
12.11.24	Least concern	B	87.78	Eucalyptus carnea, E. tindaliae, Corymbia intermedia +/- E. siderophloia or E. crebra woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.25	Of concern	B	80.20	Corymbia henryi and/or Eucalyptus fibrosa subsp. fibrosa +/- E. crebra, E. carnea, E. tindaliae woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.25	Of concern	C	5.05	Corymbia henryi and/or Eucalyptus fibrosa subsp. fibrosa +/- E. crebra, E. carnea, E. tindaliae woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.27	Endangered	B	90.53	Eucalyptus racemosa subsp. racemosa and/or E. seeana and Corymbia intermedia woodland on metamorphics +/- interbedded volcanics	Sparse
12.11.3	Least concern	B	18.78	Eucalyptus siderophloia, E. propinqua +/- E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides open forest on metamorphics +/- interbedded volcanics	Mid-dense
12.11.5	Least concern	B	51.33	Corymbia citriodora subsp. variegata woodland to open forest +/- Eucalyptus siderophloia/E. crebra, E. carnea, E. acmenoides, E. propinqua on metamorphics +/- interbedded volcanics	Mid-dense
12.3.11	Of concern	B	3.84	Eucalyptus tereticornis +/- Eucalyptus siderophloia, Corymbia intermedia open forest on alluvial plains usually near coast	Mid-dense
12.3.5	Least concern	B	6.36	Melaleuca quinquenervia open forest on coastal alluvium	Mid-dense
12.3.5	Least concern	C	0.15	Melaleuca quinquenervia open forest on coastal alluvium	Mid-dense
12.3.6	Least concern	B	16.97	Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia open forest on coastal alluvial plains	Mid-dense
12.3.6	Least concern	C	0.12	Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia open forest on coastal alluvial plains	Mid-dense
12.9-10.4	Least concern	B	3.51	Eucalyptus racemosa subsp. racemosa woodland on sedimentary rocks	Sparse
non-rem	None	X	134.90	None	None
water	None	C	0.05	None	None

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
water	None	Water	2.15	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work
- accepted development vegetation clearing codes
- performance outcomes in State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 5.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA), and includes endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 5.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map as assessable vegetation -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
686	Crinia tinnula	wallum froglet	V	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, sedgeland, wet and dry heathland (e.g. Banksia robur, Xanthorrhoea) and wallum (Banksia aemula shrubland/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.	Sea level to 150m.	Sandy and sandy-alluvial substrates.	None
860	Phascolarctos cinereus	koala	V	SEQ: Open eucalypt forest and woodland that has: a) multiple strata layers containing Eucalyptus, Corymbia, Angophora, Lophostemon or Melaleuca trees that-at 1.3 metres above the ground-have a diameter both greater and less than 30 centimetres; and b) at least 1 of the following species: Eucalyptus tereticornis, E. fibrosa, E. propinqua; E. umbra, E. grandis, E. microcorys, E. tindaliae, E. resinifera, E. populnea, E. robusta, E. nigra, E. racemosa, E. crebra, E. exserta, E. seeana, Lophostemon confertus, L. suaveolens, Melaleuca quinquenervia. Outside SEQ: Open eucalypt forest and woodland that contains Eucalyptus &/or Corymbia spp. Tree species used for food varies across State and can include Eucalyptus tereticornis, E. camaldulensis, E. coolabah; E. drepanophylla, E. platyphylla, E. orgadophilla, E. thozetiana, E. melanophloia, E. populnea, E. melliodora, E. dealbata, E. microtheca, E. crebra, E. exserta, E. blakelyi, E. papuana, Corymbia tessellaris, C. citriodora, Melaleuca quinquenervia, M. leucadendra.	Sea level to 1000m.	None	Riparian areas, plains and hill/escarpment slopes.
848	Petauroides volans	greater glider	V	Tall mature open wet and dry eucalypt forest (Eucalyptus &/or Corymbia spp.) to low open eucalypt woodland; presence of hollow-bearing trees.	Sea level to 1300m.	Usually on soils of relatively high fertility.	None
1107	Ninox strenua	powerful owl	V	Wet and dry tall open eucalypt forest (Eucalyptus pilularis, E. acmenoides, E. tereticornis, E. camaldulensis, E. crebra, E. melliodora, Corymbia citriodora & C. intermedia), including mountain forest gullies/gorges; forests aged 60+ years (large & old) on fertile soils with suitable hollows; roosting in dense foliage of closed forest (occasionally caves) and foraging in open forest and woodland including areas adjacent to urban/rural development. Nest in large hollows (45-75cm diameter, 50-180cm deep) 6-45m above ground, in large (>100cm dbh) old eucalypts on the side or at the head of heavily wooded gully.	Sea level to 1000m.	None	Gully.
1478	Anthochaera phrygia	regent honeyeater	E	Dry eucalypt woodland and open forest, woodland, rural and urban areas with mature eucalypts; favours box-ironbark associations including Eucalyptus sideroxylon, E. albens, E. melliodora, E. moluccana, E. robusta, E. caliginosa, E. maculata occasionally with Angophora leiocarpa, and Casuarina cunninghamiana in riparian forest; generally comprise large/mature trees that are reliable nectar producers (both in timing and quantity) with tall shrub layer on moist fertile sites (lower foothills/river valleys/creeklines). Nest in mistletoe, usually on horizontal branch or in vertical fork of rough-barked tree 1-30m above ground.	Sea level to 550m.	None	None
3235	Zieria furfuracea subsp. gymnocarpa	None	E	open forest of Lophostemon confertus, Eucalyptus crebra, Eucalyptus carnea, Acacia disparrima, or Eucalyptus propinqua, E. microcorys, Corymbia intermedia, or Eucalyptus propinqua, E. crebra, E. umbra, Corymbia intermedia, or Eucalyptus acmenoides, E. drepanophylla, E. propinqua, E.microcorys; open eucalypt forest with occasional rainforest elements; woodland of Eucalyptus crebra, Acacia disparrima and Mallotus philippensis	0 to 200 m	None	gully or hill slope

Label	Regional Ecosystem (mandatory unless otherwise specified)
686	12.2.5, 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, 12.3.20, 12.5.2, 12.5.10. These regional ecosystems are not a mandatory essential habitat factor for this species.
860	SEQ: 11.3.2, 11.3.4, 11.3.25, 11.3.26, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.9.9, 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 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, 12.3.14, 12.3.18, 12.3.19, 12.3.20, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.6, 12.5.7, 12.5.10, 12.5.12, 12.8.1, 12.8.8, 12.8.9, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.20, 12.8.24, 12.8.25, 12.9-10.1, 12.9-10.2, 12.9-10.3, 12.9-10.4, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.11, 12.9-10.12, 12.9-10.14, 12.9-10.17, 12.9-10.18, 12.9-10.19, 12.9-10.21, 12.9-10.25, 12.9-10.26, 12.9-10.27, 12.9-10.28, 12.9-10.29, 12.11.2, 12.11.3, 12.11.5, 12.11.6, 12.11.7, 12.11.8, 12.11.9, 12.11.14, 12.11.16, 12.11.17, 12.11.18, 12.11.22, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.2, 12.12.3, 12.12.5, 12.12.6, 12.12.7, 12.12.8, 12.12.9, 12.12.11, 12.12.12, 12.12.14, 12.12.15, 12.12.23, 12.12.24, 12.12.25, 12.12.28. Outside SEQ: 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6, 4.3.8, 4.3.10, 4.3.11, 4.4.1, 4.5.3, 4.5.5, 4.5.6, 4.5.8, 4.5.9, 4.7.1, 4.7.7, 4.7.8, 4.9.6, 4.9.10, 4.9.12, 4.9.17, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.11, 6.3.12, 6.3.17, 6.3.18, 6.3.22, 6.3.24, 6.3.25, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, 6.5.13, 6.5.14, 6.5.15, 6.5.16, 6.5.17, 6.5.18, 6.5.19, 6.6.2, 6.7.1, 6.7.2, 6.7.5, 6.7.6, 6.7.7, 6.7.9, 6.7.11, 6.7.12, 6.7.13, 6.7.14, 6.7.17, 6.9.3, 7.2.3, 7.2.4, 7.2.7, 7.2.11, 7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.47, 7.3.48, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.8.19, 7.11.5, 7.11.6, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 7.11.48, 7.11.49, 7.11.50, 7.11.51, 7.12.4, 7.12.5, 7.12.17, 7.12.21, 7.12.22, 7.12.23, 7.12.25, 7.12.26, 7.12.27, 7.12.29, 7.12.31, 7.12.32, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.10, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.27, 9.4.1, 9.4.2, 9.4.3, 9.5.1, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.15, 9.5.16, 9.5.17, 9.7.1, 9.7.2, 9.7.3, 9.7.4, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.3, 9.8.4, 9.8.5, 9.8.9, 9.8.10, 9.8.11, 9.8.13, 9.10.1, 9.10.3, 9.10.4, 9.10.5, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.12, 9.11.13, 9.11.14, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.21, 9.11.22, 9.11.23, 9.11.24, 9.11.25, 9.11.26, 9.11.28, 9.11.29, 9.11.30, 9.11.31, 9.11.32, 9.12.1, 9.12.2, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.14, 9.12.15, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.25, 9.12.26, 9.12.27, 9.12.28, 9.12.29, 9.12.30, 9.12.31, 9.12.32, 9.12.33, 9.12.35, 9.12.36, 9.12.37, 9.12.38, 9.12.39, 9.12.44, 10.3.2, 10.3.3, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.17, 10.3.20, 10.3.27, 10.3.28, 10.4.3, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.21, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.18, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.11, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.11.9, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.6, 13.12.8, 13.12.9, 13.12.10.
848	7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.47, 7.3.48, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.11.5, 7.11.6, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.38, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 7.11.48, 7.11.49, 7.11.50, 7.11.51, 7.12.4, 7.12.5, 7.12.17, 7.12.21, 7.12.22, 7.12.23, 7.12.24, 7.12.25, 7.12.26, 7.12.27, 7.12.28, 7.12.29, 7.12.30, 7.12.33, 7.12.34, 7.12.35, 7.12.51, 7.12.52, 7.12.53, 7.12.54, 7.12.55, 7.12.56, 7.12.58, 7.12.59, 7.12.60, 7.12.61, 7.12.62, 7.12.63, 7.12.65, 7.12.66, 7.12.69, 9.3.1, 9.3.2, 9.3.3, 9.3.5, 9.3.6, 9.3.8, 9.3.10, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.24, 9.4.1, 9.4.2, 9.5.1, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.13, 9.5.14, 9.5.15, 9.5.16, 9.5.17, 9.7.1, 9.7.2, 9.7.3, 9.7.4, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.4, 9.8.5, 9.8.9, 9.8.10, 9.8.11, 9.10.1, 9.10.3, 9.10.4, 9.10.5, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.12, 9.11.13, 9.11.14, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.21, 9.11.22, 9.11.23, 9.11.24, 9.11.25, 9.11.26, 9.11.28, 9.11.29, 9.11.30, 9.11.31, 9.11.32, 9.12.1, 9.12.2, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.14, 9.12.15, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.25, 9.12.26, 9.12.27, 9.12.28, 9.12.29, 9.12.30, 9.12.31, 9.12.32, 9.12.33, 9.12.35, 9.12.36, 9.12.37, 9.12.38, 9.12.39, 9.12.40, 9.12.44, 10.3.2, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.7, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.31, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.7, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.20, 11.7.1, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.10.1, 11.10.2, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.15, 11.11.16, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.13, 11.12.14, 11.12.16, 11.12.17, 11.12.19, 11.12.20; 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 12.2.11, 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, 12.3.18, 12.3.19, 12.3.20, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.5, 12.5.6, 12.5.7, 12.5.8, 12.5.10, 12.5.11, 12.5.12, 12.7.1, 12.7.2, 12.8.1, 12.8.2, 12.8.8, 12.8.10, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.20, 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, 12.9-10.7, 12.9-10.8, 12.9-10.11, 12.9-10.12, 12.9-10.13, 12.9-10.14, 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, 12.9-10.25, 12.9-10.26, 12.9-10.27, 12.9-10.28, 12.9-10.29, 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, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 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, 12.12.12, 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, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.11.9, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.6, 13.12.8, 13.12.9, 13.12.10

Label	Regional Ecosystem (mandatory unless otherwise specified)
1107	8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.2.8, 8.2.11, 8.2.13, 8.2.14, 8.3.1, 8.3.3, 8.3.6, 8.3.8, 8.3.9, 8.3.10, 8.3.11, 8.5.1, 8.8.1, 8.10.1, 8.11.2, 8.11.3, 8.11.5, 8.12.1, 8.12.2, 8.12.3, 8.12.4, 8.12.5, 8.12.7, 8.12.8, 8.12.11, 8.12.12, 8.12.14, 8.12.16, 8.12.17, 8.12.18, 8.12.19, 8.12.26, 8.12.27, 8.12.28, 8.12.29, 8.12.30, 8.12.31, 8.12.32, 11.2.2, 11.2.3, 11.3.1, 11.3.11, 11.3.12, 11.3.25, 11.3.26, 11.3.40, 11.4.1, 11.4.3, 11.4.7, 11.4.9, 11.5.7, 11.5.16, 11.8.1, 11.8.13, 11.9.1, 11.9.4, 11.9.5, 11.9.6, 11.9.10, 11.9.13, 11.10.1, 11.10.2, 11.10.5, 11.10.8, 11.10.9, 11.10.13, 11.11.3, 11.11.5, 11.11.13, 11.11.14, 11.11.18, 11.12.4, 11.12.13, 11.12.19, 11.12.21, 12.2.1, 12.2.2, 12.2.3, 12.2.4, 12.2.5, 12.2.7, 12.2.8, 12.3.1, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.7, 12.3.9, 12.3.10, 12.3.11, 12.3.15, 12.3.16, 12.3.17, 12.3.18, 12.3.19, 12.3.20, 12.3.21, 12.5.1, 12.5.3, 12.5.6, 12.5.7, 12.5.13, 12.8.1, 12.8.2, 12.8.3, 12.8.4, 12.8.5, 12.8.6, 12.8.7, 12.8.8, 12.8.9, 12.8.10, 12.8.11, 12.8.12, 12.8.13, 12.8.14, 12.8.18, 12.8.21, 12.8.22, 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, 12.9-10.14, 12.9-10.16, 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, 12.9-10.25, 12.9-10.26, 12.9-10.29, 12.11.1, 12.11.2, 12.11.3, 12.11.4, 12.11.5, 12.11.6, 12.11.9, 12.11.10, 12.11.11, 12.11.12, 12.11.13, 12.11.16, 12.11.17, 12.11.18, 12.11.19, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.1, 12.12.2, 12.12.3, 12.12.4, 12.12.5, 12.12.6, 12.12.11, 12.12.13, 12.12.15, 12.12.16, 12.12.17, 12.12.18, 12.12.20, 12.12.26, 12.12.28, 13.3.2, 13.3.3, 13.3.5, 13.9.2, 13.11.2, 13.11.5, 13.11.6, 13.11.7, 13.12.1, 13.12.4, 13.12.11
1478	8.2.1, 8.2.3, 8.2.4, 8.2.6, 8.2.7, 8.2.8, 8.2.12, 8.2.13, 8.2.14, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.8, 8.3.11, 8.3.13, 8.5.1, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.9.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.12.4, 8.12.5, 8.12.6, 8.12.7, 8.12.8, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 8.12.26, 8.12.27, 8.12.31, 8.12.32, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.4, 11.7.6, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.19, 11.12.20, 11.12.21, 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, 12.3.16, 12.3.17, 12.3.18, 12.3.19, 12.3.20, 12.3.21, 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, 12.9-10.12, 12.9-10.13, 12.9-10.14, 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, 12.9-10.25, 12.9-10.26, 12.9-10.28, 12.9-10.29, 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, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 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, 12.12.12, 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, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.8, 13.12.9, 13.12.10
3235	12.11.5

3.6 Protected plants (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA), with clearing of protected plants in the wild regulated by the Nature Conservation (Wildlife Management) Regulation 2006. These requirements apply irrespective of the classification of the vegetation under the *Vegetation Management Act 1999*.

Prior to clearing, if the plants proposed to be cleared are in the wild (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') and the exemptions under the Nature Conservation (Wildlife Management) Regulation 2006 are not applicable to the proposed clearing, you must check the flora survey trigger map to determine if any part of the area to be cleared is within a high risk area. The trigger map for this property is provided in section 5.5. The exemptions relate to:

- imminent risk of death or serious injury (refer s261A)
- imminent risk of serious damage to a building or other structure on land, or to personal property (refer s261B)
- *Fire and Emergency Service Act 1990* (refer 261C)
- previously cleared areas (refer s261ZB)
- maintenance activities (refer s261ZC)
- firebreak or fire management line (refer s261ZD)
- accepted development vegetation clearing code (refer s261ZE)
- conservation purposes (refer s261ZG)
- authorised in particular circumstances (refer s385).

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) from the *Vegetation Management Act 1999* (i.e. listed in the Planning Regulations 2017) while some are different.

If the proposed area to be cleared is shown as blue (i.e. high risk) on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken in accordance with the flora survey guidelines. The main objective of a flora survey is to locate any endangered, vulnerable or near threatened plants (EVNT plants) that may be present in the clearing impact

area.

If a flora survey identifies that EVNT plants are not present within the clearing impact area or clearing within 100m of EVNT plants can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing. The clearing must be conducted within two years after the flora survey report was submitted.

If a flora survey identifies that EVNT plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the application form clearing permit.

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that EVNT plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

Further information on protected plants is available at
http://www.ehp.qld.gov.au/licences-permits/plants-animals/protected-plants/

For assistance on the protected plants flora survey trigger map for this property, please contact the Department of Environment and Science at palm@des.qld.gov.au.

3.7 Emissions Reduction Fund (ERF)

The ERF is an Australian Government scheme which offers incentives for businesses and communities across the economy to reduce emissions.

Under the ERF, landholders can earn money from activities such as planting (and keeping) trees, managing regrowth vegetation and adopting more sustainable agricultural practices.

The purpose of a project is to remove greenhouse gases from the atmosphere. Each project will provide new economic opportunities for farmers, forest growers and land managers.

Further information on ERF is available at https://www.qld.gov.au/environment/land/state/use/carbon-rights/.

4. Contact information for DNRME

For further information on vegetation management:
Phone 135VEG (135 834)
Email vegetation@dnrme.qld.gov.au
Visit www.dnrme.qld.gov.au/our-department/contact-us/vegetation-contacts to submit an online enquiry.

For contact details for other State and Commonwealth agencies, please see Section 6.

5. Maps

The maps included in this report may also be requested individually at:

https://www.dnrme.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form
and
http://www.ehp.qld.gov.au/licences-permits/plants-animals/protected-plants/map-request.php

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

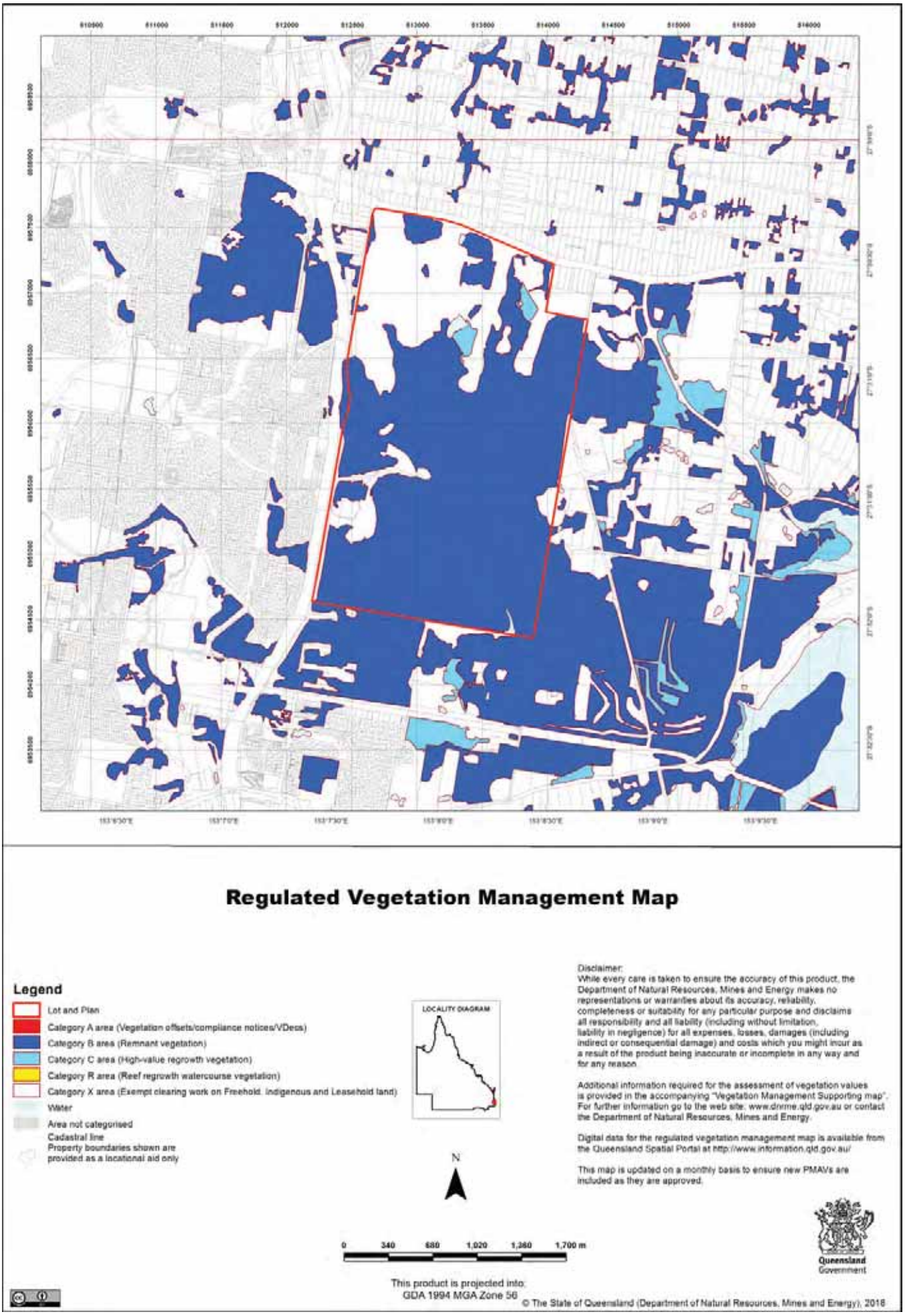
Coastal/non coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and the State Development Assessment Provisions (SDAP).

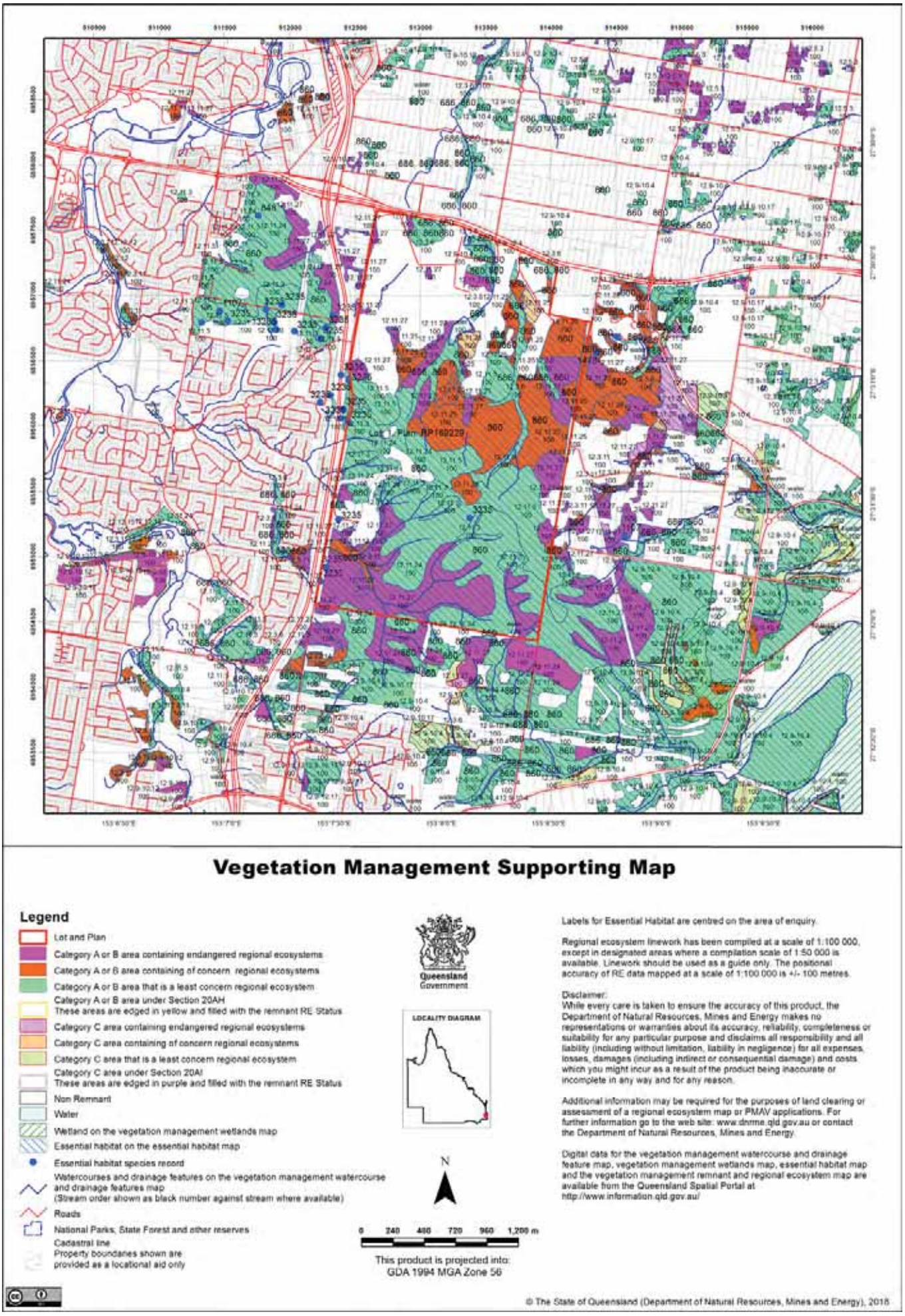
Protected plants map

The protected plants map shows areas where particular provisions of the *Nature Conservation Act 1992* apply to the clearing of protected plants.

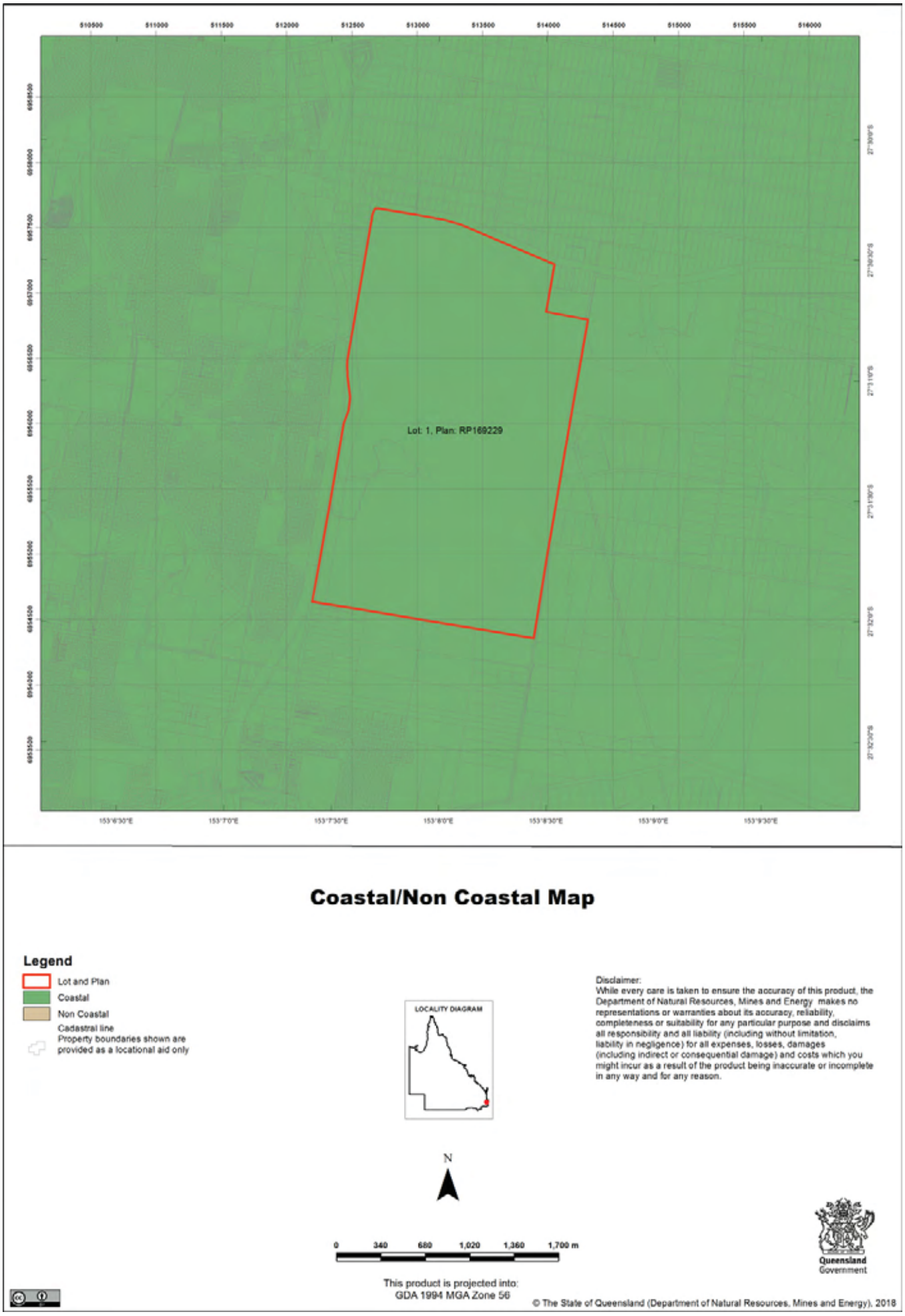
5.1 Regulated vegetation management map



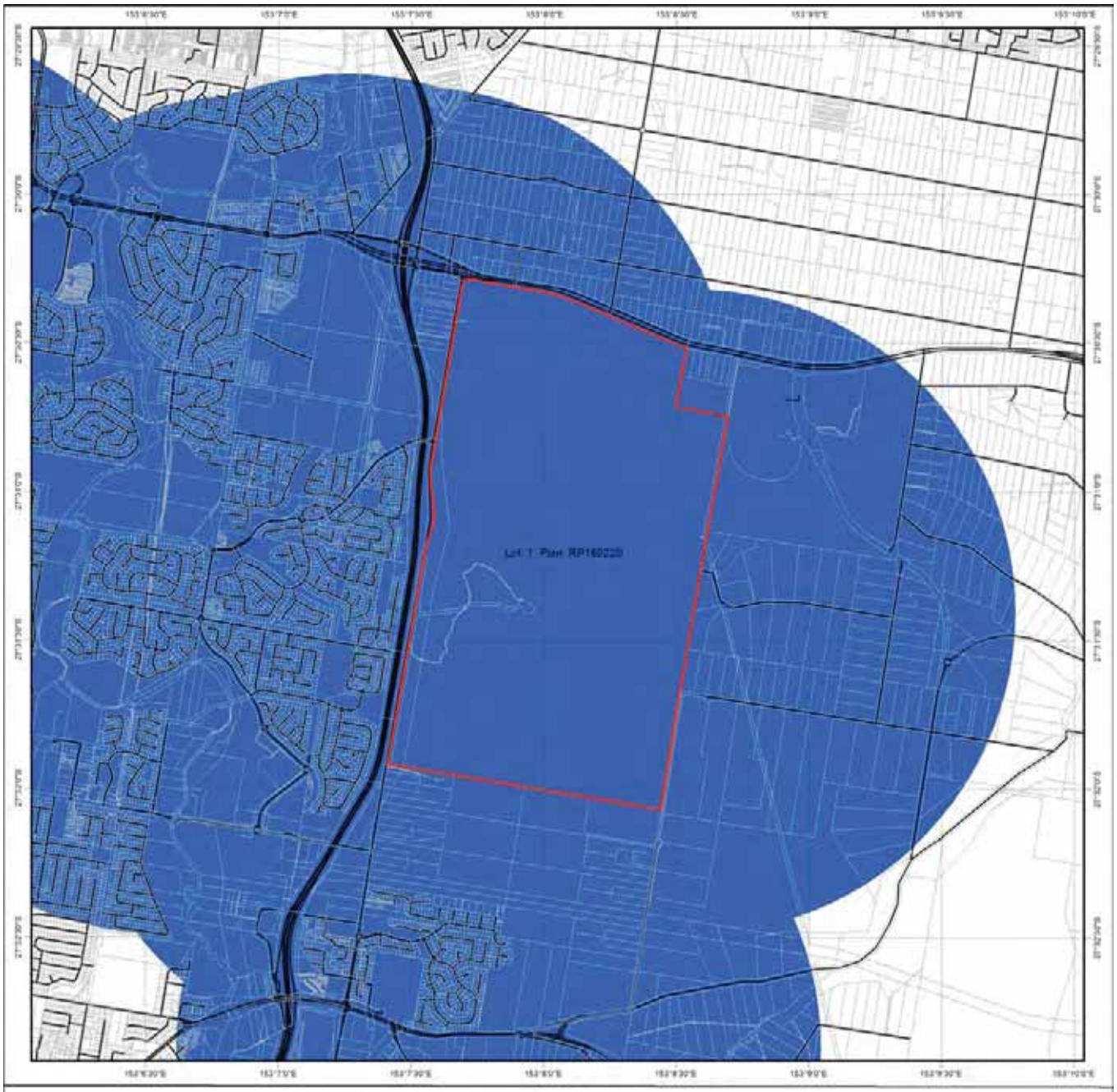
5.2 Vegetation management supporting map



5.3 Coastal/non coastal map



5.4 Protected plants map administered by DES



Protected Plants Flora Survey Trigger Map

Legend

- Lot and Plan
- High risk area
- Cadastral line
  Property boundaries shown are provided as a locational aid only
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@ehp.qld.gov.au

N

0 240 480 720 960 1,200 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

6. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
Interference with overland flow Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Natural Resources, Mines and Energy (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dnrme.qld.gov.au
Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Aboriginal and Torres Strait Islander Partnerships (Queensland Government)	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
Mining and environmentally relevant activities Infrastructure development (coastal) Heritage issues Protected plants and protected areas[1]	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992* *Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
Interference with fish passage in a watercourse, mangroves Forestry activities[2]	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Manufacturing, Infrastructure and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
Local government requirements	*Local Government Act 2009*	Department of Local Government, Racing and Multicultural Affairs (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office

1. In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992*, which endeavours to ensure that protected plants (whether whole plants or protected plants parts) are not illegally removed from the wild, or illegally traded. Prior to clearing, you should check the flora survey trigger map to determine if the clearing is within a high-risk area by visiting www.des.qld.gov.au. For further information or assistance on the protected plants flora survey trigger map for your property, please contact the Department of Environment and Science on 13QGOV (13 74 68) or email palm@des.qld.gov.au.

2. Contact the Department of Agriculture and Fisheries before clearing:

- Any sandalwood on state-owned land (including leasehold land)
- On freehold land in a 'forest consent area'
- More than five hectares on state-owned land (including leasehold land) containing commercial timber species listed in parts 2 or 3 of Schedule 6 of the Vegetation Management Regulation 2012 and located within any of the following local government management areas-Banana, Bundaberg Regional, Fraser Coast Regional, Gladstone Regional, Isaac Regional, North Burnett Regional, Somerset Regional, South Burnett Regional, Southern Downs Regional, Tablelands Regional, Toowoomba Regional, Western Downs Regional.

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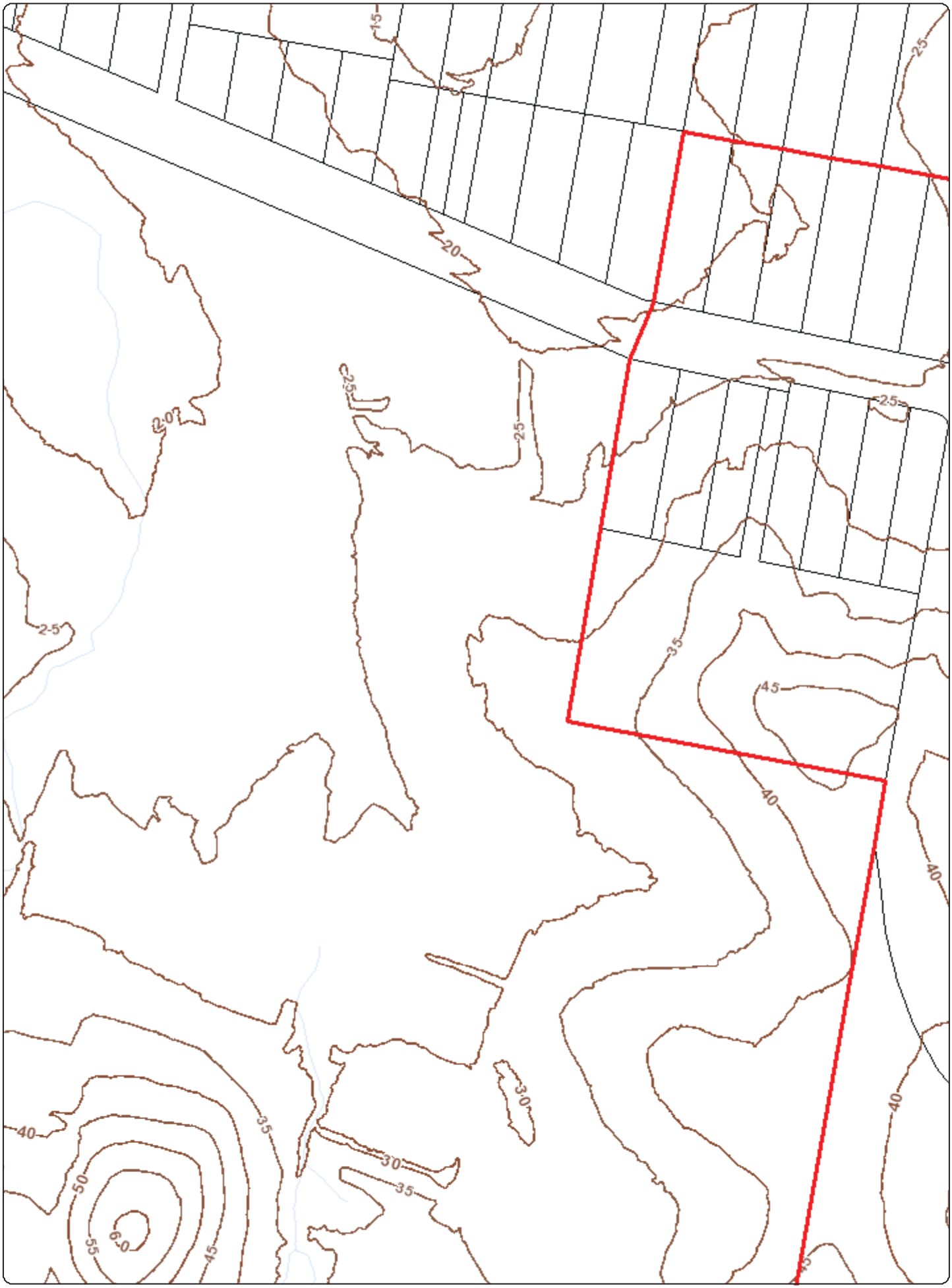
APPENDIX C

CONTOURS



Brisbane City Plan 2014

BRISBANE CITY
Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:5,000

0 180

Metres

Date: 13/12/2017

Legend

- Labels - Streets_Stree...
- Contours 10m
- Contours 5m
- Contours 1m
- Railway Line
- Airport Roads
- Waterbody
- Brisbane River, Creek
- Drainage Regions
- Drainage Centrelines (BCC Masked)
- Drainageline

Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 18 September 2015.

Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Date: 13/12/2017

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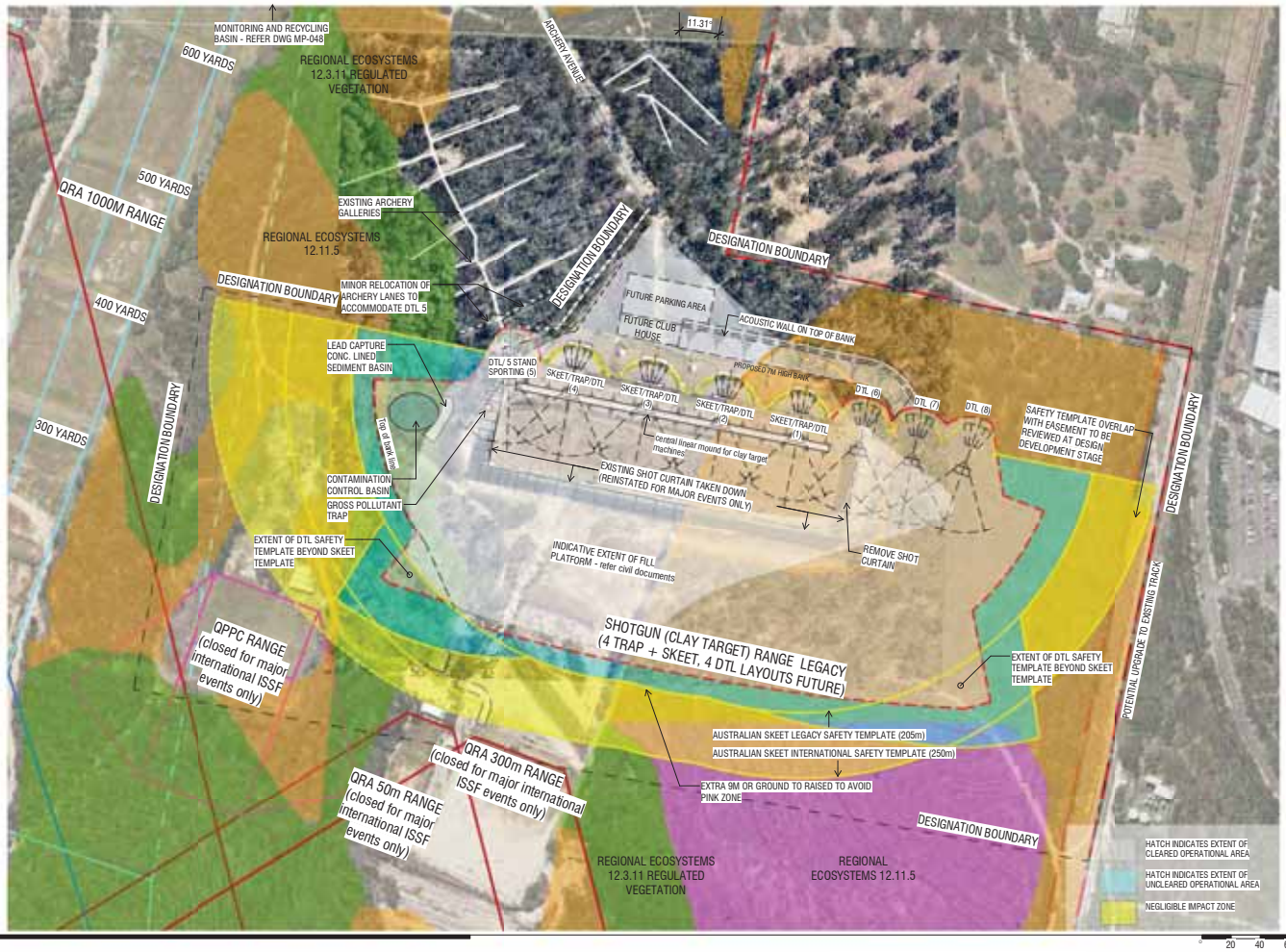
APPENDIX D

PROPOSED DEVELOPMENT



BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3846 0877
bne@modedesign.com.au

DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING INFRASTRUCTURE & PLANNING

BELMONT SHOOTING COMPLEX
1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT CLAY TARGET RANGE

20 40 60 80 100

Project No: 14479BNE
Date:
Scale: 1 : 2500@ A3
Drawn / Check: AutChecker

MP - 045F

24/08/2018 12:33:49 PM

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APPENDIX E

BUSHFIRE HAZARD OVERLAY CODE

8.2.5.3 Performance outcomes and acceptable outcomes

Table 8.2.5.3.A—Performance outcomes and acceptable outcomes

Performance outcomes	Acceptable outcomes	Response
Section A—If for accepted development subject to compliance with identified requirements (acceptable outcomes only) or assessable development other than for reconfiguring a lot		
PO1 Development addresses the bushfire hazard determined by a site-specific bushfire hazard assessment. Note—Bushfire hazard is assessed based on the vegetation existing on site, adjacent and nearby to the site at the time of application, except where reconfiguring a lot, when the level of bushfire hazard posed by any areas subject to revegetation is assessed as if that area had reached its mature state.	**AO1** Development is designed and sited in compliance with: (a) a current approved bushfire management plan relevant to the full nature of the uses, which identifies the level of bushfire hazard and the location of hazardous vegetation affecting the development; or (b) a building protection zone approved as part of the reconfiguring of a lot; or (c) for a lot less than or equal to 2,500m^2, a site-specific bushfire hazard assessment prepared in accordance with the Bushfire planning scheme policy which: (i) is undertaken by a person suitably qualified and experienced with technical expertise in the field of bushfire hazard identification and mitigation, including protection of biodiversity values; (ii) determines the relevant bushfire attack level for	**Compliant. A site-specific bushfire hazard assessment was carried out for the area of the proposed development (this report). It identifies the location of potentially hazardous vegetation.**

	that part of the site in which development is proposed; (iii) identifies the location of hazardous vegetation that poses a bushfire risk to the development; or (d) for a lot greater than 2,500m^2, a site-specific bushfire hazard assessment prepared in accordance with the Bushfire planning scheme policy which: (i) confirms the level of bushfire hazard for the part of the site which development is proposed; (ii) identifies the location of hazardous vegetation that poses a bushfire risk to the development. Note—Where a bushfire hazard assessment determines that the bushfire hazard for the part of the site in which development is proposed is 'low', no further assessment against this code is required.	
PO2 Development is sited, designed and maintained taking account of all relevant factors affecting the bushfire hazard on the site, including site topography, aspect, location and type and structure of vegetation to: (a) minimise the number of buildings and people working, living or visiting	**AO2.1** Development other than an extension to an existing building is: (a) sited in a building protection zone where approved as part of reconfiguring a lot stage; or (b) sited in compliance with an approved bushfire management plan relevant to the full nature of the use; or (c) if there is no approved building protection zone and	**Not applicable. The development is an extension of an existing structure.**

a site exposed to bushfire risk; (b) protect life during bushfire; (c) increase the survival of buildings and structures during a bushfire; (d) minimise bushfire risk from build-up of fuels around buildings and structures. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating achievement of this performance outcome.	no approved bushfire management plan, where on a lot great than 10ha, located in the area of lowest risk from bushfire on the site; and (d) if there is no approved building protection zone and no approved bushfire management plan, where on a lot greater than 2,500m^2: (i) located away from ridgelines in compliance with Figure a; (ii) located on land with a gradient less than 15%; (iii) preferably located on east- to south-facing slopes and avoiding north- to west-facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffer area sub-category or the Medium hazard buffer area sub-category; (iv) with setbacks to hazardous vegetation 1.5 times the predominant mature canopy height, or 20m whichever is greater so that vegetation does not overhang a building.	

	AO2.2 Development other than an extension to an existing building is sited within a building protection zone extending a minimum of 20m from the outermost projection of the main building or any habitable structure or to the maximum extent possible on sites less than 2500m^2 where a building protection zone would extend into neighbouring properties; and (a) clusters buildings and structures in the building protection zone; (b) designs the inner 10m of the building protection zone to maintain a very low fuel state in the first 10m, and a fuel-reduced state to the extent of the building protection zone, in compliance with Figure b and Figure c. Note—The building protection zone includes the dwelling and all ancillary structures and may extend to a road or a building protection zone in an adjoining site.	**Not applicable. The development is an extension of an existing structure.**
PO3 Development utilises fencing that: (a) does not contribute to the spread of bushfire; (b) in an urban area or in proximity to accommodation uses, contributes to reducing bushfire hazard to a	**AO3.1** Development for a fence within 20m of any building used for accommodation comprises non-combustible or fire retardant materials.	**Compliant. While the development is still in the design phase, any fences within 20m of any building used for accommodation will be constructed of non-combustible or fire retardant materials.**
	AO3.2	**Compliant. While the development is still in the design phase, any fences constructed as part of**

building; (c) facilitates the safe movement of fauna.	Development for a fence: (a) incorporates gaps and spacing to allow the safe movement of fauna; or (b) is designed to enable fauna to climb the fence.	**the development will incorporate gaps and spacing to allow the safe movement of fauna; or will be designed to enable fauna to climb the fence.**
PO4 Development ensures that the location, siting, and design of development and associated driveways and access routes: (a) avoid potential for entrapment during a bushfire; (b) facilitate safe and efficient emergency services to access and egress the site during a bushfire; (c) enables safe evacuation of the site during a bushfire for site occupants. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO4** Development ensures that: (a) the length of driveways or access routes does not exceed 70m between the most distant part of any occupied building and the nearest part of the public road; or (b) where the length of the driveway or access route exceeds 70m: (i) the driveway or private access route design meets the requirements of emergency vehicles in compliance with Table 8.2.5.3.C; (ii) the driveway or access route provides all weather access for two-wheel-drive vehicles; (iii) where relying on a private access route or driveway longer than 200m to reach a public road, a safe alternative access and egress route is provided.	**Compliant. While the driveway exceeds 70 m, it is an all weather road that meets the requirements of Table 8.2.5.3.C. As per the Bushfire Management Plan (this document), a safe alternative access and egress route will be provided as part of the development.**
PO5 Development has adequate road access to the site for emergency vehicles and	**AO5** Development has frontage to a constructed, all-weather public road capable of carrying emergency service	**Compliant. The development is part of the Belmont Shooting Range complex, with frontage to Old Cleveland Road.**

safe evacuation in a bushfire.	vehicles.	
PO6 Development makes adequate provision for fire-fighting requirements, including water supply.	**AO6** Development ensures that: (a) a reliable reticulated water supply and water pressure is available for fire-fighting requirements with water supply and pressure, which is in compliance with the standards specified by the relevant utilities provider; or: (b) where sufficient reticulated water supply is not available for: (i) residential lots, there is a minimum water supply available and retained for fire-fighting purposes in compliance with Table 8.2.5.3.B, which may be in the form of a separate tank or a reserve section as part of a main water supply tank; or (ii) development other than for residential lots involving new premises or an existing premises with a gross floor area greater than 50m^2, on-site water storage is provided which is appropriate to the use, according to the standards specified by the relevant emergency services agency and is not less than 5,000L.	**Compliant. While the development is still in the design phase, adequate provision for fire-fighting requirements, including water supply, will be available as appropriate for the development.**

	Note—Water supply for fire fighting is in addition to water supply for household use. Where a non-reticulated supply of water is required, swimming pools, creeks and dams should not be used as a substitute for a dedicated static supply as these sources of water are not reliable during drought conditions.	
PO7 Development ensures that the water supply provided for fire-fighting is safely located and freely accessible for fire-fighting purposes at all times.	**AO7** Development, for which sufficient reticulated water supply is not available, provides: (a) a water supply outlet located away from any potential fire hazards, such as gas bottles; (b) a hardstand area of 11m by 3.5m for fire-fighting vehicles within 2m of the water supply outlet; (c) tanks on the bushfire hazard side of the buildings with adequate shielding for the protection of fire fighters; (d) pumps which are shielded from bushfire hazard; (e) an outlet pipe which is 50mm in diameter and fitted with a 50mm male camlock (standard rural fire brigade fitting); (f) that any underground tank for fire-fighting purposes has an access hole of 200mm to allow a tanker to refill direct from the tank; (g) that any above-ground water tank is made of concrete or metal and its stand is protected from bushfire hazard;	**Compliant. While the development is still in the design phase, should reticulated water supply not be available, appropriate water supply and associated infrastructure as specified by the code will be available on site.**

	(h) that all above-ground water pipes external to the building are metal, including and up to any taps. Note—Plastic tanks are not to be used.	
Additional performance outcomes and acceptable outcomes for all development in the Biodiversity areas overlay if on a site larger than 2,500m^2		
PO8 Development through the siting, design, and construction of buildings, access routes and fire maintenance trails, and ongoing site management: (a) provides effective separation from sources of bushfire risk; (b) responds to the bushfire risk in that location; (c) maintains the safety and protection of people and property over time; (d) maximises the protection of vegetation in areas of high biodiversity value. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome that ensures:	**AO8** Development locates building protection zones as shown on Figure b and Figure c, driveways and access routes and any fire maintenance trails: (a) outside of the Biodiversity areas overlay; or (b) within the existing disturbed, degraded or cleared areas, using natural fire breaks to avoid vegetation clearing and to avoid or otherwise minimise fragmentation or incursions into a habitat area, fauna movement corridor or remnant vegetation.	**Compliant. Clearing will be required as a health and safety requirement to manage lead associated with shotgun use. While this will necessitate clearing vegetation shown as "high ecological significance" on the Brisbane City Plan Biodiversity Overlay, clearing will be minimised as follows:** **- Only clearing the understorey where feasible, thus leaving the tree canopy intact (in the "uncleared operational area - see Appendix D of the Bushfire Management Plan)** **- Superimposing the access, egress, and fire trail network on existing tracks and trails**

• ongoing site management, such as the bushfire risk to buildings, does not increase beyond the standard to which they have been designed and constructed; • appropriate design and maintenance of the site, and access routes and driveways.		
Section B—If for assessable development other than reconfiguring a lot		
PO9 Development ensures that the following uses avoid being located in the bushfire overlay area and otherwise support safe and efficient evacuation and emergency services access to the site during a bushfire: (a) the introduction of significant worker or resident populations in a bushfire hazard area; (b) the location of vulnerable uses;	**AO9.1** Development: (a) does not increase the number of people living, working on or visiting the site by more than 10%; or (b) increasing the number of people living, working on or visiting the site, or vulnerable, difficult to evacuate or assembly uses by more than 10%, implements the recommendations of an approved bushfire management plan, which identifies measures that address the identified bushfire risk relevant to the development.	**Compliant. The Bushfire Management Plan prepared for the development (this document) provides measures that address bushfire risk, including measures relating to bushfire prevention, bushfire preparedness and control, and access and egress in the event of a bushfire.**

(c) the introduction or expansion of difficult to evacuate uses; (d) the congregation of large numbers of people in a bushfire hazard area including assembly uses. Note—This includes consideration of appropriate alternative shelter for vulnerable uses, management of health and wellbeing requirements during evacuation, safe site operation, and access and egress arrangements in bushfire events. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO9.2** Development provides alternative access routes that meet the road design requirements of items 1–7 in Table 8.2.5.3.C, for the following: (a) an extension to existing premises which increases the number of people living, working on or visiting the site by more than 10%; (b) the introduction of vulnerable, difficult to evacuate or assembly uses.	**Compliant. The Bushfire Management Plan prepared for the development (this document) provides a plan outlining main vehicle access and vehicle access and egress alternatives, which are to be according to the standard provided in Table 8.2.5.3.C.**
Additional performance outcomes and acceptable outcomes if involving storage or handling on site of hazardous chemicals in quantities that would be equivalent to or exceed the threshold quantities set out in Table 8.2.5.3.D		
PO10 Development does not cause: (a) unacceptable risk to people, property and the environment due to the impact of bushfire on the storage or handling on site of hazardous chemicals; (b) excessive danger or difficulty to emergency services for emergency	**AO10** Development for storage or handling of hazardous chemicals: (a) is not located within the bushfire overlay; or (b) complies with an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure the development:	**Not applicable. The development will not result in storage or handling on site of hazardous chemicals as per Table 8.2.5.3.D.**

response or evacuation.	(i) mitigates the bushfire risk relevant to the development; (ii) does not pose an unacceptable risk to people, public health and safety or risk environmental harm; (iii) does not present significant difficulties to emergency services for emergency response or evacuation. Note—Bushfire management plans and site-based risk assessments are prepared in accordance with the Bushfire planning scheme policy. Guidance on the preparation of a hazard and risk analysis is provided in the Industrial hazard and risk assessment planning scheme policy. Note—Any risk mitigation measures, including construction of underground tanks or fire-protected above-ground tanks or package stores, are in compliance with AS 1940-2004 The storage and handling of flammable and combustible liquids.	
Additional performance outcomes and acceptable outcomes for essential community infrastructure		
PO11 Development for essential community infrastructure is located, designed and sited to: (a) protect the safety of people during a bushfire; (b) not create or increase the exposure	**AO11** Development for essential community infrastructure: (a) is ancillary to and not relied on for the provision of the essential service during a bushfire; or (b) implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures	**Not applicable. The development does not represent essential community infrastructure.**

of people to an unacceptable risk from a bushfire; (c) minimise the risk to vulnerable populations from a bushfire; (d) mitigate the impacts on the community and environment from the effects of a bushfire on the development.	that: (i) ensure the development allows for safe and efficient emergency access and site evacuation during a bushfire; (ii) do not pose an unacceptable risk to people on a premises during a bushfire; (iii) ensure the development is not at risk of failure during a bushfire which results in health or safety risks or adverse environmental impacts; (iv) enable people and property to be defended safely and effectively from a bushfire.	
PO12 Development for essential community infrastructure is able to function effectively during and immediately after bushfire events.	**AO12** Development for essential community infrastructure: (a) is ancillary to and not relied upon for the provision of the essential service during a bushfire; or (b) containing elements vital to the function of the essential service during a bushfire is not located in the Bushfire overlay area; or (c) implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure that: (i) essential community infrastructure is able to function during bushfire events;	

	(ii) access necessary to maintain safety or function of the development is not compromised by a bushfire; (iii) mitigation measures are not unduly reliant on human activation to respond to a bushfire; (iv) the safe storage of valuable records or items of cultural or historical significance, including storage of public records under the *Public Records Act 2002*, is able to be maintained during a bushfire event.	
Additional performance outcomes and acceptable outcomes if for landscaping or a park landscape plan is a requirement for development		
PO13 Development provides landscaping that does not create an unacceptable risk to people or property and provides for ongoing management of risk to the development and people from a bushfire.	**AO13** Development is in compliance with a landscaping plan which: (a) is prepared in compliance with an approved bushfire management plan; (b) preserves the requirements of any building protection zone; (c) does not increase the exposure of a habitable building not located in a building protection zone to a bushfire hazard. Note—The requirements of a building protection zone are shown in Figure b and Figure c.	**Not applicable. The development does not require significant landscaping.**

PO14 Development for a park is designed so that the park: (a) is practical to maintain and requires minimal resources to be restored to its designed function and condition after a bushfire; (b) provides for safe and efficient site evacuation and efficient emergency services access avoiding potential for entrapment during a bushfire; (c) does not place unacceptable bushfire risk on an adjoining or nearby site, people and assets; (d) provides efficient access for fire fighting; (e) provides ongoing protection from bushfire for major park assets and buildings. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO14** Development provides a park landscape plan that complies with a bushfire management plan prepared in accordance with the Bushfire planning scheme policy.	
Section C—If for reconfiguring a lot		**Not applicable. The development is not reconfiguring a lot.**

Note—The following performance outcomes and acceptable outcomes only apply to the following categories of reconfiguring a lot: • Rural: Reconfiguring a lot in a non-urban setting. • Urban (7 or more lots): Reconfiguring a lot in an urban or emerging community area which creates 7 or more lots, or involves the opening of a new road. • Urban (fewer than 7 lots): Reconfiguring a lot in urban areas which creates 6 or fewer new lots and does not involve the opening of a new road.		
PO15 Development addresses the bushfire hazard determined by a site-specific bushfire hazard assessment. Note—Bushfire hazard is assessed based on the vegetation existing on site, adjacent and nearby to the site at the time of application, except where reconfiguring a lot, when the level of bushfire hazard posed by any areas subject to revegetation is assessed as if that area had reached its mature state.	**AO15** Development addresses the level of bushfire hazard identified in a site-specific bushfire hazard assessment undertaken in accordance with the Bushfire planning scheme policy, which confirms the level of bushfire hazard for the part of the site in which development is proposed, and the location of hazardous vegetation posing a risk to the development in a bushfire. Note—Where a bushfire hazard assessment determines that the bushfire hazard for the part of the site in which development is proposed is 'low', no further assessment against this code is required.	
PO16 Development does not materially increase the number of premises exposed to unacceptable risk during bushfire events.	**AO16** Development does not materially increase the number of people living or working in the Bushfire overlay area.	

PO17 Development is designed to: (a) mitigate the risk of bushfire hazard to each lot; (b) limit the spread of bushfire within the reconfiguration; (c) achieve and maintain sufficient separation distance between development and hazardous vegetation to minimise bushfire hazard to future buildings during a bushfire; (d) allow for emergency services access. (e) locate buildings within a building protection zone Note—Lot size, location, configuration, dimensions and building measures are balanced to achieve an acceptable	**AO17.1** Development requires that lot number, size, shape and layout allow for the siting of future buildings within the lowest hazard locations on the site being located: (a) within a building protection zone in accordance with Figure b and Figure c; (b) to achieve separation distances between the development and hazardous vegetation of at least 1.5 times the predominant mature tree canopy height; (c) away from ridgelines and hilltop sites in compliance with Figure a; (d) on land with a gradient less than 15%; (e) preferably on east to south facing slopes and avoiding north to west facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffers sub-category or Medium hazard sub-category.	

level of risk to future occupants. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO17.2** Development ensures that the bushfire attack level of the nominated development footprint plan does not exceed: (a) in a rural category, bushfire attack level 19 (calculated in accordance with AS 3959-2009 Construction of buildings in bushfire-prone areas); (b) in an urban category, bushfire attack level 12.5 (calculated in accordance with AS 3959-2009 Construction of buildings in bushfire-prone areas).	
PO18 Development promotes safe site access, avoids creating a potential entrapment situation and supports accessibility and manoeuvring for fire fighting during bushfires. Note—This includes easements and boundary realignments. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO18** Development provides a lot layout which: (a) provides direct road access and egress for new lots to public roads, rather than the creation of easements; (b) in an urban category, avoids creating a new lot less than or equal to 2,500m^2 which directly adjoins hazardous vegetation; (c) in an urban category, locates a future building protection zone to avoid a driveway of longer than 70m from the road frontage to a habitable building; (d) in a rural category, provides for an alternative access where the private access roads or driveways are longer than 200m to reach a public road.	

PO19 Development ensures that the road layout and design provides: (a) efficient emergency services access to sites and manoeuvring within the subdivision; (b) safe and efficient movement of residents, workers and visitors out of the subdivision and away from an approaching bushfire; (c) safe and efficient movement of emergency services into the subdivision; (d) alternative egress routes considering the most likely bushfire scenarios; (e) ongoing availability and maintenance of access and egress routes for the purposes of evacuation and emergency services access. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO19.1** Development involving a new road or fire maintenance trail is designed and constructed in compliance with: (a) Table 8.2.5.3.C; or (b) an approved bushfire management plan.	
	AO19.2 Development has a road layout and design which: (a) provides for alternative access routes to the subdivision, by public roads that meet the requirements in Table 8.2.5.3.C and are able to access the arterial road network; (b) excludes cul-de-sacs, except where a perimeter road with a cleared width of 20m isolates the development from hazardous vegetation; (c) does not include dead-end roads or if a dead-end road is unavoidable, it is a maximum of 60m long, or 200m where located in the Environmental management zone, Conservation zone, Rural zone, or Rural residential zone, and an alternative emergency evacuation and egress route away from the most likely source of bushfire risk is provided for lots where multiple road access or exit points are not possible; (d) links road within the subdivision to, or provides for	

	future links to roads in adjacent subdivisions. Note—Where staged development occurs or development is in accordance with an approved master plan, a temporary perimeter road may be considered, subject to availability of reticulated water supply.	
PO20 Development involving new premises provides adequate infrastructure to support fire fighting.	**AO20.1** Development involving new premises ensures that: (a) lots have access to reticulated water supply and water pressure available for fire-fighting requirements with water supply and pressure that accord with the standards specified by the relevant utilities provider; or (b) where reticulated water supply is not available for: (i) residential lots, there is a minimum water supply available and retained for fire-fighting purposes in compliance with Table 8.2.5.3.B,	

	which may be in the form of a separate tank or a reserve section as part of a main water supply tank; (ii) development other than residential lots, onsite water storage is provided which is appropriate to the proposed future use according to the standards specified by the relevant emergency services agency and is not less than 5,000L. Note—Water supply for fire-fighting is in addition to water supply for household use. Where a non-reticulated supply of water is required, swimming pools, creeks and dams should not be used as a substitute for a dedicated static supply as these sources of water are not reliable during drought conditions.	
	AO20.2 Development provides fire hydrants in accordance with Central SEQ Distributor-Retailer Authority, Queensland Urban Utilities (incorporating Water Services Association of Australia) Standards.	

Table 8.2.5.3.B—Dedicated water supply requirements for residential lots without access to reticulated water supply

Development type	**Water requirement**
Lot less than 1,000m^2	5,000L per lot
Residential lot between 1,000m^2 and 9,999m^2	10,000L per lot
Residential lot greater than 1ha	20,000L per lot

Multiple dwelling	5,000L per unit up to a maximum of 20,000L

Table 8.2.5.3.C—Road design requirements for emergency vehicle access

Item	Requirements	Public road	Private access roads or driveways	Fire maintenance trails
1	Horizontal clearance	6m total: minimum carriage way width of 4m with additional 1m wide strip on each side (clear of bushes and long grass) Note—Roads should provide sufficient width to allow fire-fighting vehicle crews to work around the vehicle with fire-fighting equipment.	A minimum formed width of 4m. Note—Gates must also provide for this clearance.	A minimum clearance width of 6m. A minimum formed width of 4m.
2	Vertical clearance	Minimum vertical clearance of 4m to any overhanging obstructions including tree branches.	Minimum vertical clearance of 4m to any overhanging obstructions including tree branches. 5m clearance to all powerlines	
3	Vegetation clearing	Maintained cleared vegetation 10m on either side of centre-line	Maintained cleared vegetation with minimum 6m cleared width	
4	Maximum grade	Maximum gradient of 12.5%	A maximum gradient of	A maximum gradient of 12.5%

			12.5% where exceeding a distance of 70m from the road	with adequate drainage to prevent soil erosion and minimise ongoing trail maintenance
5	Cross fall	Cross fall does not exceed 10 degrees	—	—
6	Surface rating	Minimum 15t rated surface for urban appliances, which do not operate on unsealed roads or trails; Minimum 6.5t rating for rural fire-fighting appliances.		
7	Pavement type	All weather		
8	Turning	For both public and private roads and fire maintenance trails: 6m inner radius 12m outer radius		
9	Access, passing and reversing	Reversing bays using the access to properties to reverse fire tankers, which are 6m wide and 8m deep to any gates, meeting above turning requirements; and/or A passing bay every 200m, 20m long by 3m wide,	Fire maintenance trails provide areas for vehicles to pass or turn at intervals of not more than 400m with a maximum grade of 5%. Fire maintenance trails have vehicular access at each end. Fire maintenance trails are either located on public land or within an	

		making a minimum trafficable width of 7m at the passing bay. Note—Some short constrictions in the access may be accepted where they are not less than the minimum 3.5m and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed.	access easement that is granted in favour of Brisbane City Council and Queensland Fire and Rescue Service.

Note—Urban appliances do not operate on unsealed roads or trails. Urban appliances require 15 tonne rated surfaces. Rural appliances are typically 6.5t Gross Vehicle Mass (GVM)(4x4)

Table 8.2.5.3.D—Threshold quantities for hazardous chemicals

Item	Description of hazardous chemical		Threshold quantity
1	Flammable gases	Category 1	5,000L
2	Gases under pressure	With acute toxicity, categories 1, 2, 3 or 4	500L
3		With skin corrosion categories 1A, 1B or 1C	500L
4		Aerosols	10,000L
5		Not stated elsewhere in this table	10,000L
6	Flammable liquids	Category 1	500L
7		Category 2	2,500L

8		Category 3	10,000L
9		Any combination of chemicals from items 6 to 8 where none of the items exceeds the threshold quantities on their own	10,000L
10		Category 4	100,000L
11	Self-reactive substances	Type A	50kg or 50L
12		Type B	500kg or 500L
13		Type C to F	2,500kg or 2,500L
14	Flammable solids	Category 1	2,500kg
15		Category 2	10,000kg
16		Any combination of chemicals from items 12 to 15 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L
17	Pyrophoric liquids and pyrophoric solids	Category 1	500kg or 500L
18	Self-heating substances and mixtures	Category 1	2,500kg or 2,500L

19		Category 2	10,000kg or 10,000L
20		Any combination of chemicals from items 17 to 19 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L
21	Substances which in contact with water emit flammable gas	Category 1	500kg or 500L
22		Category 2	2,500kg or 2,500L
23		Category 3	10,000kg or 10,000L
24		Any combination of chemicals from items 21 to 23 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L
25	Oxidising liquids and oxidising solids	Category 1	500kg or 500L
26		Category 2	2,500kg or 2,500L
27		Category 3	10,000kg or 10,000L

28		Any combination of chemicals from items 25 to 27 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L
29	Organic peroxides	Type A	50kg or 50L
30		Type B	500kg or 500L
31		Type C to F	2,500kg or 2,500L
32		Any combination of chemicals from items 30 and 31 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L
33	Acute toxicity	Category 1	500kg or 500L
34		Category 2	2,500kg or 2,500L
35		Category 3	10,000kg or 10,000L
36		Any combination of chemicals from items 33 to 35 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L
37	Skin corrosion	Category 1A	500kg or 500L

38		Category 1B	2,500kg or 2,500L
39		Category 1C	10,000kg or 10,000L
40	Corrosive to metals	Category 1	10,000kg or 10,000L
41		Any combination of chemicals from items 37 to 40 where none of the items exceeds the threshold quantities on their own	10,000kg or 10,000L

Notes—

- In item 2, gases under pressure with acute toxicity, category 4, only applies up to a LC50 of 5000ppmv. This is equivalent to dangerous goods of Division 2.3 as defined in the Australian code for the transport of dangerous goods by road and rail.
- Item 4 includes flammable aerosols.
- If a flammable liquid category 4 is used, handled or stored in the same spill compound as 1 or more flammable liquids of categories 1, 2 or 3, the total quantity of flammable liquids categories 1, 2 or 3 must be determined as if the flammable liquid category 4 had the same classification as the flammable liquid in the spill compound with the lowest flash point. Example: For placarding and manifest purposes, a spill compound containing 1000L of flammable liquid category 1 and 1000L of flammable liquid category 4 is considered to contain 2000L of flammable liquid category.

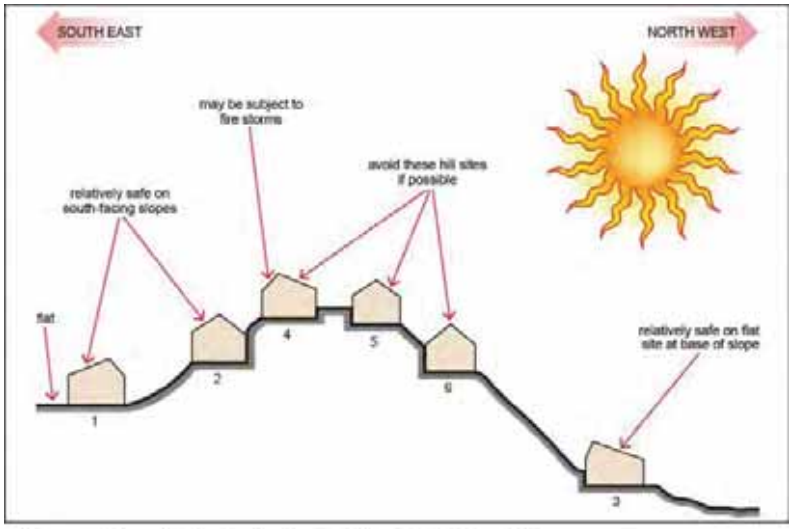


Figure a—Preferred building location to minimise bushfire risk intermediate

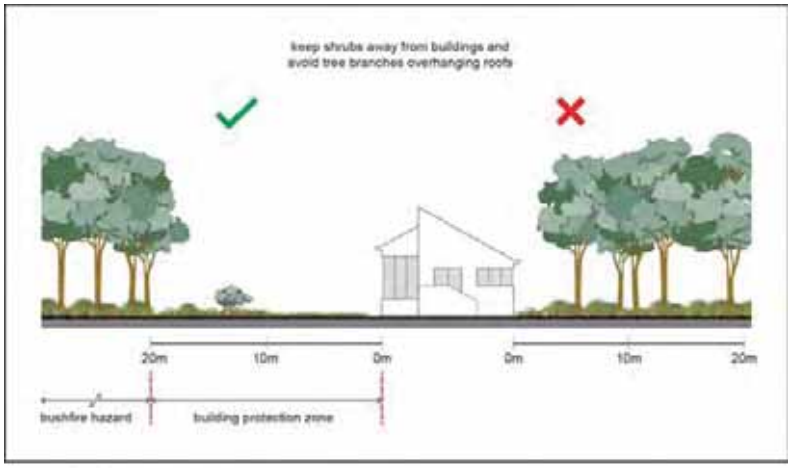


Figure b—Building protection zones

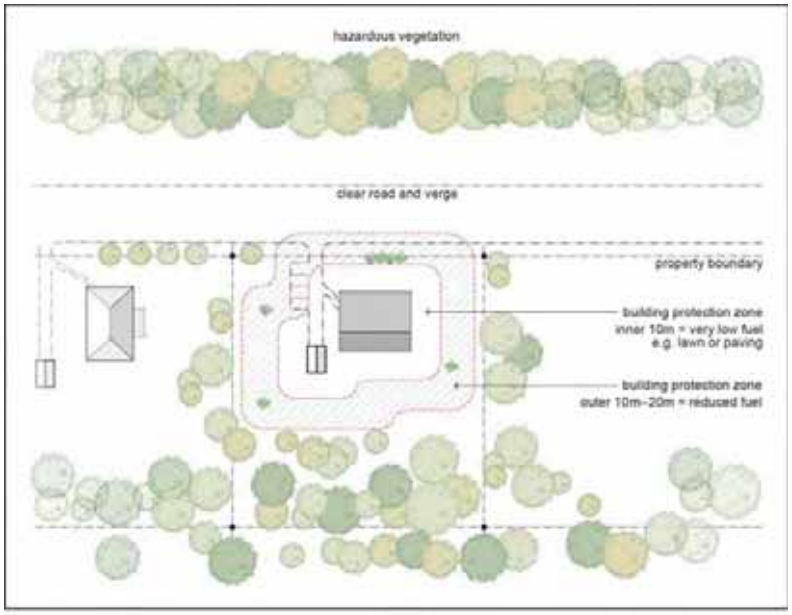


Figure c—Requirements for a building protection zone

Note—Building Protection Zone (minimum 20m):

The building protection zone may contain roads, bushfire management trails, cleared road verges, and on a site less than or equal to 2,500m^2 the building protection zone on a neighbouring site where the land use is compatible. The building protection zone includes all buildings and ancillary structures. Trees should be at least their mature canopy height away from buildings and not overhang the roof.

Inner 10m—Very low fuel area:

The inner 10m of the building protection zone directly adjacent to any building or structure is kept free of litter and may be paved or concreted, gravel or lawn. This zone prevents continuity of fuel such as shrubs, leaf litter build up, extending to the building. Trees are retained or planted as individual specimens and are a distance equal to their mature canopy height away from buildings. Trees do not overhang buildings.

Outer 10m—Reduced fuel area:

The outer 10m of the building protection zone may contain shrubs where not under trees, and trees may be retained or planted where spaced to avoid a continuous canopy across or into a site. This area is designed to reduce bushfire intensity, shield buildings from radiant heat, and prevent flames transferring from ground fuels to the canopy of trees. Trees are retained or planted sparsely or in small clumps to avoid providing a continuous canopy towards the building. Shrubs are not planted beneath trees as these act as a 'fuel ladder' to the tree canopy. Trees maintain a minimum of a distance equal to their mature canopy height away from buildings, and do not overhang buildings.

Appendix L

Traffic Advice

Department of Housing and Public Works

Queensland Government

1 November 2018
Our Ref: 17BRT0343-02-let
Your Ref:

Attention: Adam Rodney

Mode Design

Suite 1, 142 Bundall Road,

Bundall QLD 4217

BELMONT SHOTGUN RANGE, INFRASTRUCTURE DESIGNATION (ID)

1.0 Project Background and Description

As part of the 2018 Gold Coast Commonwealth Games, a new three position shotgun and trap facility was constructed in the north eastern corner of the Belmont Shooting Complex, as indicated in the figure below. The new facility was constructed for use only during the Commonwealth Games.

This brief traffic assessment considers the ranges' continued use beyond the Commonwealth Games, and the construction of five additional shooting positions, for a total of eight.

The scope of this assessment covers both internal design, and a basic internal/external impact assessment.

The architectural plans, produced by Mode Architecture, for both the three position range constructed for the Commonwealth Games, and the expanded eight position range now proposed, are included as attachments at the end of this document.

`

2.0 Estimated Range Usage

Two modes of operation are anticipated for the expanded legacy range as described below. The estimated usage is based on surveys conducted at the existing 12 position BGC shotgun range.

1. Normal operations (inclusive of monthly competition Sundays) will occur between 5 and 7 days per week. The balance of the existing complex generally operates from 1pm-5pm Monday to Thursday and from 8am to 5pm Friday to Sunday. Similar hours of operation could reasonably be expected at the expanded legacy range. An average of up to 60 shooters per day (+ say 10% for spectators / officials) will use the facility in this scenario.
2. Moderate sized events, will occur 1-2 times per year on weekends, commencing at 8:00am, with up to 140 shooters per day (+ say 10% for spectators / officials).

Of the above daily figures, it is estimated that up to 80% may be on site at any given time.

3.0 Estimated Parking Demands

Based on the assumed person numbers noted above, and assuming an average car occupancy of 1.25 per car (during normal operations) and 1.5 per car (during competitions/events), the expected parking demand is roughly between 45 during normal operations, to 85 during events. Based on the above assumptions, and allowing for 10% vacancy, a parking supply of 95 spaces is considered appropriate.

As part of the build for the Commonwealth Games, a hardstand area (gravel finish) was constructed immediately adjacent to the range. The hardstand covers approximately 6000sqm, and is ideally suited for use as a low turnover car park. Assuming a very generous 45sqm per parking space (based on the informal, unmarked nature of the parking area), this area could easily accommodate approximately 130 cars. Consequently, the hard stand can accommodate the parking demands calculated above.

If this space were to be formalised, significant efficiencies could be realised, with an average of say 35sqm per parking space, thus requiring a smaller footprint for the required number of parking spaces – approximately 3325sqm for 95 parking spaces.

4.0 Traffic Generation and Impacts

During normal operations, arrivals are expected to be distributed across the day, with no obvious or significant peak. Hourly entry volumes are not expected to exceed 20vph.

During events, it is estimated that up to 80% of competitors / spectators / officials could arrive in the hour immediately prior to the start of the event (ie 85vph, taking into consideration car occupancy).

Departures will be similarly distributed in both scenarios.

Internal Impacts

Given the very low traffic volumes generally using the broader site, this additional traffic is unlikely to cause any operational issues for the internal road network during either normal operations or events.

External Impacts

At 20vph, the estimated traffic generation during normal operations is considered very minor, and given a) the access from Old Cleveland Road is restricted to left-in / left-out movements, and b) the recent construction of a dedicated auxiliary left turn lane (AUL) into the site, the anticipated impacts will be both minimal, and managed appropriately.

Whilst traffic generation during events is estimated to be somewhat higher (85vph), the recently constructed auxiliary left turn lane will have sufficient capacity to comfortably accommodate it. Furthermore, it should be noted that these events will generally occur on weekends, starting in the early morning between 8am and 9am, when traffic on Old Cleveland Road is relatively light.

Consequently, the impact of the additional traffic generated by the new shotgun range on the external state controlled road is expected to be minimal.

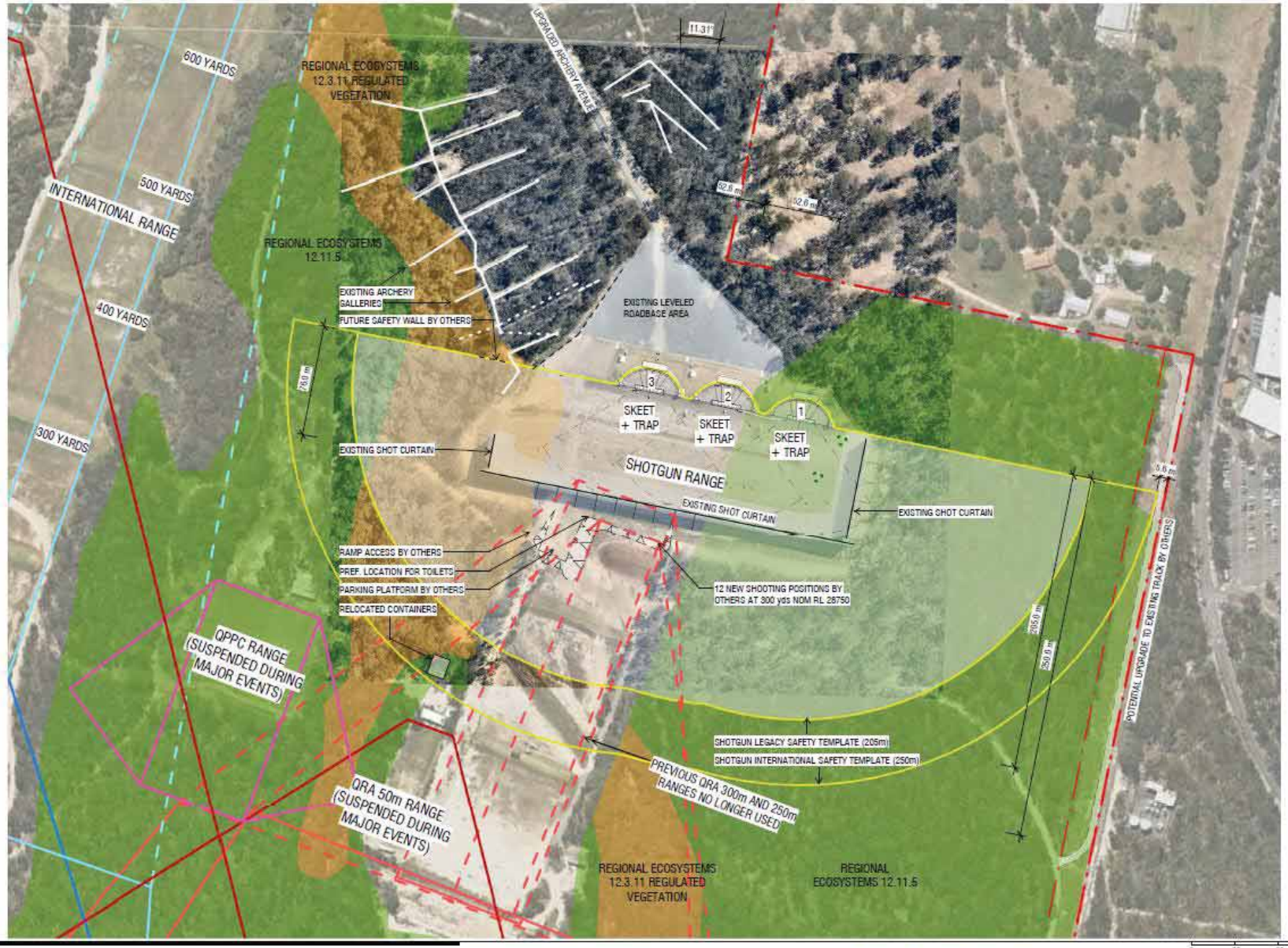
5.0 Internal Roads

As part of the build for the Commonwealth Games, the access road to the range was significantly upgraded, being widened to 6m, and fully paved, as far north as the entry to the adjacent archery range. North and west of the archery range entry, however, the existing road has a reduced width, and consequently, it is proposed to upgrade any narrow sections of this road to a 6m carriageway to maintain a consistent minimum width along its length.

6.0 Conclusion

Based on the development plans provided by Mode Architects, and on a physical inspection of the existing site, the proposed expansion of the Commonwealth Games legacy shotgun range, from 3 to 8 shooting positions, generally satisfies practical requirements with respect to parking supply and the width of the access road carriageway.

The impact of the additional traffic generated by the new shotgun range on both the internal roads and the external state controlled road is expected to be minimal, with the recently constructed auxiliary left turn lane (AUL) into the site contributing significantly to the external impact mitigation.



mode

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DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING INFRASTRUCTURE & PLANNING

BELMONT SHOOTING COMPLEX
1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

SHOTGUN RANGE - EXISTING

0 30 60 90 120

Project No:	14479BNE
Date:	13/03/18
Scale:	1 : 2500@ A3
Drawn / Check:	JS FG
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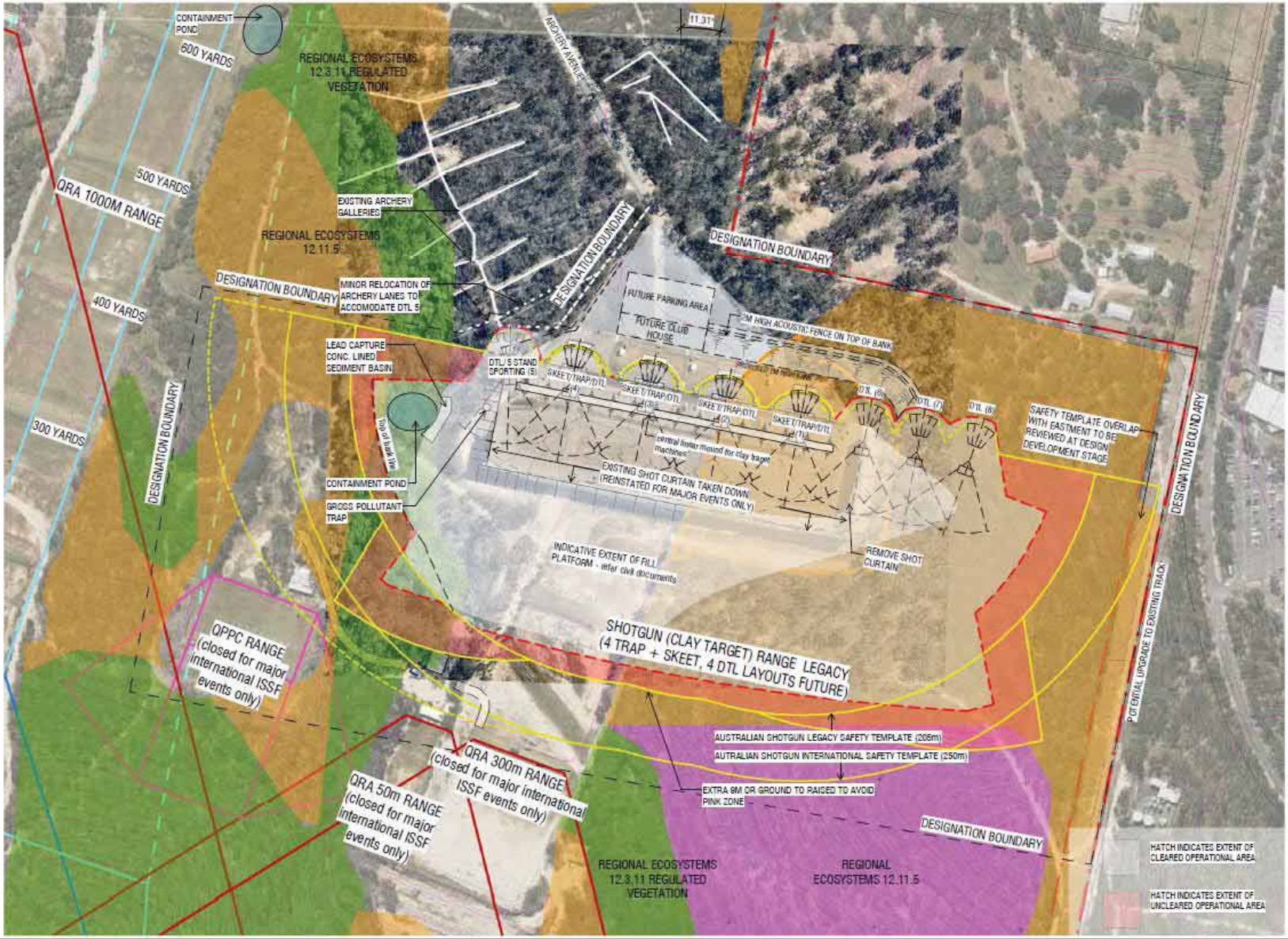

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1485 OLD CLEVELAND ROAD, BELMONT QLD

Ministerial Infrastructure Designation

Do not scale off this drawing

PROPOSED PERMANENT CLAY TARGET RANGE

0 20 40 60 80 100

Project No: 14479BNE
Date:
Scale: 1 : 2500@ A3
Drawn / Check: AutChecker

MP - 045F

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Appendix M

Geotechnical Report

Department of Housing and Public Works

Queensland Government

SOIL SURVEYS

PROJECT NO. 114-16656

MARCH 2016

MODE DESIGN CORPORATION PTY LTD

GEOTECHNICAL INVESTIGATION

PROPOSED CLAY TARGET RANGE

BELMONT SHOOTING CENTRE

OLD CLEVELAND ROAD, BELMONT

Soil Surveys Engineering Pty Limited
Specialists in Applied Geotechnics
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Gold Coast Office
Job No: 114-16656
Ref: 1-16656, 2016-03-15, BR VER 1
Author: Peter Elkington

15th March, 2016

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ATTENTION: KATHERINE RICKARD

Dear Sir,

RE: GEOTECHNICAL INVESTIGATION – PROPOSED CLAY TARGET RANGE - BELMONT SHOOTING CENTRE, OLD CLEVELAND ROAD, BELMONT

Enclosed is a copy of our report for the above project dated March 2016. An electronic copy of the report has been issued.

Authority to proceed with the investigation was received from Katherine Rickard on behalf of Mode Design and was dated 25th February, 2016.

Should you have any queries regarding this report, please do not hesitate to contact Peter Elkington at our Gold Coast office.

Yours faithfully,

P. ELKINGTON (RPEQ 7226)

for and on behalf of

SOIL SURVEYS ENGINEERING PTY LIMITED

TABLE OF CONTENTS

Appendices

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation carried out by Soil Surveys Engineering Pty Limited on the 7th March, 2016 for the Proposed Clay Target Range at the Belmont Shooting Centre, Old Cleveland Road, Belmont.

The objectives of this investigation were to assess subsurface conditions at the site in accordance with the Scope of Services detailed in Section 2.0.

2.0 SCOPE OF GEOTECHNICAL SERVICES

The scope of geotechnical services provided by Soil Surveys Engineering Pty Limited was directed towards evaluating the following items as detailed in our proposal 1-16656, 2016-01-09, PR 2 VER 1 dated 23rd February, 2016

- Investigation of the subsurface profile at the proposed target location and the pavement area by drilling, sampling and insitu testing with eight boreholes.
- Laboratory testing on selected samples to assess the reactive nature, strength and pavement design parameters of the subsurface material.
- Engineering analysis of site investigation and laboratory test results to evaluate:-
  - Trafficability and site preparation
  - Earthworks recommendations
  - Foundation recommendations
  - Retaining wall design recommendations
  - Pavement recommendations
  - Site management recommendations

3.0 PROPOSED DEVELOPMENT

It is understood that the development of a new Clay Target Shooting Range is proposed. Works are understood to involve the following:

- Cut and fill areas
- Concrete pavements for walkways, and storage containers
- Skeet house (small lightweight temporary structure with raft footing system)
- Trap houses (2.5m deep in-ground structures – retaining wall design
- Trap houses will be in natural ground, new fill material or a combination of both.

Shot curtain (15m high curtain wall. Timber poles with guy wire supports, and bored pier anchors). The shot curtain footings will be in natural ground, new fill material, or a combination of both.

4.0 GEOTECHNICAL INVESTIGATION

4.1 Field Investigation

Subsurface conditions at the site were investigated by drilling and sampling eight boreholes to depths of 4.5m, using an EVH2100 drilling rig. In addition, dynamic cone penetrometer tests were carried out adjacent to the boreholes.

The soil classification descriptions, field and laboratory testing were carried out in general accordance with Australian Standards.

AS.1726 - 1993	Geotechnical Site Investigations
AS.1289	Methods of Testing Soils for Engineering Purposes

Notes relating to this report, borehole records and a site plan showing the location of the boreholes are included in the Appendices.

4.2 Laboratory Testing

Laboratory testing was carried out on selected samples retrieved from the site investigation program and was directed towards assessing the reactivity and strength of the subsurface material.

Laboratory testing included:-

- Shrink/Swell Index - to assess the reactivity of the subsurface material.
- Unconfined Compressive Strength - to assess the strength of the subsurface material.

The results of the laboratory testing are contained in Appendix C.

5.0 GEOTECHNICAL MODEL

5.1 Subsurface Profile

Subsurface conditions encountered can be broadly grouped into three material types:-

- Fill Material
- Natural Soils
- Weathered Rock

Fill material was encountered in all borehole locations (with the exception of Borehole's 03, 09 and 11) to depths of between 0.25m and 0.6m comprising clay and gravel based materials.

Natural soils were encountered in all borehole locations generally comprising stiff to hard silty/sandy clay of medium to high plasticity overlying extremely weathered and distinctly weathered siltstone and sandstone of weak and medium strong strength and continued to the termination of the borehole.

Table 1 presents a summary of the encountered subsurface profile. Detailed borehole record sheets are appended to this report.

TABLE 1 SUBSURFACE PROFILE SUMMARY

BH NO.	FILL	NATURAL					BH TD
		Silty/ Sandy/ Gravelly Clay	Clayey Silt	Silty Sandy Gravel	Weathered Rock		
					XW	DW	
BH 01	0.0-0.5	0.5-0.7	NE	NE	NE	0.7-TD	1.1
BH 02	0.0-0.5	0.5-0.9	NE	NE	NE	0.9-TD	1.2
BH 03	NE	0.0-2.3	NE	NE	NE	2.3-TD	2.5
BH 04	0.0-0.5	0.5-2.7	2.7-TD	NE	NE	NE	3.0
BH 05	0.0-0.25	0.25-TD	NE	NE	NE	NE	3.0
BH 06	0.0-0.45	0.45-2.1	NE	NE	2.1-2.5	2.5-TD	2.7
BH 07	0.0-0.3	0.3-1.1	NE	NE	NE	1.1-TD	1.3
BH 08	0.0-0.45	0.45-1.9	NE	NE	NE	1.9-TD	2.1
BH 09	NE	0.0-0.6	NE	NE	0.6-1.2	1.2-TD	1.4
BH 10	0.0-0.6	0.6-1.4	NE	NE	1.4-2.2	2.2-TD	2.4
BH 11	NE	0.0-0.6 0.8-0.9	NE	0.6-0.8	NE	0.9-TD	1.1

Notes:
1. All depths in metres below ground level at time of investigation.
2. NE - Not Encountered; TD - Termination Depth.

5.2 Groundwater

Groundwater or subsurface seepage was not encountered in the boreholes at the time of drilling.

Groundwater levels would be expected to vary with seasonal and climatic conditions.

6.0 ENGINEERING ASSESSMENT

This section of the report includes evaluation of the following:-

- Earthworks
- Foundations
- Retaining Walls
- Pavements
- Site Management

6.1 Trafficability and Site Preparation

At the time of the field investigation, trafficability was considered to be fair with access available across the site for our truck mounted drilling rig.

However, seepage may occur through the surficial soils resulting in a subsequent loss of strength. This may limit trafficability and create difficulties for earthworks operations. This situation would be more pronounced if rainfall followed initial clearing, stripping and grubbing.

Problems may also arise from disturbance of the upper level soil fabric with removal of vegetation. Depressions could be formed resulting in water traps and potential softening of adjacent and underlying soils.

It is recommended that after stripping, clearing and grubbing, the exposed surface in the construction area be proof rolled to improve trafficability and identify areas of weak soils.

An important aspect of maintaining trafficability is drainage control. It should be ensured that runoff is diverted away from the construction area to prevent ponding of water. In addition, the construction area should be "sealed" in the event of rain.

Potential trafficability problems with this site should not be underestimated. The site may become untrafficable if appropriate drainage control measures, along with construction practices appropriate for site conditions, are not maintained.

Nevertheless, the contractor should fully inform himself of the ground conditions, on site, prior to commencement of earthworks. This requirement should be explicit in any earthworks specifications or contract.

6.2 Earthworks

It is understood that minor earthworks involving cut to fill and regrading of the site is required.

Earthwork procedures should be carried out in a responsible manner in accordance with AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments".

Earthwork procedures should include the following:-

- Clearing, stripping and grubbing should be carried out in areas subject to earthworks. Also all soils containing organic matter should be stripped from the construction area. This material is not considered suitable for use as structural fill.
- Sloping ground, etc. should be benched to "key in" fill material and optimise compaction. The benches should slope back at 1V:10H and be at least 0.5m wide. Wider benches to accommodate the width of the roller may need to be adopted in some situations. Figure 1 refers.

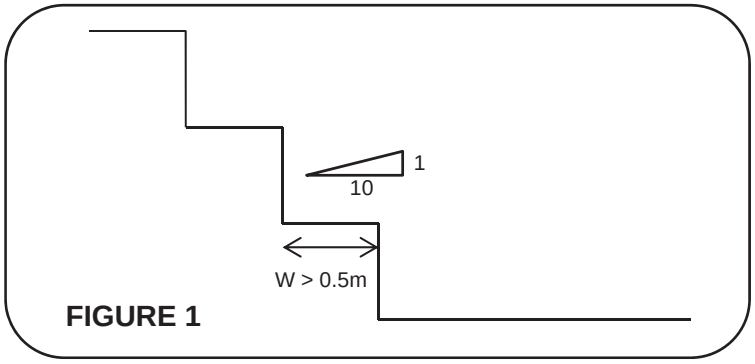

FIGURE 1

- Depressions formed by the removal of vegetation, underground elements etc. should have all disturbed weakened soil cleaned out and be backfilled with compacted select material.
- Following stripping, the exposed ground surface should be proof rolled using a vibrating pad foot roller of minimum weight of 10 tonnes to detect any soft or loose material and to compact the upper level soils. Loose soils, particularly loose surface clayey sands, should be compacted to the appropriate requirements. Soft, wet clays should preferably be removed. In areas of cut, proof rolling should be deferred until after the cut operation.
- The insitu soils, where free of organic and deleterious material, may be used for structural fill provided the moisture content of the soils on placement approximates the optimum moisture content required for compaction. This may require conditioning to bring the soils to optimum. However, it should be noted that the plastic clay soils could be expected to present difficulties in handling, placement and compaction if the appropriate moisture content could not be achieved, particularly if the clays were overly moist.

- Any imported fill, if needed to make up earthwork deficiencies, should be of fair to good quality and conform to the following general specification:-

  - Soaked CBR — Minimum of 10%
  - Liquid Limit — 30% - 40%
  - Plastic Limit — 8% - 15%
  - Maximum Aggregate Size — 75mm
  - Passing 2.36mm Sieve — 55% - 75%
  - Passing 0.425mm Sieve — 35% - 50%
  - Passing 0.075mm Sieve — 30% - 40%
  - Shrink/Swell Index — Maximum of 1.0%

- Guidelines for minimum relative compaction values for insitu soils and imported fill for the building and pavements are presented in Table 2 below.

TABLE 2 MINIMUM RELATIVE COMPACTION

Location	Minimum Dry Density Ratio (%)
Building Area	98
Pavement Area	
a) > 0.3m below pavement subgrade	95
b) ≤ 0.3m below pavement subgrade	98
Note: The recommended compactions are percentages of the maximum dry density determined by Australian Standard 1289 5.1.1 (Standard Compaction).	

- Field density testing should be carried out to check the standard of compaction achieved and the placement moisture content. The frequency and extent of testing should be as per guidelines in AS.3798-2007, Section 8.0.
- Backfilling for service trenches, etc. should use good quality material. The backfill should be placed in uniform layers over the full width of the excavations with the layers not exceeding 200mm thickness, loosely placed. The backfill material should be compacted to the specifications outlined above for insitu or imported cohesive material.
- Most soils encountered on site should be within the excavation limits of a small dozer (eg. Cat D4 or similar) in bulk earthworks and a medium sized backhoe (eg. Case 580 or similar) in trench excavations.

6.3 Building Foundations

Given the subsurface profile encountered, a combination of high level footings and deep foundation systems would generally be acceptable for the proposed building.

6.3.1 High Level Footings

Where appropriate, a high level footing system, designed to accommodate the anticipated ground surface movement and founded consistently into natural very stiff or better clays or weathered rock may be considered. Our recommendation is that all footings be founded at a minimum depth of 400mm below ground level and at least 200mm into the founding strata.

For footing design the following allowable base bearing capacities are recommended.

TABLE 3 ALLOWABLE BASE BEARING CAPACITY

Material	Allowable Bearing Capacity (kPa)
Fill	Not Recommended
Natural Clay - Very Stiff - Hard	200 400
Siltstone - XW	600

The bearing capacities are subject to site assessment of footing excavations by an experienced geotechnical engineer.

for the design of lateral capacity for the footings, the following parameters may be considered.

TABLE 4 DESIGN PARAMETERS FOR LATERAL RESTRAINT

Material	Cohesion Cu (kPa)	Friction Angle Ø	Allowable Horizontal Bearing Capacity (kPa)
Fill	-	28	Not Recommended
Natural Clay - Very Stiff - Hard	100 200	28 28	125 175
Weathered Rock - XW	300	32	300

6.3.2 Deep Foundations

A deep foundation system possibly utilising bored piers or screw piles founding in underlying clays could be considered as an alternative to high level footings if required.

The design of a deep foundation system should consider the following:-

- Compressional capacity
- Lateral capacity
- Uplift considerations
- Construction considerations

It is recommended that the deep foundation system on this project be designed in accordance with AS 2159-2007 'Piling - Design and Installation'. This code uses the limit state design method.

Compressional Capacity

The design of a single pile or a pile group must be such that both the geotechnical strength R^*_g and the structural strength R^*_s, are greater than or equal to the design action effect S*, ie.

$$R^*_g \geq S^* \text{ and } R^*_s \geq S^*$$

The design geotechnical strength (R^*_g) can be calculated as the ultimate geotechnical strength (R_{ug}) multiplied by the geotechnical strength reduction factor $Ø_g$.

For design of piles in clay and weathered rock the following equations may be used based on the limit state design method. However, piling contractors should be requested to provide their own calculations based on experience and relevant pile load tests.

$$R_{ug} = Q_b + Q_s$$

where $Q_b = A_b \times S \times N_s$

and, $Q_s = A_s \times S \times \alpha$

$$R^*_g = R_{ug} \times Ø_g$$

where R_{ug} = ultimate geotechnical strength of pile (kN)

Q_b = ultimate bearing capacity of pile base (kN)

Q_s = ultimate capacity of pile skin friction (kN)

R^*_g = design geotechnical strength of pile (kN)

$Ø_g$ = geotechnical strength reduction factor, adopt 0.48, (but refer also Table 4.1 in AS2159) (Higher values could be considered with appropriate engineering supervision).

N_c = bearing capacity factor which varies between 5.6 and 9 depending on depth of penetration of the pile (Nc = 9 for at least 4 pile diameters penetration).

A_b = area of pile base (m^2)

A_s = circumferential area of pile (m^2)

S = shear strength in the clay/weathered rock (kPa)

α = adhesion factor*

* The adhesion factor depends upon the method of installation of the pile and the shear strength of the soils and weathered rock being penetrated.

Shear strength and ultimate geotechnical strength (R_{ug}) parameters for the materials encountered on the site are outlined in Table 5 for preliminary design.

TABLE 5 ULTIMATE GEOTECHNICAL STRENGTH (R_{UG}) PARAMETERS

Material	Shear Strength (kPa)	Base Bearing (kPa)		Skin Friction (kPa)
		L>2D<4D	L≥4D	
Natural Clay -Very Stiff	100	600	900	25
- Hard	200	1200	1800	60
Siltstone - XW	300	1800	2700	90

Notes:
1. L= Pier socket into stratum, D = Pier diameter
2. Recommended geotechnical strength reduction factor ($Ø_g$) = 0.48.
3. Considering limit state analysis (AS 2159), the design geotechnical strength R^*_g is calculated by multiplying the ultimate geotechnical strength R_{ug} by the geotechnical strength reduction factor $Ø_g$, ie. $R^*_g = R_{ug} \times Ø_g$.
4. Should a "working stress" approach be adopted, a minimum factor of safety of 3.0 on base and 2.0 on skin friction is recommended.
5. Skin friction contribution from clays in the upper 1.5m of the profile should be ignored.
6. Higher capacities may be available in the DW or better rock subject to inspection and possible probe drilling to confirm the absence of reverse weathering below founding level.

Lateral Capacity

The lateral capacity of a pile is a function of many factors including the soil profile, pile fixity and eccentricity, embedment length and other factors such as failure mode, strength of the pile and the shear strength of the surrounding founding materials.

Horizontal pile capacities will be provided by passive resistance from the residual clays and weathered rock strata.

An assessment of a single pile's lateral capacity is provided by using Broms Charts as shown in Figure 2. Refer to Table 8 for applicable parameters. Piles are usually deemed to be classed as short when the L/B ratio is less than 10 to 12.

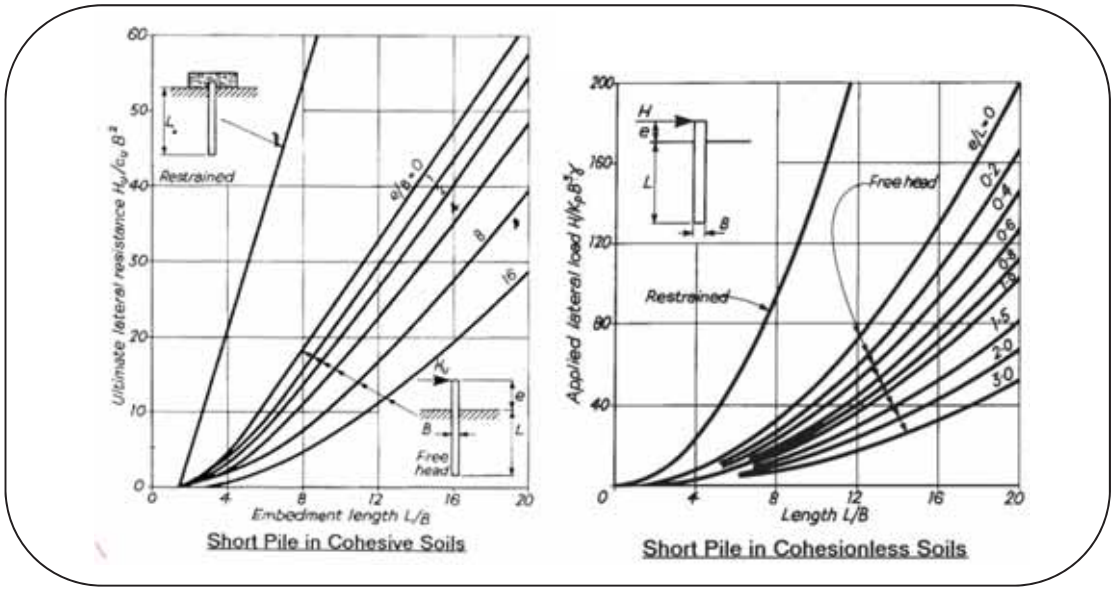

FIGURE 2 ULTIMATE LATERAL RESISTANCE OF SHORT PILES

TABLE 6 DESIGN VALUES FOR LATERAL PILE CAPACITY CALCULATION

Material	Design Cu Value (kPa)	Design Kp	Bulk Density (kN/m3)
Residual Clay - Very Stiff to Hard	100	2.56	18
Siltstone - XW	300	2.56	18
Where: Cu = Undrained Shear Strength (kPa) Kp = Passive Resistance Coefficient (neglecting friction effects)			

Should a 'working stress' approach be adopted, a factor of safety of between 2.5 and 3.0 should be adopted.

Tensional Effects - Potential Uplift

It is recommended that individual piers be assessed for uplift capacity as well as the overall pier capacity.

For a full clay profile, potential uplift pressure due to the effect of swelling soils in the top 1.5m of the clay profile must also be considered.

The design action effect S* can be calculated using the following formula as per AS.2159-1995 3.3.2(b)(i)(B) :-

$$S^* = 1.5F_{es}$$

where F_{es} = tensile load due to swelling pressure

The tensile load due to swelling pressure (F_{es}) can be calculated using the "Rational Pier Formula" as Fes = 0.15 times Swell Pressure multiplied by the pier surface area to a depth of 1.5m, where swell pressures are estimated to be in the range of 150kPa.

The design geotechnical strength R^*_g at the top of the pile can be calculated using Section 4.3.2 of AS.2159-1995 where for a pile without an enlarged base :-

$$R^*_g = \emptyset_g R_{ug}$$

$$where\ R_{ug} = f_{st} A_s + W$$

where

$\emptyset_g$ = Geotechnical strength reduction factor = 0.48 (refer Note 3, Table 5)

R_{ug} = Ultimate geotechnical strength of pile (kPa)

f_{st} = Skin friction (kPa) (refer Table 5)

A_s = Surface area of pile in intimate contact with soil (m^2) (ie. below 1.5m)

W = Weight of pile (kN)

It should be noted that in the above formula the weight of the pile could also include a component of dead load.

Construction Considerations

Given the nature and strength of the subsurface material encountered, it is recommended that inspections be undertaken by an experienced geotechnical engineer/engineering geologist from Soil Surveys Engineering Pty Limited during pier excavations to confirm the adequacy of the founding material.

Inspections should be carried out prior to placement of reinforcing steel and following cleaning of pier bases. It should be ensured that all loose material is removed from the base of piers prior to pouring of concrete. The use of a 'clean-out' bucket should be explicit in instructions to the drilling contractor. The practice of 'using water and spinning the augers' to remove loose material from the pier base is generally unacceptable.

Whilst groundwater was not encountered in boreholes at the time of the investigation, should a bored pier foundation system be adopted, some allowance for dewatering and the use of liners should be made.

6.4 Retaining Walls

It is understood that retaining walls may be required as part of the proposed development. The expected maximum retained height will be in the order of 2m.

For cantilever walls or temporarily braced walls, a triangular distribution should be considered.

For cantilever walls, or temporarily braced walls, which allow movement at the top, ie. at least 0.005H in clays, the active case (Ka) applies with a triangular distribution. For walls which cannot tolerate this movement, the at rest (Ko) case applies with a triangular distribution. Figure 3 refers.

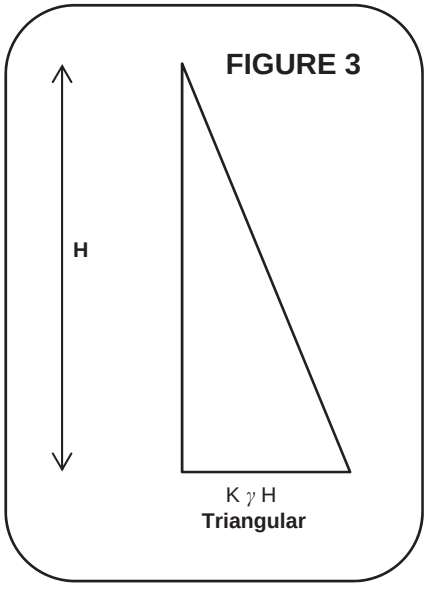

FIGURE 3

The lateral pressure distribution shown in Figure 3 does not include hydrostatic pressure or surcharge loadings.

The force exerted by the soil on a unit length of wall for the triangular distribution is given by:

$$P = 1/2\ \gamma\ H^2\ K$$

where P = force per unit length (kN/m)

γ = unit weight of soil

H = height of wall (m)

K = earth pressure co-efficient

Assuming that temporary batters will be cut at angles as detailed in Section 6.2, the following parameters may be adopted for wall design (Table 7).

TABLE 7 PARAMETERS FOR USE IN RETAINING WALL DESIGN

Material	Density (kN/m^3)	Earth Pressure Coefficient Vertical Wall		Long Term Drained Ø (degrees)
		Ka	Ko	
Fill	17	0.41	0.58	25
Gravel	19	0.33	0.50	30
Clay	19	0.36	0.53	28
Siltstone	21	0.27	0.43	35

Any backfill placed behind the wall should be loose granular material. The backfill should not be heavily compacted since research has shown that compaction can raise the earth pressure to above the 'at rest' pressure.

Adequate surface and subsoil drainage should be provided for all retaining walls on the site. Cut-off / interceptor drains should also be provided around the high side of the wall to ensure stormwater runoff from the area above the wall is suitably diverted.

The placement of a filter fabric between the retained soil and the drainage material (eg. granular backfill) for protection against silting of the drainage material is recommended. The outlets to subsoil pipe drains must be located beyond the ends of the walls and connected to a proper drainage system. It is suggested the pipes be wrapped in filter fabric to minimise silting.

In weather exposed locations, to reduce infiltration by surface runoff, the surface of the backfill should be sealed. This can be achieved by either compacting a material of low permeability ie. on site clay or concrete, etc. with a slope towards an open drain.

Due to possible long term problems with blocking of gravel filters and drains and short term storm conditions that could flood the fill behind retaining walls, it is recommended that all retaining walls be designed for some water pressure distribution. A suggested water pressure distribution for retaining walls on this site would be half height water pressure. The design should then be checked using limiting equilibrium for full height water pressure.

During installation of any retaining walls, the insitu soils should be battered back to minimise fall-in and subsequent disruption of works. Suitable precautions to satisfy Health & Safety requirements must also be adhered to.

6.5 Site Management

It is important that proper site management for the existing soil conditions be observed by both the builder at the time of the construction and the owner throughout the life of the proposed development.

Particular reference to this is set out in AS2870-2011. It should be noted that where proper site management particularly with respect to change in moisture conditions is not followed the foundation recommendations contained in this report could be considered void.

The following are some specific comments with respect to site management.

- It is important that the site be well drained. The ground around the structures should slope away at 1 in 20 for 2 metres and then fall to the stormwater system to prevent ponding of water adjacent to the building.
- Founding soils should not be allowed to become saturated.
- It is recommended that service trenches under the structures be minimised as disruption or breakage of these service lines could lead to saturation of the material. If this were to occur all footing recommendations contained within this report would be void. Where service trenches are adopted the possible effects of leakage should be considered in the design
- Footings should be placed with minimal delay after excavation to avoid desiccation or wetting of the founding soils. If footings cannot be poured on the same day as excavation, a blinding layer of 50mm thickness is recommended. Piers should be poured immediately following excavation.
- Do not let the slab subgrade "dry out" prior to casting.
- Future shrubs and trees should be planted at a distance at least equivalent to three quarters of their mature height away from the building to avoid shrinkage movement in the potentially expansive founding soils. Existing trees that may encroach this restriction should be removed. It is recommended that trees to be removed be removed as early as possible prior to building construction to enable soil moisture to reach equilibrium.

7.0 LIMITATIONS

We have prepared this report for the use of **MODE DESIGN CORPORATION PTY LTD**, for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than **MODE DESIGN CORPORATION PTY LTD**. It may not contain sufficient information for purposes of other parties or for other uses.

Your attention is drawn to 'Appendix A', 'Notes Relating to this Report'. Interpretation of factual data given in this report is based on judgement, not a greater knowledge of facts other than those reported.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes, the method of drilling, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes. Subsurface conditions between boreholes may vary significantly from conditions encountered at the borehole locations.

In the event that conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, after the event.

Soil Surveys Engineering consider that a documentation review service (during the design phase and prior to construction) to verify that the intent of geotechnical recommendations is properly reflected in the design, along with construction inspections, forms a very important component of the geotechnical engineering design service/process.

This statement is not intended to reduce the level of responsibility accepted by Soil Surveys Engineering in accordance with our commission, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so and the risks they accept should they decline to have Soil Surveys Engineering carry out a geotechnical documentation review and geotechnical construction inspections.

The geotechnical review ensures geotechnical risks to our Client and their project are minimised at the design and tender stage of the project. Further, with Soil Surveys Engineering being commissioned to carry out geotechnical construction inspections, an opportunity becomes available at the time of construction to confirm any assumptions made in the preparation of the report and allow the effect of any normally occurring variation in ground conditions to be assessed with respect to construction.

P. ELKINGTON (RPEQ 7226)

For and on behalf of
SOIL SURVEYS ENGINEERING PTY LIMITED

APPENDICES

APPENDIX A

NOTES RELATING TO THIS REPORT

INTRODUCTION

These notes are provided by Soil Surveys Engineering Pty Limited (the Company) to complement the geotechnical report in regard to classification methods and field procedures. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited information about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such information obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and at the time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

Soils - The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-1993 (Geotechnical Site Investigations), where appropriate. In general, descriptions cover the following properties - soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the dominant particle size and behaviour as set out in AS 1726-1993.

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, shear vane, laboratory testing or engineering examination. The strength terms are defined in AS1726-1993 Table A4.

Non-cohesive soils are classified on the basis of relative density usually based on insitu testing or engineering examination (see AS1726-1993 Table A5).

Rocks - Rock types are classified by their geological names (AS1726-1993 Table A6), together with descriptive terms regarding weathering (AS1726-1993 Table A9), strength (refer Table 1 below), defects (AS1726-1993 Table A10), etc. Where strength testing (ie Point Loads) is carried out, AS1726-1993 Table A8 is used. Where relevant, further information regarding rock classification is attached.

Table 1 Estimated strength descriptions given to rock based on engineering examination

Strength Term	Approximate Qu (MPa)
Extremely Weak	< 1.0
Very Weak	1.0 - 5.0
Weak	5.0 - 25
Medium Strong	25 - 50
Strong	50 - 100
Very Strong	100 - 250
Extremely Strong	> 250

Ref ISRM "Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses"

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon sample disturbance, (information on strength and structure).

Undisturbed samples are taken by pushing a thin walled sample tube, usually 50mm diameter (U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength, volume change potential and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

TEST LOCATIONS

Test locations (e.g. boreholes, CPT's, test pits etc.) were based on available access at the time of testing (access may need to be provided "by others"). Test locations may have been shifted if access was not suitable.

Unless noted otherwise, accuracy of test locations are to the accuracy of hand held GPS equipment.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application.

Test Pits - These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling - A borehole of 50 to 100mm diameter is advanced by manually operated equipment. Refusal of the augers can occur on a variety of materials such as hard clay, gravel or rock fragments and does not necessarily indicate rock level.

Continuous Spiral Flight Augers - The borehole is advanced using 75 to 300 mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the augers. Information from the drilling (as distinct from specific sampling) is of relatively lower reliability due to remoulding, inclusion of cuttings from above or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table has a lower reliability than augering above the water table. Various drill bits are attached to the base of the augers during the drilling. The depth of refusal of the different bit types can provide information as to the strength of the material encountered. Generally two different bit types are used. The 'V' bit is a V shaped steel bit and the 'TC' bit is a tungsten carbide tipped screw type bit.

Wash Boring - The borehole is usually advanced by a rotary bit with water or fluid pumped down the hollow drill rods and returned up in the space between the rods and the soil or casing, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration. More accurate information on soil strata is gained by regular testing and sampling using the Standard Penetration Test (SPT) and undisturbed thin walled tube samples (U50).

Mud Stabilized Drilling - Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilize the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from regular intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling - A continuous core sample is obtained using a diamond or tungsten carbide tipped core barrel. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable method of investigation. In rocks, NMLC coring (nominal 52 mm diameter) is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses is determined on site by the supervisor. If the location of the loss is uncertain, it is placed at the top end of the run, when the core is placed in a storage tray and recorded on the log.

Standard Penetration Tests - Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" - Test 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm, the upper 150 mm being neglected due to possible disturbance from the drilling method. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued at a reduced penetration.

In the case where full penetration is obtained with successive blow counts for each 150 mm of, say 4, 6 and 7 blows, the record shows,

4, 6, 7 N = 13

In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm, the record shows:

15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, it is noted on the borehole logs.

A modification to the SPT test is where the same driving system is used with a solid 60^0 tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid SPT are shown as "N_c" on the borehole logs, together with the number of blows per 150 mm penetration.

Cone Penetration Tests - Test Method - Cone Penetration Tests (CPT) are carried out in accordance with AS 1289 Test 6.5.1-1977, using an electrical friction-cone penetrometer.

The test essentially comprises the measurement of resistance to penetration of a cone of 35.7 mm diameter pushed into the soil at a rate of 10-20 mm per second by hydraulic force. The resistance to penetration is recorded in terms of pressure on the end area of the cone (cone resistance, q_c, in MPa) and friction on the side of the 135 mm long sleeve immediately above the top of the cone (friction resistance, f_s, in kPa). These forces are measured by electrical transducers (strain gauges) within the cone device. The ratio between friction resistance and cone resistance is also calculated as a percentage, ie.-

$$Friction\ Ratio\ (FR) = \frac{Friction\ Resistance, f_s\ (kPa) \times 100}{cone\ resistance,\ q_c\ (kPa)}$$

The friction ratio, FR, is generally low in sands (less than 1% or 2%) and generally higher in clays (say 3% or more). The interpretation of sandy clays, clayey sands and material with a high silt content is more difficult, but intermediate values (between 1% and 3%) would be expected. Highly organic clays and peats generally have a friction ratio in excess of 5%.

Static cone data is recorded in the field on disc for later presentation using computer aided drafting.

The equipment can be operated from any conventional drill rig. A total applied load in the range of 4 to 10 tonnes is required for practical purposes, although lighter loads may be used. The cone penetrometers are available with various capacities of cone resistance ranging up to 100 MPa for general purpose investigations, while a range of 0 to 10 MPa can be used where more sensitive investigations of soft clay are required.

The cone resistance value provides a continuous measure of soil strength or density, and together with the friction ratio, provide very useful indications of the presence of narrow bands of geotechnically significant layers such as thin, soft clay layers or lenses of sand which might otherwise be missed using conventional drilling methods.

The lithology of the encountered soils is interpreted from static cone data and is generally presented on the static cone log sheets.

It is important to note that the lithology is interpreted information and is based on research by Schmertmann (1970), Sanglerat (1972), Robinson and Campinalli (1986), modified to suit local conditions as indicated by borehole information and laboratory testing.

As soils generally change gradually it is sometimes difficult to accurately describe depths of strata changes, although greater accuracy is obtained with the static cone compared with conventional drilling. In addition, friction ratios decrease in accuracy with low cone resistance values, and in desiccated soils. As a result, some overlap and minor discrepancies may

exist between static cone and nearby borehole information.

Portable Dynamic Cone Penetrometers - Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 100mm increments of penetration.

The DCP comprises a Cone of 20 mm diameter with 30 degree taper attached to steel rods of smaller section.

The cone end is driven with a 9 kg hammer falling 510 mm (AS. 1289 Test 6.3.2). The test was developed initially for pavement subgrade investigations, and empirical correlations of the test results with California Bearing Ratio have been published by various Road Authorities. The Company has developed their own correlations with Standard Penetration tests and Density Index tests in sands.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems.

wAlthough groundwater may be present in lower permeability soils, it may enter the hole slowly or perhaps not at all during the time the hole is open.

wA localized perched water table may lead to an erroneous indication of the true water table.

wWater table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.

wThe use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be bailed out of the bore and mud must be washed out of the hole or "reverted" if water observations are to be made.

More reliable measurements can be made by use of standpipes which are read after stabilizing at periods ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc.) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is important to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms and the attached explanatory notes summarize important aspects of the Laboratory Test Procedures adopted.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. The information provided in Soil Surveys Engineering reports is opinion and interpretation and not factual. The client/contractor increases their risk by not retaining the person who authored the geotechnical report, to carry out site inspection and review (overseeing role) during construction, to confirm opinion and interpretation expressed in the report is accurate. Where the report has been prepared for a specific design proposal the information and interpretation may not be relevant if the design proposal is changed. If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. Since the test sites in any exploration represent a very small proportion of the total site and since the exploration only identifies actual ground conditions at the test sites, even under the best circumstances actual conditions may vary from those inferred to exist. No responsibility is taken for:-

wUnexpected variations in ground and/or groundwater conditions.

wChanges in policy or interpretation of policy by statutory authorities.

wThe actions of other persons.

wAny work where the company is not given the opportunity to supervise the construction using the Companies designs/recommendations.

If differences occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, well after the event.

Extreme events including but not limited to the results of climate change, eg. flood levels above previously identified levels, beach scour or erosion beyond normal expectations (as identified by local authorities) extreme rainfall events, war, espionage, sabotage may result in different conditions between time of investigation and time of construction.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document “Guidelines for the Provision of Geotechnical Information in Construction Contracts (1987)”, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances, where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer. We would be happy to assist in this regard as an extension of our investigation commission. Construction drawings should be reviewed by Soil Surveys Engineering, with sufficient time to allow changes if required, prior to inspections.

Otherwise Soil Surveys Engineering reserves the right to refuse to carry out inspections.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

i) Site visits during construction to confirm reported ground conditions

ii) Site visits to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, the stability of a filled or excavated slope; or

iii) Full-time engineering presence on site.

In the vast majority of cases it is advantageous to the principal for the geotechnical engineer who wrote the investigation report to be involved in the construction stage of the project.

The geotechnical engineer cannot take responsibility for variations in encountered conditions, where he is not given the opportunity to review plans for the proposed development with sufficient time to allow review and make changes to the proposed development if required, and where he is not given the opportunity to inspect the site and oversee construction methods with regard to site conditions with sufficient time to observe all relevant site conditions and operations.

RESPONSIBLE USE OF GEOTECHNICAL INFORMATION

Recommendations in our report are for design purposes only and provided on the basis that inspections are carried out to allow finalisation of opinions and recommendations contained in our report.

The geotechnical investigation consisting of field and laboratory testing has been carried out to indicate typical conditions by indicating conditions and parameters at the specific locations of boreholes/test pits. Subsurface conditions are indicated at these locations only and the inference of conditions between or away from these locations (interpolation and extrapolation) involves a certain degree of risk. Persons inferring such conditions or carrying out such inferences should do so with a degree of caution and conservatism which is commensurate with the consequences of the risk of error.

Estimates of volumes based on our findings require interpolation and extrapolation between test locations and as such may be significantly different from actual volumes.

APPENDIX B

BOREHOLE RECORD SHEETS

Soil Surveys Engineering Pty. Limited
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Gold Coast: ph +61 7 5500 0465 goldcoast@soilsurveys.com.au

BOREHOLE RECORD SHEET

Location Number: BH 01

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513930 Northing: 6956769 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.40		FILL Sandy CLAY (CH) Very stiff, high plasticity, brown, fine to medium grained sand, moist.		
	0.60		FILL Sandy CLAY (CH) Very stiff, high plasticity, brown, fine to medium grained sand, with fine to coarse sized gravel, moist.		
	1.0		FILL Silty Sandy CLAY (CL) Hard, low plasticity, grey and light yellow brown, fine to medium grained sand, moist.		
	1.10		FILL Clayey SAND (SC) Medium dense, fine to medium grained, dark grey, high plasticity fines, old tree root, moist.		
	1.90		NATURAL Silty CLAY (CH) Very stiff to hard, high plasticity, light grey and yellow brown mottled, moist.		
	2.0				
	2.70		Silty CLAY (CH) Very hard, high plasticity, light grey and yellow brown mottled, moist.		
	3.0				
	3.60		SILTSTONE (XW) Extremely weathered, very weak, light grey and red yellow mottled.		
	4.0				
	4.50		BOREHOLE BH 01 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 0.7m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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BOREHOLE RECORD SHEET

Location Number: BH 02

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: Northing: RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.20		FILL Gravelly CLAY (CI) Very stiff to hard, medium plasticity, yellow brown, fine to medium sized gravel, moist.		
	0.50		FILL Sandy GRAVEL (GP) Medium dense, fine to coarse sized, brown, fine to medium grained sand, moist.		
	0.80		NATURAL Sandy CLAY (CH) Very stiff, high plasticity, red brown, fine to medium grained sand, some fine sized gravel, moist.		
	1.0				
	1.10		Sandy CLAY (CH) Hard to very hard, high plasticity, red brown, fine to medium grained sand, some fine sized gravel, moist.		
	1.90		Sandy CLAY (CH) Hard to very hard, high plasticity, red brown, fine to medium grained sand, with bands of ironstone, some fine sized gravel, moist.		
	2.0		SILTSTONE (XW) Extremely weathered, very weak, light grey.		
	3.0				
	4.0				
	4.50		BOREHOLE BH 02 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 1.7m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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BOREHOLE RECORD SHEET

Location Number: BH 03

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513992 Northing: 6956755 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.30		NATURAL Gravelly CLAY (CH) Very stiff, high plasticity, yellow brown, fine to medium sized gravel, moist.		
	1.0		Silty CLAY (CH) Very stiff to hard, high plasticity, grey, moist.		
	1.20		Silty CLAY (CH) Very stiff to hard, high plasticity, grey, with bands of ironstone, moist.		
	1.90		SILTSTONE (XW) Extremely weathered, very weak, light grey and red brown mottled.		
	2.0				
	3.0				
	4.0				
	4.50		BOREHOLE BH 03 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 1.8m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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BOREHOLE RECORD SHEET

Location Number: BH 04

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513986 Northing: 6956573 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.10		FILL Gravelly Clayey SAND (SC) Loose, fine to medium grained, grey brown, high plasticity fines, fine to medium sized gravel, moist.		
	0.40		FILL Gravelly SAND (SP) Medium dense, fine to medium grained, brown, fine to coarse sized gravel, moist.		
	1.0		NATURAL Silty CLAY (CI) Hard, medium plasticity, red brown, moist.		
	1.20		Silty CLAY (CI) Hard, medium plasticity, light grey and red yellow mottled, moist.		
	1.90		Silty CLAY (CI) Very hard, medium plasticity, light grey and red yellow mottled, moist. (tending to a weathered Siltstone)		U50 PP=>600
	2.0				
	2.30		SILTSTONE (XW) Extremely weathered, very weak, light grey.		
	3.0				
	4.0				
	4.50		BOREHOLE BH 04 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 0.2m and 1.8m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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Specialist in Applied Geotechnics
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Gold Coast: ph +61 7 5500 0465 goldcoast@soilsurveys.com.au

BOREHOLE RECORD SHEET

Location Number: BH 05

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513905 Northing: 69566954 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.10		FILL Sandy CLAY (CH) Very stiff, high plasticity, red brown, fine to medium grained sand, moist.		
	0.70		FILL Sandy CLAY (CH) Very stiff, high plasticity, red brown, fine to medium grained sand, with fine to coarse sized gravel, moist.		
	0.90		FILL Sandy CLAY (CH) Very stiff, high plasticity, red brown, fine to medium grained sand, with fine to coarse sized gravel, with broken concrete blocks, moist.		D
	1.70		FILL Gravelly SAND (SP) Medium dense, fine to medium grained, brown, fine sized gravel, moist.		
	2.30		FILL CLAY (CH) Very stiff, high plasticity, grey and yellow brown, some fine to medium grained sand, moist.		
			NATURAL Silty CLAY (CH) Very stiff, high plasticity, light grey and red brown mottled, moist.		U50 PP=200
	5.20		Silty CLAY (CH) Very stiff to hard, high plasticity, light grey and red brown mottled, moist.		U50 PP=300
	6.90		SILTSTONE (XW) Extremely weathered, very weak, grey and red brown.		U50 PP=450
	7.50		BOREHOLE BH 05 TERMINATED AT 7.50 m		

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 3.6m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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BOREHOLE RECORD SHEET

Location Number: BH 06

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513904 Northing: 6956676 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.30		FILL Gravelly Clayey SAND (SC) Loose, fine to medium grained, brown, high plasticity fines, fine to coarse sized gravel, moist.		
	0.70		FILL Gravelly Clayey SAND (SC) Loose, fine to medium grained, brown, high plasticity fines, fine to coarse sized gravel, with small siltstone cobbles, moist.		
	0.90		FILL Sandy CLAY (CH) Very stiff to hard, high plasticity, red brown and grey mottled, fine to medium grained sand, moist.		
	1.0		NATURAL Silty CLAY (CH) Very stiff, high plasticity, light grey and red brown mottled, moist.		U50 PP=250
	1.80		Silty CLAY (CH) Very stiff, high plasticity, light grey and red brown mottled, with lenses of ironstone, moist.		
	2.0				
	2.30		Gravelly Sandy CLAY (CH) Very stiff to hard, high plasticity, light grey and yellow brown, fine to coarse grained sand, fine sized gravel, very moist.		
	3.0				
	3.40		SILTSTONE (XW) Extremely weathered, very weak, grey and red brown.		
	4.0				
	4.50		BOREHOLE BH 06 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 0.3m and 2.3m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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BOREHOLE RECORD SHEET

Location Number: BH 07

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513872 Northing: 6956694 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.15		FILL Gravelly Sandy CLAY (CH) Very stiff, high plasticity, brown, fine to medium grained sand, fine to medium sized gravel, moist.		
	0.70		FILL Sandy GRAVEL (GP) Medium dense, fine to very coarse sized, angular, multicoloured, fine to medium grained sand, moist.		
	1.0		FILL Gravelly Sandy CLAY (CH) Very stiff, high plasticity, brown, fine to medium grained sand, fine to medium sized gravel, moist.		D
	1.30		FILL COBBLES Dense, yellow brown mottled grey.		
	1.60		NATURAL Sandy CLAY (CI) Hard, medium plasticity, grey brown, fine to medium grained sand, moist.		
	2.0				
	2.40		Silty CLAY (CH) Hard, high plasticity, red brown and grey mottled, moist.		
	3.0				
	3.40		SILTSTONE (XW) Extremely weathered, very weak, red brown and light grey mottled.		
	4.0				
	4.50		BOREHOLE BH 07 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 0.2m and 2.9m.
3) Maximum TC bit at 1.4m. Borehole moved 1.5m north.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

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BOREHOLE RECORD SHEET

Location Number: BH 08

Project Number: 114-16656
Project Name: Proposed Clay Target Range
Location: Belmont Shooting Centre
Client: Mode Design Corp. Pty Ltd
Date: 07/03/2016

Easting: 513839 Northing: 6956776 RL:
Logger: BM Operator: BM Machine: EVH2100

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.10		FILL Gravelly Sandy CLAY (CI) Very stiff, medium plasticity, grey brown, fine to medium grained sand, fine to medium sized gravel, dry.		
	0.40		NATURAL Silty CLAY (CH) Hard, high plasticity, red brown, moist.		
	1.0		Silty CLAY (CH) Hard, high plasticity, light grey, moist.		
	1.20		Silty CLAY (CH) Hard, high plasticity, light grey, with lenses of ironstone, moist.		U50 PP=>600
	2.0				
	2.30		SILTSTONE (XW) Extremely weathered, very weak, light grey and red brown mottled.		
	3.0				
	4.0				
	4.50		BOREHOLE BH 08 TERMINATED AT 4.50 m		
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1) Groundwater not encountered.
2) DCP refusal met at 1.6m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved:
Date:

APPENDIX C

LABORATORY TEST CERTIFICATES

SOIL SURVEYS ENGINEERING P/L
Unit 8, 140 Millaroo Drive
HELENSVALE QLD 4212
PHONE 07 55026795
FAX 07 55026724

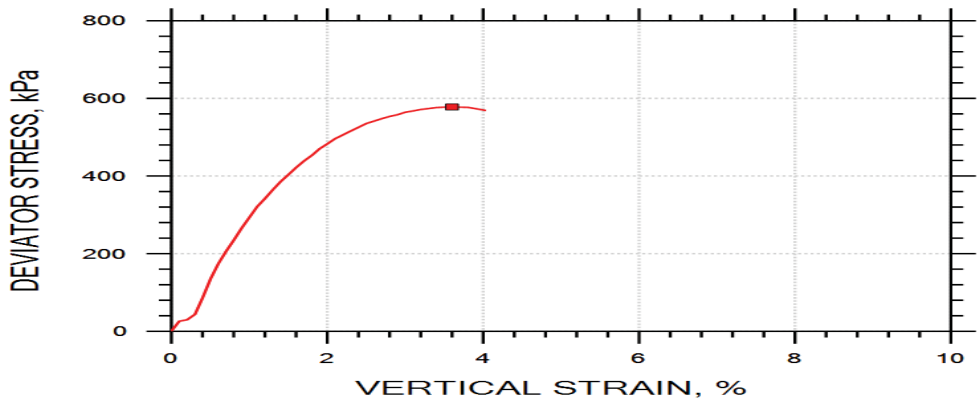
SOIL SURVEYS

UNCONSOLIDATED COMPRESSIVE STRENGTH (Qu) REPORT

Client:	**Mode Design Corporation Limited**	Report Number:	WHL16-0347-S3 QU
Address:	**C/O 2/19 Finchley Street, Milton, QLD, 4064**	Report Date:	15/03/2016
Job Number:	**1-16656**	Order Number:	
Project:	**Clay Target Range**	Test Methods:	AS1289 6.4.1, 2.1.1
Location:	**Belmont Shooting Range**		

Lab Number:	S3	Sample Identification
Date Sampled:	7/03/2016	LOCATION: BH8
Date Tested:	14/03/2016	
Sampling Method:	U50	DEPTH: 1.5-1.6m
Description:	CLAY(CH) GREY, RED MOTTLE, SOME SAND AND GRAVEL	

Rate of Strain (%/min):	0.5
Strain at Failure (%):	3.6
Mode of Failure:	SHEAR
Specimen Dimensions:	
Average Height (mm):	100
Average Diameter (mm):	47
Diameter to Height ratio:	2.1:1
Sample Type:	UNDISTURBED
Wet Density (t/m^3):	2.13
Dry Density (t/m^3):	1.83
Moisture content (%):	16.3
Maximum Principal Stress (kPa):	578
COMPRESSIVE STRENGTH (kPa):	**578**



Remarks: PP >600

SOIL SURVEYS

Approved Signatory

C.Ferguson-Hannah

Form Number

REP-QU-01

SOIL SURVEYS ENGINEERING P/L
Unit 8, 140 Millaroo Drive
HELENSVALE QLD 4212
PHONE 07 55026795
FAX 07 55026724

SOIL SURVEYS

UNCONSOLIDATED COMPRESSIVE STRENGTH (Qu) REPORT

Client:	**Mode Design Corporation Limited**	Report Number:	WHL16-0347-S3 QU
Address:	**C/O 2/19 Finchley Street, Milton, QLD, 4064**	Report Date:	15/03/2016
Job Number:	**1-16656**	Order Number:	
Project:	**Clay Target Range**	Test Methods:	AS1289 6.4.1, 2.1.1
Location:	**Belmont Shooting Range**		

Lab Number:	S3	Sample Identification
Date Sampled:	7/03/2016	LOCATION: BH8
Date Tested:	14/03/2016	
Sampling Method:	U50	DEPTH: 1.5-1.6m
Description:	CLAY(CH) GREY, RED MOTTLE, SOME SAND AND GRAVEL	

Whole Sample

Split Sample

Remarks: PP >600

SOIL SURVEYS

Approved Signatory

C.Ferguson-Hannah

Form Number

REP-QU-01

Helensvale Lab
Gold Coast
Unit 8, 140 Millaroo Drive
Helensvale QLD 4212
Australia
Ph:+61 7 5502 6795
Fax:+61 7 5502 6724

SOIL SURVEYS

Shrink Swell Index Report

Report No: SSI:WHL16-0347-S2
Issue No: 1

Client: Mode Design Corporation P/L
C/O 8/140 Millaroo Drive
Helensvale QLD 4212

Project: Clay Target Range

Project Location: Belmont Shooting Range

Project Number: 1-16656

This laboratory is accredited for compliance with ISO/IEC 17025.

NATA Accredited Laboratory Number: 15301

Approved Signatory: C.Ferguson-Hannah (Senior Technician)
Date of Issue: 15/03/2016

Sample Details

Sample ID:	WHL16-0347-S2	**Sampling Method:**	As Supplied
Field ID:	N/A	**Material:**	N/A
Date Sampled:	7/03/2016	**Source:**	Borehole
Date Submitted:	N/A	**Specification:**	N/A
Project Location:	Belmont Shooting Range		
Sample Location:	BH6, 1.5m		
Borehole Number:	N/A		
Borehole Depth (m):	N/A		

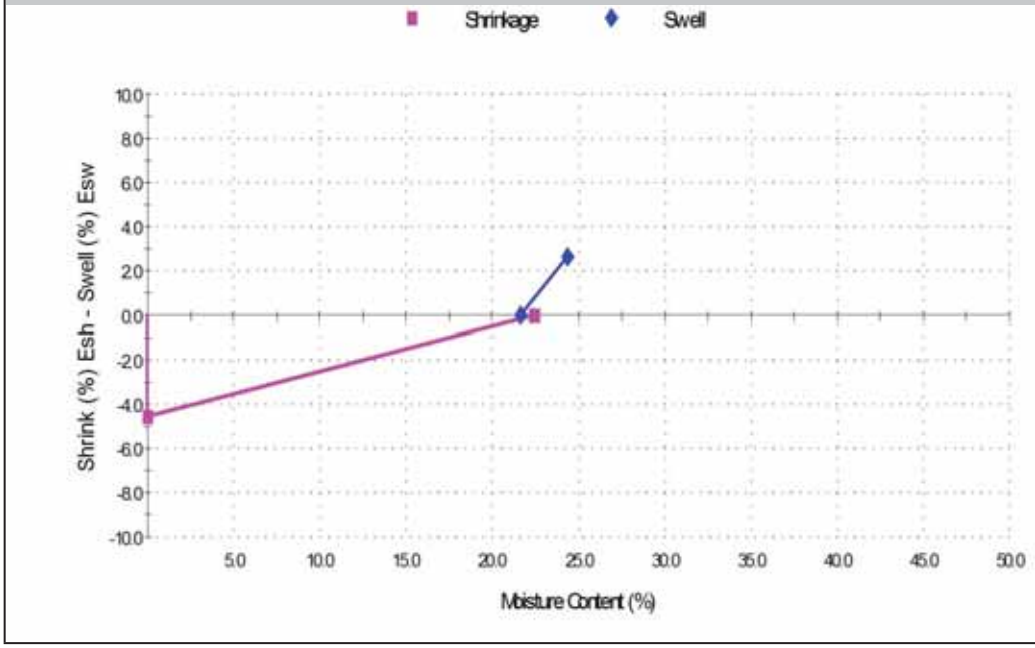
Swell Test — AS 1289.7.1.1

Swell on Saturation (%):	2.6
Moisture Content before (%):	21.7
Moisture Content after (%):	24.3
Est. Unc. Comp. Strength before (kPa):	N/A
Est. Unc. Comp. Strength after (kPa):	N/A

Shrink Test — AS 1289.7.1.1

Shrink on drying (%):	4.5
Shrinkage Moisture Content (%):	22.4
Est. inert material (%):	N/A
Crumbling during shrinkage:	N/A
Cracking during shrinkage:	SLIGHT

Shrink Swell



Shrink Swell Index - Iss (%): 3.2

Comments

DESCRIPTION: CLAY(CH) GREY, RED BROWN MOTTLE, TRACE OF SAND AND GRAVEL
UNIT WEIGHT: 2.00 t/m3

SOIL SURVEYS ENGINEERING P/L
Unit 8, 140 Millaroo Drive
HELENSVALE QLD 4212
PHONE 07 55026795
FAX 07 55026724

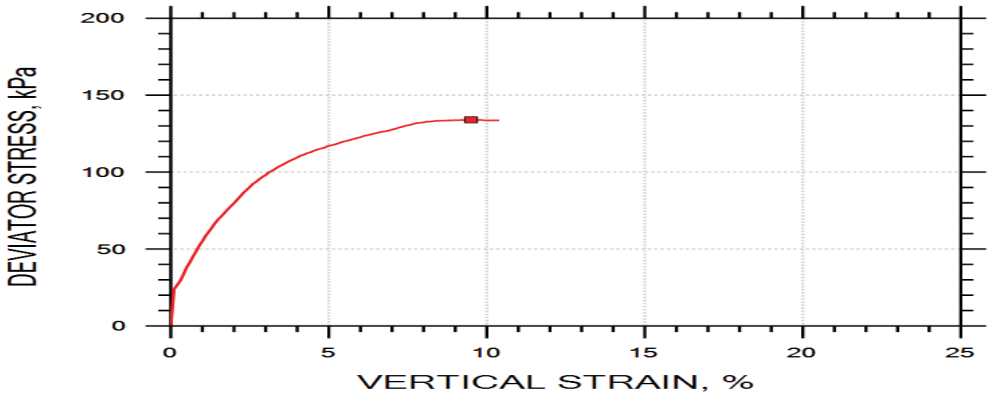
SOIL SURVEYS

UNCONSOLIDATED COMPRESSIVE STRENGTH (Qu) REPORT

Client:	**Mode Design Corporation Limited**	Report Number:	WHL16-0347-S1 QU
Address:	**C/O 2/19 Finchley Street, Milton, QLD, 4064**	Report Date:	15/03/2016
Job Number:	**1-16656**	Order Number:	
Project:	**Clay Target Range**	Test Methods:	AS1289 6.4.1, 2.1.1
Location:	**Belmont Shooting Range**		

Lab Number:	S1	Sample Identification
Date Sampled:	7/03/2016	LOCATION: BH5
Date Tested:	14/03/2016	
Sampling Method:	U50	DEPTH: 4.5-4.6m
Description:	SILTY CLAY(CH) GREY, RED MOTTLE	

Rate of Strain (%/min):	0.5
Strain at Failure (%):	9.5
Mode of Failure:	PARABOLIC / SHEAR
Specimen Dimensions:	
Average Height (mm):	100
Average Diameter (mm):	47
Diameter to Height ratio:	2.1:1
Sample Type:	UNDISTURBED
Wet Density (t/m^3):	2.04
Dry Density (t/m^3):	1.69
Moisture content (%):	20.4
Maximum Principal Stress (kPa):	134
COMPRESSIVE STRENGTH (kPa):	**134**



Remarks: PP 200-300

SOIL SURVEYS

Approved Signatory

C.Ferguson-Hannah

Form Number

REP-QU-01

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HELENSVALE QLD 4212
PHONE 07 55026795
FAX 07 55026724

SOIL SURVEYS

UNCONSOLIDATED COMPRESSIVE STRENGTH (Qu) REPORT

Client:	**Mode Design Corporation Limited**	Report Number:	WHL16-0347-S1 QU
Address:	**C/O 2/19 Finchley Street, Milton, QLD, 4064**	Report Date:	15/03/2016
Job Number:	**1-16656**	Order Number:	
Project:	**Clay Target Range**	Test Methods:	AS1289 6.4.1, 2.1.1
Location:	**Belmont Shooting Range**		

Lab Number:	S1	Sample Identification
Date Sampled:	7/03/2016	LOCATION: BH5
Date Tested:	14/03/2016	
Sampling Method:	U50	DEPTH: 4.5-4.6m
Description:	SILTY CLAY(CH) GREY, RED MOTTLE	

Whole Sample

Split Sample

Remarks: PP 200-300

SOIL SURVEYS

Approved Signatory

C.Ferguson-Hannah

Form Number

REP-QU-01

SOIL SURVEYS
ENGINEERING PTY LTD

Unit 8, 140 Millarroo Drive
HELENSVALE QLD 4212
PH:07 55026795 FAX:0755026724
EMAIL: gclab1@soilsurveys.com.au WEBSITE:soilsurveys.com.au

SOIL SURVEYS

pH REPORT

Client :	**Mode Design Corporation P/L**	Report No:	WHL16-0427-S1-S3
Client Address :	**C/O 8/140 Millaroo Drive Helensvale QLD 4212**	Report Date:	4/04/2016
Job Number :	**1-16656**		
Project :	**Clay Target Range**	Test	
Location :	**Belmount Shooting Range**	Methods :	AS1289.4.3.1

Lab No :	S1	S2	S3			
Date Sampled :	11/3/016	11/03/2016	11/03/2016			
Date Tested :	4/04/2016	4/04/2016	4/04/2016			
Sample Location : Borehole: Depth(m):	 BH 4 2.0m	 BH 5 1.0m	 BH 7 1.2m			
Soil Description :	Gravelley Silt (MH) Grey	Sandy Silt (ML) Trace of Gravel, Brown	Gravelley Silt (ML) Pale Brown			
Soil to Water Ratio :	**1:2.5**	**1:2.5**	**1:2.5**			
pH:	**6.6**	**7.9**	**5.8**			

Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

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APPROVED SIGNATORY

Mark Rutten
NATA Accred No:15301

FORM NUMBER

REP-pH-02
V1 13/07/15

APPENDIX D

SITE PLAN

SURVEY SCOPE

LOCATION OF REQUIRED BORE SAMPLES

0 1 2 3 4 5

BRISBANE
Plaza Level, Mosaic
826 Ann St
Fortitude Valley QLD 4006
T +61 7 3846 0877
bne@modedesign.com.au

DEPARTMENT OF STATE DEVELOPMENT

BELMONT SHOOTING CENTRE
1485 OLD CLEVELAND ROAD, BELMONT QLD

SURVEY SCOPE GEOTECH

MASTER PLAN

Do not scale off this drawing

Project No:	14479BNE
Date:	09/02/16
Scale:	As indicated@
Drawn / Check:	PA KR
MP - 025S	3

9/02/2016 9:53:17 AM

Appendix N

SPP Interest Maps

Department of Housing and Public Works

Queensland Government

State Planning Policy - Lot Plan Search

Making or amending a local planning instrument and designating land for community infrastructure

Date: 18/08/2017

Queensland Government

Department of Infrastructure
Local Government
and Planning

0 500 1,000 1,500 2,000

Metres

Disclaimer: This map has been prepared with due care based on the best available information at the time of publication. However, the State of Queensland (acting through the department) makes no representations, either express or implied, that the map is free from errors, inconsistencies or omissions. Reliance on information contained in this map is the sole responsibility of the user. The State disclaims responsibility for any loss, damage or inconvenience caused as a result of reliance on information or data contained in this map.

State Planning Policy mapping layers - consolidated list for all selected Lot Plans

(Note: Please refer to following pages for State Interests listed for each selected Lot Plan)

BIODIVERSITY
- MSES - Protected areas (nature refuge)
- MSES - Wildlife habitat
- MSES - Regulated vegetation (category B)
- MSES - Regulated vegetation (essential habitat)
- MSES - Regulated vegetation (intersecting a watercourse)

WATER QUALITY
- Water supply buffer area
- Water resource catchments

NATURAL HAZARDS RISK AND RESILIENCE
- Flood hazard area - Local Government flood mapping area*
- Bushfire prone area

ENERGY AND WATER SUPPLY
- Pump station facilities and reservoir facilities (Seqwater)
- Pipelines and channels (Seqwater)
- Major electricity infrastructure (Powerlink)

TRANSPORT INFRASTRUCTURE
- State-controlled road

STRATEGIC AIRPORTS AND AVIATION FACILITIES
- Obstacle limitation surface area
- Obstacle limitation surface contours
- Wildlife hazard buffer zone

Queensland Government

Department of Infrastructure, Local Government and Planning

State Planning Policy mapping layers for each selected Lot Plan

Lot Plan: 1RP169229 (Area: 5020019 m^2)
BIODIVERSITY
- MSES - Protected areas (nature refuge)
- MSES - Wildlife habitat
- MSES - Regulated vegetation (category B)
- MSES - Regulated vegetation (essential habitat)
- MSES - Regulated vegetation (intersecting a watercourse)

WATER QUALITY
- Water supply buffer area
- Water resource catchments

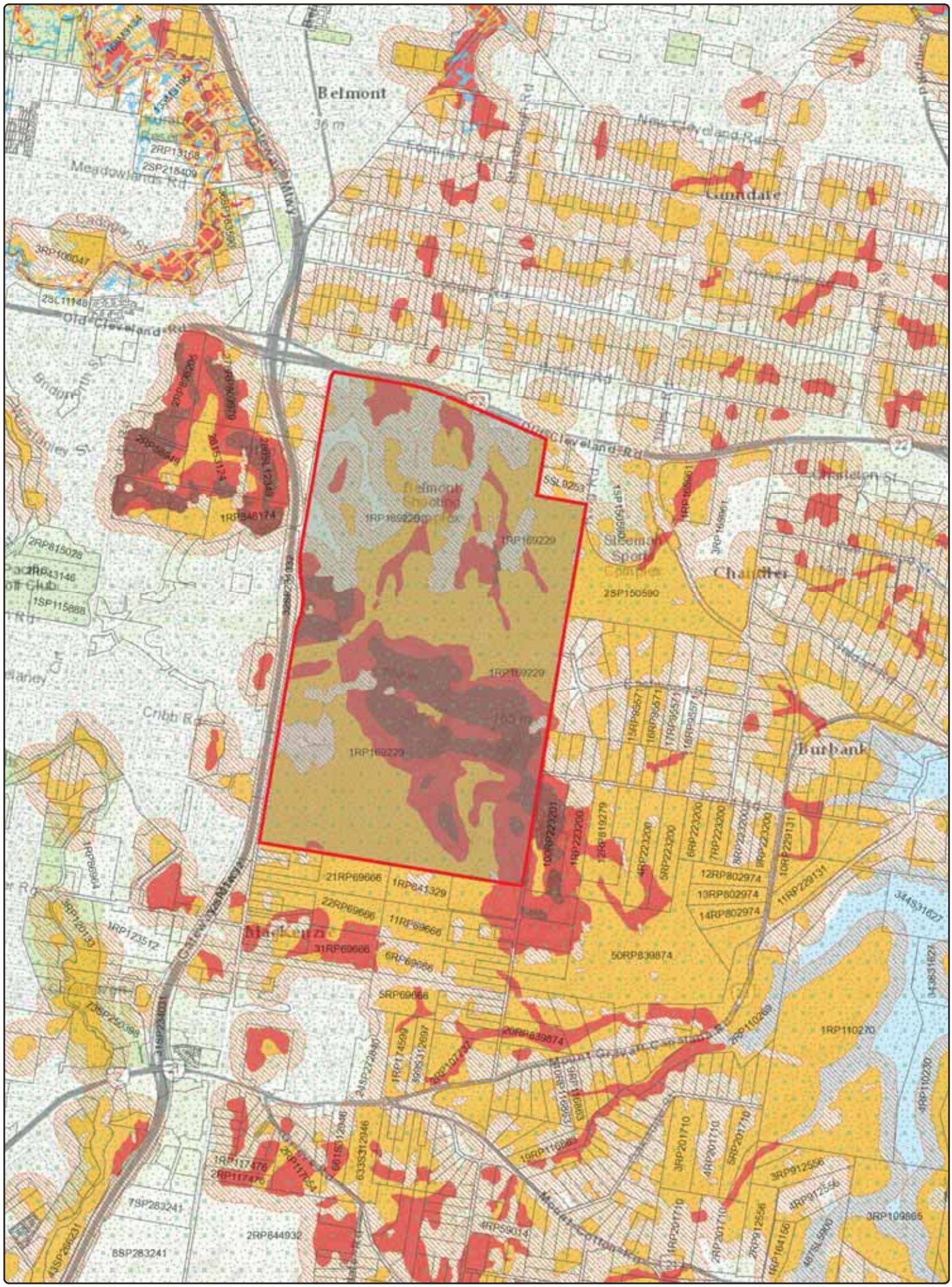
NATURAL HAZARDS RISK AND RESILIENCE
- Flood hazard area - Local Government flood mapping area*
- Bushfire prone area

ENERGY AND WATER SUPPLY
- Pump station facilities and reservoir facilities (Seqwater)
- Pipelines and channels (Seqwater)
- Major electricity infrastructure (Powerlink)

TRANSPORT INFRASTRUCTURE
- State-controlled road

STRATEGIC AIRPORTS AND AVIATION FACILITIES
- Obstacle limitation surface area
- Obstacle limitation surface contours
- Wildlife hazard buffer zone

Queensland Government
Department of Infrastructure, Local Government and Planning



State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure

Date: 18/08/2017

Department of Infrastructure, Local Government and Planning

0 590 1,180 1,770 2,360

Metres

Disclaimer:
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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (50k)

Cadastre (50k)

Erosion prone area

Erosion prone area

High storm tide inundation area

High storm tide inundation area

Medium storm tide inundation area

Medium storm tide inundation area

Flood hazard area - Level 1 - Queensland floodplain assessment overlay

Flood hazard area - Level 1 - Queensland floodplain assessment overlay

Flood hazard area - local government flood mapping area

Flood hazard area - local government flood mapping area

Bushfire prone area

Very High Potential Bushfire Intensity

High Potential Bushfire Intensity

Medium Potential Bushfire Intensity

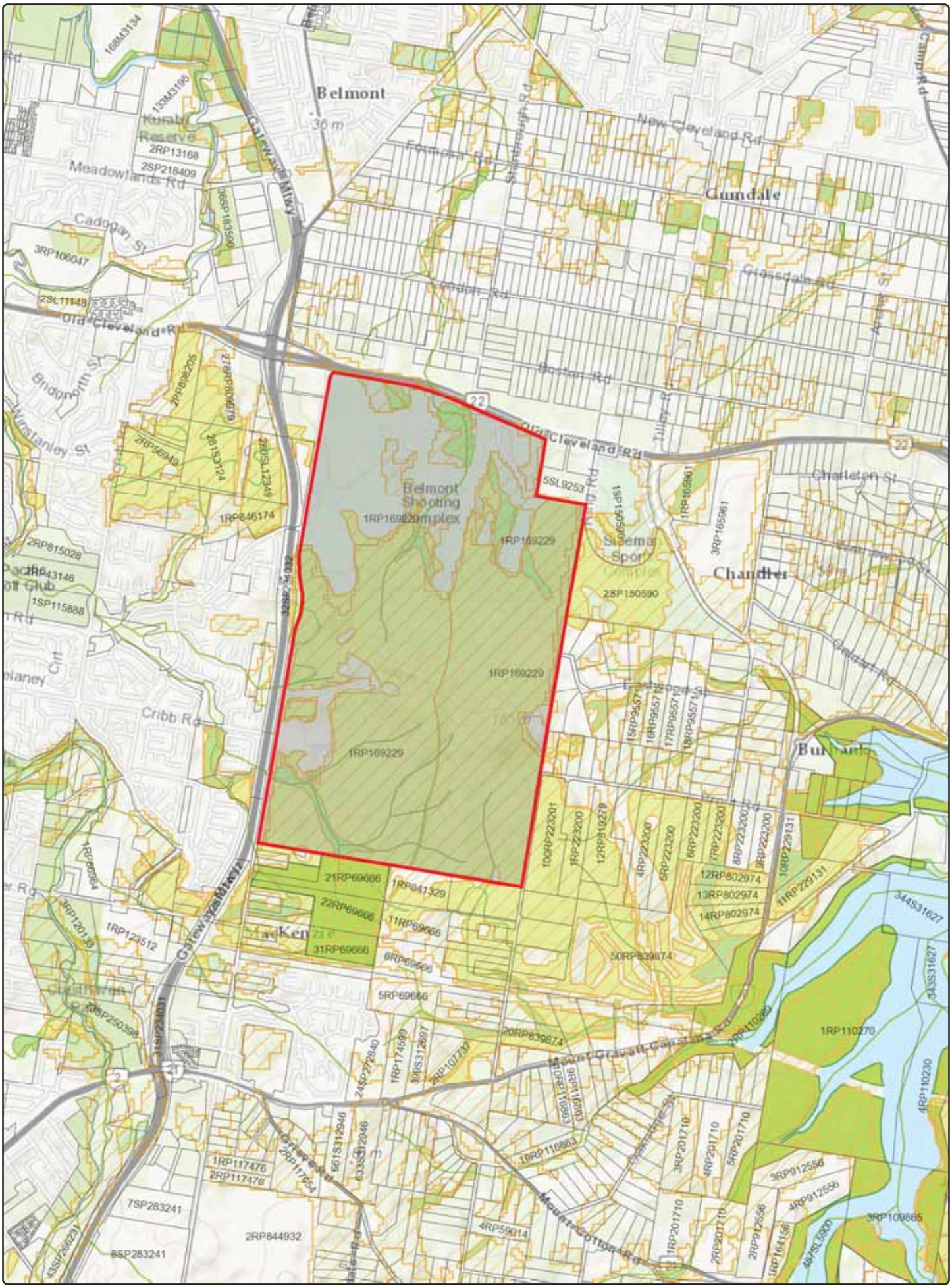
Potential Impact Buffer

Date: 18/08/2017

Department of Infrastructure, Local Government and Planning

State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure



State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure

Date: 18/08/2017

Department of Infrastructure, Local Government and Planning

0 590 1,180 1,770 2,360

Metres

Disclaimer:
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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (50k)

Cadastre (50k)

MSES - Regulated vegetation (intersecting a watercourse)

MSES - Regulated vegetation (intersecting a watercourse)

MSES - High ecological value waters (watercourse)

MSES - High ecological value waters (watercourse)

MSES - Wildlife habitat

MSES - Wildlife habitat

MSES - Strategic environmental areas (designated precinct)

MSES - Strategic environmental areas (designated precinct)

MSES - High ecological significance wetlands

MSES - High ecological significance wetlands

MSES - High ecological value waters (wetland)

MSES - High ecological value waters (wetland)

MSES - Legally secured offset area (offset register)

MSES - Legally secured offset area (offset register)

MSES - Legally secured offset area (regulated vegetation offsets)

MSES - Legally secured offset area (regulated vegetation offsets)

MSES - Protected areas (estate)

MSES - Protected areas (estate)

MSES - Protected areas (nature refuge)

MSES - Protected areas (nature refuge)

MSES - Marine park

MSES - Marine park

MSES - Declared fish habitat area

MSES - Declared fish habitat area

MSES - Regulated vegetation (category B)

MSES - Regulated vegetation (category B)

MSES - Regulated vegetation (category C)

MSES - Regulated vegetation (category C)

MSES - Regulated vegetation (category R)

MSES - Regulated vegetation (category R)

MSES - Regulated vegetation (essential habitat)

MSES - Regulated vegetation (essential habitat)

MSES - Regulated vegetation (wetland)

MSES - Regulated vegetation (wetland)

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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (50k)

Cadastre (50k)

Bulk water storage infrastructure (Seqwater)

Bulk water storage infrastructure (Seqwater)

Bulk water storage infrastructure (Sunwater)

Bulk water storage infrastructure (Sunwater)

Facilities for extracting ground water (Seqwater)

Facilities for extracting ground water (Seqwater)

Pipelines and channels (Seqwater)

Pipelines and channels (Seqwater)

Pipelines and channels (Sunwater)

Pipelines and channels (Sunwater)

Pump station facilities and reservoir facilities (Seqwater)

Pump station facilities and reservoir facilities (Seqwater)

Pump station facilities and reservoir facilities (Sunwater)

Pump station facilities and reservoir facilities (Sunwater)

Water treatment plants and water quality facilities (Seqwater)

Water treatment plants and water quality facilities (Seqwater)

Major electricity infrastructure (Energex)

Major electricity infrastructure (Energex)

Major electricity infrastructure (Ergon)

Major electricity infrastructure (Ergon)

Electricity substation (Energex)

Electricity substation (Energex)

Electricity substation (Ergon)

Electricity substation (Ergon)

Electricity substation (Powerlink)

Electricity substation (Powerlink)

Major electricity infrastructure (Powerlink)

Major electricity infrastructure (Powerlink)

Queensland Government

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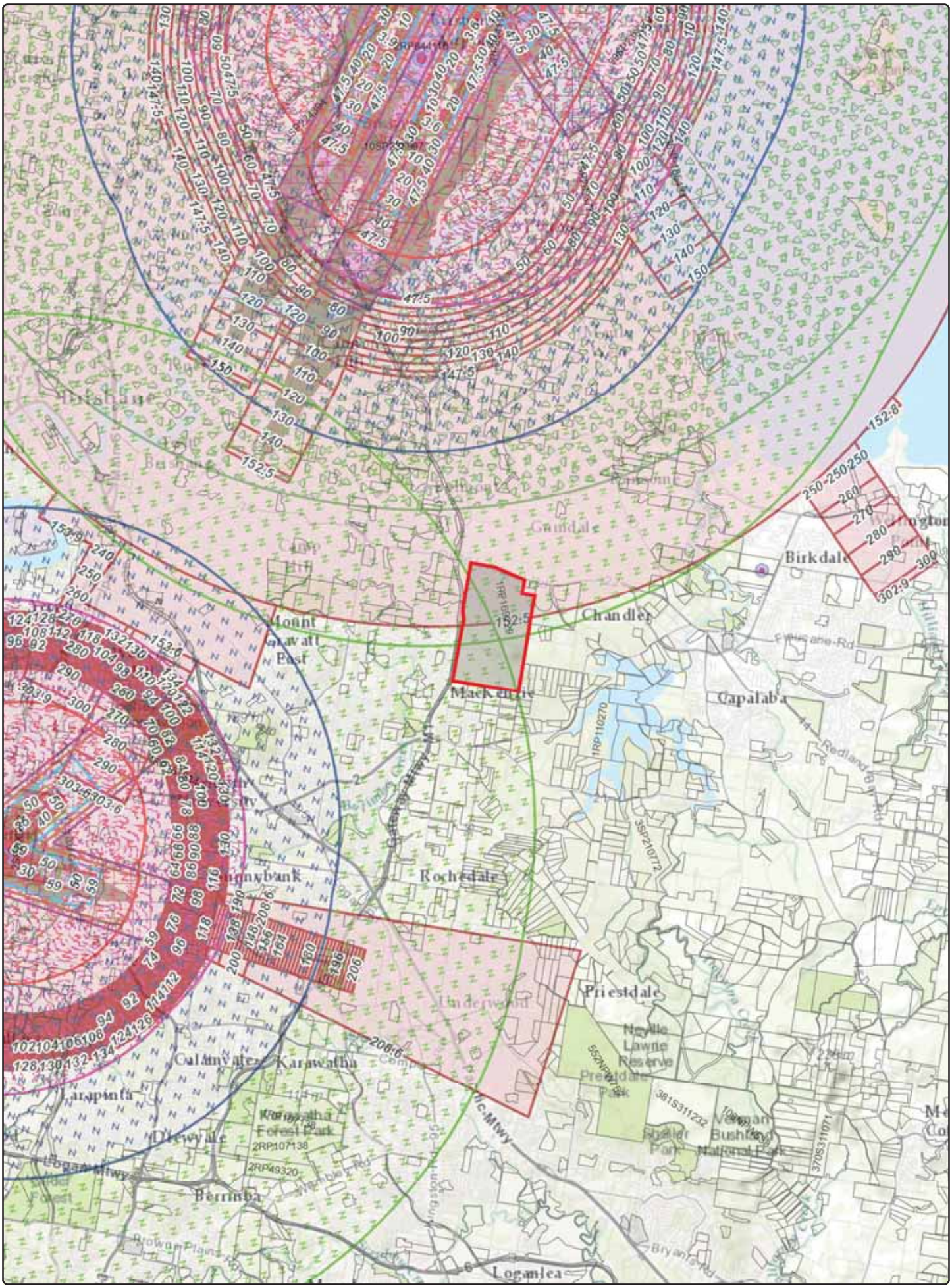

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0 2,300 4,600 6,900 9,200

Metres

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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (150k)

Cadastre (150k)

Wildlife hazard buffer zone

3km

8km

13km

Lighting area buffer 6km

Lighting area buffer 6km

Light restriction zone

Zone A

Zone B

Zone C

Zone D

Aviation facility

Location

Building restricted area - Zone A

Building restricted area - Zone A/B

Building restricted area - Area of interest

Obstacle limitation surface contours

Obstacle limitation surface contours

Public safety area

Public safety area

ANEF 40 contour or greater

ANEF 40 contour or greater

ANEF 35 - 40 contour

ANEF 35 - 40 contour

ANEF 30 - 35 contour

ANEF 30 - 35 contour

ANEF 25 - 30 contour

ANEF 25 - 30 contour

ANEF 20 - 25 contour

ANEF 20 - 25 contour

Height restriction zone 0m

Height restriction zone 0m

Height restriction zone 7.5m

Height restriction zone 7.5m

Height restriction zone 15m

Height restriction zone 15m

Height restriction zone 45m

Height restriction zone 45m

Height restriction zone 90m

Height restriction zone 90m

Obstacle limitation surface area

Obstacle limitation surface area

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Metres

Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (50k)

Cadastre (50k)

Public passenger transport facility

Public passenger transport facility

Future public passenger transport facility

Future public passenger transport facility

Future State-controlled transport tunnel

Future State-controlled transport tunnel

State-controlled transport tunnel

State-controlled transport tunnel

Future busway corridor

Future busway corridor

Busway corridor

Busway corridor

Future light rail corridor

Future light rail corridor

Light rail corridor

Light rail corridor

State-controlled road

State-controlled road

Future State-controlled road

Future State-controlled road

Future railway corridor

Future railway corridor

Railway corridor

Railway corridor

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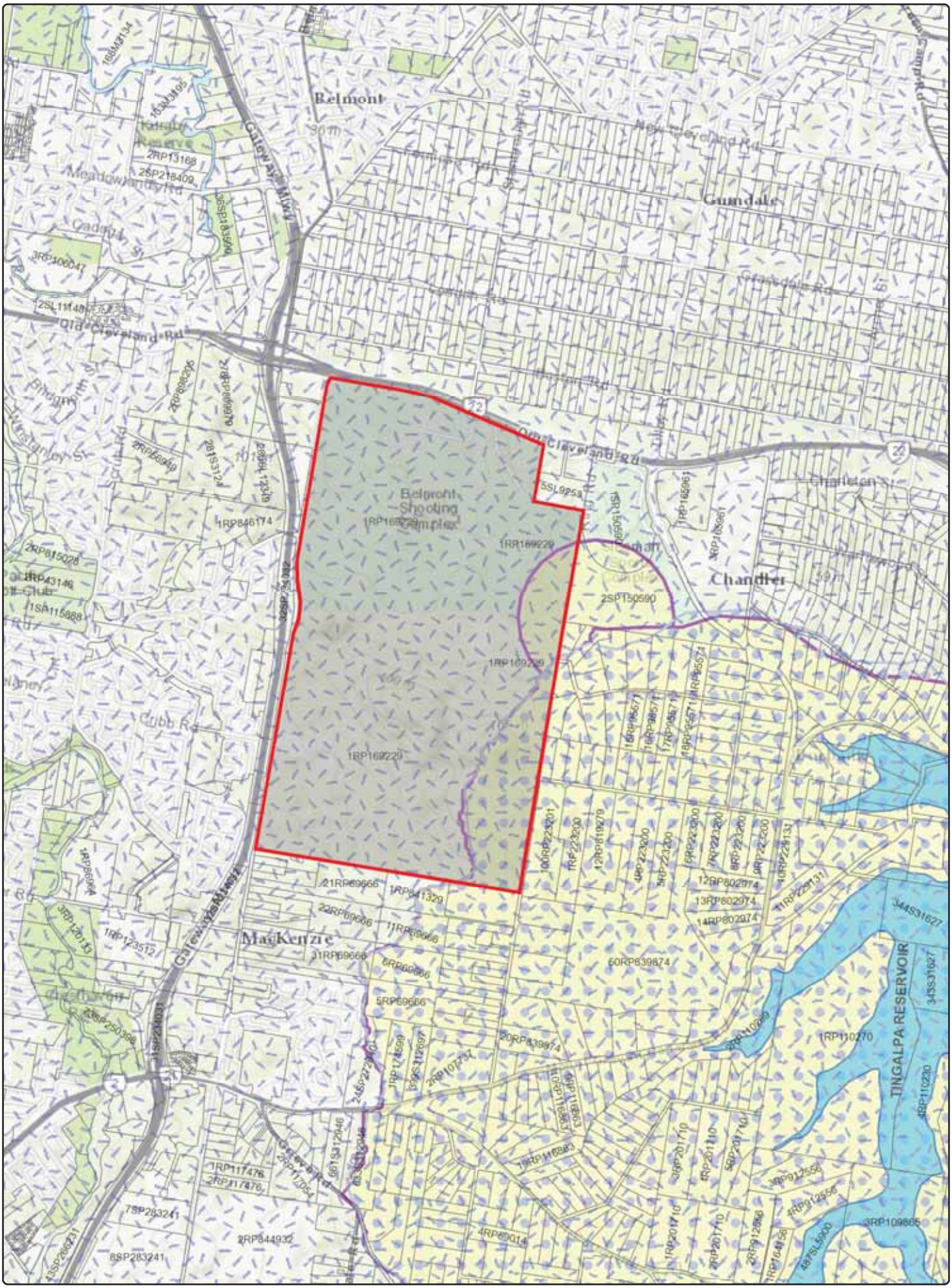

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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (50k)

Cadastre (50k)

Slightly disturbed waters

Slightly disturbed waters

Climatic regions - stormwater management design objectives

Climatic regions - stormwater management design objectives

Urban water supply storage

Urban water supply storage

High ecological value water areas

High ecological value water areas

Water resource catchments

Water resource catchments

Water supply buffer area

Water supply buffer area

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Department of Infrastructure, Local Government and Planning

State Planning Policy

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Appendix O

State Development Area and Regional Plan Map

Department of Housing and Public Works

Queensland Government

DA Mapping System – Print Screen

Date: 24/11/2017

0 290 580 870 1,160

Metres

Department of Infrastructure, Local Government and Planning

Queensland Government

Disclaimer:
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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (25k)

Cadastre (25k)

State development area

State development area

DA Mapping System – Print Screen

Department of Infrastructure, Local Government and Planning

Queensland Government

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Legend

Drawn Polygon Layer

Override 1

Drawn Polygon Layer

Override 1

Cadastre (50k)

Cadastre (50k)

Regional planning boundary

Regional planning boundary

Local government area

Local government area

Regional land use categories (SEQ, WBB, MIW, FNQ)

Urban Footprint

Rural Living Area

Regional Landscape and Rural Production Area

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