Environmental Assessment Report

Department of Education
6 Full Cohort Program – Ferny Grove State High School

June 2018

Department of Housing and Public Works

Queensland Government

Document history

Version	Date	Status	Key changes made	Author/s	Reviewer/s
1.0	25/06/2018	Draft	Document development	JZ	
1.1	29/06/2018	Final	Issue to DSDMIP	JZ	

Abbreviations

AHD	Australian Height Datum
ANEF	Australian Noise Exposure Forecast
ARI	Average Recurrence Interval
AS	Australian Standards
ASS	Acid Sulfate Soils
BCA	Building Code of Australia
BCC	Brisbane City Council
CLR	Contaminated Land Register
DES	Department of Environment and Science
DHPW	Department of Housing and Public Works
DoE	Department of Education
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
DTMR	Department of Transport and Main Roads
EMR	Environmental Management Register
EPA	*Environmental Protection Act 1994*
EPBC	*Environmental Protection and Biodiversity Conservation Act 1999* (Cth)
GFA	Gross Floor Area
NCA	*Nature Conservation Act 1992*
PA	*Planning Act 2016*
PR	*Planning Regulation 2017*
PWD	People with Disability
QDC	Queensland Development Code
SEQRP	South East Queensland Regional Plan
SEQ	South East Queensland
SHS	State High School
SPP	State Planning Policy
VMA	*Vegetation Management Act 1999*

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PART A – EXECUTIVE SUMMARY

1 Infrastructure Proposal

With reference to section 36(3) of the *Planning Act 2016,* the below sets out the matters required as part of the Infrastructure Proposal, and 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:	Lot 106 on SP259861
	Property address:	26 McGinn Road, Ferny Grove
	Registered owner:	The State of Queensland (represented by the Department of Education and Training)
	Tenure:	Freehold
	Site area:	13.48ha
	Google Earth co-ordinates:	27°40'611.11" S; 152°93'30.25" E
b) any existing uses on the premises proposed to be designated;	Lot 106 on SP259861 is currently improved by the Ferny Grove State High School and supported facilities.	
c) existing uses on adjoining sites;	The site adjoins detached dwellings to the south and west. To the east of the site is a large outdoor sport and recreation area (including Ferny Grove Bowls and Community Club, Arana Bridge Club, sporting ovals), the Ferny Grove Resource Recovery Centre and Brisbane Tram Museum. Opposite the site on McGinn Road consists of detached dwellings.	
d) the type of infrastructure;	6 educational facilities	
e) information about the nature, scale and intensity of the infrastructure and each use proposed;	***Drawings at Appendix 5 – Proposal Plans***	
f) the intended outcomes of the proposed uses on the site;	In 2007 the non-compulsory Prep Year was introduced to Queensland schools and in the following year the Year 1 starting age was subsequently raised. Consequently, a smaller cohort of students, often referred to as the half cohort, was introduced to Queensland state schools. Over the following years this cohort of students has increased in size and across the state schooling sector now reflects approximately two thirds the size of a usual year level cohort. In 2015, this smaller cohort of students entered Year 8 along with the first group of Year 7 students in secondary schools as part of the Flying Start suite of reforms. The half cohort, currently in Year 10, will enter Senior Secondary in 2018 and will exit the system at the end of the 2019 school year, creating six full cohorts across secondary schools for the first time in 2020.	

	An analysis of infrastructure requirements for 2020 indicates additional capacity is needed in a number of schools across the State, including Centenary State High School. To accommodate the six full cohorts in 2020, it is proposed to provide the school with a new Learning Centre incorporating a number of learning spaces and associated spaces The school's current Built Capacity is 2,122 and the current Student Enrolment Capacity is 1,745. To accommodate the six full cohorts in 2020, it is proposed to provide the school with a new Learning Centre incorporating a number of learning spaces and associated spaces. On completion, the school's Built Capacity will be 2,546 and a Student Enrolment Capacity of 2,094.	
g) any anticipated impacts on the surrounding infrastructure network (both state and local);	Nil. Impacts on surrounding infrastructure will be fully explored in the Environmental Assessment Report (EAR).	
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;	CULTURAL HERITAGE	The proposed development is located within an area subject to previous clearing, therefore, the nature of the activity is likely to be classified as 'area previously subject to significant disturbance – Category 4', under the *Aboriginal Cultural Heritage Act 2003* (ACHA), Section 28 Duty of Care Guidelines. Subject to measures set out in paragraph 5.6 – 5.12, under Category 4 of the Duty of Care Guidelines, the proposed activates can proceed without further cultural heritage assessment. It should be noted that any Aboriginal cultural heritage, if found, is protected under the ACHA even if DEHP has not recorded it. Contract documents will include provisions for works to cease and the relevant Aboriginal Party to be contacted if evidence of Aboriginal cultural heritage is encountered during site works.
	WATER QUALITY	The site is in the Climatic regions - stormwater management design objectives. A stormwater management plan has been prepared and included at ***Appendix 11***.
	BIODIVERSITY • MSES – Regulated Vegetation (category B & intersecting a watercourse)	The vegetated area along the southern boundary of the site is mapped as MSES – Regulated Vegetation (category B & intersecting a watercourse). The proposed works are to be constructed towards the northern part of the site. Nil impacts are expected as a result of the proposal.
	NATURAL HAZARDS RISK AND RESILIENCE	The local government planning scheme mapping shows that the southern part of the site is affected by flooding from Creek/Waterway. The proposed Learning

	• Flood hazard area – Local Government flood mapping area • Bushfire Prone Area (Medium Potential Bushfire Intensity and Potential Impact Buffer)	Centre is not located within the flood area. The future multi-purpose hall will be sited within the mapped flood area and will need to achieve appropriate design requirements for flood planning. A flood assessment has been undertaken and included at ***Appendix 10***. The site is mapped as a bushfire prone area. A large portion is identified as a Potential Impact Buffer area. Parts of the site along the eastern and southern boundary are mapped as medium, high and very high potential bushfire intensity. The proposed Learning Centre is not mapped within the bushfire prone area. The future multi-purpose hall will be sited within the potential impact buffer area. A bushfire assessment and management plan has been prepared and included at ***Appendix 15***.
	Refer to Appendix 6 – State Interest Trigger Maps	
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 Urban Footprint land use category. The site is not included in a state development area.	
	Refer to Appendix 6 – State Interest Trigger Maps	
j) sufficient information to address the requirements of section 36(1) of the Act;	The proposed infrastructure meets the criteria in section 36 of the *Planning Act 2016* as the infrastructure will satisfy budgetary commitments for the supply of infrastructure. Refer to the Capital Statement 2017-18 for the funding commitments relating to the *Six Full Cohorts – 2020 Ready* program: https://s3.budget.qld.gov.au/budget/papers/3/3-Capital-outlays-by-entity.pdf The future multi-purpose hall is not funded through the current *Six Full Cohorts – 2020 Ready* program and will be subject to a separate funding allocation in the future.	
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	***Refer to Part G – Consultation***	

	from general public consultation;	
l)	any other matter the infrastructure entity considers relevant to the request.	Nil

PART B – INTRODUCTION

In accordance with the requirements of the *Planning Act 2016* (PA), it is proposed to undertake an Infrastructure Designation of land within the Brisbane City Council (BCC) local government area on behalf of the Department of Education (DoE) for the Ferny Grove State High School (SHS). The proposed designation applies to land located at 26 McGinn Road, Ferny Grove and alternatively described as Lot 106 on SP259861.

In accordance with *Six Full Cohorts – 2020 Ready* program, the Queensland Government is committed to building fit for purpose learning environments that support educational outcomes. The program provides a capital investment of $250 million over two years for new classrooms and other infrastructure in the State's secondary schools. The purpose of this is to cater for the 17,000 additional students expected by the 2020 calendar year.

The purpose of the Infrastructure Designation is to undertake the following scope of works:

- new multi-storey Learning Centre, consisting of 3 storeys (general learning areas, flexible spaces, science laboratory) with undercroft area;
- provide covered link access from the new building to the spine of the school;
- new modular hire building to decant classes;
- redevelop and formalise north-western car parking area;
- new north-eastern car parking area; and
- future single-court multi-purpose hall.

The DoE has made a funding commitment of approximately $18.1 million as part of the *Six Full Cohorts – 2020 Ready* program and approximately $10 million for the future multi-purpose hall at the Ferny Grove SHS.

The proposed works are intended to future proof the school while providing facilities that improve the amenity of the Ferny Grove SHS consistent with current standards and sited with consideration of the functionality of the buildings, and connection with existing and planned future buildings.

Building and Asset Services' (BAS) Town Planning Unit has prepared this Environmental Assessment Report (EAR) to provide information in the assessment of the proposed Ministerial designation of land for infrastructure.

2 Legislative Context

2.1 The Planning Act 2016

A list of infrastructure is set out in Schedule 5 of the *Planning Regulation 2017* (PR).

The PA prescribes the way in which a designation can be undertaken. Chapter 2, Part 5 of the PA (refer **Appendix 1**) 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 https://www.statedevelopment.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.

It is noted that BAS has held pre-lodgement discussions with the Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) regarding an alternative designation process to that described above. It is recognised the proposed development is considered 'low risk' and as such a streamlined approach has been agreed and includes:

1. Pre-lodgement Meeting;
2. Environmental Assessment Report;
3. Consultation and State Interest Review; and
4. Final Assessment and Minister Decision.

The EAR has been drafted in accordance with the Chapter 7 of the *Minister's Guidelines and Rules* and has been prepared to generally align with Step 2 of the alternative designation process.

The effect of a Ministerial designation is that the use of the site for the described infrastructure and services may proceed despite the local government's planning scheme.

This designation will be undertaken in accordance with Chapter 2, Part 5 of the PA.

PART C – SITE DETAILS

3 Subject Site

3.1 Property Snapshot

Site Overview	
Street Address	26 McGinn Road, Ferny Grove
Real Property Description	Lot 106 on SP259861
Site Area	13.48ha
Local Government Authority	Brisbane City Council
Current Land Use	Educational Establishment
Regional Plan	South East Queensland Regional Plan

3.2 Ownership and Tenure

The allotment is freehold and owned by the State of Queensland (represented by the Department of Education and Training).

3.3 Location

The site is located within the Brisbane City Council local government area. As illustrated in *Figure 1* and *Figure 2*, the site consists of an irregular shaped allotment with an area of 13.48 hectares. The site is currently improved with the Ferny Grove SHS comprising of various school buildings, ancillary outbuildings / structures and infrastructure with a street frontage of approximately 82m to Persimmon Street and 390m to McGinn Road. A watercourse is located towards the southern portion of the site which traverses across the oval in an east-west direction. This area is heavily vegetated with no buildings or structure sited within this part of the site.

3.4 Surrounding Land Uses

The site directly adjoins residential uses in the form of detached dwellings to the south and west.

To the east of the site is a large outdoor sport and recreation area which consists of the Ferny Grove Bowls and Community Club, Arana Bridge Club, Ferny Grove Resource Recovery Centre, Brisbane Tram Museum and various sporting ovals.

Directly opposite the site on McGinn Road are residential uses consisting of detached dwellings.

3.5 Easements and Encumbrances

There are no easements or encumbrances burdening the site.

A copy of the Certificate of Title, Survey Plan and Smart Map is in **Appendix 3** for reference.

Figure 1. Site Aerial Source: DSDMIP

Figure 2. Site Context Source: DSDMIP

3.6 Topography

The site has a fall of approximately 19 metres, with the south-eastern corner being the highest point at approximately 77m AHD and falling to the north and north-west, with the oval being the lowest point of the site. From the bottom bank of the oval at 56m AHD, the land steadily rises to the north-western corner and northern boundary towards Persimmon Street and McGinn Road.

Figure 3. Contour Plan (2009) Source: BCC eBIMAP

A contour and detail survey of the development area is included in **Appendix 4** for reference.

3.7 Socio-economic Profile

3.7.1 Brisbane City Council Local Government Area Profile

Brisbane is a city and local government area (LGA) in the south-east corner of Queensland, Australia. It is the State capital of Queensland and the most populous LGA in the country. Neighbouring GLAs include Moreton Bay, Redland, Logan, Ipswich and Somerset.

The Brisbane LGA has a resident population of approximately 1,131,155 persons (at 2016).

3.7.2 Ferny Grove Profile

Ferny Grove is a suburb located approximately 13km from the Brisbane CBD. As at the 2016 Australian Census, 5,725 persons were recorded as residing in Ferny Grove.

The median age of people in Ferny Grove is 39 years. Children aged 0–14 made up 20.7% of the population and people aged 65 and over made up 15.1% of the population, respectively.

Of the families in Ferny Grove, 50.5% were couple families with children, 35.4% were couple families without children and 13.3% were one parent families.

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 Road Network

4.1.1 Existing Road Network

The site has two (2) road frontage of approximately 393m to McGinn Road, which is identified as a district road and approximately 82m to Persimmon Street, which is identified as a neighbourhood road.

McGinn Road is a key east-west road that links to Tramway Street and then onto Samford Road further to the south.

4.1.2 Existing Public Transport Network

The existing public transport network in proximity to the Ferny Grove SHS includes the several Translink bus and rail services, as follows:

- Ferny Grove train station (approximately 173m walking distance to the north)
- Bus stops along McGinn Road (opposite the school at the McGinn Road / Arbor Street intersection and approximately 90m walking distance to the west at the McGinn Road / Archdale Road intersection)
  - Route 367: Ferny Grove to Upper Kedron
  - Route 397: Arana Hills to Mitchelton
  - Route 398: Ferny Grove to Mitchelton

4.1.3 Existing Active Transport Network

An existing footpath is provided along the McGinn Road and Persimmon Street frontage of the school. The existing footpath along the Persimmon Road does not extend beyond the site boundary. The existing footpath along the McGinn Road frontage extend further to the east and west of the site boundary.

McGinn Road also includes appropriate width to accommodate cycle infrastructure, and is clearly demarcated within the road reserve area.

4.2 Services

4.2.1 Water Infrastructure

With reference to *Figure 4* Council's eBIMAP mapping system, the school has access to water infrastructure, via a 100mm and 50mm connection, from the main located on the northern side of McGinn Road and western side of Persimmon Street.

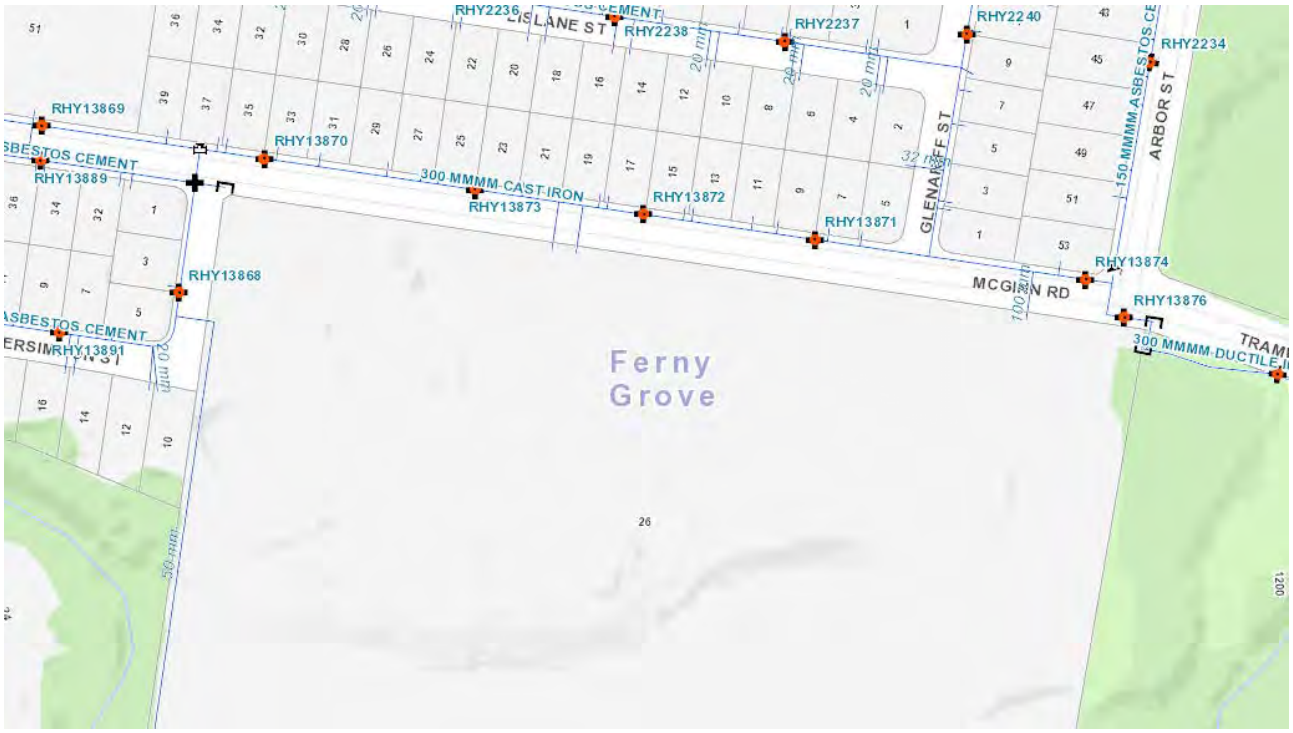


Figure 4. Water infrastructure Source: BCC eBIMAP

4.2.2 Sewer Infrastructure

With reference to *Figure 5* Council's eBIMAP mapping system, the school has access to sewer infrastructure, via the sewer gravity main which traverses across the site in an east to west direction and connection at McGinn Road.

Figure 5. Sewer infrastructure Source: BCC eBIMAP

4.2.3 Stormwater Infrastructure

With reference to *Figure 6* Council's eBIMAP mapping system, the school has access to stormwater infrastructure with several gullies along the school frontage on McGinn Road, which then connects to manholes along McGinn Road.

Figure 6. Stormwater infrastructure Source: BCC eBIMAP

4.2.4 Electricity Infrastructure

The school has access to electricity with overhead lines located at the corner of McGinn Road and Arbor Street which then terminates at a transformer along McGinn Road.

4.2.5 Telecommunications Infrastructure

The existing Network Centre is located in the Administration Building and will be the connection point for backbone data services to the proposed new facilities. The existing site Main Distribution Frame (MDF) is also located within the Administration Building.

PART D – DESIGNATION PROPOSAL

5 Proposed Designation

5.1 Description under the Planning Regulation 2017

The proposal seeks to designate the site as follows:

Ferny Grove State High School

126 McGinn Road, Ferny Grove

Lot 106 on SP259861

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

> ***6 educational facilities***

5.2 Intent of Designation

The designation affirms the existing use of the site as an educational establishment, and will facilitate the immediate planned works at the school and future planned developments on the site consistent with the designation purpose.

Educational and community facilities are defined as infrastructure under Schedule 5 of the *Planning Regulation 2017*, being assets necessary to support the community and for the public benefit. The proposed infrastructure will facilitate the efficient and timely supply of infrastructure; and satisfy statutory requirements and budgetary commitments of the State for the supply of infrastructure.

5.3 Project History

In 2007 the non-compulsory Prep Year was introduced to Queensland schools and in the following year the Year 1 starting age was subsequently raised. Consequently, a smaller cohort of students, often referred to as the half cohort, was introduced to Queensland state schools.

Over the following years this cohort of students has increased in size and across the state schooling sector now reflects approximately two thirds the size of a usual year level cohort.

In 2015, this smaller cohort of students entered Year 8 along with the first group of Year 7 students in secondary schools as part of the Flying Start suite of reforms. The half cohort, currently in Year 9, will enter Senior Secondary in 2018 and will exit the system at the end of the 2019 school year, creating six full cohorts across secondary schools for the first time in 2020.

An analysis of infrastructure requirements for 2020 indicates additional capacity is needed in number of schools across the State, including Ferny Grove SHS. To accommodate the six full cohorts in 2020, it is proposed to provide the school with a new Learning Centre incorporating a number of learning spaces and associated spaces.

The *Six Full Cohorts – 2020 Ready* program is a Queensland Government commitment to delivering fit for purpose learning environments that support educational outcomes. The program

provides a capital investment of $250 million over two years for new classrooms and other infrastructure in the State's secondary schools to cater for the 17,000 additional students expected by the 2020 calendar year.

To align with the *Six Full Cohorts – 2020 Ready* program, the DoE has made a funding commitment of approximately $18.1 million to deliver the following:

- construct a multi-storey learning centre;
- provide a covered link access from the new building to the spine of the school;
- new north-eastern car parking area; and
- redevelop and formalise north-western car parking area.

Further to the above works, the plan has also made allowance for the future provision of learning areas within the under croft of the proposed Learning Centre. The additional learning areas are not funded through the current *Six Full Cohorts – 2020 Ready* program and will be subject to a separate funding allocation in the future. The DoE has also made a funding commitment of approximately $10 million to deliver a future multi-purpose hall at the Ferny Grove SHS.

5.4 Site Selection

The DoE and lead architect lead an informal planning analysis to determine the most suitable location for the proposed Learning Centre at Ferny Grove SHS. As part of this process, consultation was undertaken with relevant stakeholders, such as the school community and Parent's and Citizens' (P&C) Association to discuss key requirements and needs for the school. In particular it is noted the analysis has consideration of the following:

- the existing topographic conditions over the site.
- minimise noise and amenity impacts to the adjoining residences.

Similarly, options were explored for the future multi-purpose hall with consideration of the following:

- need to retain on-site car parking spaces.
- need to retain / relocate existing infrastructure and widening of internal access.
- requirement to design and construct building to avoid flooding.

5.5 Proposal Description and Details

The proposal seeks to undertake the following works at Ferny Grove SHS:

- construct a multi-storey learning centre;
- provide covered link access from the new building to the spine of the school;
- new modular hire building to decant classes;
- redevelop and formalise north-western car parking area;
- new north-eastern car parking area; and
- future single-court multi-purpose hall.

The proposal plans are provided in **Appendix 5** for further reference.

The new Learning Centre is proposed to be designed as a three storey building with a height of up to 12.4 metres and gross floor area of approximately 1,216m^2. At this stage, the ground floor will remain as an open undercroft area with potential to facilitate future development by way of infilling with learning rooms, if necessary. The undercroft area requires a minimum 3.3m ground to ceiling clearance to allow for services for the potential future room fit out.

The proposed pitch of the roof varies from 5 to 12 degrees, which will provide sufficient natural ventilation and clearance for the proposed internal fixtures. The building features an external colour-gridded screen inspired by images of a periodic table and dividing colours across the façade in the same way that elements are grouped in the periodic table.

The proposed Learning Centre will be sited within an existing cleared area of the school and will result in the removal of landscaped trees only. The proposal will maintain the existing boundary fence, reinstate the grass areas and makes allowance for landscaping between the car parking areas and the boundary to enhance the streetscape.

The external materials proposed for the new Learning Centre include a mix of lightweight but durable materials such as pre-finished fibre cement, metal cladding and roof sheeting, brick and powder coated aluminium. The chosen materials are reflected in the surrounding built environment of the school and region, and are cost-effective, practical for their intended function, durable and low maintenance to limit ongoing maintenance and lifecycle costs.

The new modular building to be sited west of the main entrance at McGinn Road will be a single-storey building of approximately 3.6m in height. This building will be temporary to decant classes until the new Learning Centre is completed for occupation.

The future multi-purpose hall is intended as a single-court facility with a building height of approximately 9.5 metres and roof pitch of up to 7 degrees. The future hall is intended to include functional spaces consisting of courts, stage area, multi-purpose room and amenity areas. The proposed location of the future hall is subject to flooding and therefore will be designed to withstand flood loads. The building is intended to be constructed with a suspended floor and on pillars to allow water to flow across the underside of the building.

The proposed works will ensure the school is able to address current capacity challenges and foreseeable expansion of capacity. The proposed works are intended to future proof the school while providing facilities that improve the amenity of the Ferny Grove SHS consistent with current standards and sited with consideration of the functionality of the buildings, and connection with existing and planned future buildings.

5.5.1 School Population

Based on current DoE forecasts, the Ferny Grove SHS is anticipated to grow to approximately 2,080 students by the 2020 calendar year.

At present, the school has a student enrolment capacity (SEC) to accommodate 1,745 students and a built capacity (BLT) to accommodate for 2,122 students.

It is noted the DoE references the SEC when considering the number of students a school can optimally accommodate within existing learning spaces. Learning spaces are generally designed where student enrolments exceed the SEC for the school then the DoE is required to investigate opportunities for new infrastructure to accommodate the increase in student population.

The proposed development, inclusive of the undercroft area to accommodate for additional learning areas, will provide for an ultimate SEC of approximately 2,094 students. This will meet the population growth demands for the 2020 calendar year, and beyond.

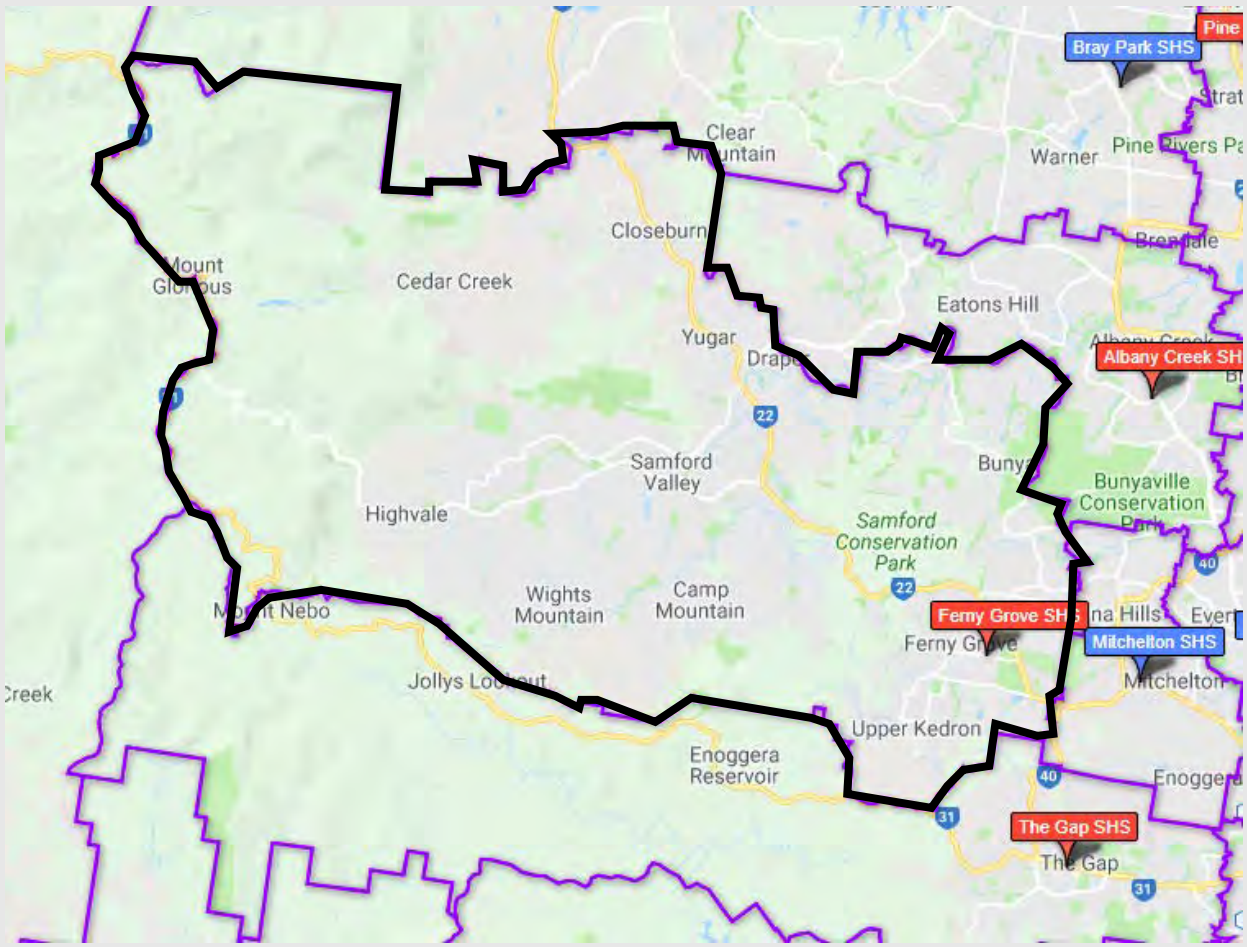
5.5.2 Hours of Operation

The Ferny Grove SHS operates from 8:55 am and finishes at 3:00 pm with office hours from 8:00 am until 4:00 pm.

5.5.3 School Catchment Area

The Ferny Grove SHS catchment includes all and part of the suburbs of Ferny Grove, Ferny Hills, Bunya, Draper, Yugar, Closeburn, Cedar Creek, Mount Glorious, Highvale, Samford, Samford Valley, Samford Village, Wights Mountain, Camp Mountain and Upper Kedron.

School Catchment Area



Source: DoE

Legend

Ferny Grove SHS Catchment Area

5.5.4 Vehicle and Parking

Vehicle access to the Ferny Grove SHS is currently provided via three (3) driveway crossovers including:

- Left in / left out on McGinn Road (to eastern car park);
- all movements access on McGinn Road (to central car park); and
- all movement access on Persimmon Street (to western car park).

The bus stops located on the southern side of Tramway Street and northern side of McGinn Road are heavily utilised by students. A large majority of the students travelling by car are dropped-off / picked-up compared to parents parking, which is expected for a secondary school and consistent with other state high schools in South East Queensland.

The site currently provides a total of 96 formal on-site car parking spaces and two (2) informal parking areas used by staff members. A new car parking area is expected to be constructed by

December 2018 which will provide an additional 77 formal on-site car parking spaces at the school. The existing informal car parking area at the corner of Persimmon Street / McGinn Road will be formalised providing a total of 54 on-site car parking spaces and represents a net increase of 13 on-site parking spaces at this location.

An existing 2 min set down / pick up facility of approximately 140m in length is located along part of McGinn Road frontage.

5.5.5 Pedestrian Facilities

Numerous pedestrian paths, covering the full verge width, are provided along the direct frontages of the subject site. As such, the existing network is considered to provide safe and direct pedestrian access to the school.

5.6 Designation Process

In accordance with the alternative designation process as agreed with DSDMIP, this EAR has been prepared with the intention to support the consultation and state interest review stage being undertaken with those stakeholders identified in Part G – Consultation of this report. Section 9.2 also includes an approved Community Engagement Plan in which this Infrastructure Designation Proposal will follow.

Although an alternative process, this EAR has been drafted in accordance with the Chapter 7 of the *Minister's Guidelines and Rules*.

Once information gathered as part of this stage is collated, the DSDMIP will undertake a final assessment of the proposed development before consideration by the Minister for State Development, Manufacturing, Infrastructure and Planning.

PART E – LOCAL AND STATE PLANNING PROVISIONS

6 Planning Assessment

In terms of development under the PA, the designation is proposed to be undertaken in accordance with Chapter 2, Part 5 of the Act. The effect of the designation, if made, is that the use of the site for the designated infrastructure and service will be exempt from the local government's planning scheme.

In relation to any building works, these will be accepted development in accordance with Schedule 7, Part 1, item 2 of the PR.

6.1 Local Planning Framework

Where land is not designated for infrastructure, any development involving a material change of use should have regard to the requirements of the relevant planning scheme. Whilst the intended designation will result in development being exempt from assessment against the planning scheme, consideration has still been given to its relevant provisions.

The *Brisbane City Plan 2014* (Planning Scheme) commenced on 30 June 2014 and is the relevant planning scheme for the site.

6.2 Planning Scheme Provisions

The below table provides a summary of the key planning scheme provisions relevant to the site.

Planning scheme information	
Planning scheme	*Brisbane City Plan 2014*
Area classification	CF5 Community facilities zone (Education purposes)
Local area plan	Ferny Grove-Upper Kedron neighbourhood plan
Overlays	• Airport Environs overlay • Bicycle Network overlay • Biodiversity Areas overlay • Bushfire overlay • Critical infrastructure and movement network overlay • Flood overlay • Industrial amenity overlay • Road hierarchy overlay • Streetscape hierarchy overlay • Waterway corridor overlay

6.3 Use Definition

With reference to the Planning Scheme, Schedule 1 Definitions, the proposal for a new building within an established school is classified under 'Educational Establishment' and defined below.

Educational Establishment: *means the use of premises for—*

(a) training and instruction to impart knowledge and develop skills; or

(b) student accommodation, before or after school care, or vacation care, if the use is ancillary to the use in paragraph (a).

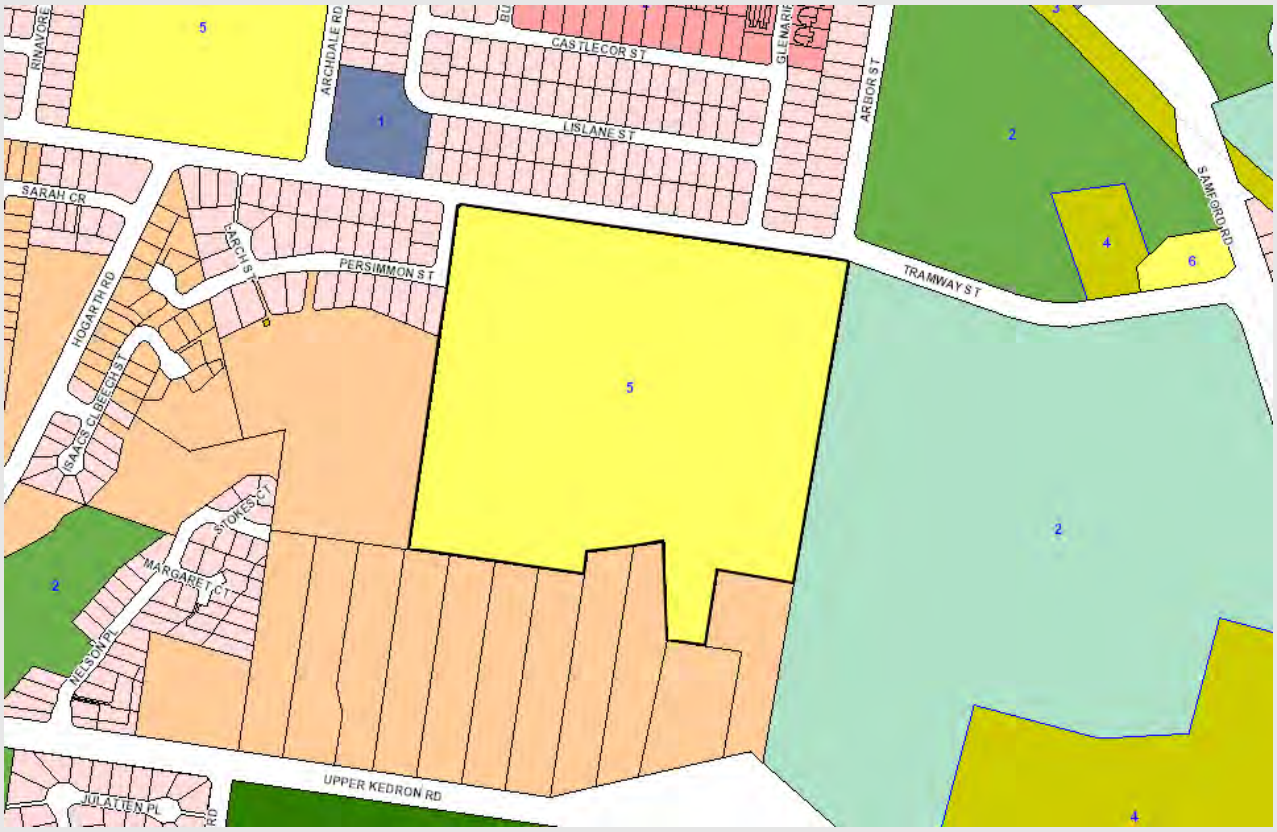
Examples of an educational establishment— college, outdoor education centre, primary school, secondary school, special education facility, technical institute, university

In accordance with Table SC1.1.2.B – Defined activity groups, an Educational Establishment is listed under the Community Facilities – Education Purposes under the Planning Scheme.

6.4 Zoning

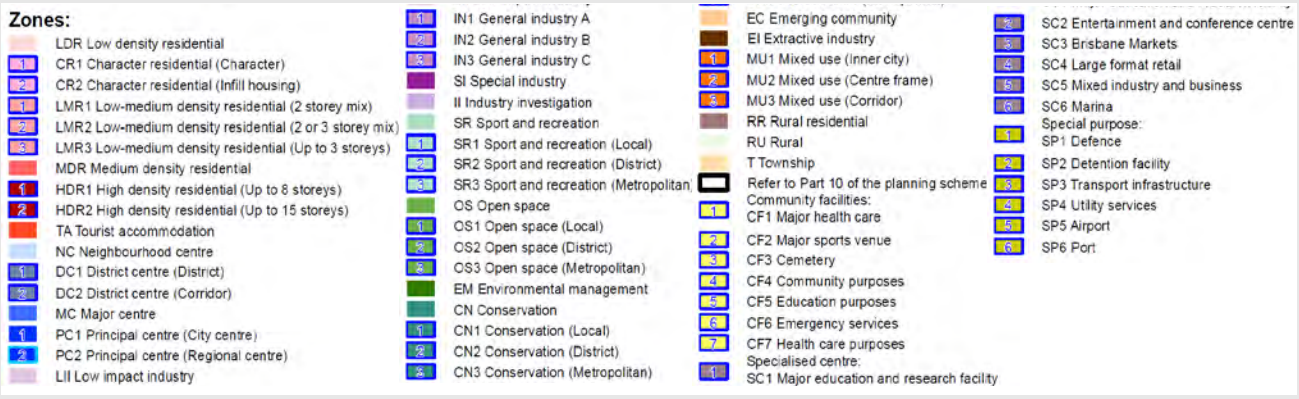
Under Part 6 of the Planning Scheme the subject site is identified within the CF5 Community Facilities (Education Purpose) Zone, as indicated in the figure below.

Planning Scheme – Zoning



Source: Brisbane City Plan

Legend



The purpose of the Community Facilities Zone code is to provide for community related activities and facilities whether under public or private ownership. These may include the provision of

municipal services, public utilities, government installations, hospitals and schools, transport and telecommunication networks and community infrastructure of an artistic, social or cultural nature.

The following overall outcomes are to be achieved by development in the Community Facilities zone:

(a) Development contributes to the city being well served with community buildings, facilities, spaces and activities meeting the diversity of community needs.

(b) Development provides for both privately owned community facilities and community facilities that are owned or operated by federal, state or local government.

(c) Development that limits the ongoing operation and expansion of an existing community facility or prejudices the establishment of a new community facility appropriate to the relevant zone precinct is not accommodated.

(d) Development in a particular zone precinct is predominantly for community facilities that are envisaged in that zone precinct, unless an appropriate adaptation of the premises for another community facility use can be demonstrated.

The Ferny Grove SHS is an existing State government educational establishment. The proposed works are generally consistent in scale, height and bulk of development at the school and will not prejudice the established use of the site. The proposal is in keeping with the purpose and character of the school facility and community needs.

The majority of proposed works are well separated from adjoining detached dwellings and will be appropriately attenuated to further minimise potential impacts to amenity.

The proposed works are located within a developed area of the site which has been cleared of native vegetation and is outside mapped environmental features.

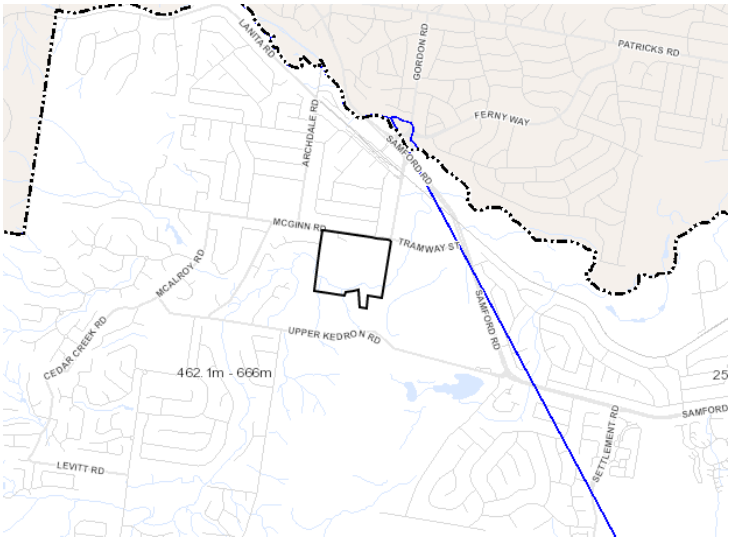
6.4.1 Ferny Grove-Upper Kedron Neighbourhood Plan

The site is located in the Ferny Grove-Upper Kedron neighbourhood plan under the Planning Scheme. The site is not in a specific precinct of this neighbourhood plan and therefore no additional provisions apply to future development on this site as a result of its inclusion.

6.5 Overlays

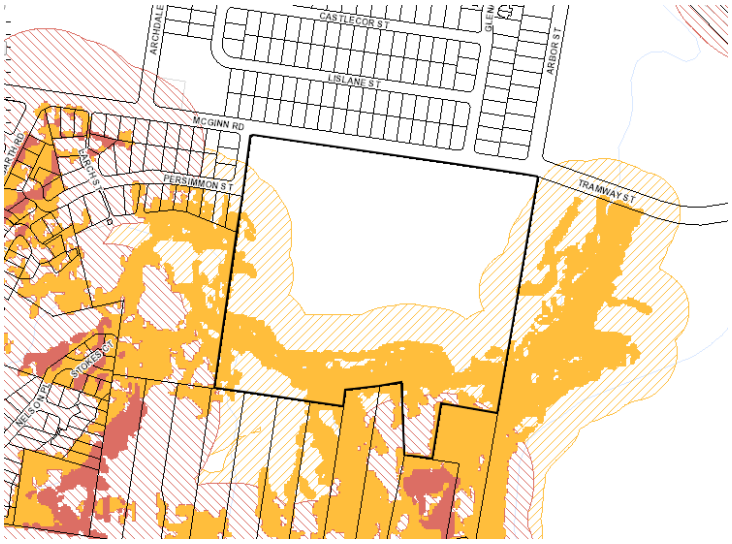
The planning scheme identifies physical constraints affecting development through the inclusion of overlays. Where a site is affected by a Council constraint, additional development limitations may be placed over the property/s by the Planning Scheme.

It is noted that the site is affected by the following overlays:

Overlay	Overlay map
Airport Environs The site is identified within the: • Procedures for Air Navigation Surfaces (PANS).	
Bicycles Network • McGinn Road to the north and part of the south-eastern corner of the site are identified as a Secondary cycle route. • Persimmon Street to the west is identified as a Local cycle route.	
Biodiversity • The southern portion of the site, being the oval area, is mapped as high ecological significance.	

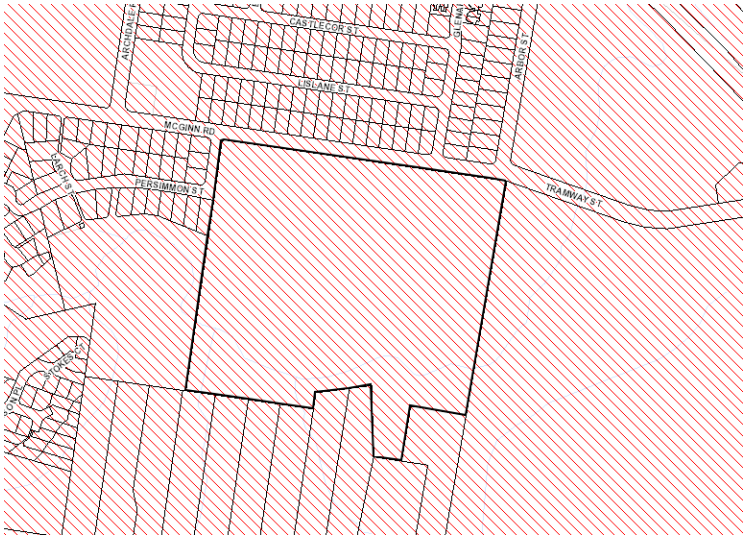
Bushfire

- The site is mapped within a medium hazard area and medium hazard buffer area.



Critical Infrastructure and Movement Network

- The site is mapped within the critical infrastructure and movement planning area.



Flood

- The site is mapped within the Creek / Waterway flood planning area (sub-categories 1,3,4 and 5),
- A small portion of the south-western corner is within the overland flow flood planning area.

Industrial Amenity

- A small portion at the south-eastern corner of the site is mapped within the industrial amenity investigation area.

Road Hierarchy

The site has road frontage to the following:

- McGinn Road to the north which is identified as a District Road
- Persimmon Street to the west which is identified as a Neighbourhood Road.

Streetscape Hierarchy

- Both street frontages are classified as neighbourhood streets – minor road.

Waterway Corridor

- The southern portion of the site is mapped within the Citywide and Local waterway corridor.

7 State Planning Framework

7.1 The Planning Act 2016

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 the SPP has effect throughout Queensland and sits above regional plans and planning schemes in the hierarchy of planning instruments.

7.2 State Planning Policy

The SPP applies to the extent relevant when designating premises for infrastructure. When making or amending a designation, the Planning Minister must have regard to the relevant parts of the SPP as shown in the table 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 are discussed in further detail 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 improved educational facilities for the school. 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 an 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.*

The proposal seeks to designate the site for the purposes of providing improved educational facilities at Ferny Grove SHS. The designation forwards the efficient and timely delivery of infrastructure while ensuring that subsequent works on the site can proceed without assessment against the *Brisbane City Plan 2014.*

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.*

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

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 is proposed in accordance with Chapter 2 of the PA. Development of plans and assessment of impacts has had due consideration to relevant state and local plans and mapping and 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 Planning Policy	Applicability
Planning for Liveable Communities and Housing	
Liveable Communities	N/A
Housing Supply and Diversity	N/A
Planning for Economic Growth	
Agriculture	N/A
Development and Construction	N/A
Mining and Extractive Resources	N/A
Tourism	N/A
Planning for the Environment and Heritage	
Biodiversity	Yes
Coastal Environment	N/A
Cultural Heritage	Yes
Water Quality	Yes

Planning for Safety and Resilience to Hazards	
Emissions and Hazardous Activities	N/A
Natural Hazards Risk and Resilience	Yes
Planning for Infrastructure	
Energy and Water Supply	N/A
Infrastructure Integration	N/A
Transport Infrastructure	N/A
Strategic Airports and Aviation Facilities	N/A
Strategic Ports	N/A

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
Biodiversity The site contains MSES - Regulated vegetation (Category B). The SPP mapping shows a portion of the site towards the southern boundary being affected by MSES regulated vegetation (Category B). The proposed works are not located within this area and will not impact on the biodiversity.	
Water Quality The site is within the water resource catchment and reference should be made with the SPP, including the SPP Code: Water Quality. A site-based stormwater management plan has been prepared and is provided in **Appendix 11.**	

Natural Hazards Risk and Resilience

The site is within the Flood hazard area – Local Government flood mapping.

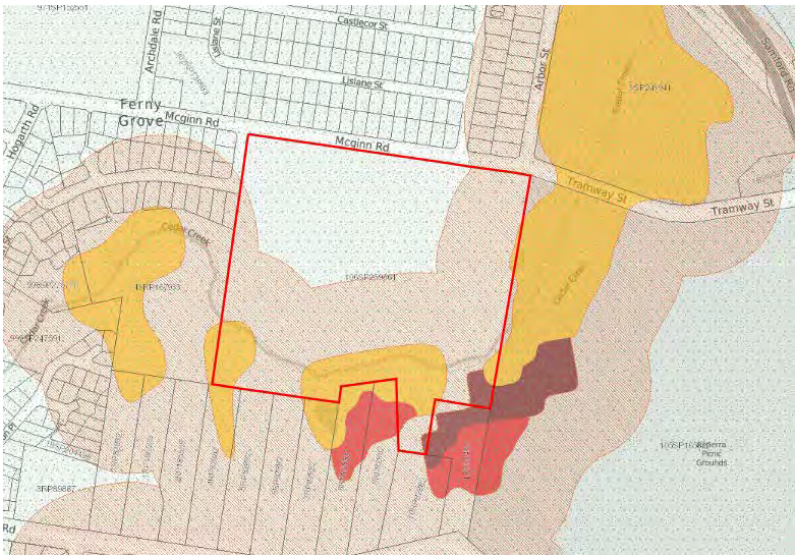
With reference to section 6.5 of the Report the location of the new Learning Centre is not subject to flooding as per the Flood Hazard Overlay map under the Planning Scheme.

The location of the future multi-purpose hall is affected by flooding from creek/waterway as per the Flood Hazard Overlay map under the Planning Scheme. A Flood Assessment been undertaken and included at **Appendix 10**. The 500 year ARI flood level affecting the location of the future hall is RL 57.85m AHD. The future hall will be designed to achieve a finished floor level of RL 59m AHD which is above the defined 0.2% AEP flood level (500 year ARI) at this location of the site. The building will be constructed with a suspended floor and on pillars to allow water to flow through during a flood event.

The site is mapped as containing areas of medium potential bushfire intensity and potential impact buffer.

The new Learning Centre is not located within the mapped bushfire hazard area. Part of the future multi-purpose hall is mapped within the potential impact buffer area.

A bushfire assessment and management plan has been prepared and is provided in **Appendix 15.**



7.2.4 Stormwater Management Design Objectives

Information on how the proposal meets the SPP stormwater management design objectives is discussed further in Part F – Environmental Assessment.

7.3 Regional Planning

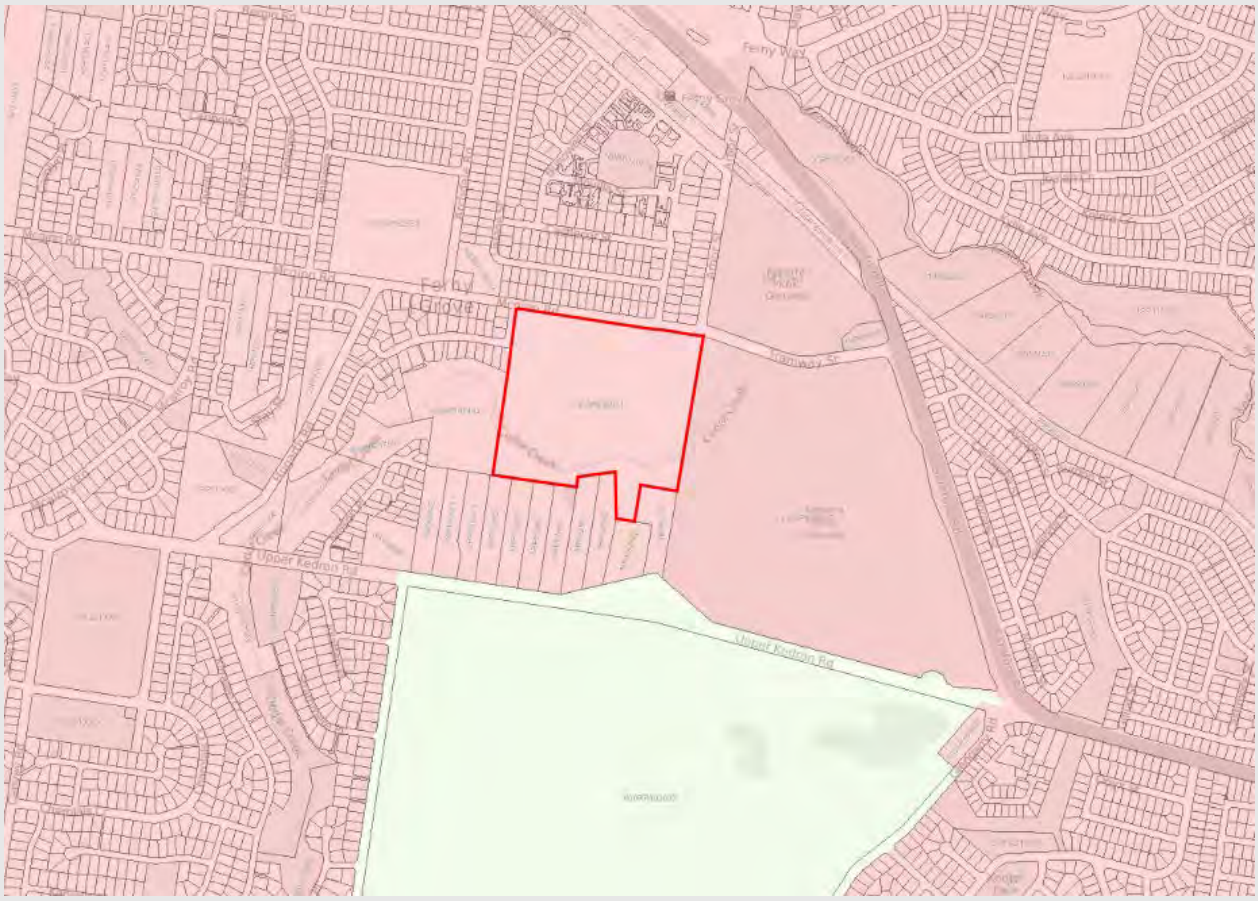
The site is included within the Urban Footprint of the *South East Queensland Regional Plan 2017*.

The Urban Footprint identifies land within which the region's urban development needs to 2041 can be accommodated in a way consistent with the goals, elements and strategies of *ShapingSEQ*.

The Urban Footprint identifies land that can meet the Region's urban development needs seeks to incorporate the full range of urban uses including housing, industry, business, infrastructure, community facilities and other integral components of well-planned urban environments, such as local areas for sport and recreation and urban open space.

The proposed Ferny Grove SHS is considered consistent with the intent of the Regional Plan. As a new educational establishment, the proposed school is located in an area undergoing significant urbanisation and will provide necessary supporting infrastructure that supports the existing and future residential community.

Regional Plan – Urban Footprint



Source: DSDMIP SARA

Legend

- Site Boundary
- Urban Footprint

PART F – ENVIRONMENTAL ASSESSMENT

8 Environmental Assessment

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.

8.1 Road Infrastructure

8.1.1 Site Access and Traffic

Context

The site does not adjoin or is not in proximity to a State-controlled Road.

The site has frontages to McGinn Road, which is a District Road and Persimmon Street which is a Neighbourhood Road. The school has primary road frontage to McGinn Road, with vehicular access via existing crossovers along both McGinn Road and Persimmon Street.

The school also operates buses during normal school hours to assist with extra-curricular activities (i.e. excursions).

Proposal

The proposed scope of works will accommodate an anticipated growth in students from 1,745 students and 127 teaching staff, to 2,094 students and 159 staff by 2020. Based on this anticipated growth, there is a potential overall increase to the school population of up to 32 full-time equivalent (FTE) staff and 345 students.

A traffic assessment has been prepared and included in **Appendix 12.** The results of the SIDRA analysis concludes that the increase in traffic will generate minimal increase in delay (<42 seconds) at the existing Persimmon Street / McGinn Road intersection. The increase in students will also have minimal impact on the McGinn Road / Arbor Street / Tramway Street intersection and Samford Road / Tramway Street intersection.

The traffic report recommends that the follow items be considered to improve existing deficiencies:

- Ban right turns into Glenariff Street from McGinn Road; and
- Ban right turns out of Glenariff Street into McGinn Road.

Actions and Recommendations

Based on the traffic assessment, the proposed works are not considered to have a material impact to site access or the operation of the road or traffic network.

Further consultation with the local government will be necessary to facilitate the improvements to McGinn Road following the designation.

8.1.2 Car Parking

Context

The site currently provides a total of approximately 96 formal car parking spaces and two (2) informal park areas used by staff members only.

Proposal

The proposal will provide a total of 131 car parking spaces. An additional net increase of 90 formal car parking bays will result as part of the development and meets the planning scheme provision, Department of Transport and Main Roads (DTMR) and Department of Education's guidelines.

The traffic assessment notes that existing parking deficiencies can be addressed by consideration of the following:

- on-site parking / set down areas be increased along the school's frontage.
- limiting the observed "stopping" duration at southern pick-up / drop-off by enforcing a 2 min max parking during the school's peak operating hours.

Actions and Recommendations

The proposed parking provision is considered suitable for the proposed development and also provides sufficient capacity to support the growth forecasts for the school.

Further consultation with the local government will be necessary to facilitate the improvements to McGinn Road.

8.1.3 Public Transport Infrastructure

Context

Based on the traffic assessment, the bus stops located on the southern side of Tramway Street and northern side of McGinn Road are heavily utilised by students.

There are a number of bus routes servicing the school including #396, 397 and 398. There are three external bus stops in proximity to the school which services both public and private bus routes located along McGinn Road (Translink bus stop #006613 and #030050) and Tramway Street (Translink bus stop #011309).

Proposal

The traffic assessment recommends improvements to the following Translink bus stops:

- Queuing control fencing could be installed at Translink bus stop #011309 on Tramway Street.
- Bus cantilevered shelter and queuing control fencing could be installed at Translink bus stop #030050 on McGinn Road.
- Limit buses queueing back on Tramway Street via management controls.

Actions and Recommendations

The existing number of bus services is considered sufficient to support the school population and as such there is no material impact anticipated to the public transport infrastructure.

Further consultation with the local government and DTMR will be necessary to facilitate the improvements to the bus stops.

8.1.4 Active Transport Infrastructure

Context

There are pedestrian footpaths along both sides of McGinn Road whilst Persimmon Street has a pedestrian footpath along the school frontage side only. The existing pedestrian footpaths along McGinn Road are connected by two (2) pedestrian crossings as well as unpatrolled pedestrian crossings along McGinn Road and Persimmon Street to car parking areas. Wide shoulders accommodate cycle lanes along both sides of McGinn Road, however no cyclist facilities are provided on Persimmon Street.

Proposal

The school is adequately serviced by existing pedestrian paths and the school currently provides bicycle storage throughout the school to accommodate existing bicycle parking demands at the school.

Actions and Recommendations

The proposed works are not considered to have a material impact to the existing active transport infrastructure or network.

8.2 Services Infrastructure

8.2.1 Water Infrastructure

Context

The school has access to water infrastructure, via 100mm and 50mm connections, which connects to the main located on the northern side of McGinn Road and western side of Persimmon Street.

Proposal

The site currently provides existing infrastructure available for connection. The existing infrastructure is likely to have sufficient capacity to cater for the proposed development at the site.

Actions and Recommendations

The adequacy, capability and location of the existing water infrastructure to service the proposed development will be confirmed prior to the construction phase.

8.2.2 Sewer Infrastructure

Context

The school has access to sewer infrastructure, via a sewer gravity main link which traverses across the site in an east to west direction across the oval and at McGinn Road. There are several existing sewer lines located throughout the site.

Proposal

The site currently provides existing infrastructure available for connection. The existing network is likely to have sufficient capacity to cater for the proposed development.

Actions and Recommendations

The adequacy, capability and location of the existing sewer infrastructure to service the proposed development will be confirmed prior to the construction phase.

8.2.3 Stormwater Infrastructure

Context

The school has access to stormwater infrastructure with several gullies and manholes along the school frontage on McGinn Road. There are several existing stormwater lines and grates located throughout the site.

Proposal

The proposed development at the school will result in an increase the impervious area over the site.

A stormwater management plan has been prepared and included in **Appendix 11**. The proposal will discharge runoff into the existing Council stormwater system, via the Gully pit at McGinn Road and existing stormwater pit on the oval, which discharges into Cedar Creek. The hydrologic model determined that the increase of peak discharge as a result of development to Cedar Creek and McGinn Road is less than 0.0001% during all ARI events and up to 0.001% during a 50 year ARI event, respectively. The minute increase in flows are not expected to create an adverse impact to

downstream properties and no on-site detention is considered necessary for the proposed development.

It is proposed to provide appropriately sized bio-retention basins to ensure the development meet water quality objectives.

Actions and Recommendations

With reference to the stormwater management plan in **Appendix 11**, the proposed development has a negligible impact on peak discharges from the site compared to pre-developed flows.

8.2.4 Electricity Infrastructure

Context

The existing electricity supply to the school is via a single overhead line which terminates at a transformer at McGinn Road. There are several electrical lines connected to power boxes which are located throughout the site.

Proposal

Based on the estimated existing site load, in addition with the estimated maximum demand of the new development, it is expected the existing incoming supply will not need to be upgraded.

Actions and Recommendations

The adequacy, capability and location of the existing electricity infrastructure to service the proposed development will be confirmed with the relevant service provider prior to the construction phase.

8.2.5 Telecommunications Infrastructure

Context

The existing Network Centre is located in the Administration Building and will be the connection point for backbone data services to the proposed new facilities. The existing site Main Distribution Frame (MDF) is also located within the Administration Building.

Proposal

The existing network is considered to have sufficient capacity to cater for the proposed development.

Actions and Recommendations

The adequacy, capability and location of the existing telecommunications infrastructure to service the proposed development will be confirmed prior to the construction phase.

8.3 Flora and Fauna

8.3.1 Vegetation Management Act 1999

Context

Vegetation clearing is predominantly regulated under the *Vegetation Management Act 1999* (VMA) and the PA. A development permit is required to clear where the clearing is not exempt clearing

work through the *Planning Regulation 2017*, or where it cannot be carried out under a self-assessable vegetation clearing code or an area management plan under the VMA.

Many routine vegetation management activities can be carried out as exempt clearing work listed in the *Planning Regulation 2017*, or through an self-assessable vegetation clearing code or an area management plan (AMP). The need for a development approval depends on the type of vegetation; the land tenure of the land (e.g. freehold or Indigenous land); the location, extent and purpose of the proposed clearing; and who is proposing to do the clearing (e.g. state government body, landholder).

Proposal

The Department of Environment and Science (DES) regulated vegetation management mapping shows the site as containing remnant vegetation towards the southern boundary (refer to **Appendix 6**).

No proposed or future works are to be carried out in this portion of the school site.

Actions and Recommendations

Vegetation that is not required to be cleared for the proposed development should be protected from construction impacts in accordance with the *AS 4970-2009 Protection of Trees on Development Sites*.

Future works should be avoided in vegetated areas of the site where practicable.

8.3.2 Environmental Protection and Biodiversity Conservation Act 1999

Context

The purpose of the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is to ensure the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage places as defined in the EPBC Act.

Proposal

The EPBC Protected Matters Report (refer **Appendix 7**) identified 1 critically endangered ecological community; 4 critically endangered, 4 endangered and 3 vulnerable bird species; 1 critically endangered insect species, 3 endangered and 11 vulnerable plants; 2 endangered and 5 vulnerable mammal species, 3 vulnerable reptile species; and a number of migratory species which may be present within a 1km radius of the site.

Actions and Recommendations

The presence of any invasive, declared or pest species (flora or fauna) will be confirmed prior to commencement of construction. If found, these will be removed in accordance with legislative requirements.

8.3.3 Nature Conservation Act 1992

Context

The *Nature Conservation Act 1992* (NCA) protects all plants that are native to Australia. The *Nature Conservation (Wildlife Management) Regulation 2006* regulates the clearing of protected plants in Queensland.

Proposal

The NCA Wildlife Online database shows records of 2 vulnerable species present within a 1km radius of the subject site (refer to **Appendix 7**).

The site is not mapped as a 'high risk' area under the Protected Plants Flora Survey Trigger Map (refer to **Appendix 6**).

Actions and Recommendations

Trees and other vegetation to be removed should be confirmed and inspected for hollows and nests by a suitably qualified person prior to clearing. If hollows, nests or other potential breeding places are present, they must be assessed by a suitably qualified person to determine if they are breeding places in accordance with the NCA. If any breeding places are located within the development footprint a Species Management Plan (SMP) must be approved by DES prior to impacting on the breeding place. Mitigation measures such as the establishment of nest boxes (or other relevant measures) prior to tree clearing may also be required under the SMP.

8.3.4 Protected and Vulnerable Areas

Context

The map of referable wetlands is a Statewide regulatory map under the *Environmental Protection Regulation 2008*. It identifies the location of wetland protection areas (WPA) in Great Barrier Reef (GBR) catchments and also identifies wetlands of high ecological significance (HES) and general ecological significance (GES) across the state.

Proposal

With reference to the relevant State interest trigger maps in **Appendix 6**, the site is not mapped as 'Fish Habitat', 'Waterways for Waterway Barrier Works' or 'Referable Wetlands' under the *Fisheries Act 1994* or the *Environmental Protection Act 1994*.

Actions and Recommendations

No further actions or recommendations are considered necessary.

8.3.5 Koala Conservation

Context

The *State Government Supported Community Infrastructure Koala Conservation Policy 2017* (The Policy) regulates the planning and delivery of all Queensland Government supported infrastructure projects, as listed under Schedule 5 of the *Planning Regulation 2017*, and applies to land within the South East Queensland Koala Protection Area (SEQKPA) which result in:

- the clearing of native vegetation that will result in a total cleared area of less than 500m^2;
- a new building and any reasonably associated infrastructure with a total development footprint of less than 500m^2;
- an extension to an existing building and any reasonably associated infrastructure if the extension results in a total development footprint of less than 500m^2;
- extracting gravel, rock or sand from an area of less than 5,000m^2; and
- excavating or filling an area of less than 5,000m^2.

Where a proposed development is located within the SEQKPA and meets any of the above criteria, then a Koala Self-Assessable Management Plan needs to be prepared.

Proposal

The proposal relates to State government infrastructure and involve works with a total development footprint greater than 500m^2. As such, the development is regulated by the *State Government Supported Infrastructure Koala Conservation Policy 2017*, and a Koala Self-Assessable Management Plan has been prepared and included in **Appendix 14**.

The intended outcomes of the Koala Conservation Policy has been appropriately addressed in the Management Plan. The Management Plan takes into consideration the koala habitat and connectivity values identified and is specifically developed for the site and proposed development.

Actions and Recommendations

The Management Plan must be considered in all relevant phases of the project and a copy of the document provided to relevant personnel involved in the project including project managers, principal design consultants, landscape architects and construction contractors.

To ensure adequate records are kept of the implementation of these management strategies, reference should be made to Section 4 of the Management Plan. The DoE will ensure the Project Manager is responsible in ensuring accurate records are maintained and updated as necessary.

8.3.6 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 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*.

Proposal

The EPBC Protected Matters Report as included in **Appendix 7** identified invasive fauna and invasive flora species within 1km radius of the site.

With respect to the above, it is noted the school site is well maintained and therefore unlikely that any declared species will be present on the site.

Actions and Recommendations

Prior to works commencing on site, the DoE will ensure the Contractor undertakes a site inspection to confirm presence of any pest plants and / or animals. If found, these will be removed in accordance with legislative requirements.

The DoE will also ensure the Contractor adheres to the appropriate fire ant carrier movement restrictions if encountered during works.

8.4 Soils and Geology

8.4.1 Geotechnical Conditions

Context

Investigations into the ground conditions are required prior to any development works on the site. The investigations should be carried out to establish the nature and type of subsurface material at the site to allow engineering assessment of site classification (AS2870); earthworks recommendations; rock excavatability; groundwater control; and suitable foundation types.

Proposal

A geotechnical investigation has been undertaken for the new Learning Centre and modular building only and included in **Appendix 16**.

Actions and Recommendations

The recommendations outlined in the report relating to earthworks and site preparation, batters, potential ground surface movements, building foundations, soil aggressivity, earthquake site classification and site management will need to be taken into consideration by the Contractor, as part of detailed design and construction phase.

8.4.2 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

The DoE will ensure the Contractor prepares an ESCP that addresses the erosion risks identified for the site, and that the Plan is implemented and monitored throughout the construction phase for the proposed development.

8.4.3 Acid Sulfate Soils

Context

The site is not subject to the ASS Overlay under the Planning Scheme.

Proposal

The proposal will involve minor earthworks and is not anticipated to result in any disturbance or impacts to ASS.

Actions and Recommendations

No further actions or recommendations are considered necessary.

However, if potential or actual ASS is identified during construction, an ASS investigation should be carried out and managed in accordance with an ASS management plan. Should development works involve the removal of 100m^3 or more; or filling of 500m^3 or more of the material with an average depth off >0.5m, then the SPP State Interest – Water Quality will be triggered.

8.4.4 Contaminated Land

Context

With reference to **Appendix 8**, the site is not listed on the Environmental Management Register (EMR) or Contaminated Land Register (CLR).

Proposal

The proposal will not involve any EMR activities nor involve uses which could contaminate the land.

Actions and Recommendations

No further actions or recommendations are considered necessary.

8.5 Heritage and Native Title

8.5.1 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.

8.5.2 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

Search results from the Department of Aboriginal and Torres Strait Islander Partnership (DATSIP) cultural heritage database shows no records of cultural heritage site point recorded within a 100m buffer area of the site.

The nature of the activity is likely to be classified 'an area previously subject to significant ground disturbance' - Category 4, under the *Aboriginal Cultural Heritage Act 2003*, Section 28 Duty of Care Guidelines

Subject to measures set out in paragraph 5.6-5.12, under Category 4 of the Duty of Care Guidelines, the proposed activates can proceed without further cultural heritage assessment.

Actions and Recommendations

No further actions or recommendations are considered necessary.

However it should be noted that any Aboriginal cultural heritage, if found, is protected under the ACHA even if DEHP has not recorded it. Contract documents should include provisions for works to cease and the relevant Aboriginal Party to be contacted if evidence of Aboriginal cultural heritage is encountered during site works.

8.5.3 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

Confirmation of native title will be required prior to works proceeding.

Actions and Recommendations

The DoE will ensure Native Title is undertaken and confirmed prior to construction.

8.6 Natural Hazards

8.6.1 Flooding

Context

The site is mapped as affected by flood under the Planning Scheme. The entire school oval towards the southern boundary of the site is subject to flooding from Creek / Waterway.

Proposal

The proposed Learning Centre and modular building are not located within the identified flood planning area.

The future multi-purpose hall will be sited within the identified flood planning area and may be subject to flooding. A school hall being a Class 9B structure is required to achieve a flood immunity requirement equivalent to a 500 year ARI flood event in accordance with the planning scheme.

A flood and risk assessment has been undertaken and included in **Appendix 10**. The flood assessment determined that the 500 year ARI flood level affecting the location of the future hall is at RL 57.85m AHD. It is proposed to construct the future multi-purpose hall with a finished flood level at RL59.0m AHD. The proposal meets the minimum finished floor level requirements. It is proposed to construct the future hall on a suspended floor which would not impede the flood water from the creek or create an adverse impact to neighbouring properties. The risk assessment determined the following:

- Zero risk to people as the finished floor level of the hall is well above the minimum flood immunity level and is not isolated during a flood event;
- Minimal flood hazard during a large flood event as the finished floor level provides over a metre of freeboard above the 500 Year ARI flood level at the location;
- Access to the hall is not cut off during a flood event;
- Evacuation route from the hall is via the existing school and to McGinn Road;
- Evacuation route would not be cut off during a flood event;
- Not expected to place any burden on emergency services given the location and access route is flood immune;
- Flood recovery and economic impacts are expected to be minimal;
- No hazardous good are anticipated to be stored at the building;
- Flood resilient building materials would not be required as the building is to be constructed above the 500 Year ARI flood level. Footings and supports should be designed to withstand the hydrostatic, hydrodynamic and debris impacts loads; and
- Increase rainfall intensity is not expected to adversely impact the building.

Actions and Recommendations

A flood emergency management plan is not considered necessary for the development.

The future multi-purpose hall should be constructed with a finished flood level at RL59.0m AHD. The footings and supports should be designed to withstand the hydrostatic, hydrodynamic and debris impact loads.

8.6.2 Bushfire

Context

The site is affected by bushfire hazards under local and State mapping. The site is mapped as containing medium bushfire hazard and buffer area.

Proposal

No proposed works are not located within the medium bushfire hazard area.

The new Learning Centre is located in proximity to and the future multi-purpose hall is partially located within the buffer area.

A bushfire assessment and management plan has been prepared and included in **Appendix 15**. The assessment has been informed through a quantitative and qualitative assessment of the site. The quantitative assessment included a review of the vegetation communities, slope and aspect whilst the qualitative assessment was based on the known bushfire behaviour of the site.

The assessment undertook a detailed, site-specific, technical assessment of the site to determine the actual level of potential bushfire risk and was based on an assessment of the vegetation community, slopes and aspects displayed across the site, which was then allocated into ‘sub-units’. Each sub-unit is essentially an area of land with a particular combination of vegetation, slope and aspect characteristics.

The allocation of sub-units allowed for a total score to be determined against the Vegetation Community Hazard, Slope Hazard and Aspect Hazard. The scores were then analysed to provide a resulting hazard rating for each of the sub-units. The rating is determined where a Hazard Score:

- of 13 or greater is considered ‘High’ bushfire hazard area;
- of 6 to 12.5 is considered ‘Medium’ bushfire hazard area; and

- of 1 to 5.5 is considered 'Low' bushfire hazard area.

Sub-unit	Vegetation Score	Slope Score	Aspect Score	Total Hazard Score	Hazard Rating
BHU 1	6	3	3.5	12.5	MEDIUM
BHU 2A	4	2	0	6	MEDIUM
BHU 2B	4	5	3	12	MEDIUM
BHU 3A	4	5	2	11	MEDIUM
BHU 3B	4	3	1	8	MEDIUM

With reference to the hazard map and table above the Bushfire Hazard Rating for the proposed site is considered 'Medium'.

In accordance with the Australian Standard (AS) 3959-2009 Construction of Buildings in Bushfire Prone Areas, the Learning Centre and Eastern and Southern Façade of the multi-purpose hall scored a Bushfire Attack Level (BAL) of 12.5.

Actions and Recommendations

Based on the report, the following recommendations and mitigation measures have been provided to address the potential risk of bushfire attack, including:

- new Learning Centre and Multi-Purpose Hall should be constructed in accordance with AS 3959-2009;
- Bushfire Management Plan is to be implemented as part of the development;
- eradication of weeds at the ground and shrub layer for the strip of vegetation along the western boundary as well as the vegetation community protruding into the site from the west;
- the weedy understorey in these areas be entirely eradicated and replaced with a suitable low flammability species or turf; and

- landscaping measures should include use of low flammability treatments.

The DoE will ensure the that the above recommendations are carried out as part of the proposed development.

8.6.3 Landslip

Context

The site is not mapped as affected by landslip.

Proposal

The proposal will involve minor earthworks to accommodate the proposed new facilities 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.

8.7 Socio-economic Impacts

8.7.1 Socio-economic Profile

Context

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 Ferny Grove SHS will continue to provide positive socio-economic impacts, including:

- continued long-term educational and associated (i.e. trades) employment opportunities;
- investment of up to $28 million and the associated benefits to the economy;
- improved educational facilities that meets the projected population growth;
- meeting the demographic profile and providing the community with access to educational services; and
- focus on delivering quality education, with a curriculum that caters for the varied needs and skills of students.
- integration with the surrounding community with potential for external user groups to utilise community spaces provided by the school.

Actions and Recommendations

No further actions or recommendations are considered necessary.

8.8 Construction Impacts

8.8.1 Construction Management

Context

During development and construction it is essential to minimise impacts on students, staff, neighbouring residents and the general public. Consideration for the planning of construction works within an operating school environment is paramount.

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.

Actions and Recommendations

The DoE will ensure a CEMP is prepared during detailed design and that the Contractor implements and acts in accordance with the Plan during construction.

8.8.2 Hours of Construction Operation

Context

The site is located in an 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:

- on a business day or Saturday, before 6.30am or after 6.30pm; or
- on any other day, at any time.

Actions and Recommendations

The DoE will ensure the default noise standards are included as part of the Contractor's CEMP.

8.8.3 Traffic

Context

Traffic associated with construction activities may create nuisance impacts to nearby properties and amenity.

Proposal

Given the high order status of McGinn Road it is considered appropriate for construction access to utilise the existing road and access as part of construction works for the proposed development.

Actions and Recommendations

The DoE and Contractor will provide confirmation on access locations points as part of the CEMP. With reference to section 8.8.2, the DoE will also ensure the hours of construction operation are included as part of the Contractor's CEMP.

8.8.4 Air Quality

Context

Construction activities may cause air quality impacts (i.e. dust) to nearby properties.

Proposal

Potential air quality impacts will be treated with water and / or appropriate procedures to limit the likelihood of discomfort to any students, staff and neighbouring personnel.

Actions and Recommendations

The DoE will ensure appropriate air quality management procedures are included as part of the Contractor's CEMP.

8.8.5 Noise

Context

Sensitive uses such as residential dwellings are located in close proximity to the school and will likely result in potential noise impacts from construction vehicles and development activities.

Proposal

Potential noise impacts during the construction stage will be identified during detailed design and appropriate mitigation measures included to ensure noise is minimised where possible. As noted in section 8.8.2, DoE will ensure the hours of construction operation are included as part of the CEMP and adhered to by the Contractor.

Actions and Recommendations

With reference to section 8.8.2, DoE will ensure the hours of construction operation are included as part of the Contractor's CEMP.

8.8.6 Light

Context

Potential lighting impacts from construction activities to neighbouring properties needs consideration.

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 8.8.2 of this Report.

Given the proposed operation 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.

8.8.7 Hazardous Materials

Context

According to the Built Environment Materials Information Register (BEMIR) records, cement based asbestos has been 'confirmed' and 'assumed' at Ferny Grove SHS.

Proposal

The proposed development will only require demolition of the existing shed to facilitate the development and is therefore unlikely to result in exposure of hazardous materials (asbestos).

Actions and Recommendations

Development activities which involves demolition of existing structures will be subject to a hazardous materials survey to identify the presence of asbestos, lead or other materials hazardous to human health. Where such materials are identified, demolition and removal is to be undertaken by a suitably licenced contractor.

8.8.8 Waste

Context

Construction waste and hazardous materials must be appropriately disposed of during construction activities to avoid impacts to the surrounding built and natural environment.

Proposal

Any regulated waste generated during construction will be handled and disposed of appropriately and in accordance with the requirements of the *Environmental Protection Act 1994*.

Actions and Recommendations

It is unlikely the activity will generate any regulated waste. Waste that will be generated by the proposed development is to be confirmed during the planning and design stage. Waste management facilities are to be designed and provided, or modified (if existing), in conjunction with a waste management plan if necessary.

8.9 Operational Impacts

8.9.1 Traffic

Context

Traffic associated with the school has potential to cause impacts to the continuing operation of the road network, in addition to nearby properties and amenity.

Proposal

The proposed works relating to the Ferny Grove SHS will result in a minor increase in traffic movements to, and from, the school. Based on current school population growth forecasts, it is expected the school will reach approximately 2,094 students and 127 staff by the 2020 calendar

year, which represents an overall increase of approximately 345 students and 32 FTE staff over the next three year period.

The proposal will provide a net increase of ninety (90) on-site parking spaces and is adequate for the increase in student enrolments and staff.

Actions and Recommendations

As noted in section 8.1.1, 8.1.2 and 8.1.3, the proposed works is will result in an increase in school population however is not anticipated to have a material impact to the existing operation of the road or traffic network.

8.9.2 Air Quality

Context

The proposed works at Ferny Grove SHS will not produce any emissions, gasses or negative air quality impacts.

Proposal

The proposed scope of works is for educational uses which aims to provide improved learning facilities for the school population. The proposal will not result in any emissions, gasses or negative air quality impacts.

Actions and Recommendations

No further actions or recommendations are considered necessary.

8.9.3 Noise

Context

With respect to noise, anticipated impacts to, and from the school, includes:

- road traffic noise levels from McGinn Road; and
- ambient noise levels from the school to nearby residences.

The new Learning Centre is in proximity to sensitive receptors located on Persimmon Street which may be affected.

Proposal

An acoustic impact assessment has been prepared and included in **Appendix 13**. The assessment notes that the future hall is located a considerable distance (over 150m) from the nearest residential boundary and is therefore not assessed further within the report.

Noise monitoring was undertaken and focussed on the potential ambient noise levels generated from the school to nearby residences along Persimmon Street only.

Ambient noise levels was undertaken from 27 February to 2 March 2018 at a location chosen to be representative of the nearest residential premises along Persimmon Street and assessed against both the provisions of the Brisbane City Plan, Environmental Protection Act and Environmental Protection (Noise) Policy.

The impact assessment assessed potential noise generated by the Learning Centre building from the below sources and resulted in the following:

- *Students and teachers in classes on Levels 1, 2 and Ground level in the future;*
- *Students and teachers in the collaboration spaces and corridors on Levels 1 and 2;*
- *Students in the undercroft on the ground floor and on the terraced retaining walls around the building; and*
- *Mechanical Plant.*

Teaching Spaces

Noise from students and staff inside the teaching spaces and laboratories is not expected to be significant at houses along Persimmon Street as the building has solid walls facing in this direction, and the combination of cutting the building into the ground and retaining the existing modular building will reduce noise levels at the residential boundary. The rooms may be air conditioned in the future which will further reduce any noise radiating from the rooms.

Collaboration Spaces and Corridors

Noise from students and teachers in the covered collaboration spaces on Levels 1 and 2, will be reduced at the nearest houses due to the design of the building. Collaboration spaces have been located to face away from the houses towards the science building. Noise from students and staff in the corridors on Level 1 will be reduced by the combination of cutting the building into the ground and retaining the existing modular building which will act as a noise barrier. The Level 2 corridor may have line of sight over the modular building to the residential boundary, however student noise will only occur for short periods between classes. The corridor construction may include acoustic absorption panels to reduce the buildup of reverberant noise, which will further reduce student and staff noise radiating to houses.

Undercroft and Terraces

Noise from students in the undercroft and on the terraced retaining walls near the new building will be reduced by the combination of cutting the building into the ground and retaining the existing modular building which will act as a noise barrier. It is expected that these spaces will mainly be used during recess between classes. The ceiling construction to the undercroft may include acoustic absorption panels to reduce the buildup of reverberant noise.

Mechanical Plant

Plant associated with air conditioning and ventilation for the new building will be located and selected to meet the noise criteria provided in Table 1, at the nearest residences. The condenser plant is planned to be located away from the nearest houses, and the combination of cutting the building into the ground and retaining the existing modular building will act as a noise barrier.

Actions and Recommendations

The assessment concluded that noise from the new building can be minimised and mechanical plant can be selected to meet the Environmental Protection Act, Environmental Protection Policy and Brisbane City Council criteria, with the constructions described in the report contained in **Appendix 13**.

It is recommended that the building constructions described in this report be incorporated into the building design, documentation and construction, and that mechanical plant be selected to achieve the noise criteria at the nearest houses on Persimmon Street.

8.9.4 Light

Context

The Ferny Grove SHS operates during normal business hours, with school operating from 8:55am until 3:00pm and office hours from 8:00am until 4:00pm.

The existing car park lighting operates on a timer and the school has security lights which remain on within the Administration Block.

Proposal

New lighting will be provided to the covered walkways linking the new Learning Centre with existing walkways and car parking areas. Security lighting for the Administration Block will operate as per normal with no changes proposed.

The proposal is not considered to result in the generation of adverse lighting impacts. Lighting will be provided to the facility, including the parking area, in accordance with the applicable Australian Standards.

Actions and Recommendations

No further actions or recommendations are considered necessary.

8.9.5 Safety and Security

Context

All schools require appropriate safety and security measures and should be prepared in accordance with DET's *Security Design Requirements*. The design of the Security System will address the functional, installation and technical upgrade and expandability requirements that provides for future proofing, flexibility and expandability.

Proposal

The Ferny Grove SHS has a security risk rating of 'Low'. As such, measures included in the cost plan for physical and electronic security includes:

- Crimsafe to all external glazing;
- External lighting;
- Passive infra-red security sensors;
- Reed switches to all external doors;
- Perimeter / precinct fencing appropriate for the High School environment;
- Swipe card security to all external gates; and
- Update existing concept security alarm system.

Actions and Recommendations

No further actions or recommendations are considered necessary.

PART G – CONSULTATION

9 Consultation Engagement

9.1 Stakeholders

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

Affected Parties

- Brisbane City Council.

State Government Departments

- DSDMIP, representing relevant State Agencies.

Elected Representatives

- Councillor Steve Toomey (The Gap) – Brisbane City Council;
- Hon Mark Furner MP – State Electoral District of Ferny Grove; and
- Hon Jane Prentice MP – Federal Electoral Division of Ryan.

Stakeholders

- Adjoining landowners; and
- Surrounding landowners.

Native Title Party

- Turrbal People

School Representatives

- Principal – Ferny Grove State High School.

9.2 Community Engagement Plan

The following community engagement plan has been adopted as part of this Infrastructure Designation process.

Activity	Description	Stakeholder Group	Actions
Prior to public notification			
Email	Email seeking advice about infrastructure requirements.	Brisbane City Council	Email Telephone call
Meeting	On stakeholder request, organise meeting to present project and discuss matters of interest—in particular impacts on local government infrastructure.	Brisbane City Council	Meet if requested.
During public notification			
Public notice	Place public notice in local newspaper	Broader community	Prepare and book public notice

Street signage	Place street signage to McGinn Road frontage	Broader community	Prepare and erect public notice signage to street
Update web content	Update DHPW web page with information about the Infrastructure Designation proposal, including the EAR and details about the engagement process.	Broader community	Prepare content update Publish content update
Letters to stakeholders	Prepare letters that outline the Infrastructure Designation proposal and the engagement process. Distribute the letters.	Affected parties and stakeholders	Prepare letter 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, stakeholders and broader community	Publish contact information in relevant public notices and letters

9.3 Initial Consultation

Prior to the commencement of the Infrastructure Designation, the DoE and key Ferny Grove SHS representatives undertook initial consultation activities with:

Stakeholder Group	Date	Description
Brisbane City Council	28/03/2018	• Provide email correspondence to BCC with information on Infrastructure Designation Proposal; • Discussion on telephone with BCC Officer regarding proposal and designation process; and
	20/04/2018	• Correspondence received from BCC; and • EAR addresses issues as identified in correspondence.
DSDMIP	11/05/2018	• Pre-lodgement meeting to discuss proposal; • Confirm school capacity and technical reporting requirements (i.e. traffic); • Confirm relevant stakeholder groups and consultation strategy;
Ferny Grove SHS Principal, Deputy Principal, Business Manager and Infrastructure Officer	23/04/2018	• Preliminary discussions on capacity needs, facility and service requirements, design issues; and • Development of the project brief and schematic design project proposal.
	11/05/2018	• Consultation on contract documentation stage; • Review and updates to contract documentation; and • Endorsement of contract documentation.

PART H – CONCLUSION

This EAR has been prepared by BAS, on behalf of DoE, seeking an Infrastructure Designation of land for the Ferny Grove SHS, located at 26 McGinn Road, Ferny Grove and otherwise described as Lot 106 on SP259861.

The PA 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.

Educational and community facilities are defined as infrastructure under Schedule 5, Part 2 of the *Planning Regulation 2017*, being assets necessary to support the community and for the public benefit. The proposed designation as part of this proposal is therefore best described as:

6 educational facilities

The designation affirms the existing use of the site as an educational establishment, and will facilitate the immediate planned works at the school and future planned developments on the site consistent with the designation purpose. The proposed infrastructure will facilitate the efficient and timely supply of infrastructure; and satisfy statutory requirements and budgetary commitments of the State for the supply of infrastructure.

The assessment provided within the EAR provides key details with respect to the Ferny Grove SHS, and has undertaken an assessment of the proposed infrastructure against the relevant statutory frameworks, incorporating local and state assessment criteria and Commonwealth legislation.

PART I – APPENDICES

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

Appendix 1	Extracts from the *Planning Act 2016*
Appendix 2	Designation Flowchart
Appendix 3	Property Information
Appendix 4	Contour and Detail Survey
Appendix 5	Proposal Plans
Appendix 6	State Interest Trigger Mapping
Appendix 7	EPBC Protected Matters Report & NCA Wildlife Online Report
Appendix 8	CLR & EMR Search
Appendix 9	Service Infrastructure Plans
Appendix 10	Flood Assessment
Appendix 11	Stormwater Management Plan
Appendix 12	Traffic Impact Assessment
Appendix 13	Acoustic Impact Assessment
Appendix 14	Koala Self-Assessable Management Plan
Appendix 15	Bushfire Assessment and Management Plan
Appendix 16	Geotechnical Report

Appendix 1

Extracts from Planning Act 2016

Department of Housing and Public Works

Queensland Government

Part 5 Designation of premises for development of infrastructure

35 What is a designation

(1) A ***designation*** is a decision of the Minister, or a local government, (a ***designator***) that identifies premises for the development of 1 or more types of infrastructure that are prescribed by regulation.

(2) A designation may include requirements about any or all of the following—

(a) works for the infrastructure (the height, shape, bulk, landscaping, or location of works, for example);

(b) the use of premises, for example—

(i) vehicular and pedestrian access to, and circulation on, premises; and

(ii) operating times for the use; and

(iii) ancillary uses;

(c) lessening the impact of the works or use (environmental management procedures, for example).

(3) The chief executive may, by notice, require a local government to include a matter in subsection (2) in a designation made by the local government.

Note—

For the effect of a designation on the categorisation of development, see section 44(6)(b).

36 Criteria for making or amending designations

(1) To make a designation, a designator must be satisfied that—

(a) the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or

(b) there is or will be a need for the efficient and timely supply of the infrastructure.

(2) To make or amend a designation, if the designator is the Minister, the Minister must also be satisfied that adequate environmental assessment, including adequate consultation, has been carried out in relation to the development that is the subject of the designation or amendment.

(3) The Minister may, in guidelines prescribed by regulation, set out the process for the environmental assessment and consultation.

(4) The Minister is taken to be satisfied of the matters in subsection (2) if the process in the guidelines is followed.

(5) However, the Minister may be satisfied of the matters in another way.

(6) Sections 10 and 11 apply to the making or amendment of the guidelines as if the guidelines were a State planning policy.

(7) To make or amend a designation, a designator must have regard to—

(a) all planning instruments that relate to the premises; and

(b) any assessment benchmarks, other than in planning instruments, that relate to the development that is the subject of the designation or amendment; and

(c) 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

(ca) 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

(d) any properly made submissions made as part of the consultation carried out under section 37; and

(e) the written submissions of any local government.

37 Process for making or amending designation

(1) This section is about the process for—

(a) making a designation for premises; or

(b) amending a designation for premises, including by amending—

(i) the area of the premises; or

(ii) the type of infrastructure for which the premises were designated.

(2) If the Minister proposes to make or amend a designation, the Minister must give notice of the proposal to the affected parties.

(3) However, the Minister need not give the notice to an owner of premises if—

(a) a notice has already been given to the owner as part of the consultation for an assessment under section 36(2); or

(b) the Minister can not notify the owner after making reasonable efforts.

(4) The notice must invite the affected parties to make submissions about the proposal to the Minister within a period of at least 15 business days after the notice is given.

(5) If, after considering any properly made submissions, the Minister decides not to proceed with the proposal, the Minister must give a decision notice to the affected parties.

(6) If a local government proposes to make or amend a designation, the local government must follow the process in the designation process rules, before the local government makes or amends the designation.

(7) Sections 10 and 11 apply to the making or amendment of the designation process rules as if the designation process rules were a State planning policy.

(8) In this section—

designation process rules means rules made by the Minister and prescribed by regulation.

38 Process after making or amending designation

(1) If, after considering any properly made submissions, the designator decides to make or amend a designation, the designator must publish a gazette notice that states—

(a) that the designation has been made or amended; and

(b) a description of the designated premises; and

(c) the type of infrastructure for which the premises were designated; and

(d) for an amendment—the nature of the amendment.

(2) The designator must give the following things to each affected party and the chief executive—

(a) a copy of the gazette notice;

(b) a notice of any requirements included in the designation under section 35(2);

(c) a notice of how the designator dealt with any properly made submissions.

39 Duration of designation

(1) A designation stops having effect on the day (the ***end day***) that is 6 years after the designation starts to have effect, unless—

(a) on the end day—

(i) a public sector entity owns, or has an easement for the same purpose as the designation over, the designated premises; or

(ii) another entity owns, or has an easement over, the designated premises and construction of the infrastructure for which the premises were designated started before the end day; or

(b) before the end day—

(i) a public sector entity gave a notice of intention to resume the designated premises under the Acquisition Act, section 7; or

(ii) a public sector entity signed an agreement to take designated premises under the Acquisition Act or to otherwise buy the premises; or

(iii) the designator complies with subsection (3).

(2) The designator may extend the duration of a designation, for up to 6 years, by publishing a gazette notice about the extension before the designation stops having effect.

(3) The designator must give notice of the extension of the designation to—

(a) if the Minister is the designator—each of the affected parties and the chief executive; or

(b) if a local government is the designator—the owner of the premises and the chief executive.

(4) If a public sector entity discontinues proceedings to resume designated premises, either before or after the end day, the designation stops having effect on the day when the proceedings are discontinued.

40 Repealing designation—designator

(1) A designator may repeal a designation made by the designator by publishing a gazette notice that states—

(a) that the designation is repealed; and

(b) a description of the designated premises; and

(c) the type of infrastructure for which the premises were designated; and

(d) the reasons for the repeal.

(2) The designator must give a copy of the notice to—

(a) if the Minister is the designator—each of the affected parties and the chief executive; or

(b) if a local government is the designator—the owner of the premises and the chief executive.

(3) Any development started under the designation may be completed as if the designation had not been repealed.

(4) Subject to any requirements under section 35(2), a use of the premises that is the natural and ordinary consequence of the development is taken to be a lawful use.

41 Repealing designation—owner's request

(1) An owner of an interest in designated premises may request a designator to repeal a designation made by the designator on the basis that the designation is causing the owner hardship.

(2) Subsection (1) does not apply if—

(a) the premises are subject to an easement for the infrastructure for which the premises are designated; or

(b) the designation also applies to other premises and relates to a land corridor for the infrastructure; or

(c) the premises are a road.

(3) The request must be in writing, and contain any information that the guidelines made under section 36(3) require.

(4) The designator must, within 40 business days after receiving the request—

(a) repeal the designation, using the process under section 40; or

(b) decide to refuse the request; or

(c) decide to take other action that the designator considers appropriate in the circumstances.

(5) The designator must, within 5 business days after making a decision under subsection (4)(b) or (c), give a decision notice to the owner.

42 Noting designation in planning scheme

(1) This section applies if a local government—

(a) makes, amends, extends or repeals a designation; or

(b) receives a notice about the Minister making, amending, extending or repealing a designation.

(2) The local government must include a note about the making, amendment, extension or repeal in—

(a) the local government's planning scheme; and

(b) any planning scheme that the local government makes before the designation stops having effect.

(3) The note must—

(a) identify the premises that were designated; and

(b) describe the type of infrastructure for which the premises were designated; and

(c) state the day when the designation, amendment, extension or repeal started to have effect.

(4) The local government must include the note in the planning scheme in a way that ensures the other provisions of the scheme that apply to the designated premises remain effective.

(5) To remove any doubt, it is declared that—

(a) the note is not an amendment of a planning scheme; and

(b) a designation is taken to be part of a planning scheme; and

(c) a designation is not the only way that a planning scheme may identify infrastructure; and

(d) a designation does not affect the provisions of a planning scheme that apply to designated premises, even after the designation stops having effect.

Appendix 2

Designation Flowchart

Indicative process

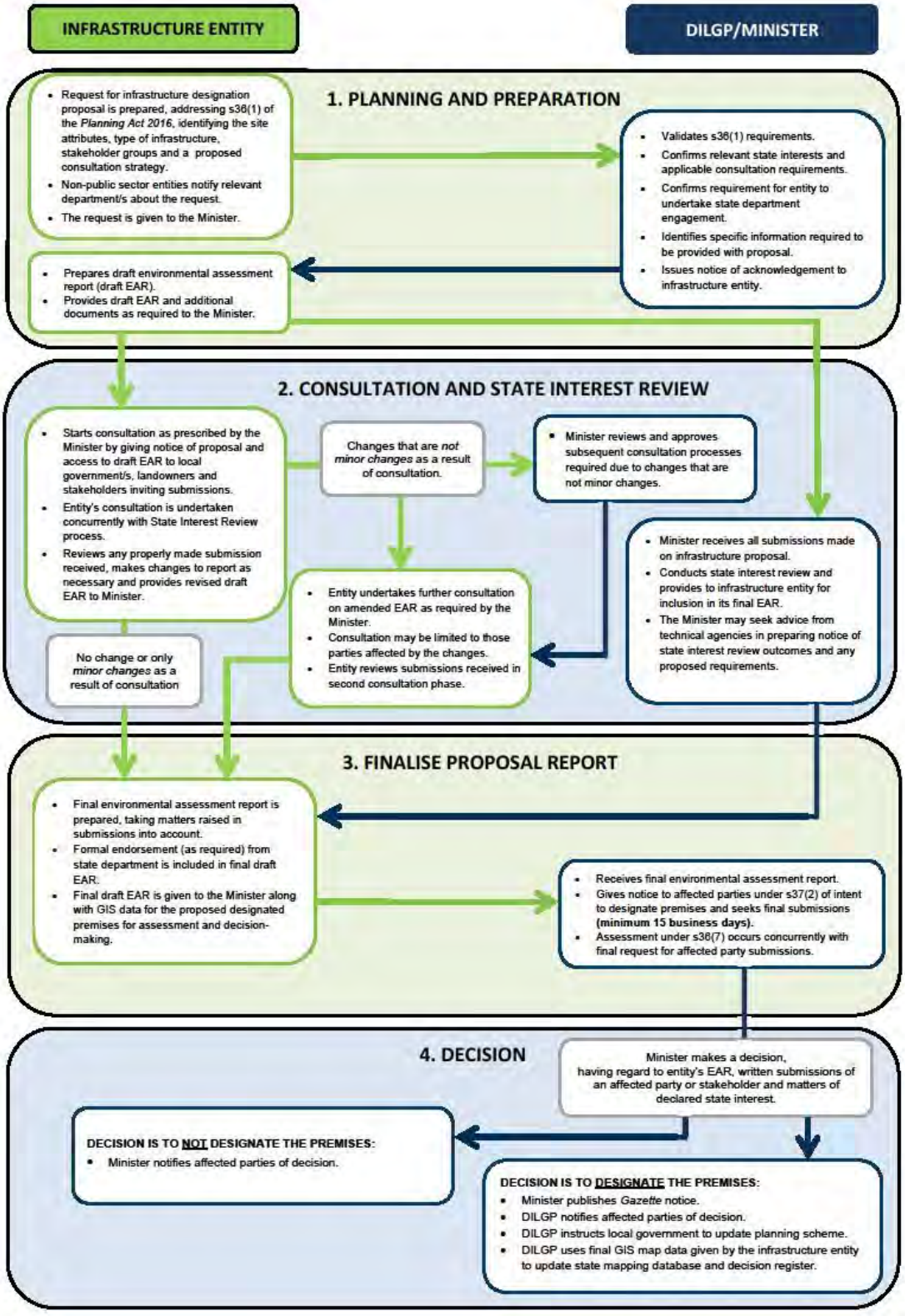


Figure 3: Flow chart of the ministerial designation process under the MGR

Appendix 3

Property Information

CURRENT TITLE SEARCH

DEPT OF NATURAL RESOURCES AND MINES, QUEENSLAND

Request No: 27415694
Search Date: 24/11/2017 08:56 **Title Reference: 51022992**
Date Created: 28/01/2016

Previous Title: 50448410

REGISTERED OWNER

Dealing No: 717025291 21/01/2016

THE STATE OF QUEENSLAND
(REPRESENTED BY DEPARTMENT OF EDUCATION AND TRAINING)

ESTATE AND LAND

Estate in Fee Simple

LOT 106 SURVEY PLAN 259861
Local Government: BRISBANE CITY

EASEMENTS, ENCUMBRANCES AND INTERESTS

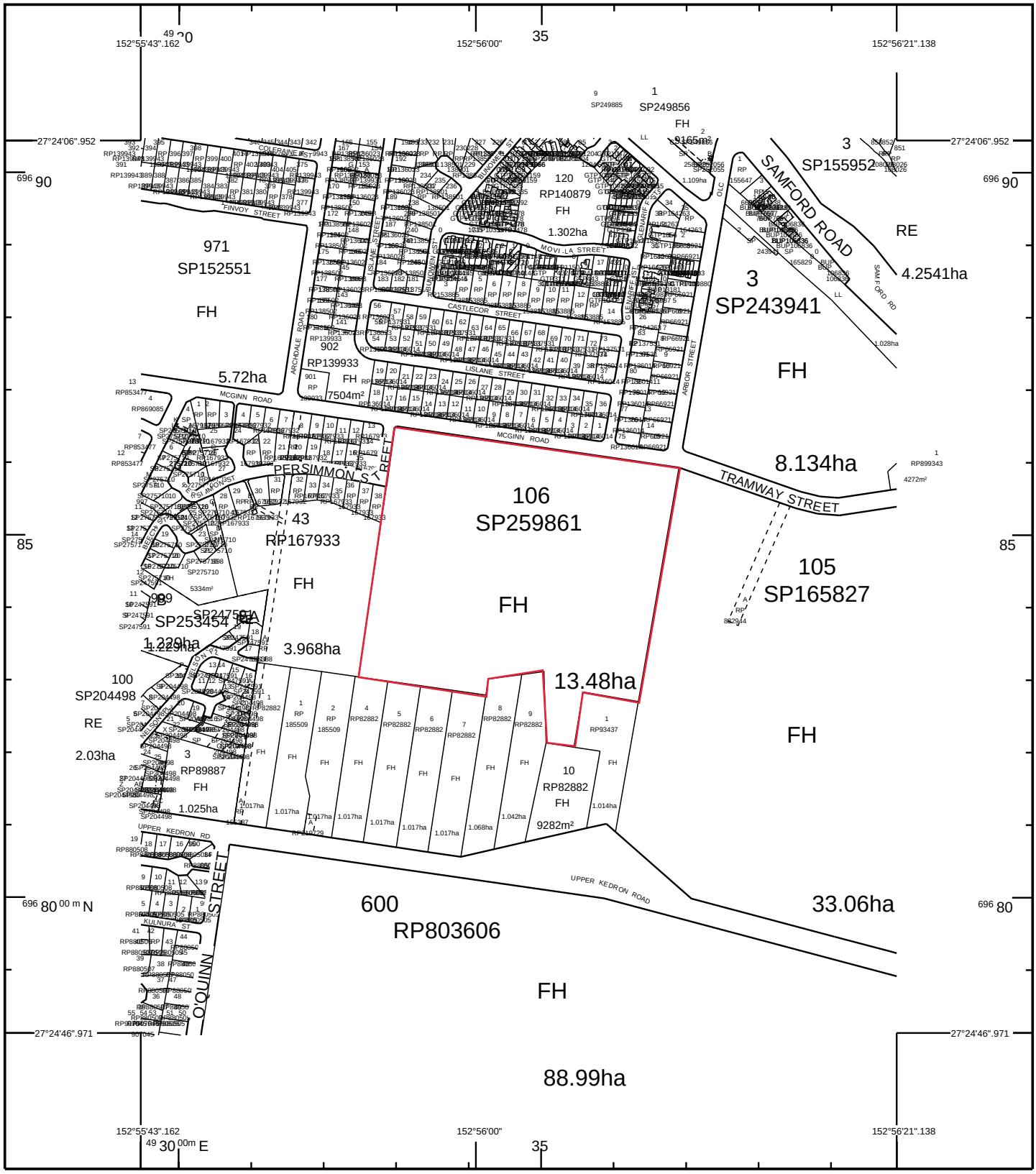
1. Rights and interests reserved to the Crown by
Deed of Grant No. 40038333 (Lot 1307 on CP SL8443)

ADMINISTRATIVE ADVICES - NIL
UNREGISTERED DEALINGS - NIL

CERTIFICATE OF TITLE ISSUED - No

** End of Current Title Search **

Requested By: SMIS .



STANDARD MAP NUMBER
9443-22421

0 150 300 450 600 750 m

HORIZONTAL DATUM:GDA94 ZONE:56 SCALE 1 : 7500

MAP WINDOW POSITION & NEAREST LOCATION

GDA

SUBJECT PARCEL DESCRIPTION

DCDB

Lot/Plan	106/SP259861
Area/Volume	13.48ha
Tenure	FREEHOLD
Local Government	BRISBANE CITY
Locality	FERNY GROVE
Segment/Parcel	27087/248

CLIENT SERVICE STANDARDS

PRINTED (dd/mm/yyyy) 24/11/2017

DCDB 23/11/2017

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SmartMap

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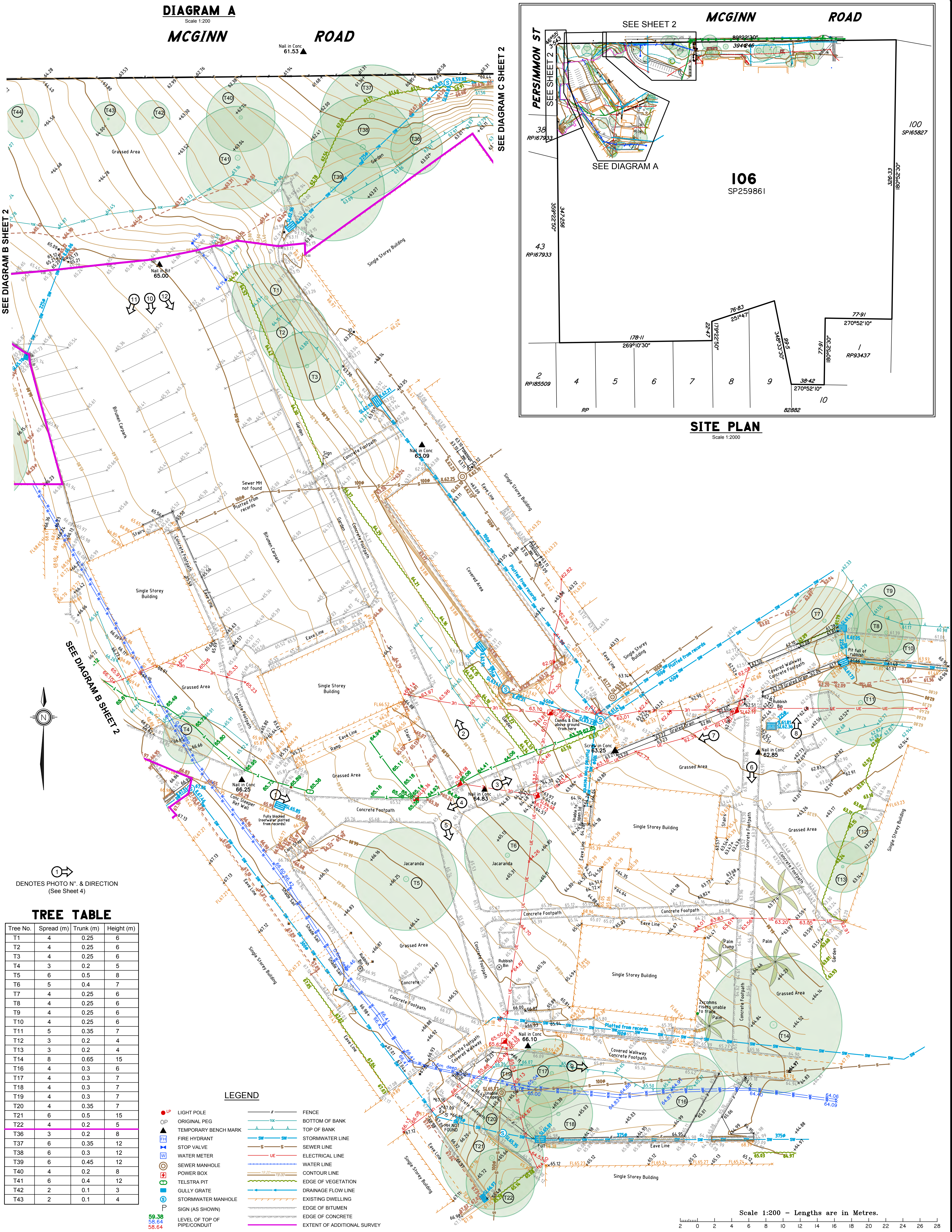
Queensland Government

Appendix 4

Contour + Detail Survey

DIAGRAM A

Scale 1:200



1 ⇨ DENOTES PHOTO N°. & DIRECTION (See Sheet 4)

TREE TABLE

Tree No.	Spread (m)	Trunk (m)	Height (m)
T1	4	0.25	6
T2	4	0.25	6
T3	4	0.25	6
T4	3	0.2	5
T5	6	0.5	8
T6	5	0.4	7
T7	4	0.25	6
T8	4	0.25	6
T9	4	0.25	6
T10	4	0.25	6
T11	5	0.35	7
T12	3	0.2	4
T13	3	0.2	4
T14	8	0.65	15
T16	4	0.3	6
T17	4	0.3	7
T18	4	0.3	7
T19	4	0.3	7
T20	4	0.35	7
T21	6	0.5	15
T22	4	0.2	5
T36	3	0.2	8
T37	6	0.35	12
T38	6	0.3	12
T39	6	0.45	12
T40	4	0.2	8
T41	6	0.4	12
T42	2	0.1	3
T43	2	0.1	4

LEGEND

LIGHT POLE	FENCE
ORIGINAL PEG	BOTTOM OF BANK
TEMPORARY BENCH MARK	TOP OF BANK
FIRE HYDRANT	STORMWATER LINE
STOP VALVE	SEWER LINE
WATER METER	ELECTRICAL LINE
SEWER MANHOLE	WATER LINE
POWER BOX	CONTOUR LINE
TELSTRA PIT	EDGE OF VEGETATION
GULLY GRATE	DRAINAGE FLOW LINE
STORMWATER MANHOLE	EXISTING DWELLING
SIGN (AS SHOWN)	EDGE OF BITUMEN
59.38 58.64 58.64 LEVEL OF TOP OF PIPE/CONDUIT	EDGE OF CONCRETE
	EXTENT OF ADDITIONAL SURVEY

Scale 1:200 – Lengths are in Metres.

Disclaimer: No As constructed sewer information was received for this plan at time of survey. Sewer line location undetermined.

Rev	Description	Drawn	Checked	Date
C	Additional Survey	AG	RB	16/05/2018
B	Add storm & roof water Pipe Diameters	AR	AR	3/29/2018
A	Additional Survey	AG	PH	9/3/2018
-	Original Issue	AG	RB	31/01/2018

This plan is prepared from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose. The title boundaries shown hereon were not marked by the author at the time of survey and have been determined by plan dimensions only and not by field measurement. Services shown hereon have been located where possible by field survey. If not able to be located, services may have been plotted from the records of relevant authorities where available. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

CONTOUR & DETAIL PLAN

PROJECT: Ferny Grove State High School

LOCATION: McGinn Street, FERNY GROVE

Real Property Description: Lot 106 on SP259861

CLIENT: Honeywill Construction Pty Ltd

Horiz. Datum: SP259861

Vert. Datum: AHD

Local Authority: Brisbane City Council

Contour Interval: 0.20m

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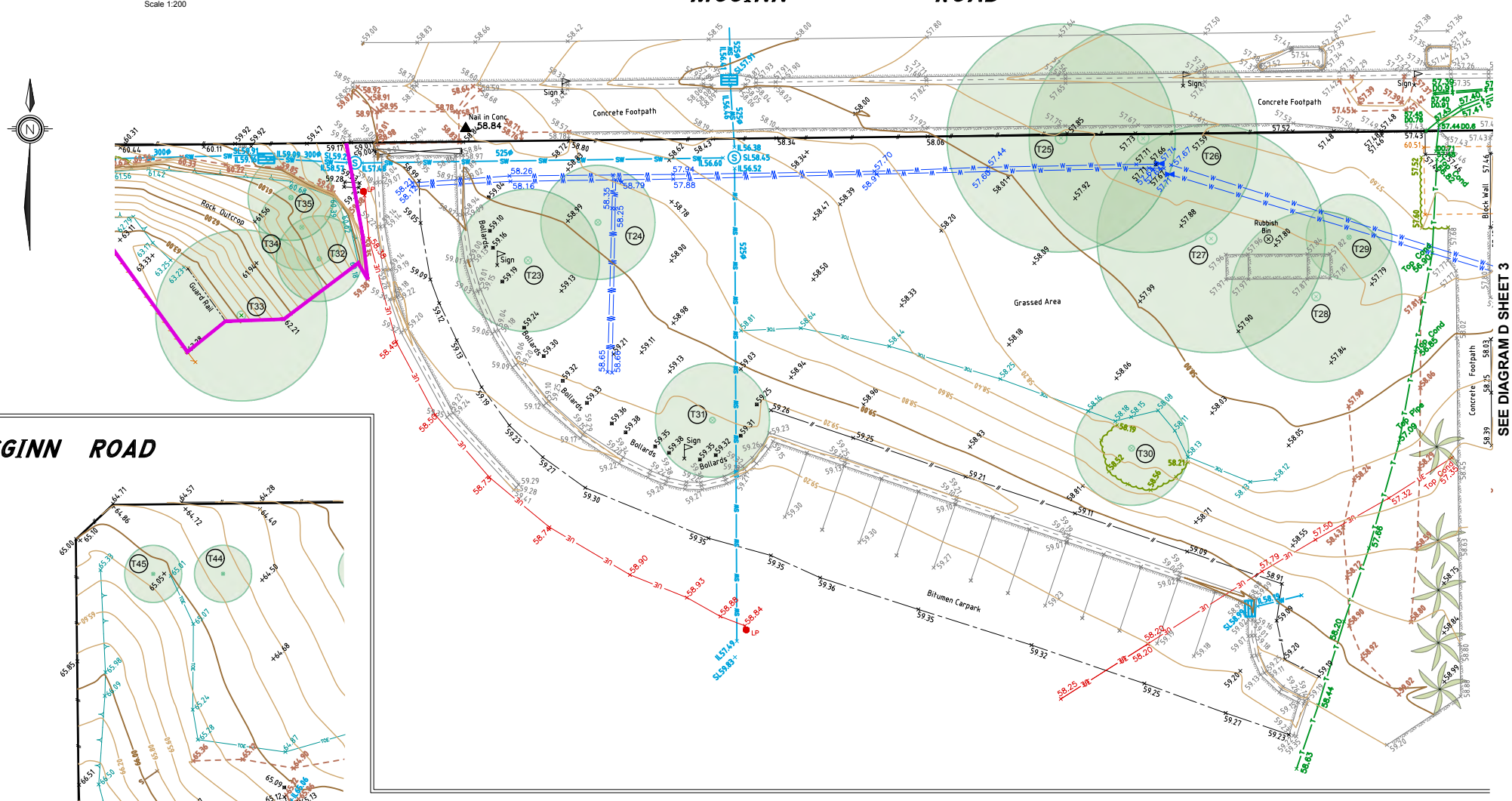
Drawn:	AG	Sheet:	1 of 4
Surveyor:	PH	Revision:	C

DIAGRAM C
Scale 1:200



SEE DIAGRAM D SHEET 3

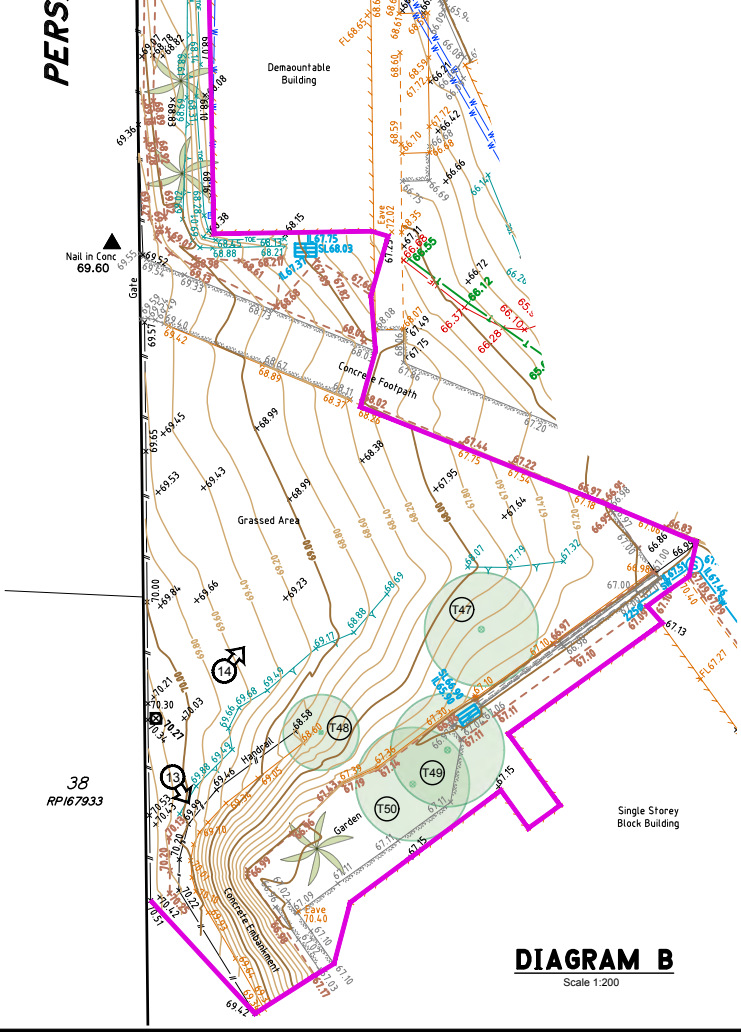


DIAGRAM B
Scale 1:200

TREE TABLE

Tree No.	Spread (m)	Trunk (m)	Height (m)
T23	5	0.4	8
T24	4	0.4	8
T25	8	0.9	15
T26	8	0.9	15
T27	4	0.5	7
T28	6	0.45	10
T29	3	0.25	5
T30	4	0.2	5
T31	4	0.3	5
T32	3	0.2	6
T33	6	0.4	12
T34	3	0.25	8
T35	3	0.25	8
T44	2	0.14	4
T45	2	0.14	4
T46	6	0.45	12
T47	3	0.25	6
T48	2	0.11	4
T49	3	0.25	6
T50	3	0.2	6

LEGEND

- LP LIGHT POLE
- OP ORIGINAL PEG
- TEMPORARY BENCH MARK
- FH FIRE HYDRANT
- STOP VALVE
- W WATER METER
- SEWER MANHOLE
- POWER BOX
- TELSTRA PIT
- GULLY GRATE
- S STORMWATER MANHOLE
- SIGN (AS SHOWN)
- 59.38 / 58.64 / 58.64 LEVEL OF TOP OF PIPE/CONDUIT
- PALM
- FENCE
- TOE BOTTOM OF BANK
- TOP OF BANK
- SW STORMWATER LINE
- S SEWER LINE
- UE ELECTRICAL LINE
- WATER LINE
- 19.20 18.00 CONTOUR LINE
- EDGE OF VEGETATION
- DRAINAGE FLOW LINE
- EXISTING DWELLING
- EDGE OF BITUMEN
- EDGE OF CONCRETE
- EXTENT OF ADDITIONAL SURVEY

1 DENOTES PHOTO N°. & DIRECTION
(See Sheet 4)

Scale 1:200 – Lengths are in Metres.
2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28

Disclaimer: No As constructed sewer information was received for this plan at time of survey. Sewer line location undetermined.

Rev	Description	Drawn	Checked	Date
C	Additional Survey	AG	RB	16/05/2018
B	Add storm & roof water Pipe Diameters	AR	AR	3/29/2018
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-	Original Issue	AG	RB	31/01/2018

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Real Property Description: Lot 106 on SP259861

CLIENT: Honeywill Construction Pty Ltd

Horiz. Datum:	SP259861		
Vert. Datum:	AHD		
Local Authority:	Brisbane City Council	Contour Interval:	0.20m

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Drawn:	AG	Sheet:	2 of 4
Surveyor:	PH	Revision:	C

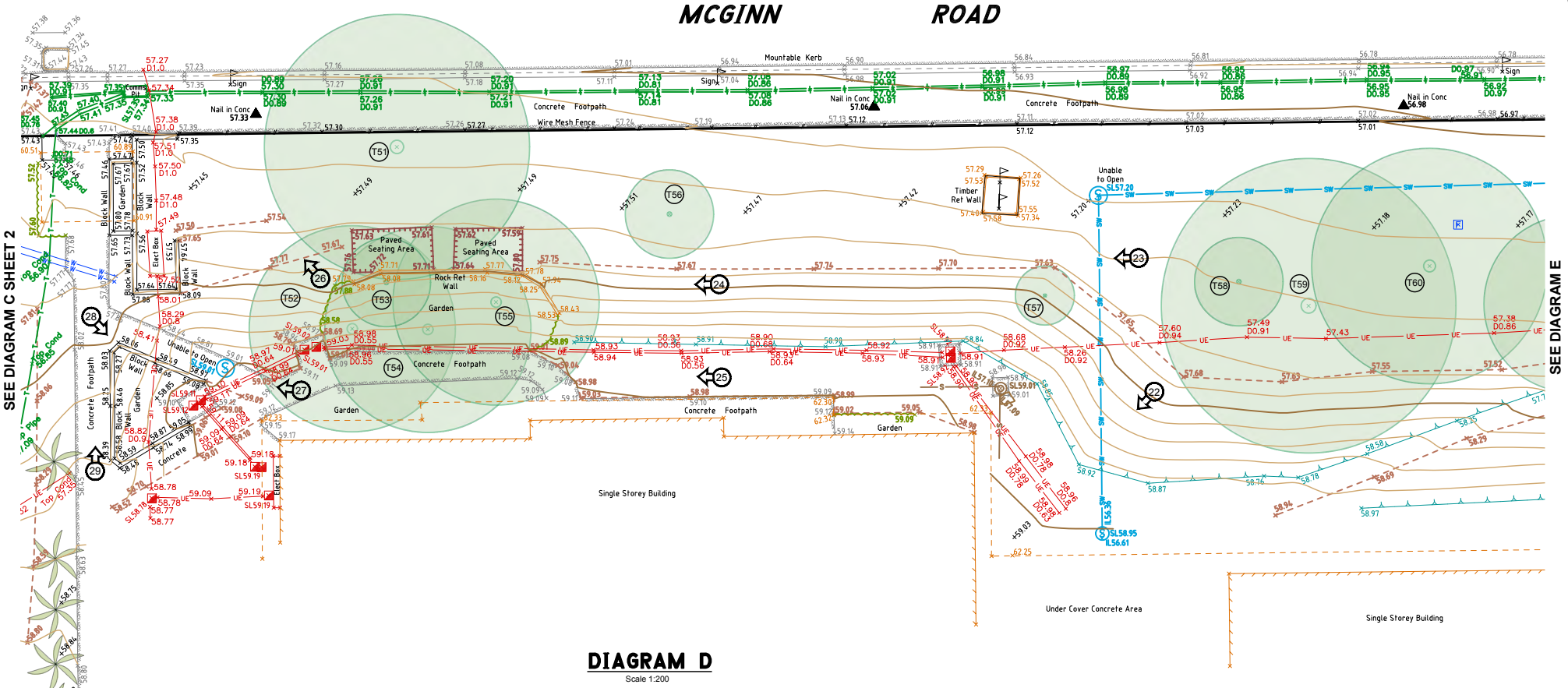

DIAGRAM D

Scale 1:200

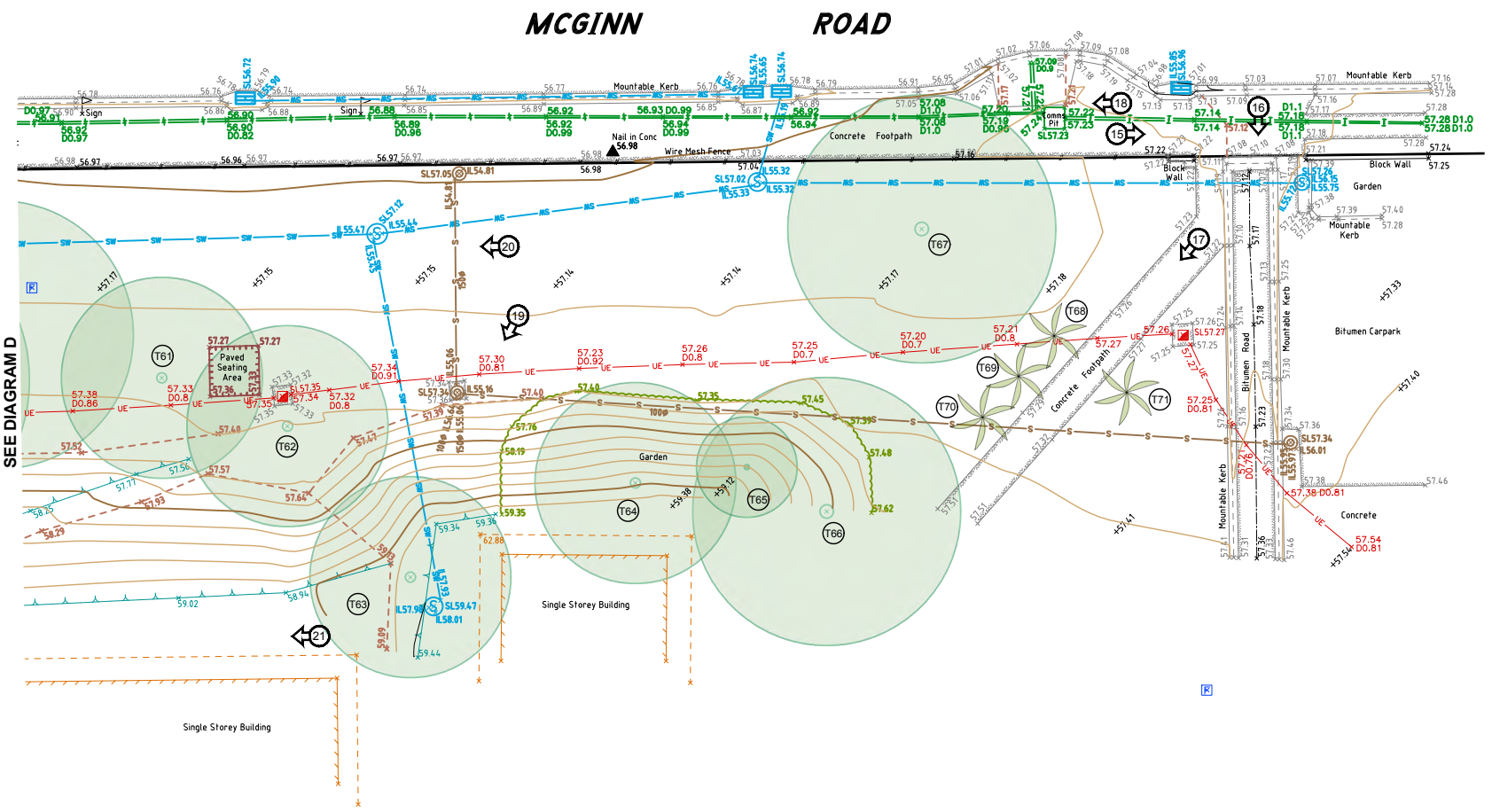

DIAGRAM E

Scale 1:200

TREE TABLE

Tree No.	Spread (m)	Trunk (m)	Height (m)
T51	9	0.7	24
T52	7	0.4	20
T53	3	0.15	7
T54	7	0.4	22
T55	7	0.4	22
T56	3	0.3	14
T57	2	0.3	6
T58	3	0.2	6
T59	10	0.8	18
T60	8	0.7	15
T61	6	0.45	20
T62	6	0.45	20
T63	6	0.3	15
T64	6	0.3	15
T65	3	0.15	10
T66	8	0.45	22
T67	8	0.45	18
T68	2	0.15	6
T69	2	0.1	6
T70	2	0.15	6
T71	2	0.1	5

LEGEND

LP	LIGHT POLE	//	FENCE
OP	ORIGINAL PEG	TOE	BOTTOM OF BANK
	TEMPORARY BENCH MARK		TOP OF BANK
FH	FIRE HYDRANT	SW	STORMWATER LINE
	STOP VALVE	S	SEWER LINE
W	WATER METER	UE	ELECTRICAL LINE
	SEWER MANHOLE		WATER LINE
	POWER BOX	18.20 / 19.00	CONTOUR LINE
	TELSTRA PIT		EDGE OF VEGETATION
	GULLY GRATE		DRAINAGE FLOW LINE
S	STORMWATER MANHOLE		EXISTING DWELLING
P	SIGN (AS SHOWN)		EAVE LINE
59.38 / 58.64	SURFACE LEVEL AT PIPE/CONDUIT		EDGE OF BITUMEN
D1.0	DEPTH TO PIPE/CONDUIT		EDGE OF CONCRETE
	PALM		

1 DENOTES PHOTO N°. & DIRECTION (See Sheet 4)

Scale 1:200 – Lengths are in Metres.

2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28

Disclaimer: No As constructed sewer information was received for this plan at time of survey. Sewer line location undetermined.

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Scale:	1:200 @ A1	Drawing No:	18003 - 01
Drawn:	AG	Sheet:	3 of 4
Surveyor:	PH/RB	Revision:	C

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

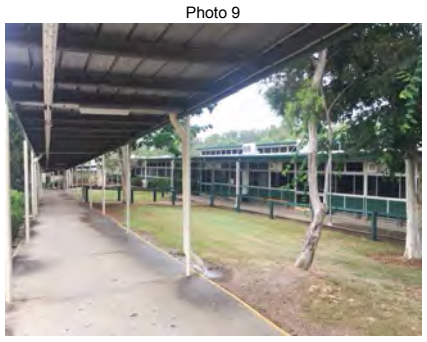

Photo 10

Photo 11

Photo 12

Photo 13

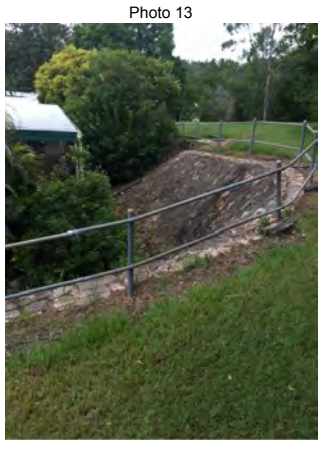

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photo 20

Photo 21

Photo 22

Photo 23

Photo 24

Photo 25

Photo 26

Photo 27

Photo 28

Photo 29

Disclaimer: No As constructed sewer information was received for this plan at time of survey. Sewer line location undetermined.

Rev	Description	Drawn	Checked	Date
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Contour Interval: 0.20m

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Scale: 1:200 @ A1

Drawn: AG

Surveyor: PH

Drawing No: 18003 - 01

Sheet: 4 of 4

Revision: C

Appendix 5

Proposal Plans

CH ID. CHANGE DETAILS

McGINN ROAD

BIORETENTION BASIN 34sqm

46°15'30" 394|43

89°22'30" 394|246

NEW CARPARK RL63.25 54 spaces (ex 41)

NEW MODS

NEW MODS

NEW CARPARK 77 spaces

CARPARK

MATHEMATICS RL59.4

DESIGN

HOME EC. RL59.4

HOME EC. RL59.28

GRAPHICS

AG. RL59.15

AUDITORIUM RL58.3

SCIENCE RL63.4

STAIR AND RAMP

MOD

NEW GLA/SCIENCE RL63.4 RL66.7 RL70.0

ADMIN RL60.4

AMENITIES RL60.4

J BLOCK RL59.9

CANTEEN

ART RL59.9

MAN. ARTS RL59.9

ART RL60.05

MUSIC RL58.3

AG. RL60.0

EXIST. COV. LINK

NEW COV. LINK

PERSIMMON STREET

LIBRARY RL63.4

DRAMA RL59.9

M BLOCK RL63.4

RL60.1

AG. RL61.0

SHEDS/ GREENHOUSES

ENGLISH RL67.4

NEW COV. LINK

HALL RL63.475

HUMANITIES RL65.4

NEW COV. LINK TO SUIT REALIGNMENT

SPECIAL ED.

STAGE

NEW HALL RL59.0 (TBC)

SHED RL59.65

SHED 59.36

RL67.05

RL67.05

BIORETENTION BASIN 55sqm

347|226 176°22'30"

1 SITE PLAN 1:500

N

GENERAL NOTES

1. Confirm details of setouts, levels, setbacks and critical dimensions on site prior to and during the works. Notify architect of any discrepencies discovered before proceeding.
2. All construction to comply with the building code of Australia and applicable Australian standards.
4. A signed original of this drawing is retained in the arkLAB Office for verification purposes.
5. These drawings are the copyright of arkLAB Architecture Pty Ltd and may not be used, retained or copied without written authority.
3. Do not scale from this drawing - use figured dimensions. Dimensions taken from structure (face of blockwork/stud) unless otherwise noted.

ADDITIONAL GENERAL NOTES

- Grid shown for reference purposes only. Measure off existing structure where indicated.
- Please verify all RL's prior to starting on site.

N

ID	DATE	ISSUE DETAILS	INT
01	09.05.18	PRELIM COORDINATION ISSUE	TM
02	18.05.18	PROGRESS ISSUE	TM

SITE PLAN | **SCALE @ A1** | CD 201742 / 0101 | 02

FGSHS - LEARNING CENTRE | **DET**

DRAWN | CHECKED | APPROVED | MCGINN RD • FERNY GROVE SHS

Friday, 18 May 2018 6:09 pm • BIM Server: server - BIM Server 21/201742_DET_FER_CD2

arkLAB ALAN JORDAN MARCH ARCHITECTURE
538 BOUNDARY ST SPRING HILL QLD 4000 ARKLAB ARCHITECTURE PTY LTD ABN 12121400913
P: 07 3236 9965 E: theLAB@arkLAB.com.au

GLA 70sqm
GLA 70sqm
COLLAB. 50sqm
FFL63.4
FLEX 90sqm
TOW RL65.8
TOW RL65.0
TOW RL64.2
TOW RL63.8
HOD 12sqm
INT. 12sqm
YEAR CO. 12sqm
GLA 70sqm
GLA 70sqm
STAFF 75sqm
KIT 5sqm
GLA 70sqm
RPS 40sqm
GEN STORE 20sqm
COLLAB. 50sqm
COVERED LINK TO ADMIN
MSB
LIFT
MALE WC 20sqm
FEMALE WC 20sqm
CLN 5sqm
STAFF WC 3sqm
STAFF WC 3sqm
PWD 5sqm
GLA 70sqm
GLA 70sqm
GLA 70sqm
GLA 70sqm
1/11
2/11
1/10
2/10
3/10
N

GROUND FLOOR PLAN - SCALE @ A3

SD 201742 / 02

E

DET ▪ LEARNING CENTRE ▪ MCGINN RD ▪ FERNY GROVE SHS

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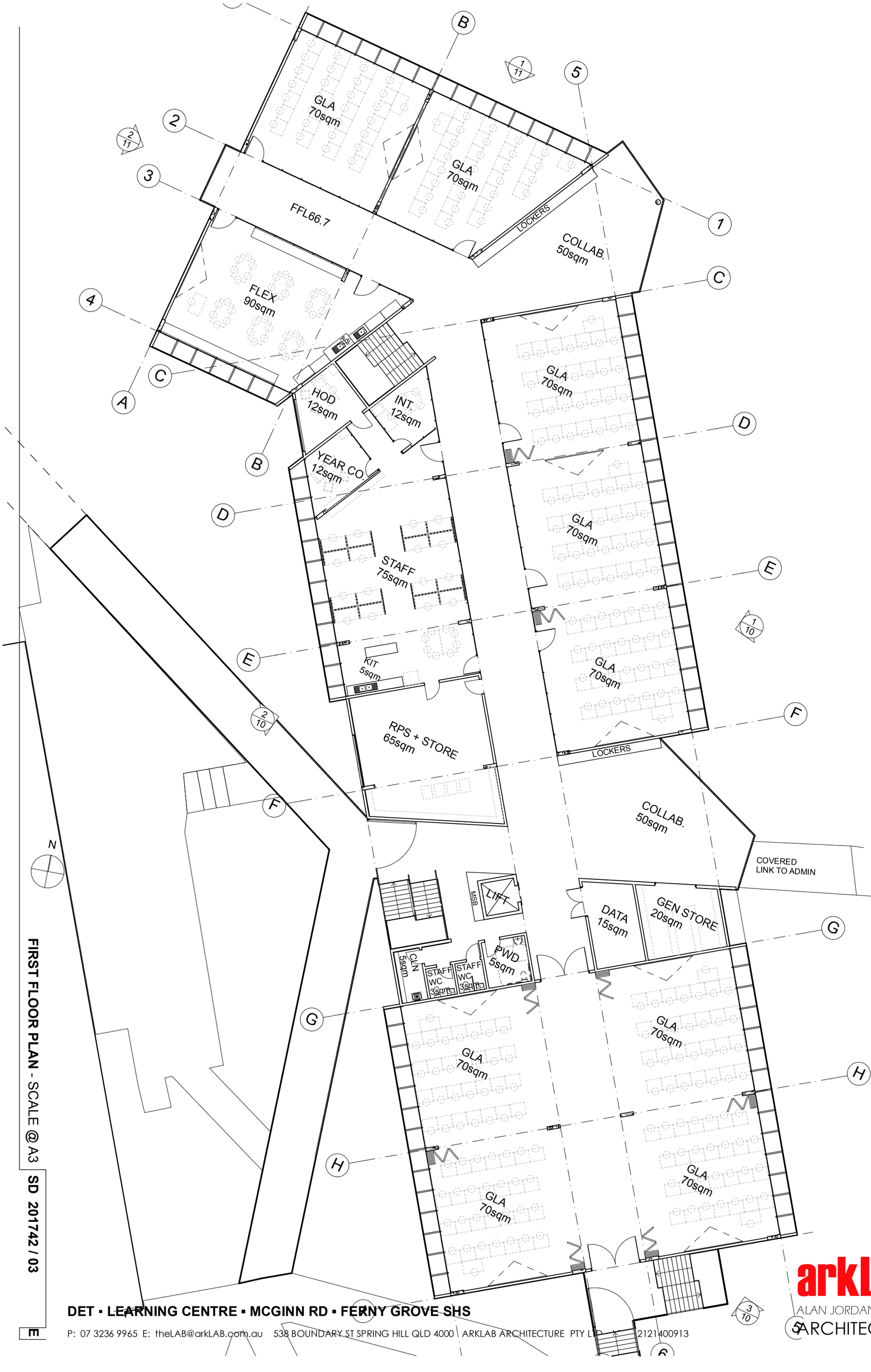
arkLAB
ALAN JORDAN M.ARCH
ARCHITECTURE



FIRST FLOOR PLAN - SCALE @ A3

SD 201742 / 03

E

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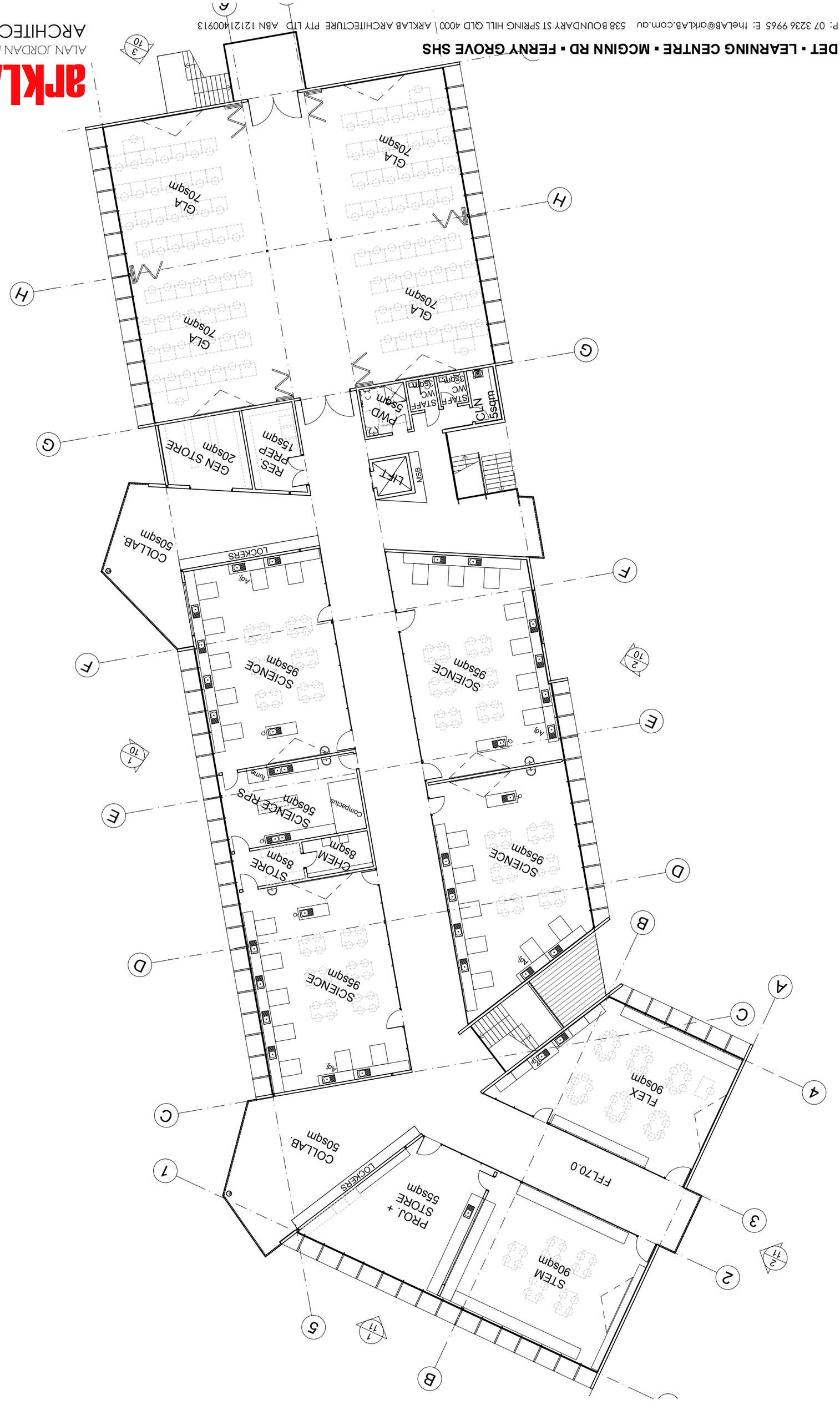
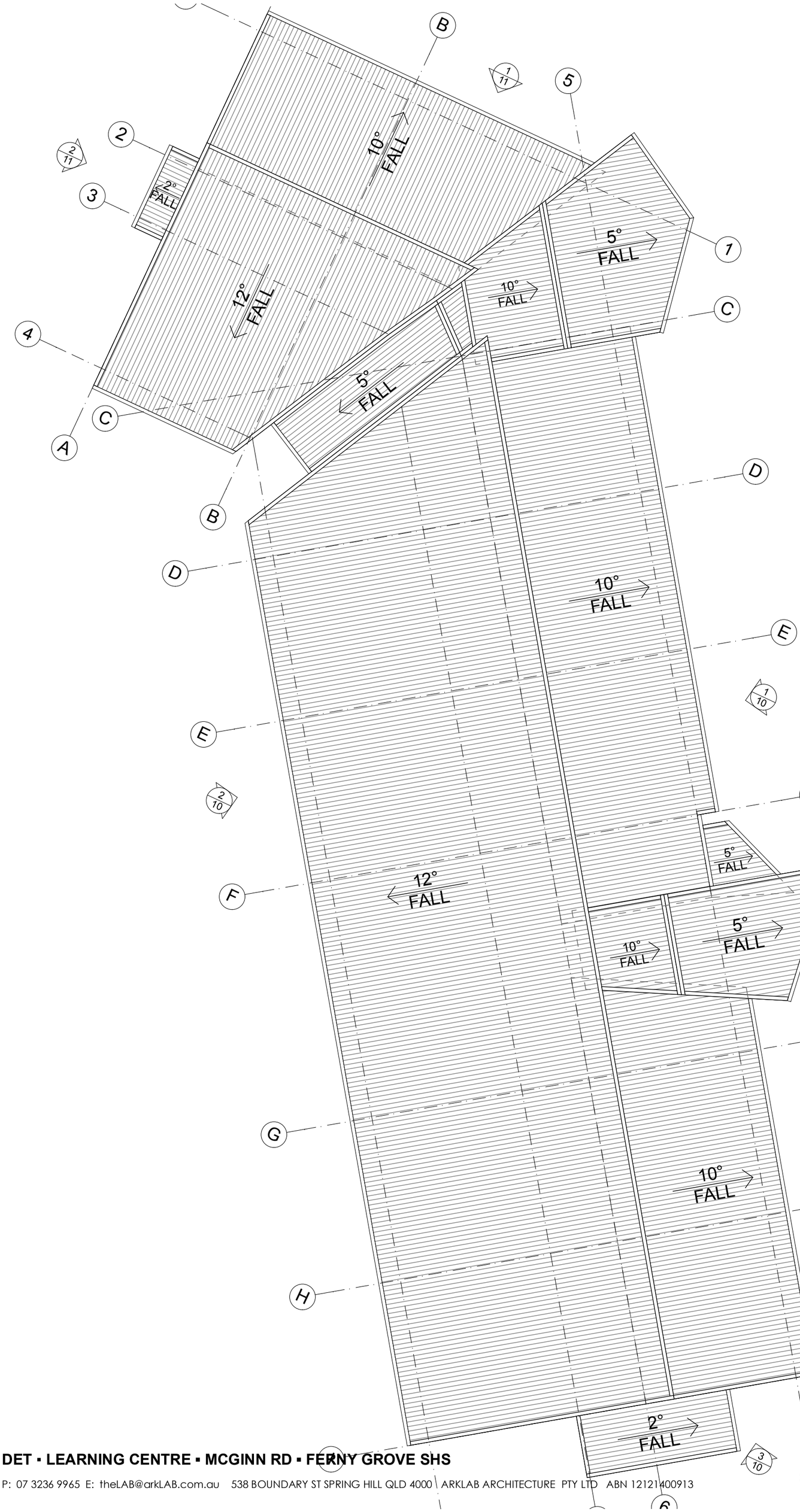
DET • LEARNING CENTRE • MCGINN RD • FERNY GROVE SHS

SECOND FLOOR PLAN - SCALE @ A3 | **SD 201742 / 04** | **E**





ROOF PLAN - SCALE @ A3

SD 201742 / 05

A

DET ▪ LEARNING CENTRE ▪ MCGINN RD ▪ FERNY GROVE SHS

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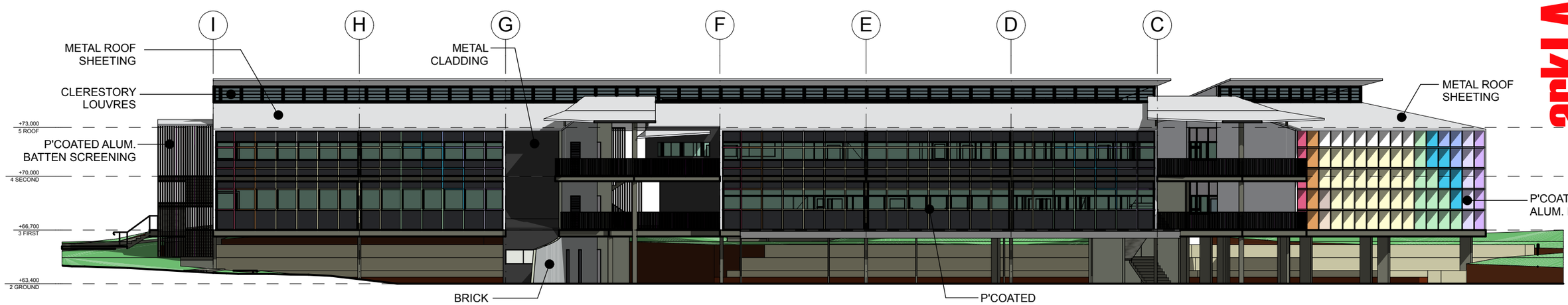
ARCHITECTURE



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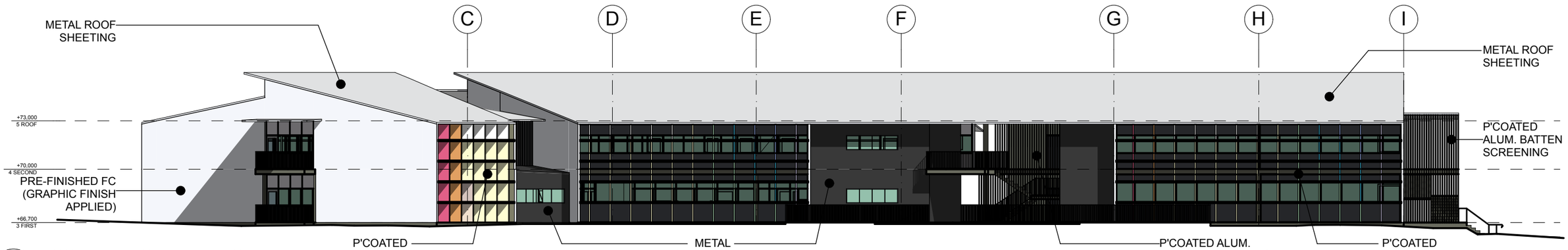

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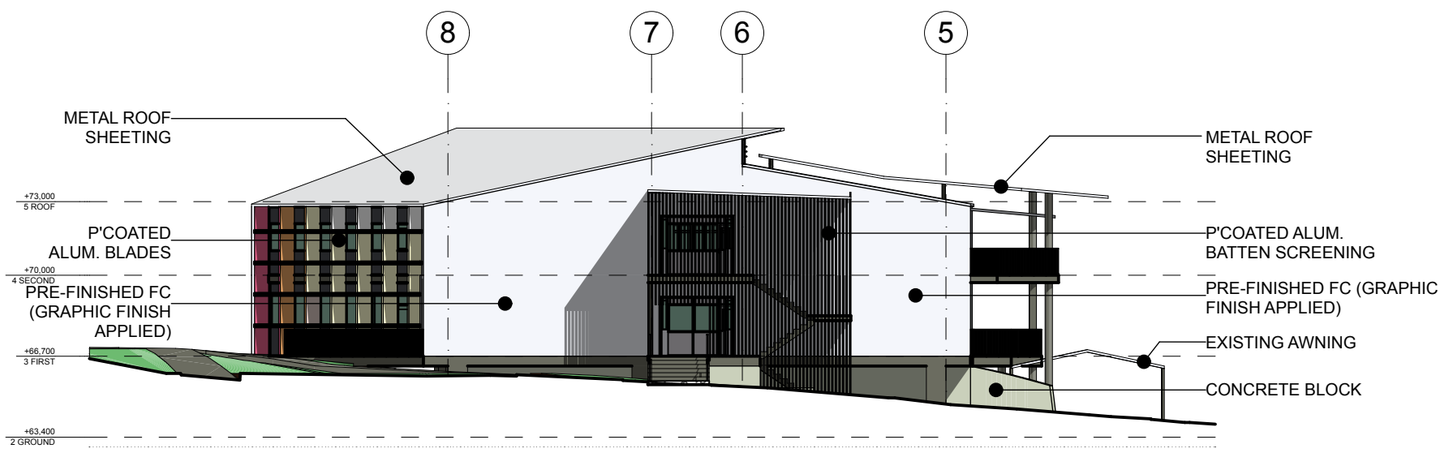

3 SOUTH ELEVATION
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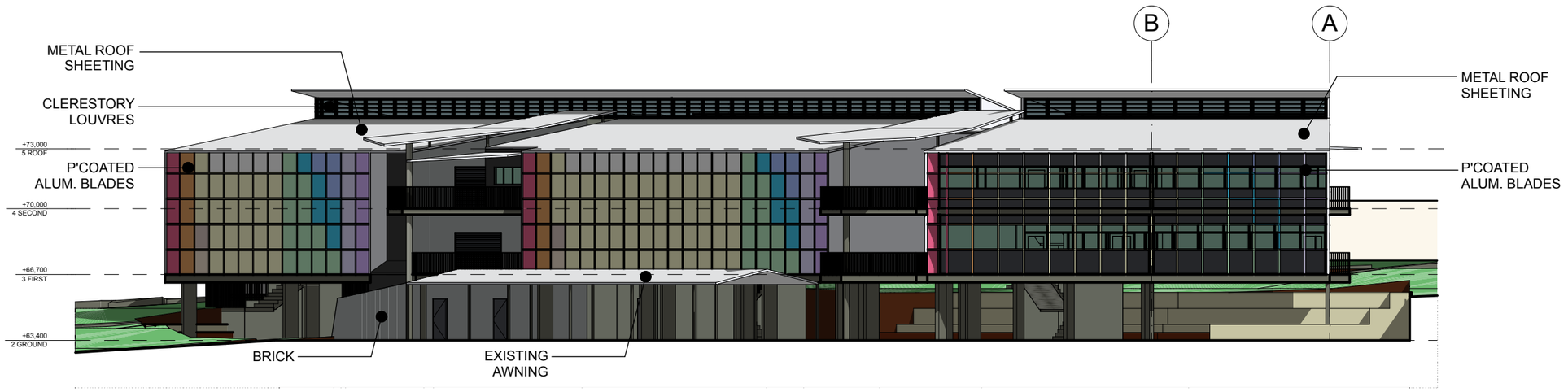
ELEVATIONS - SCALE @ A3 | **SD 201742 / 10** | **A**



1 NORTH ELEVATION
1:250

2 WEST ELEVATION
1:250

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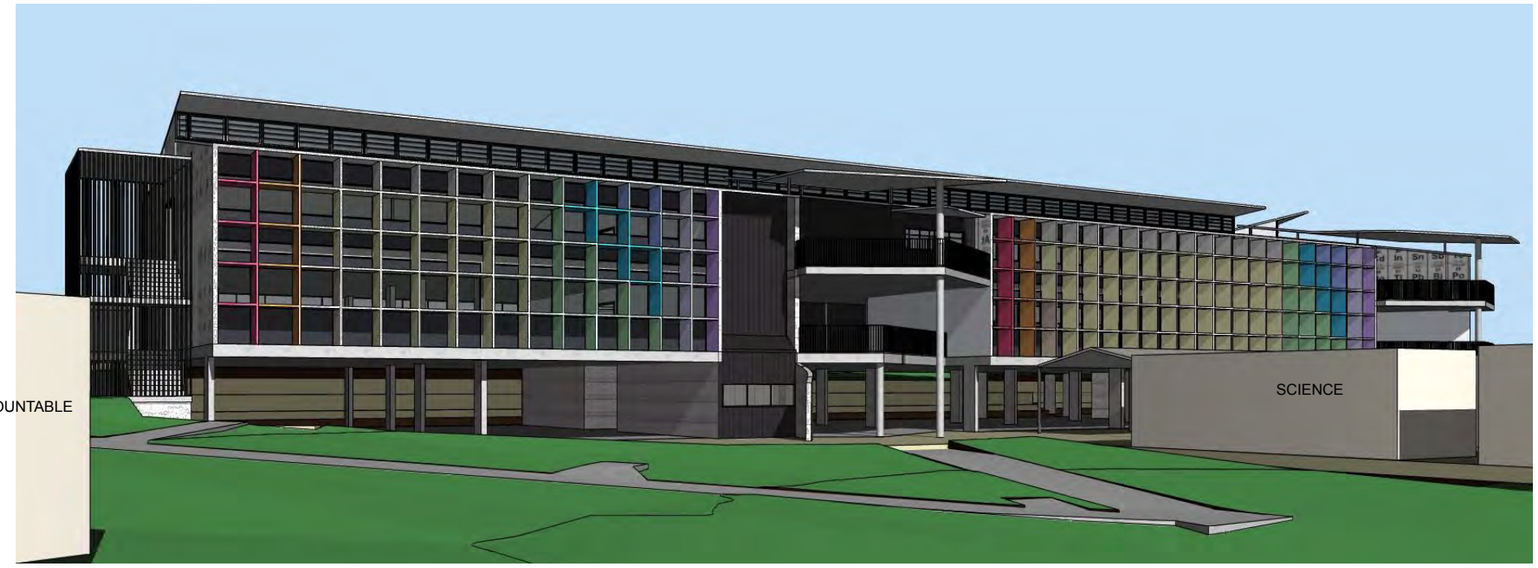

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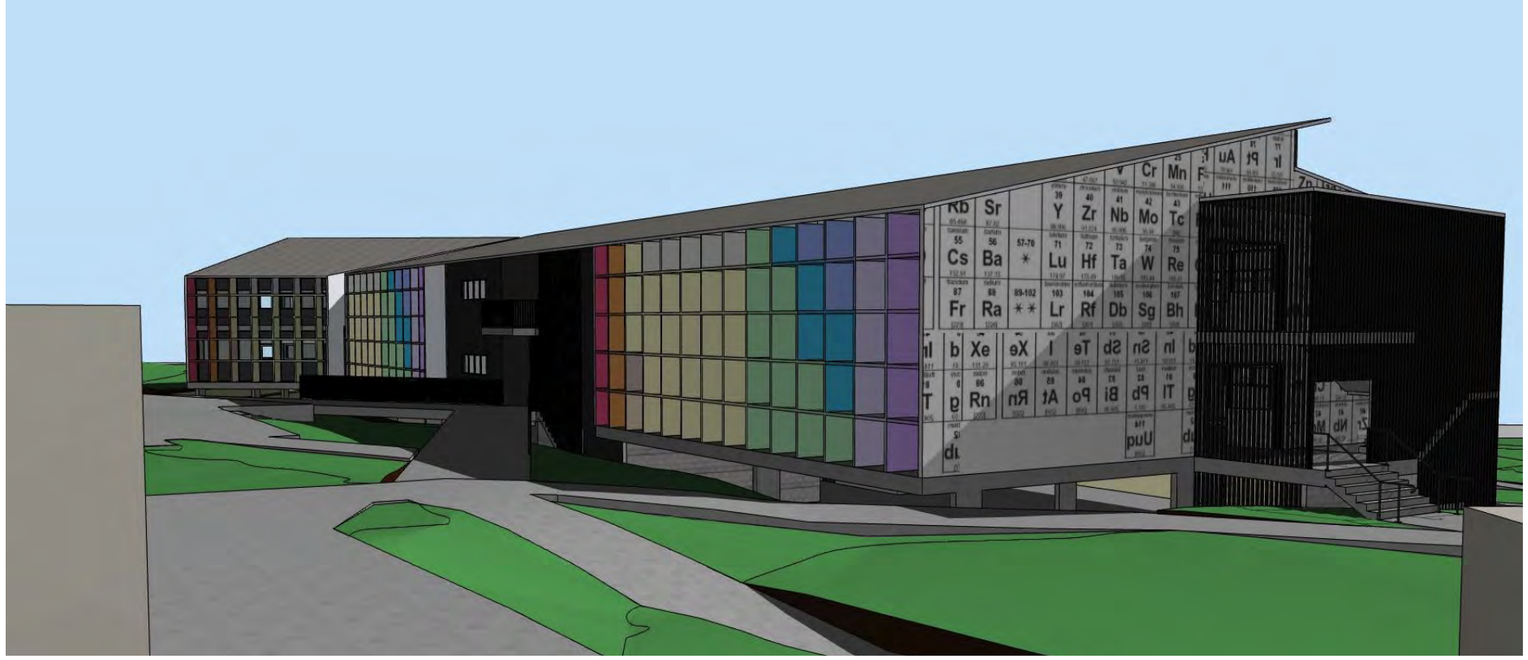

2 ENGLISH PERSPECTIVE

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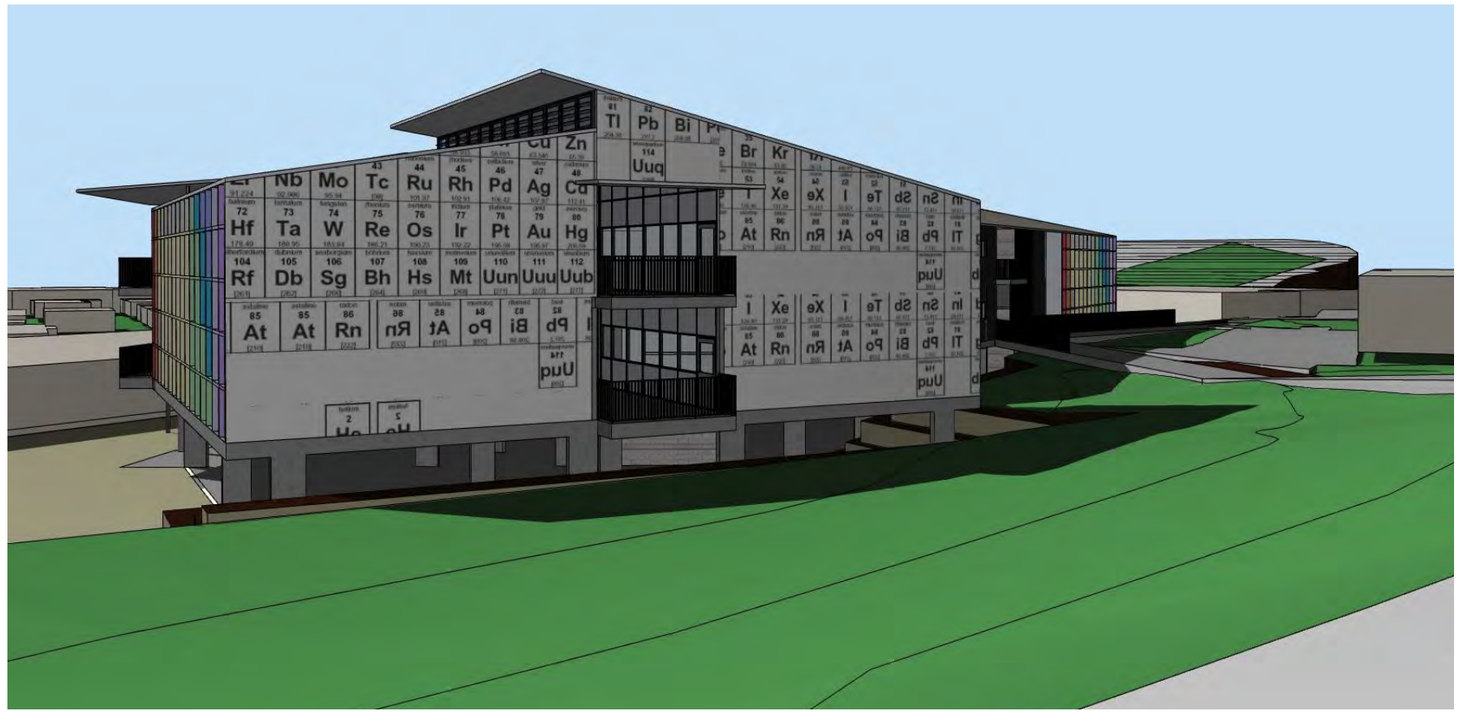
3D PERSPECTIVES - SCALE @ A3 | **SD 201742 / 20** | **D**



1 PERSIMMON ST PERSPECTIVE

2 MCGINN/PERSIMMON PERSPECTIVE

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3D PERSPECTIVES - SCALE @ A3 | **SD 201742 / 21** | **D**

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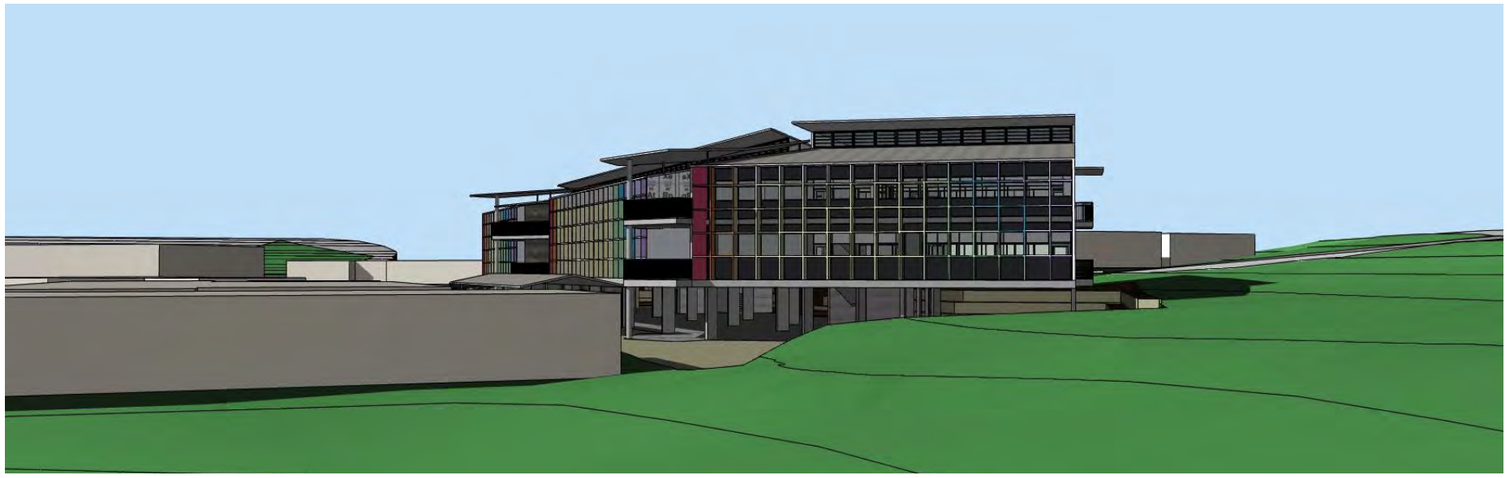

1 MCGINN RD PERSPECTIVE

2 SCIENCE PERSPECTIVE

DET • LEARNING CENTRE • MCGINN RD • FERNY GROVE SHS

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3D PERSPECTIVES - SCALE @ A3 | **SD 201742 / 22** | **D**

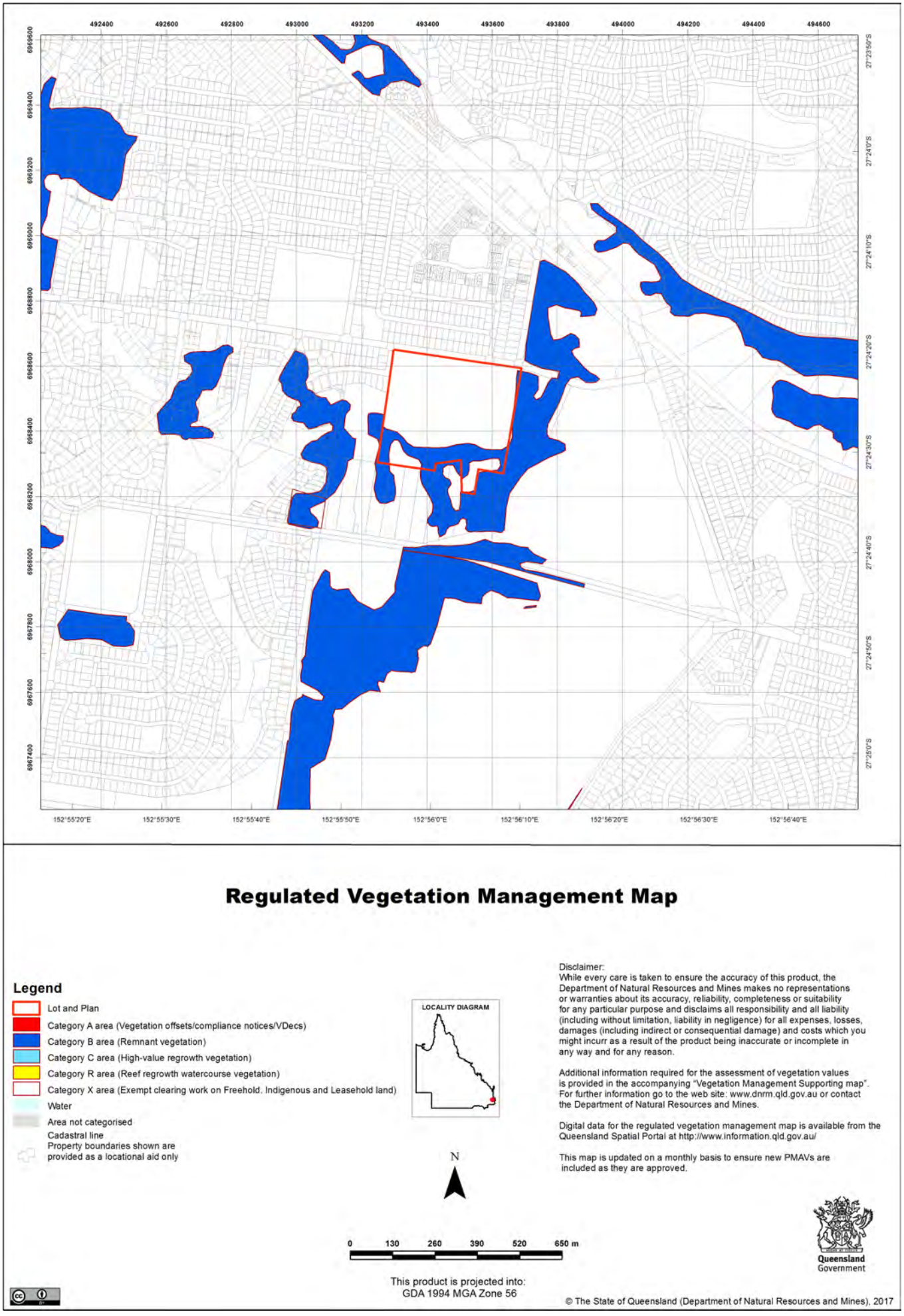
Appendix 6

State Interest Trigger Maps

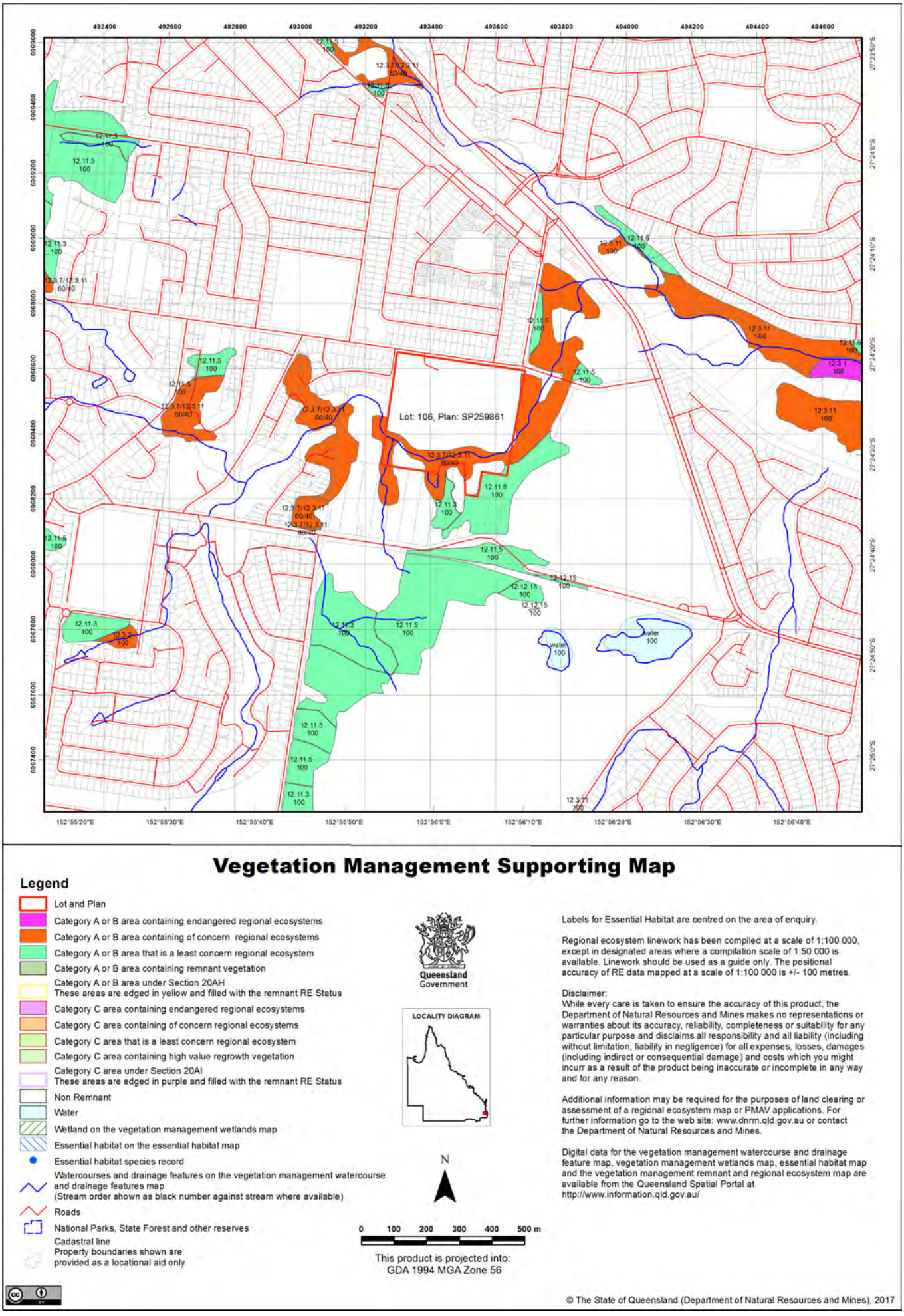
Department of Housing and Public Works

Queensland Government

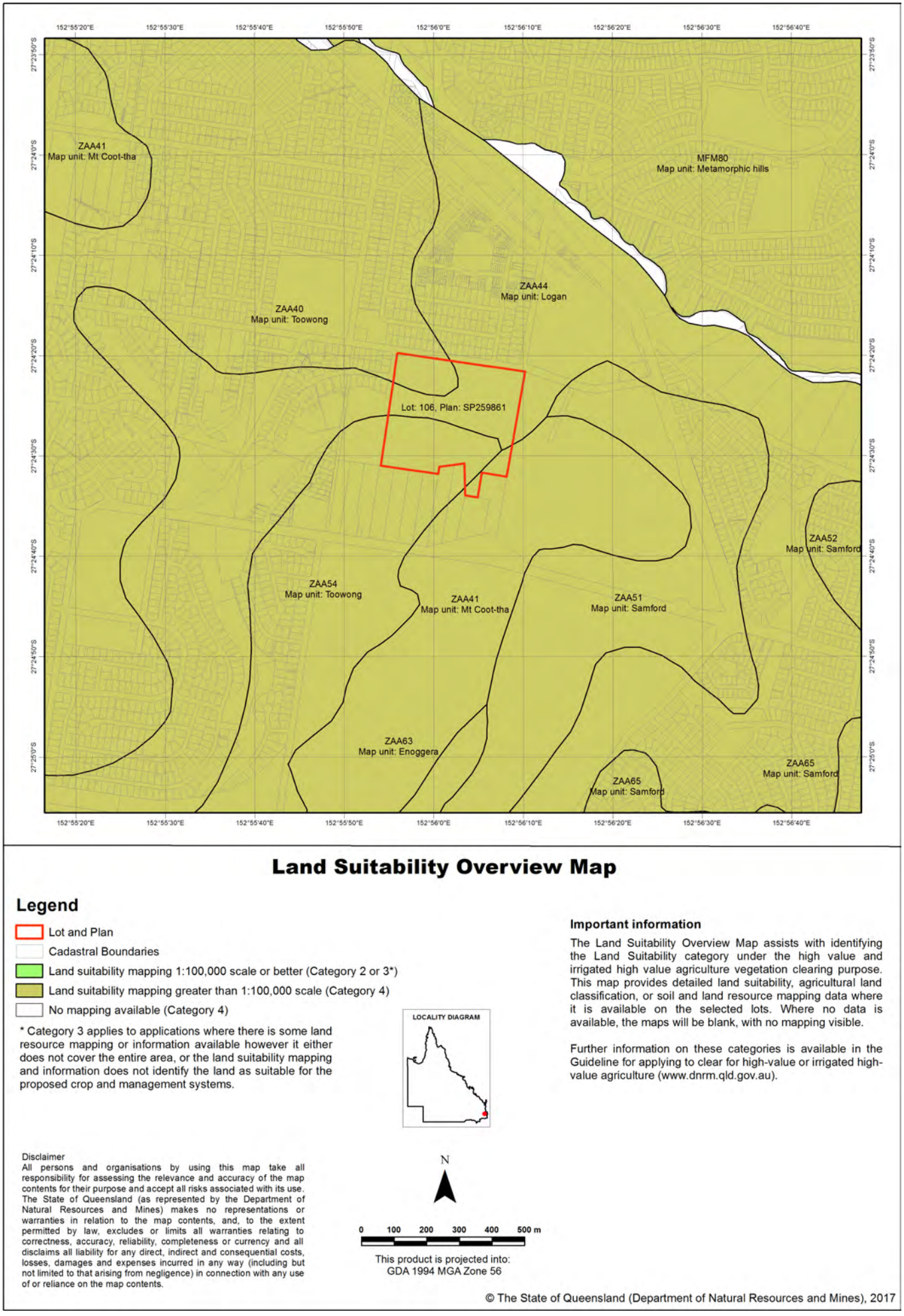
5.1 Regulated vegetation management map



5.2 Vegetation management supporting map



5.3 Land suitability map



Land Suitability Overview Map

Legend

- Lot and Plan
- Cadastral Boundaries
- Land suitability mapping 1:100,000 scale or better (Category 2 or 3*)
- Land suitability mapping greater than 1:100,000 scale (Category 4)
- No mapping available (Category 4)

* Category 3 applies to applications where there is some land resource mapping or information available however it either does not cover the entire area, or the land suitability mapping and information does not identify the land as suitable for the proposed crop and management systems.

LOCALITY DIAGRAM

Important information

The Land Suitability Overview Map assists with identifying the Land Suitability category under the high value and irrigated high value agriculture vegetation clearing purpose. This map provides detailed land suitability, agricultural land classification, or soil and land resource mapping data where it is available on the selected lots. Where no data is available, the maps will be blank, with no mapping visible.

Further information on these categories is available in the Guideline for applying to clear for high-value or irrigated high-value agriculture (www.dnrm.qld.gov.au).

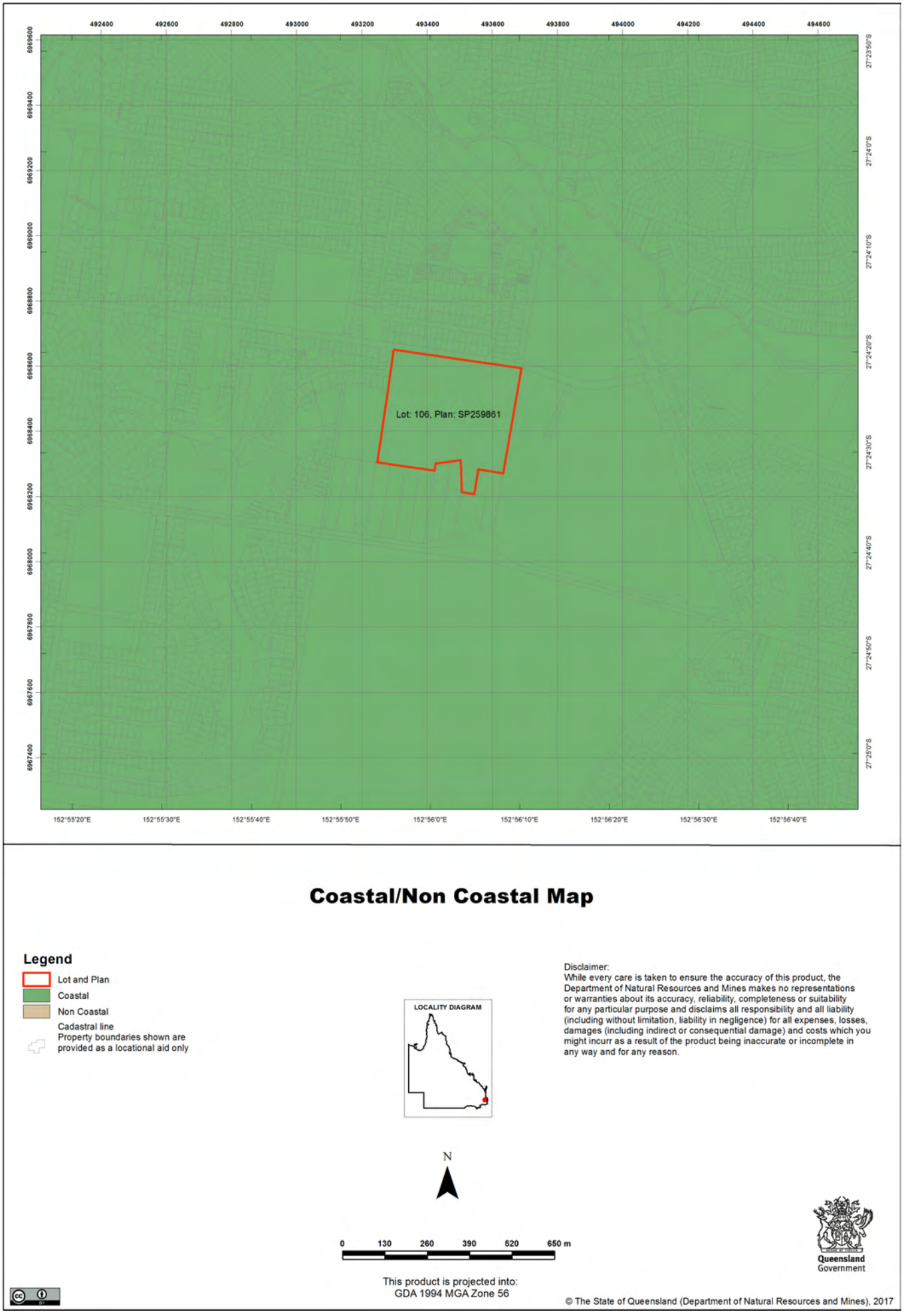
Disclaimer
All persons and organisations by using this map take all responsibility for assessing the relevance and accuracy of the map contents for their purpose and accept all risks associated with its use. The State of Queensland (as represented by the Department of Natural Resources and Mines) makes no representations or warranties in relation to the map contents, and, to the extent permitted by law, excludes or limits all warranties relating to correctness, accuracy, reliability, completeness or currency and all disclaims all liability for any direct, indirect and consequential costs, losses, damages and expenses incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the map contents.

N

0 100 200 300 400 500 m

This product is projected into:
GDA 1994 MGA Zone 56

5.4 Coastal/non coastal map



5.5 Protected plants map administered by DEHP

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

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This product is projected into:
GDA 1994 MGA Zone 56

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 Heritage Protection at palm@ehp.qld.gov.au

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.

Map of Referable Wetlands
Wetland Protection Areas

Lot and Plan

Cadastral Boundary

Wetland Protection Areas

Wetland

Trigger Area

LOCALITY DIAGRAM

N

Note:
This map shows the location of wetland protection areas which are defined under the Environmental Protection Regulation 2008. Within wetland protection areas, certain types of development involving high impact earthworks are made assessable under Schedule 3 of the Sustainable Planning Regulation 2009.

The Department of State Development Infrastructure and Planning is the State Assessment Referral Agency (SARA) under Schedule 7 of the Sustainable Planning Regulation 2009 for assessable development involving high impact earthworks within wetland protection areas. The Department of Environment and Heritage Protection is a technical agency.

The policy outcome and assessment criteria for assessing these applications are described in the State Development Assessment Provisions (SDAP) *Module 11: Wetlands and wild rivers.*

This map is produced at a scale relevant to the size of the lot on plan identified and should be printed at A4 size in portrait orientation. Consideration of the effects of mapped scale is necessary when interpreting data at a large scale.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at www.ehp.qld.gov.au or email planning.support@ehp.qld.gov.au.

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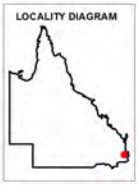
This product is projected into GDA 1994 MGA Zone 56

Map of Referable Wetlands for the Environmental Protection Act 1994

Lot and Plan
Cadastral Boundary
HES Wetland
GES Wetland

LOCALITY DIAGRAM



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Note:
This map shows the location of wetlands on the Map of Referable Wetlands which are defined under the Environmental Protection Regulation 2008.

Wetlands are assessed for ecological significance using the environmental values for wetlands in section 81A of the Environmental Protection Regulation 2008. Wetlands are considered either High Ecological Significance (HES) or of General Ecological Significance (GES) for the purposes of the environmental values.

This map is produced at a scale relevant to the size of the lot on plan identified and should be printed at A4 size in portrait orientation. Consideration of the effects of mapped scale is necessary when interpreting data at a large scale.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at <www.ehp.qld.gov.au> or email <planning.support@ehp.qld.gov.au>

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This product is projected into GDA 1994 MGA Zone 56

Koala Habitat in South East Queensland

Lot and Plan

Koala SPP - Habitat Values

Bushland Habitat
- High Value Bushland
- Medium Value Bushland
- Low Value Bushland

Suitable for Rehabilitation
- High Value Rehabilitation
- Medium Value Rehabilitation
- Low Value Rehabilitation

Other Areas of Value
- High Value Other
- Medium Value Other
- Low Value Other
- Generally not suitable
- Water

South East Queensland Koala Habitat Values western SEQ
- Bushland Habitat
- Suitable for rehabilitation
- Other areas of value
- Generally not suitable
- Water
- Cadastral Boundaries
- Local Government Boundaries

LOCALITY DIAGRAM

N

0 130 260 390 520 650 m

This product is projected into GDA 1994 MGA Zone 56

Based on or contains data provided by the State of Queensland 2010.

Note - These maps are not regulatory. Regulatory maps and requirements can be downloaded from the EHP website. Further information in relation to regulatory requirements for development and planning activities should be sought from the relevant Local Government Authority or the Department of Environment and Heritage Protection.

Map requested: (24/11/2017 08:58:59)
Lot: 106 Plan: SP259861

Koala Conservation in South East Queensland State Planning Regulatory Provisions

- Lot and Plan
- Priority Koala Assessable Development Areas
- Koala Assessable Development Areas
- Outside SPRP Koala Assessable Development Areas

Koala SPRP - Identified Broad-Hectare Areas

- Koala SPRP - Identified Broad-Hectare Areas

Koala SPRP - Habitat Values

Bushland Habitat

- High Value Bushland
- Medium Value Bushland
- Low Value Bushland

Suitable for Rehabilitation

- High Value Rehabilitation
- Medium Value Rehabilitation
- Low Value Rehabilitation

Other Areas of Value

- High Value Other
- Medium Value Other
- Low Value Other
- Generally not suitable
- Water
- Cadastral Boundaries
- Local Government Boundaries

N

0 130 260 390 520 650 m

This product is projected into GDA 1994 MGA Zone 56

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Based on or contains data provided by the State of Queensland 2010.

Note - These maps are not regulatory. Regulatory maps and requirements can be downloaded from the EHP website. Further information in relation to regulatory requirements for development and planning activities should be sought from the relevant Local Government Authority or the Department of Environment and Heritage Protection.

Appendix 7

EPBC Protected Matters Report and NCA Wildfline Report

Australian Government
Department of the Environment and Energy

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.

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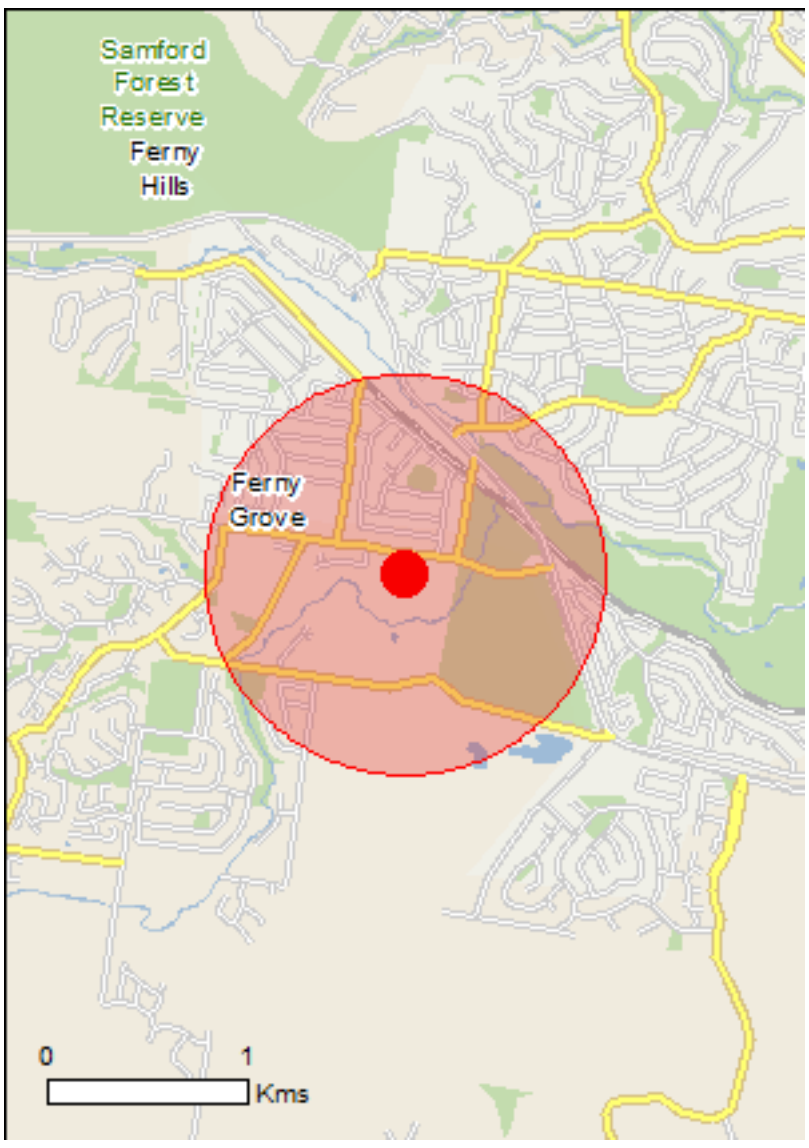
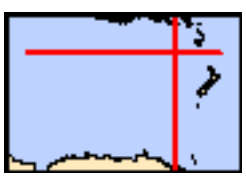


Coordinates
Buffer: 1.0Km



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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	36
Listed Migratory Species:	15

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:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	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:	None
Regional Forest Agreements:	None
Invasive Species:	47
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known 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 may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may 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 may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence 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 likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to 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 may occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may 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
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
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
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat may occur within area
Fontainea venosa [24040]	Vulnerable	Species or species habitat likely to occur within area
Lepidium peregrinum Wandering Pepper-cress [14035]	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 likely to occur within area
Macadamia ternifolia Small-fruited Queensland Nut, Gympie Nut [7214]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Sophora fraseri		
[8836]	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 likely to occur within area
Furina dunmalli		
Dunmall's Snake [59254]	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 may 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
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 likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may 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 may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely 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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may 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 may 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 may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

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
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely 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
Capra hircus Goat [2]		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

Name	Status	Type of Presence
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
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
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may 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

Name	Status	Type of Presence
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		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
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		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
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		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
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
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		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

-27.40651 152.93379

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.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -27.4065
Longitude: 152.9337
Distance: 1
Email: azadeh.nia@hpw.qld.gov.au
Date submitted: Friday 24 Nov 2017 09:03:09
Date extracted: Friday 24 Nov 2017 09:10:03

The number of records retrieved = 142

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			1
animals	birds	Acanthizidae	*Acanthiza nana*	yellow thornbill		C		1
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		2
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		1
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		2
animals	birds	Accipitridae	*Aviceda subcristata*	Pacific baza		C		1
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		1
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		3
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		2
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		3
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		2
animals	birds	Cacatuidae	*Eolophus roseicapilla*	galah		C		2
animals	birds	Campephagidae	*Coracina tenuirostris*	cicadabird		C		1
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		1
animals	birds	Columbidae	*Streptopelia chinensis*	spotted dove	Y			1
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		2
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		2
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		2
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		1
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		C		1
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		2
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		1
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		1
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		2
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		2
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow		C		3
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		1
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		1
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		1
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		1
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		1
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		2
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		4
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		2
animals	birds	Meliphagidae	*Melithreptus lunatus*	white-naped honeyeater		C		1
animals	birds	Meliphagidae	*Melithreptus gularis*	black-chinned honeyeater		C		2
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		1
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		2
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		1
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		3
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		1
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		1
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		1
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		2
animals	birds	Pachycephalidae	*Pachycephala pectoralis*	golden whistler		C		2
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		4
animals	birds	Pardalotidae	*Pardalotus punctatus*	spotted pardalote		C		1
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		4
animals	birds	Petroicidae	*Petroica rosea*	rose robin		C		1
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		1
animals	birds	Petroicidae	*Eopsaltria australis*	eastern yellow robin		C		1
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		1
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		1
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		2
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		2
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		1
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		2
animals	birds	Psophodidae	*Psophodes olivaceus*	eastern whipbird		C		1
animals	birds	Rhipiduridae	*Rhipidura rufifrons*	rufous fantail		SL		1
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		4
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		2
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		1
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		1
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		2
animals	mammals	Dasyuridae	*Dasyurus maculatus maculatus*	spotted-tailed quoll (southern subspecies)		V	E	1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		1
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	5
animals	mammals	Pteropodidae	*Pteropus poliocephalus*	grey-headed flying-fox		C	V	1
animals	ray-finned fishes	Poeciliidae	*Gambusia holbrooki*	mosquitofish	Y			1
animals	reptiles	Boidae	*Morelia spilota*	carpet python		C		2
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		1
animals	reptiles	Elapidae	*Cryptophis nigrescens*	eastern small-eyed snake		C		2
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whipsnake		C		2/1
fungi	club fungi	Basidiomycota	*Antrodia*			C		1/1
fungi	sac fungi	Graphidaceae	*Graphis aperiens*			C		1/1
fungi	sac fungi	Lecanoraceae	*Lecanora helva*			C		1/1
fungi	sac fungi	Lecanoraceae	*Lecanora caesiorubella*			C		1/1
fungi	sac fungi	Mycocaliciaceae	*Stenocybe*			C		1/1
fungi	sac fungi	Parmeliaceae	*Canoparmelia*			C		2/2
fungi	sac fungi	Parmeliaceae	*Canoparmelia texana*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema crinitum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema tinctorum*			C		6/6
fungi	sac fungi	Pertusariaceae	*Pertusaria*			C		2/2
fungi	sac fungi	Pertusariaceae	*Pertusaria thiospoda*			C		1/1
fungi	sac fungi	Pertusariaceae	*Ochrolechia subpallescens*			C		1/1
fungi	sac fungi	Physciaceae	*Pyxine subcinerea*			C		1/1
fungi	sac fungi	Physciaceae	*Buellia curatellae*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria applanata*			C		9/9

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
fungi	sac fungi	Physciaceae	*Dirinaria confluens*			C		2/2
fungi	sac fungi	Physciaceae	*Buellia dialyta*			C		1/1
fungi	sac fungi	Physciaceae	*Buellia dissa*			C		2/2
fungi	sac fungi	Physciaceae	*Buellia*			C		2/2
fungi	sac fungi	Physciaceae	*Dirinaria*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria melanoclina*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria sekikaica*			C		3/3
plants	ferns	Dennstaedtiaceae	*Hypolepis muelleri*	swamp bracken		C		1/1
plants	ferns	Salviniaceae	*Salvinia molesta*	salvinia	Y			1/1
plants	higher dicots	Acanthaceae	*Dyschoriste depressa*		Y			2/2
plants	higher dicots	Acanthaceae	*Ruellia simplex*		Y			1/1
plants	higher dicots	Apocynaceae	*Parsonsia straminea*	monkey rope		C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium amplexicaule*	blue heliotrope	Y			1/1
plants	higher dicots	Droseraceae	*Drosera burmanni*			C		1/1
plants	higher dicots	Droseraceae	*Drosera lunata*			C		1/1
plants	higher dicots	Elatinaceae	*Elatine gratioloides*	waterwort		C		2/2
plants	higher dicots	Fabaceae	*Vicia sativa subsp. nigra*		Y			1/1
plants	higher dicots	Fabaceae	*Hardenbergia violacea*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera hirsuta*	hairy indigo		C		1/1
plants	higher dicots	Fabaceae	*Crotalaria micans*		Y			1/1
plants	higher dicots	Fabaceae	*Tipuana tipu*	tipuana	Y			1/1
plants	higher dicots	Geraniaceae	*Geranium homeanum*			C		1/1
plants	higher dicots	Mimosaceae	*Calliandra haematocephala*		Y			1/1
plants	higher dicots	Mimosaceae	*Acacia maidenii*	Maiden's wattle		C		1/1
plants	higher dicots	Moraceae	*Ficus coronata*	creek sandpaper fig		C		1/1
plants	higher dicots	Myrtaceae	*Waterhousea floribunda*	weeping lilly pilly		C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus siderophloia*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus grandis*	flooded gum		C		1/1
plants	higher dicots	Myrtaceae	*Backhousia myrtifolia*	carrol		C		1/1
plants	higher dicots	Myrtaceae	*Lophostemon suaveolens*	swamp box		C		1/1
plants	higher dicots	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		1/1
plants	higher dicots	Phyllanthaceae	*Glochidion ferdinandi*			C		1/1
plants	higher dicots	Rutaceae	*Melicope micrococca*	white evodia		C		1/1
plants	higher dicots	Solanaceae	*Solanum chrysotrichum*		Y			3/3
plants	higher dicots	Ulmaceae	*Trema tomentosa var. aspera*			C		1/1
plants	monocots	Asparagaceae	*Asparagus virgatus*		Y			1/1
plants	monocots	Cyperaceae	*Cyperus exaltatus*	tall flatsedge		C		1/1
plants	monocots	Cyperaceae	*Carex maculata*			C		1/1
plants	monocots	Hydrocharitaceae	*Ottelia ovalifolia subsp. ovalifolia*			C		1/1
plants	monocots	Laxmanniaceae	*Lomandra multiflora subsp. multiflora*			C		1/1
plants	monocots	Orchidaceae	*Dipodium variegatum*			C		1/1
plants	monocots	Poaceae	*Eriochloa procera*	slender cupgrass		C		1/1
plants	monocots	Poaceae	*Panicum paludosum*	swamp panic		C		1/1
plants	monocots	Poaceae	*Sporobolus laxus*			C		1/1
plants	monocots	Poaceae	*Urochloa subquadripara*		Y			1/1
plants	monocots	Poaceae	*Paspalum mandiocanum*		Y			1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Cymbopogon refractus*	barbed-wire grass		C		1/1
plants	monocots	Poaceae	*Paspalum conjugatum*	sourgrass	Y			1/1
plants	monocots	Poaceae	*Dichanthium tenue*	small bluegrass		C		1/1
plants	monocots	Poaceae	*Oplismenus aemulus*	creeping shade grass		C		2/2
plants	monocots	Poaceae	*Panicum bisulcatum*	blackseed panic		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.

Appendix 8

CLR & EMR 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: 50423205 EMR Site Id: 01 December 2017
This response relates to a search request received for the site:
Lot: 106 Plan: SP259861

EMR RESULT

The above site is NOT included on the Environmental Management Register.

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 9

Service Infrastructure Plans

Department of Housing and Public Works

Queensland Government

N

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Map Title

102 0 51 25 25

Metres

Scale: 1: 2,003

Print Date: 7/06/2018 - 12:47 PM

Projection: Web Mercator Auxiliary Sphere

Legend

- Local Government Areas
- FLOW METER
- FLOW METER - OFFLINE
- Water Fitting
- PIGGING POINT
- JOINT
- TAPPING
- TEE
- SCOUR OUTLET
- Water Structures
- PIPE BRIDGE
- PIER
- Water Hydrant
- INGROUND HYDRANT
- Service Valve, OPEN
- SEQWATER
- SEQ - NON POT
- SEQ - OFFLINE
- Water Pump Stations
- SEQWATER
- SEQWATER - OFFLINE
- Water Pumps
- LIFT PUMP
- LIFT PUMP - OFFLINE
- Water - Model Link
- Trunk Main
- SERVICE
- Property Holding
- Brisbane City Label
- Freeway
- Tunnel Only
- Waterbody
- HillShade_25m
- Low : 0
- Locality Names
- Highway
- Freeway
- Brisbane_River_Creek
- MASK - Land Outside BCC
- Water Device - All Other Assets
- PRESSURE GAUGE
- PRESSURE GAUGE - OFFLINE
- <all other values>
- END CAP
- GIBAULT JOINT
- REDUCER
- RESERVOIR INLET
- CHEMICAL INJECTION POINT
- <all other values>
- CONCRETE STOP
- Water Chamber
- <all other values>
- Water Service Valve
- Water Network Structure - Reservoirs
- PRIVATE
- PRIVATE - NON POT
- PRIV - OFFLINE
- <all other values>
- PRIVATE
- PRIVATE - OFFLINE
- BOOSTER PUMP
- BOOSTER PUMP - OFFLINE
- Water Vertical Pressure Main
- Raw Water Main
- Scour Main
- MODEL LINK
- Sealed Plan
- Local Government Area
- Highway
- Freeway
- Brisbane_River_Creek
- High : 254
- Vegetation External
- Road Network
- Arterial Road
- Arterial Road
- StreetPro Drainage Regions
- HillShade_25m
- <all other values>
- LEVEL SENSOR
- LEVEL SENSOR - OFFLINE
- BEND
- CROSS
- TAPPING BAND
- WYE
- RESERVOIR OUTLET
- SAMPLING STATION
- ANCHOR BLOCK
- HEADWALL
- Water Network Structure Boundary
- PILLAR HYDRANT
- Service Valve, CLOSED
- QUU
- QUU - NON POT
- QUU - OFFLINE
- Water Network Structure Boundary
- QUU
- QUU - OFFLINE
- Water Sampling Point
- BORE PUMP
- BORE PUMP - OFFLINE
- Water Pressure Main - by Type
- Reticulation Main
- Water Service
- COMMON SERVICE
- Parcel - Outside Brisbane
- Road Network
- Arterial Road
- Arterial Road
- StreetPro Drainage Regions
- Local Government Area
- Freeway
- Tunnel Only
- Waterbody
- StreetPro Drainage Centrelines
- High : 254

N

BRISBANE CITY

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Map Title

237 0 118 59 59

Metres

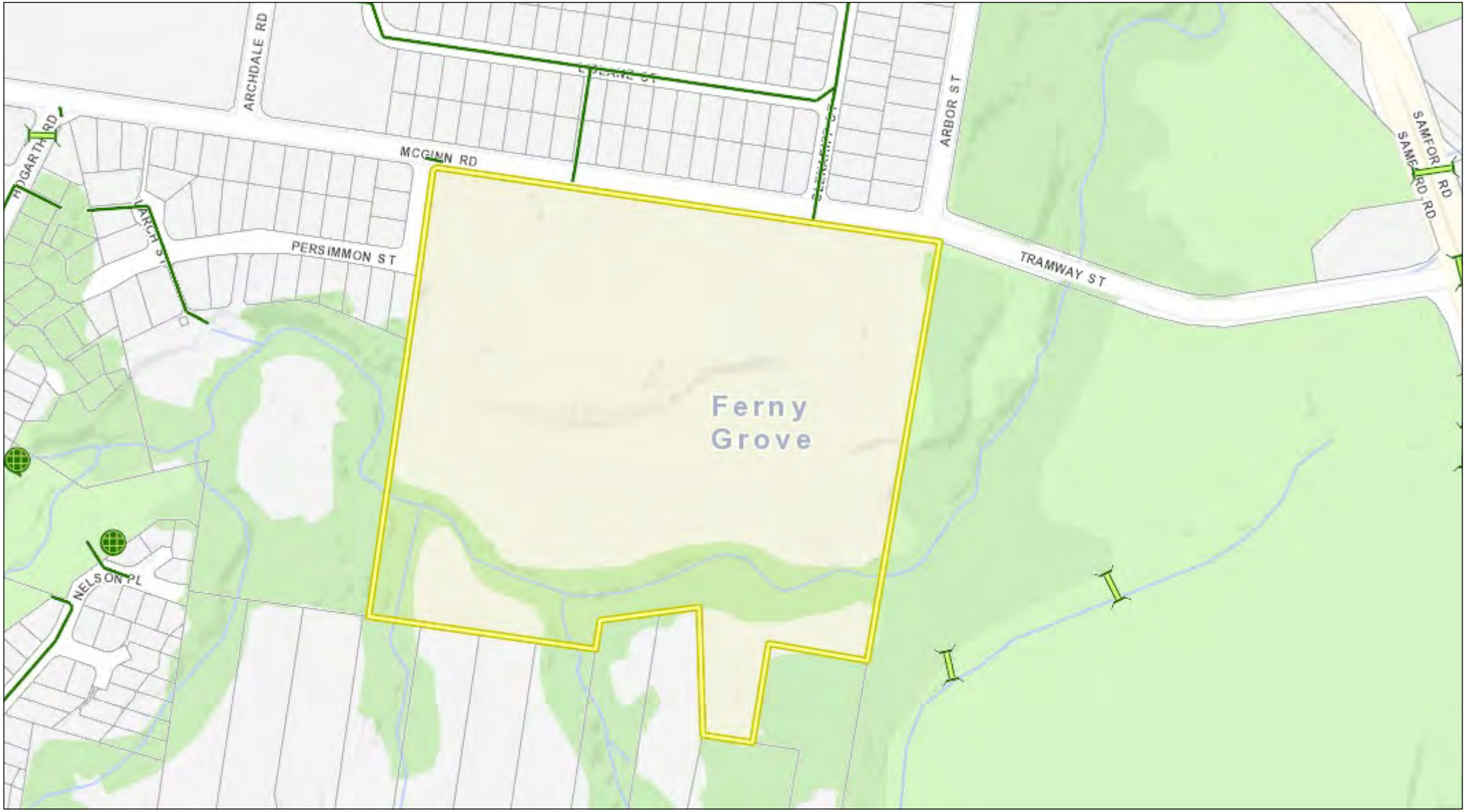
Scale: 1:4,668

Print Date: 7/06/2018 - 12:49 PM

Projection: Web Mercator Auxiliary Sphere

Legend

- Local Government Areas
  - SCOUR
  - AIR - OFFLINE
  - REFLUX - OFFLINE
  - SEWER DOOR
  - SEWER DOOR - OFFLINE
- Sewer Network Structure -Treatment Plants
- Sewer Pump Station
- Sewer Network Structure Boundary
  - SYPHON
  - RETICULATION MAIN
  - SYPHON - OFFLINE
  - RETICULATION MAIN - OFFLINE
- Sewer Pressure Main - by Type
  - RISING MAIN
  - LOW PRESSURE MAIN - OFFLINE
- Sewer Control Valve - by Type
  - VACCUM, AS CONSTRUCTED
  - SCOUR - OFFLINE
- Sewer System Valve - by Type
  - GATE
  - GATE - OFFLINE
  - TREATMENT PLANT, AS CONSTRUCTED
  - PUMP STATION
- Sewer Gravity Main - by Type
  - DISCHARGE
  - OVERFLOW MAIN
  - DISCHARGE - OFFLINE
  - OVERFLOW MAIN - OFFLINE
  - MODEL LINK
  - VACUUM MAIN
  - RISING MAIN - OFFLINE
- AIR
  - REFLUX
  - VACCUM - OFFLINE
  - <all other values>
  - BUTTERFLY
  - BUTTERFLY - OFFLINE
  - TREATMENT PLANT - OFFLINE
  - PUMP STATION - OFFLINE
  - <all other values>
  - TRUNK MAIN
  - MODEL LINK
  - TRUNK MAIN - OFFLINE
  - MODEL LINK - OFFLINE
  - LOW PRESSURE MAIN
  - MODEL LINK - OFFLINE
  - VACUUM MAIN - OFFLINE
- Property Holding
- Brisbane City Label
  - Freeway
- Tunnel Only
- Waterbody
- HillShade_25m
  - Low : 0
- Locality Names
  - Highway
  - Freeway
- Brisbane_River_Creek
- MASK - Land Outside BCC
- Parks
- Local Government Area
  - Freeway
- Tunnel Only
- Waterbody
- StreetPro Drainage Centrelines
  - High : 254
- Vegetation
- SHADING - Residential Area
  - Freeway
- Sealed Plan
- Local Government Area
  - Highway
  - Freeway
- Brisbane_River_Creek
  - High : 254
- Vegetation External
- Road Network
  - Arterial Road
  - Arterial Road
- StreetPro Drainage Regions
- HillShade_25m
  - Low : 0
- Vegetation External
- Locality Names
  - Highway
  - Freeway
- Brisbane_River_Creek
- MASK - Land Outside BCC
- Parks
- Local Government Area
  - Highway
- Parcel - Outside Brisbane
- Road Network
  - Arterial Road
  - Arterial Road
- StreetPro Drainage Regions
- Local Government Area
  - Freeway
- Tunnel Only
- Waterbody
- StreetPro Drainage Centrelines
  - High : 254
- Vegetation
- SHADING - Residential Area
- Road Network
  - Arterial Road
  - Arterial Road
- StreetPro Drainage Regions
- HillShade_25m
  - Low : 0
- Vegetation External
- Road Network
  - Arterial Road



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stormwater

203 0 101 50 50

Metres

Scale: 1:4,005

Print Date: 7/06/2018 - 1:31 PM

Projection: Web Mercator Auxiliary Sphere


Legend
Local Government Areas
Artesian Well
Culvert
Property Holding
Brisbane City Label
Freeway
Tunnel Only
Waterbody
HillShade_25m
Low : 0
Locality Names
Highway
Freeway
Brisbane_River_Creek
MASK - Land Outside BCC
Parks
Local Government Area
Freeway
Tunnel Only
Waterbody
StreetPro Drainage Centrelines
High : 254
Vegetation
SHADING - Residential Area
Freeway
Connector Road
Freeway
Brisbane_River_Creek
MASK - Land Outside BCC
High : 254
Vegetation
SHADING - Residential Area
Road Network
Arterial Road
Railway Line
Arterial Road
StreetPro Drainage Regions
SQID
Detention Basin
Surface Drain
Sealed Plan
Local Government Area
Highway
Freeway
Brisbane_River_Creek
High : 254
Vegetation External
Road Network
Arterial Road
Arterial Road
StreetPro Drainage Regions
HillShade_25m
Low : 0
Vegetation External
Locality Names
Highway
Freeway
Brisbane_River_Creek
MASK - Land Outside BCC
Parks
Local Government Area
Highway
Railway Line
Arterial Road
StreetPro Drainage Regions
HillShade_1m
Low : 0
Parks
Local Government Area
Freeway
Connector Road
Tunnel Only
Waterbody
StreetPro Drainage Centrelines
Waterbody
Lake
Drain
Parcel - Outside Brisbane
Road Network
Arterial Road
Arterial Road
StreetPro Drainage Regions
Local Government Area
Freeway
Tunnel Only
Waterbody
StreetPro Drainage Centrelines
High : 254
Vegetation
SHADING - Residential Area
Road Network
Arterial Road
Arterial Road
StreetPro Drainage Regions
HillShade_25m
Low : 0
Vegetation External
Road Network
Arterial Road
Tunnel Only
Waterbody
StreetPro Drainage Centrelines
High : 254
HillShade_25m_exclude_BCC
Low : 0
Vegetation External
Railway Station
Highway
Local Street
Freeway
Brisbane_River_Creek
Drainageline

Appendix 10

Flood Assessment

Department of Housing and Public Works

Queensland Government

FLOOD OVERLAY CODE ASSESSMENT REPORT

Ferny Grove State High School
26 McGinn Road, Ferny Grove

26 June 2018

STORM Water Consulting Pty Ltd
ACN 105 078 377
5/541 Old Cleveland Rd, CAMP HILL QLD 4152
Ph (07) 3398 4992 Fax (07) 3398 4993
www.stormw.com.au

Job No: 5974 v 2.0

Job Name: Ferny Grove State High School – 26 McGinn Road, Ferny Grove

Report Name	Date	Report No.
Flood Overlay Code Assessment Report	26 June 2018	5974 v 2.0

Project Engineer: Steve Hughes
BE Civil, MIEAust
E steve@stormw.com.au

Reviewed By: Darren Rogers
BE Civil (Hons), MIE Aust, RPEQ
Director
E darren@stormw.com.au

Downloadable Files:

Report File	5974 Report 2.0.pdf
URBS File	5974 URBS 2.0 .zip
TUFLOW File	Available on Request

Download Location: www.stormw.com.au/jobs/ 5974/2.0

Username:	fern
Password:	Fern5974

Table of Contents

1.0 INTRODUCTION

Storm Water Consulting Pty Ltd was commissioned by Honeywill Consulting Pty Ltd to prepare a Flood Overlay Code Assessment Report for the proposed development at Ferny Grove State High School, located at 26 McGinn Road, Ferny Grove.

This report has been prepared to demonstrate that the proposed development meets the requirements of Brisbane City Council's Flood Overlay Code. The Flood Overlay Code has been assessed in Appendix D of this report.

2.0 SITE CONDITIONS

2.1 Existing Site

The subject site is a school facility. The school is bordered by McGinn Road to the north and Cedar Creek to the west, south and east. The site is located within Brisbane City Council's Creek/Waterway Flood Planning Areas 1, 3, 4 & 5 and Overland Flow Flood Planning Area. An existing site plan is presented in Figure 2, Appendix A.

2.2 Developed Site

The proposed development consists of two stages. This report has been prepared to address the flooding issues affecting Stage 2. Stage 2 includes the construction of a new building (to be used as a hall) in the south eastern corner of the school. The location of the proposed building works is presented in Figure 3, Appendix A.

3.0 HYDROLOGIC MODELLING

An URBS model was set up to create an inflow boundary condition for the TUFLOW model (discussed in Section 4.0). The location of the inflow boundary condition is presented in Figure 5, Appendix A. The catchment contributing flows to the location of the boundary condition is presented in Figure 1, Appendix A. The catchment was split into sub-catchments and routing directions mapped as shown in Figure 4, Appendix A.

Alpha and Beta values were left as default parameters of 1.2 and 0.8 respectively. The continuing loss was set at 2.5mm/hr. The initial losses were set at 15mm for the 2yr ARI to the 50yr ARI events, in accordance with recommendations from the Queensland Urban Drainage Manual (QUDM) and Australian Rainfall and Runoff. The initial loss for the 100yr ARI event and 500yr ARI event was set to 0mm/hr. The catchment properties were a mix of low density residential and forested land. Detailed catchment properties are presented in Appendix C of this report. A summary of the parameters used in the URBS model is presented in Table 3.1 below.

Table 3.1 – URBS Model Parameters

ARI	Storage Coefficient	Non-Linearity Index	Initial Rainfall Loss	Continuing Rainfall Loss
years	α	β	mm	mm/hr
1	1.2	0.8	15	2.5
2	1.2	0.8	15	2.5
5	1.2	0.8	15	2.5
10	1.2	0.8	15	2.5
20	1.2	0.8	15	2.5
50	1.2	0.8	15	2.5
100	1.2	0.8	0	2.5
500	1.2	0.8	0	2.5

A summary of the peak discharges in Cedar Creek at Point 1 (shown in Figure 4) is presented below.

Table 3.2 – URBS Model Results

ARI	Existing Flows
years	m^3/s
2	43.1
5	65.3
10	79.9
20	102.6
50	135.1
100	208.0
500	285.4

4.0 2D HYDRODYNAMIC MODELLING

A TUFLOW 2D hydrodynamic model was prepared to model the inundation across the site from Cedar Creek. The TUFLOW model was setup to replicate flood level results from Brisbane City Council's Floodwise Property Reports.

4.1 Existing Scenario

The TUFLOW model was based on a 5m grid size with elevation data assigned from the ALS survey data sourced from the Department of Natural Resources and Mines. Normal depth was used for the downstream boundary condition, based on a flood slope of 0.01. Manning's values used throughout the model are presented in Table 4.1 below.

Table 4.1 – Manning's Values

Manning's Value	Surface
n=0.035	Maintained Grass Areas
n=0.100	Residential Properties

A comparison between the flood levels from Council's Floodwise Property Report and the results from the TUFLOW model is presented below.

Table 4.2 – Flood Level Result Comparison

ARI Event	Floodwise Property Report Flood Level	TUFLOW Model Flood Level
5	57.2	57.3
20	57.7	57.7
50	58.0	58.0
100	58.4	58.4

Results presented in Table 4.2 above show that the TUFLOW model results generally match the reported flood levels affecting the site from Council's Floodwise Property Report.

Flood levels plots for the 100yr ARI and 500yr ARI events are presented in Figures 6 & 7, Appendix A. Flow velocities, depths and velocity-depth products for the 100yr ARI event are presented in Figures 8-10, Appendix A.

The new hall will be located on a suspended floor. The new hall would therefore not impede the flood water from the creek and would not create an adverse impact to neighbouring properties. A developed TUFLOW model is therefore not required.

4.2 Finished Floor Levels

Minimum flood immunity requirements for the new hall are based on Table 8.2.11.3.L and Table 8.2.11.3.D of the Flood Overlay Code as shown in Table 4.3 below. The hall is classified as a Class 9b structure.

Table 4.3 – Minimum Flood Immunity Requirements

Floor Use	Minimum Finished Floor Level
School Hall (assembly building)	500yr ARI flood level

The 500yr ARI flood level affecting the location of the new hall is RL57.85m AHD. It is proposed to construct the hall with a finished floor level at RL59.0m AHD. The proposed finished floor level of the hall meets the minimum finished floor level requirement.

5.0 FLOOD OVERLAY CODE ASSESSMENT

Sections B and C of the Flood Overlay Code have been addressed in Appendix D of this report. The proposed finished floor level as discussed in Section 4.2 meets the minimum flood immunity requirement of the Flood Overlay Code. To comply with Acceptable Outcome 3, a Flood Risk Assessment has been undertaken and is presented in Section 5.1 below.

5.1 Flood Risk Assessment

Stage 2 of the development includes the construction of a new building, to be used as a school hall. A Flood Risk Assessment is required to be undertaken as the site is located in the Creek/Waterway Flood Planning Areas 1-4, which does not meet the land use compatibility in accordance with the flood hazard.

The following table presents an assessment of the flood risk associated with the proposed building. The Flood Risk Assessment has been undertaken in accordance with Section 9.4 of the Flood Planning Scheme Policy.

Table 5.1 – Flood Risk Assessment

Flood Risk Issue	Flood Risk Assessment
Number of people likely to be at risk	Zero. The finished floor level of the hall is well above the minimum flood immunity level and the hall does not become isolated during a flood event.
Hazard in larger floods	The proposed finished floor level provides over a meter of freeboard above the 500yr ARI flood level affecting the location of the hall. There is expected to be minimal flood hazard in a larger flood event.
Flood warning time	Access to the hall is not cut off due to a flood event in Cedar Creek, therefore flood warning time is not an assessable criteria.
Evacuation routes	Evacuation of the hall is through the existing school, out to McGinn Road.
Isolation – potential for evacuation route to be cut off early	The evacuation route would not be cut off by flood water from Cedar Creek.
Special care uses	There will be vulnerable people such as children using the building.
Burden placed on emergency services	There is not expected to be any burden placed on emergency services as the hall and access route is flood immune.
Special care at evacuation destinations	There will be vulnerable people such as children using the building. Special requirements for care of such ones would be able to be provided at the evacuation destination.
Length of flood recovery and social &	The building will be constructed above the 500yr ARI flood level. The flood recovery and economic impacts are expected to be

economic impacts	minimal.
Hazardous goods and environmental impacts	It is not anticipated that hazardous goods would be stored in the building.
Flood-resilient design	The floor level will be constructed above the 500yr ARI flood level. The building is therefore not required to be constructed from flood resilient building materials. Footings and supports should be designed to withstand the hydrostatic, hydrodynamic and debris impact loads accordingly. Figures 8-10, Appendix A show the 100yr ARI flood velocities, depths and velocity-depth products.
Impacts of increased rainfall intensities	Increased rainfall intensity would lead to higher flood levels. The building is proposed to be constructed with more than 1.0m of freeboard above the 500yr ARI flood level. It is unlikely increased rainfall intensity would have any adverse impact on the building.
Overland flow severe storm impact assessment	NA – Flows from Cedar Creek are the governing source of inundation affecting the site.

The outcome of the Flood Risk Assessment found that the building and access route would not be cut off during a major flood event. Extra burden would not be placed on emergency services (for evacuation assistance) as a result of development. A flood emergency management plan is therefore not considered necessary for the development and the use of the site is considered acceptable. Standard safety procedures should still be followed to ensure children are not on the adjacent oval or in the undercroft area of the building.

6.0 CONCLUSIONS

This report has been prepared to demonstrate that the proposed development meets the requirements of Brisbane City Council's Flood Overlay Code. The proposed development consists of two stages. This report has been prepared to address the flooding issues affecting Stage 2. Stage 2 includes the construction of a new building (to be used as a hall) in the south eastern corner of the school. The location of the proposed building works is presented in Figure 3, Appendix A.

A TUFLOW model has been prepared to assess the extent of inundation and flow characteristics affecting the site from Cedar Creek. Results from the TUFLOW analysis show that the location of the proposed building is impacted by flows from Cedar Creek. It is proposed to construct the new building on a suspended floor with a finished floor level at RL59.0m AHD. The proposed building works would not create an adverse impact to neighbouring properties and meets the Council's minimum flood immunity requirements.

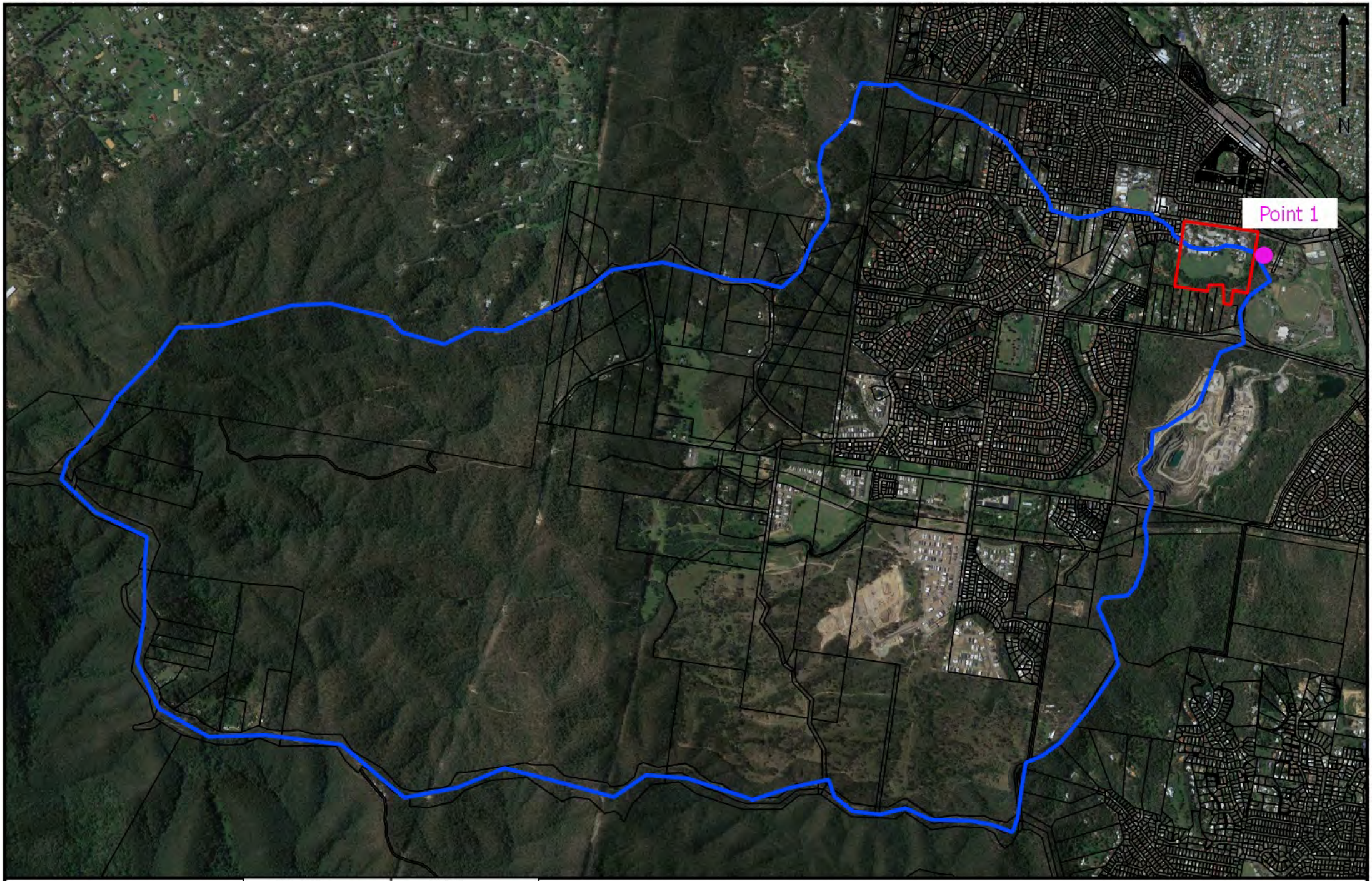
A Flood Risk Assessment has been prepared and are presented in Sections 5.1 of this report. The outcome of the Flood Risk Assessment found that the building would not become isolated and that extra burden would not be placed on emergency services (for evacuation assistance). A flood emergency management plan is therefore not considered necessary for the development and the use of the hall is considered acceptable.

Darren Rogers
BE Civil (Hons), MIE Aust, RPEQ 5016
Director

LIST OF APPENDICIES

APPENDIX A

Figures



STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:25,000

Ferny Grove State High School

Job No. J5974

Figure 1
Catchment Plan

STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:2,500

Ferny Grove State High School

Job No.	J5974

Figure 2
Existing Site Plan

STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:2,500

Ferny Grove State High School

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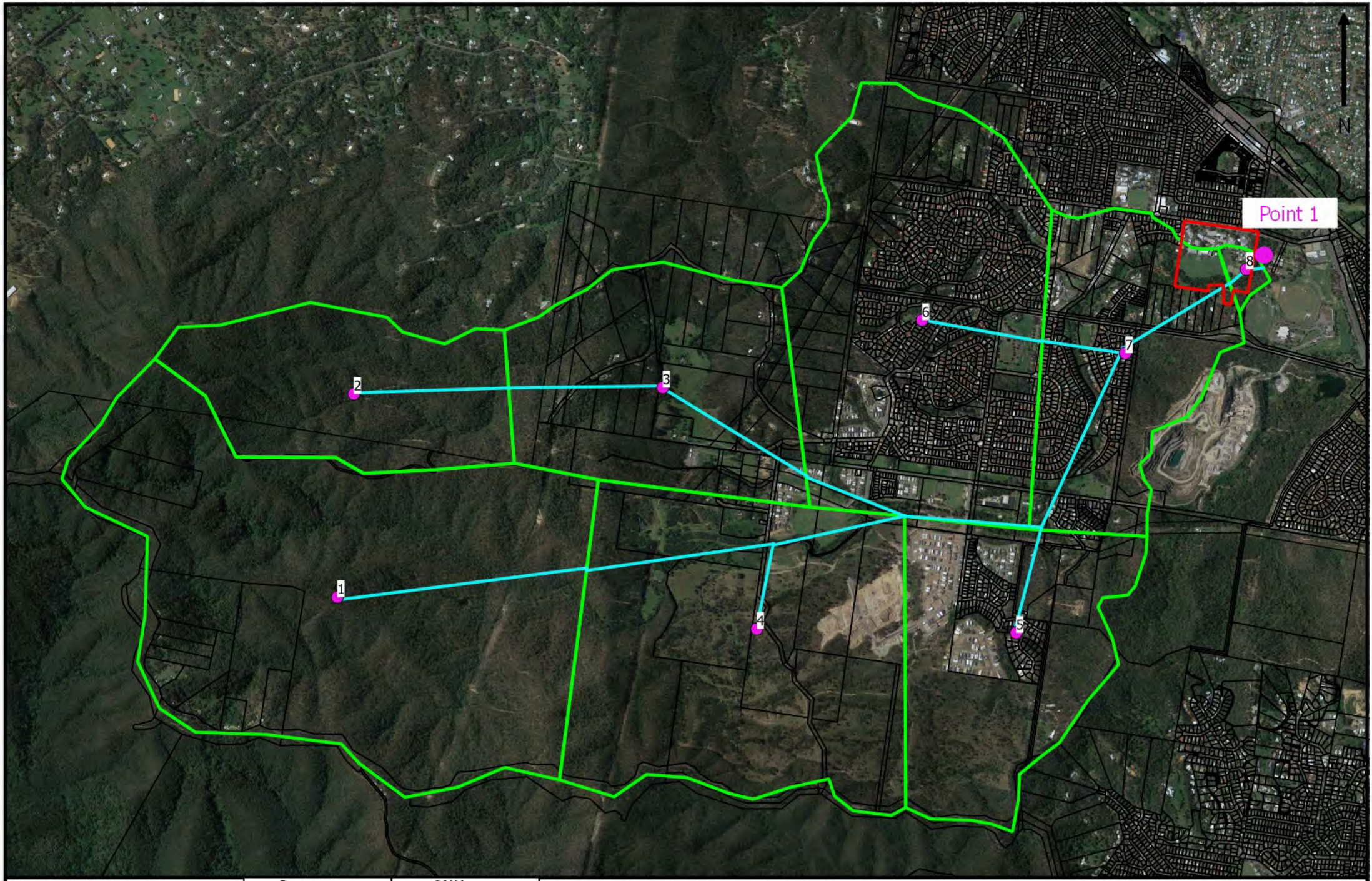
Figure 3
Development Plan



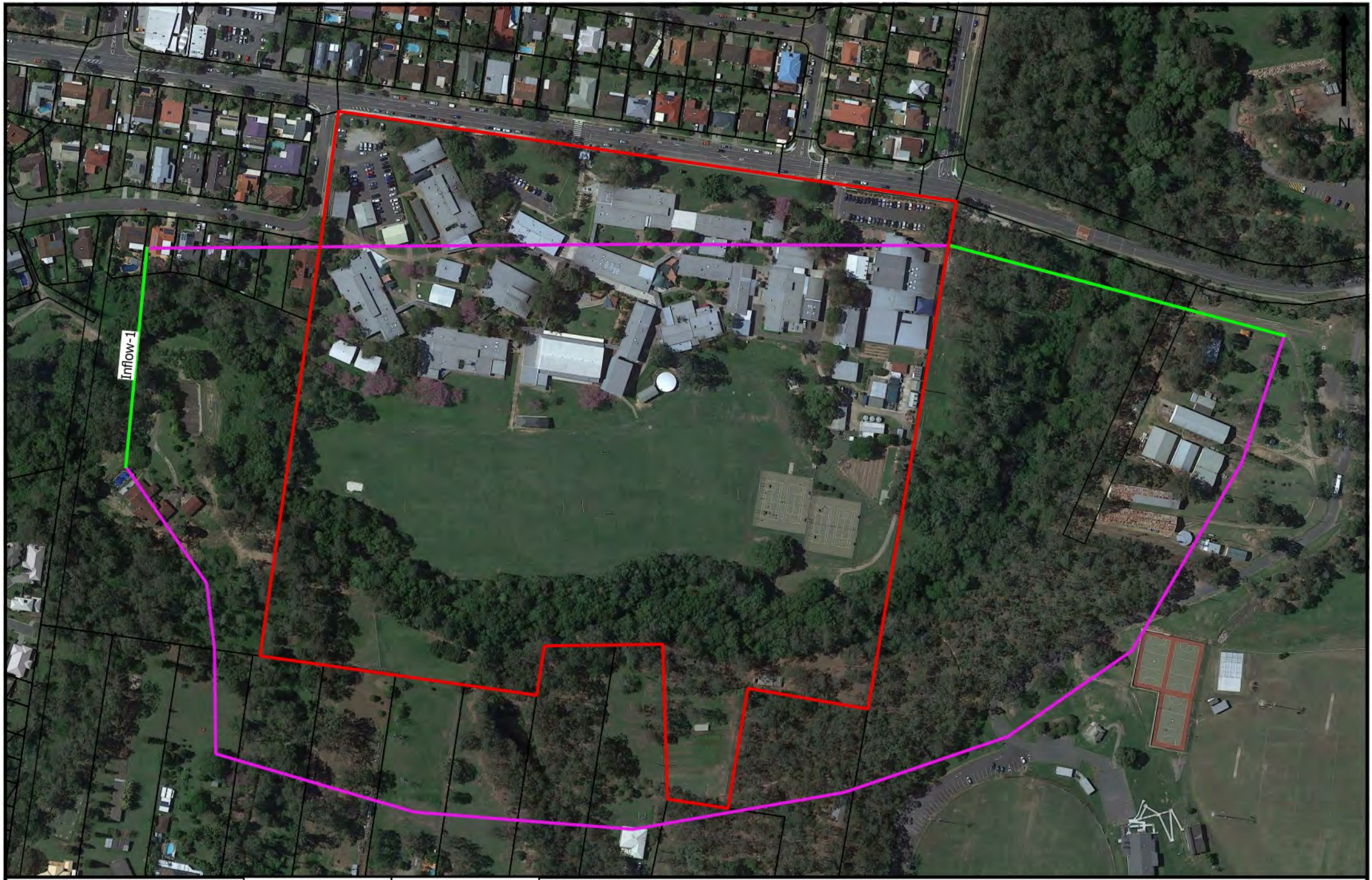
STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:25,000

Ferny Grove State High School

Job No. J5974

Figure 4
URBS Model Schematic



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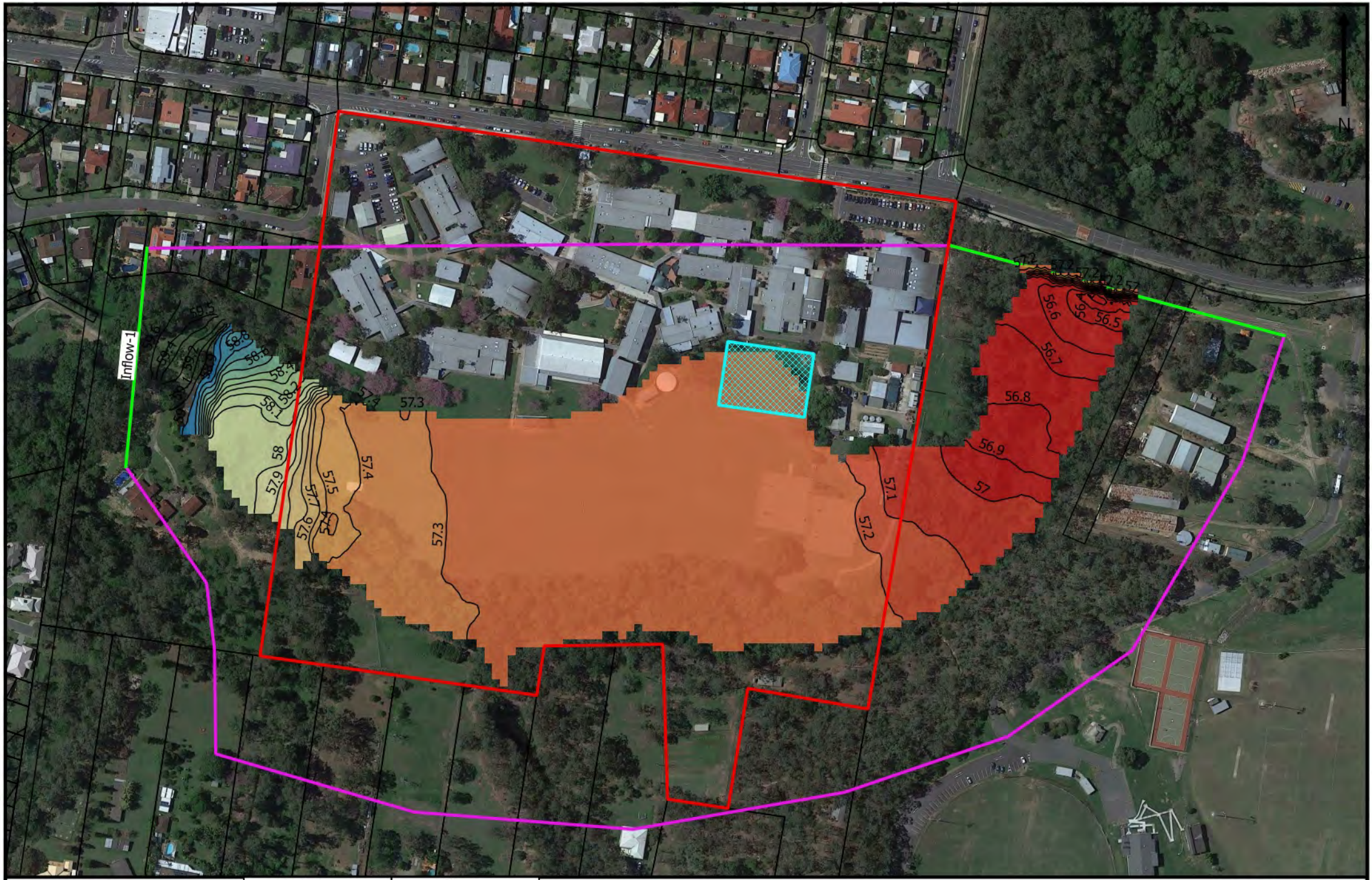
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:3,000

Ferny Grove State High School

Job No.	J5974

Figure 5
TUFLOW Model Extent



STORM Water Consulting 5/541 Old Cleveland Rd,Camp Hill, QLD, 4152, Phone (07)3398 4992	Drawn	SNH	Ferny Grove State High School	Figure 6 100yr ARI Inundation Plan
	Checked	DWR		
	Date	26/06/18		
	Scale	1:3,000	Job No. J5974	

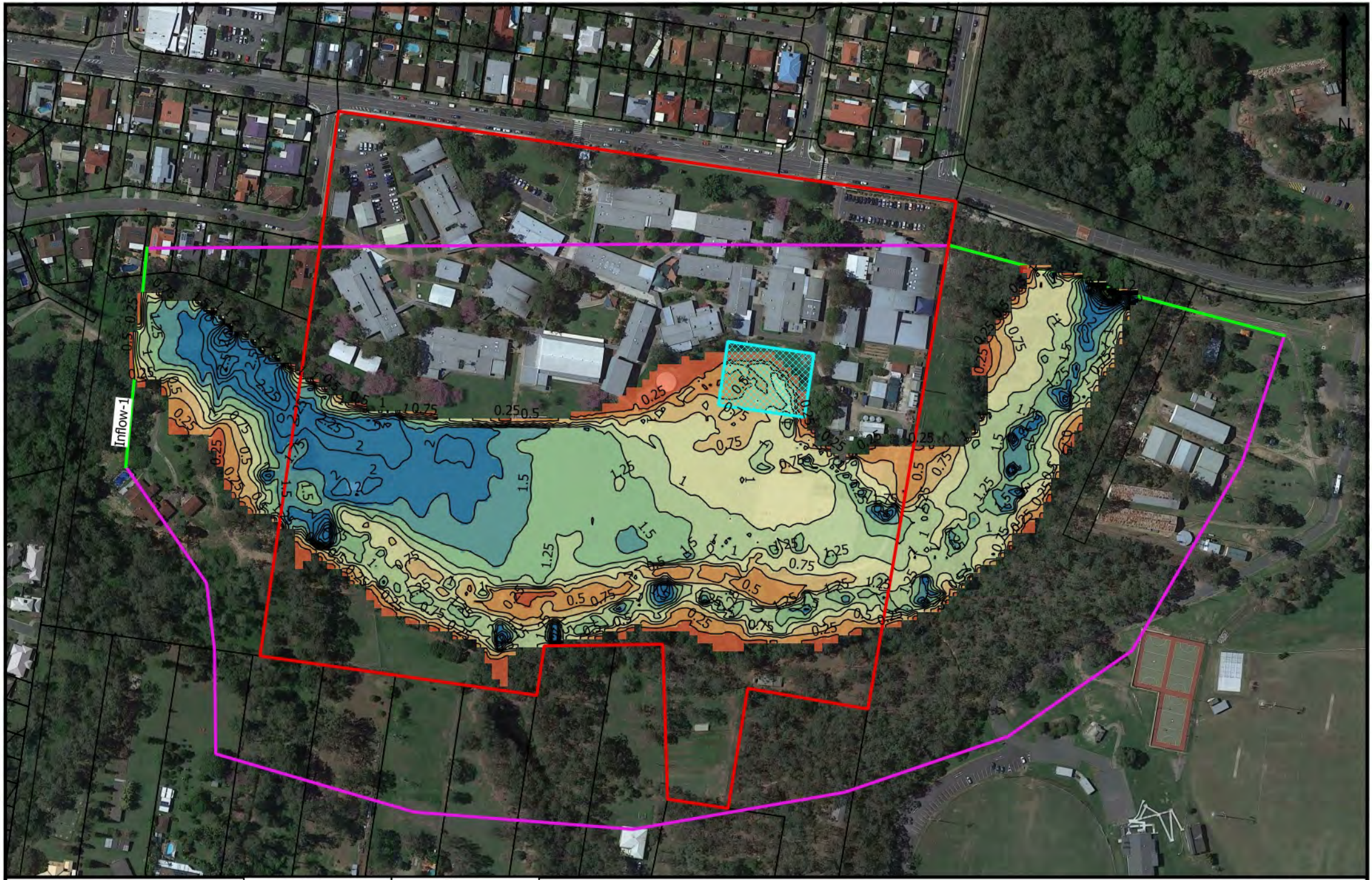
STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:3,000

Ferny Grove State High School

Job No.	J5974

Figure 7
500yr ARI Inundation Plan



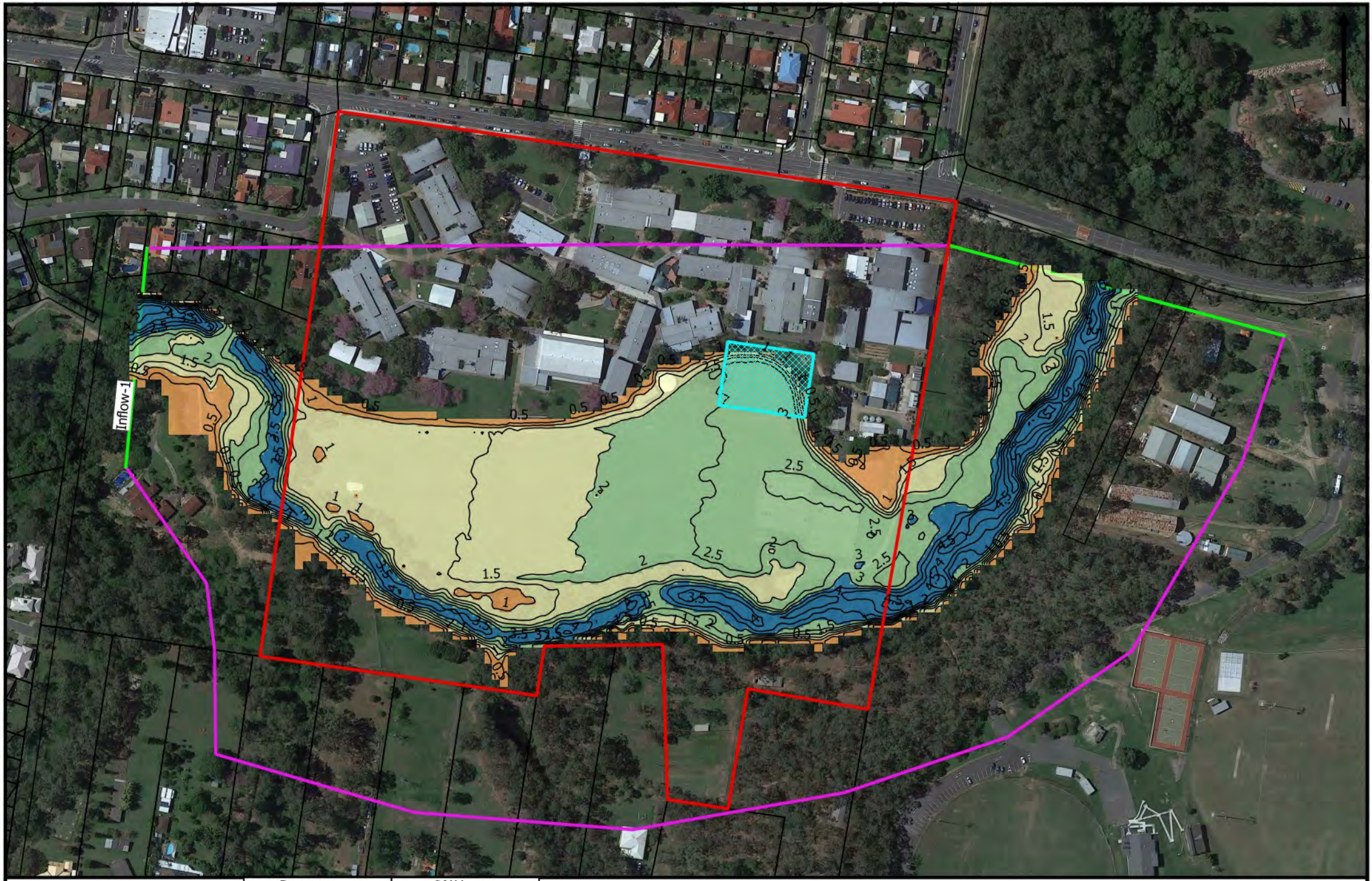
STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:3,000

Ferny Grove State High School

Job No.	J5974

Figure 8
100yr ARI Flow Velocities (m/s)



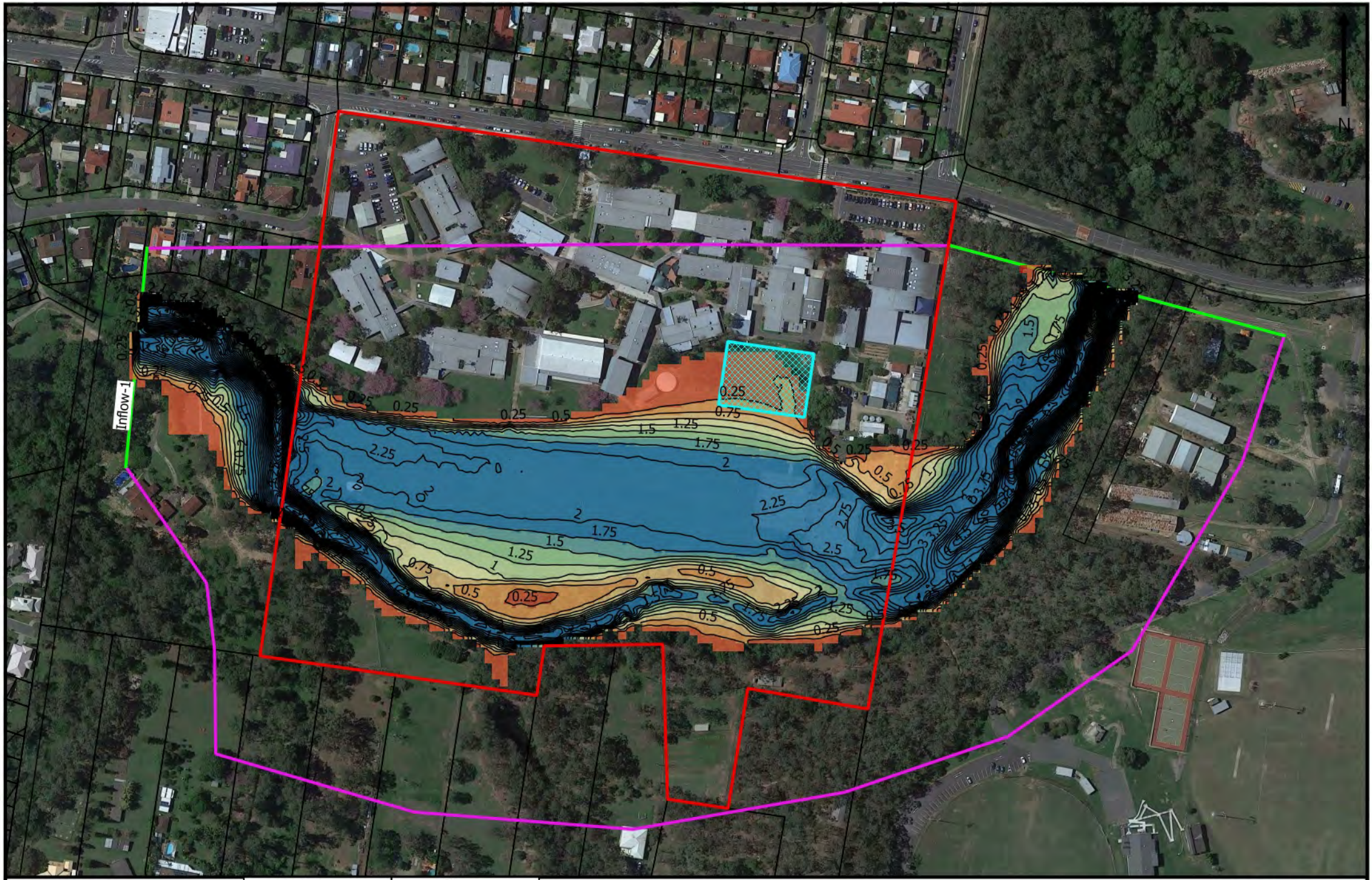
STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:3,000

Ferny Grove State High School

Job No. J5974

Figure 9
100yr ARI Flow Depths (m)



STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	26/06/18
Scale	1:3,000

Ferny Grove State High School

Job No. J5974

Figure 10
100yr ARI Velocity-Depth Products (m2/s)

APPENDIX B

Photographs

Photograph 1– Looking west across the sports oval at the rear of the school.

APPENDIX C

URBS Data

J5974_Ex.dat

```
"Index","Area","UF","UL","I"
#1,3.98975,1.00,0.00,0.00
#2,1.25833,1.00,0.00,0.00
#3,1.63199,1.00,0.00,0.00
#4,2.71132,1.00,0.00,0.00
#5,1.51886,0.70,0.30,0.20
#6,2.67340,0.30,0.70,0.50
#7,1.36122,0.50,0.50,0.25
#8,0.05081,0.50,0.50,0.15
```

J5974_Ex.U

```
Cedar Creek - Existing
MODEL: Basic
USES: L, U
Default Parameters: alpha=1.20 m=0.8
Catchment File=5974_Ex.dat

Rain    #1      L=1.324
Route thru      #4      L=1.000
Store.
Rain    #4      L=0.453
Get.
Route thru      #4      L=0.712
Store.
Rain    #2      L=0.825
Route thru      #3      L=0.811
Add Rain        #3      L=0.911
Route thru      #4      L=0.556
Get.
Route thru      #5      L=0.728
Store.
Rain    #5      L=0.563
Get.
Route thru      #8      L=1.042
Store.
Rain    #6      L=0.633
Route thru      #7      L=0.448
Get.
Add Rain        #7      L=0.662
Route thru      #8      L=0.113
Add Rain        #8      L=0.091
Print. Point-1
end of catchment details.
```

APPENDIX D

Flood Overlay Code Assessment

Sections B and C of the Flood Overlay Code have been addressed below.

Section B—If self-assessable or assessable development other than for a dwelling house or reconfiguring a lot Note—If self-assessable development complies with the acceptable outcomes of this part, no further assessment against this code is required.		
PO3 Development: (a) is compatible with flood hazard in a defined flood event; (b) minimises the risk to people from flood hazard; (c) does not reduce the ability of evacuation resources including emergency services to access and evacuate the site in a flood emergency, with consideration to the scale of the development; (d) minimises impacts on property from flooding; (e) minimises disruption to residents, business or site operations and recovery time due to flooding; (f) minimises the need to rebuild structures after a flood event greater than the defined flood event. Note—Where Table 8.2.11.3.C identifies that a flood risk assessment is required, compliance with this performance outcome can be achieved by submitting a flood risk assessment, which may be included within a flood study, addressing the criteria within this performance solution. Preparing flood risk assessments and flood studies is required to be in accordance with the Flood planning scheme policy. Note—An emergency management plan prepared in accordance with the Flood planning scheme policy, which sets out procedures for evacuation due to flooding may be used to demonstrate compliance with this performance outcome.	**AO3** Development for a material change of use complies with Table 8.2.11.3.C.	**AO3 addressed** **Development does not meet the land use compatibility criteria, therefore a flood risk assessment has been undertaken and is presented in Section 5.1 of this report.**
PO4 Development for a park ensures that the design of	**AO4.1** Development involving a building or structure in	**NA**

a park and location of structures and facilities responds to the flood hazard and balances the safety of intended users with: (a) maintaining continuity of operations; (b) impacts of flooding on asset life and ongoing maintenance costs; (c) efficient recovery after flood events; (d) recreational benefits to the city; (e) availability of suitable land within the park.	a park complies with the flood planning levels specified in Table 8.2.11.3.D.	
	AO4.2 Development involving a building or structure where Table 8.2.11.3.D does not apply: (a) is not located within the 20% AEP flood extent of any creek/waterway or overland flow path; or (b) is located above the 20% AEP flood level of any creek/waterway or overland flow path.	**AO4.2 addressed** **b) Building is located above the 20% AEP flood level affecting the site.**
Section C—If for assessable development other than for a dwelling house		
PO5 Development is located and designed to: (a) minimise the risk to people from flood hazard on the site; (b) minimise flood damage to the development and contents of buildings up to the defined flood event; (c) provide suitable amenity; (d) minimise disruption to residents, recovery time and the need to rebuild structures after a flood event up to and including the defined flood event.	**AO5.1** Development complies with the flood planning levels specified in Table 8.2.11.3.D. Note—If located in an area with no Council-derived flood levels such as an overland flow path, a Registered Professional Engineer Queensland with expertise in undertaking flood studies is to derive the applicable flood level and certify that the development meets the required flood planning levels in Table 8.2.11.3.D. The study is to demonstrate that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	**AO5.1 addressed.** **Minimum finished floor levels have been met in accordance with Table 8.2.11.3.D.**
	AO5.2 Development is: (a) not located in the: (i) Brisbane River flood planning area 1, 2a, or 2b sub-categories; (ii) Creek/waterway flood planning area 1 or 2 sub-categories; (iii) Overland flow flood planning area sub-category; or (b) only located in these sub-categories if a Registered Professional Engineer	**AO5.2 addressed** **Footing and supports should be designed to withstand the hydrostatic, hydrodynamic and debris impact loads associated with flooding up to the 100yr ARI flow conditions as presented in this report.**

	Queensland with expertise in undertaking flood studies certifies that: (i) the development design, siting and any mitigation measures will ensure the development is structurally adequate to resist hydrostatic, hydrodynamic and debris impact loads associated with flooding up to the defined flood event; and (ii) the risk to people is managed to an acceptable level.	
PO6 Development involving essential electrical services or a basement storage area is suitably located and designed to ensure public safety and minimise flood recovery and economic consequences of damage during a flood.	**AO6.1** Development ensures that: (a) all areas containing essential electrical services comply with the flood planning levels in Table 8.2.11.3.D; or (b) if a basement contains essential electrical services or a private basement storage area, the basement is a waterproof structure with walls and floors impermeable to the passage of water with all entry points and services located at or above the relevant flood planning level in Table 8.2.11.3.D. Note—A basement storage area does not include a bike storage room, change room, building maintenance storage and non-critical electrical services.	**AO6.1 addressed** **Essential electrical services are to be located above RL58.9m AHD.**
	AO6.2 Development involving a basement that relies on a pumping solution to manage floodwater ingress or for dewatering after a flood provides a redundant pump system with a backup power source for those pumps.	
PO7 Development does not directly or indirectly create a material adverse impact on flood behaviour or drainage on properties that are upstream, downstream or adjacent to the development.	**AO7.1** Development: (a) does not block, or divert floodwaters for any area affected by creek/waterway or overland flow flooding, excluding storm-tide flooding and	**AO7.1 addressed** **Development is located on a suspended floor and does not block the creek/waterway flooding on site.**

	Brisbane River flooding sources; or b) does not result in a material increase in flood level or hydraulic hazard on upstream, downstream or adjacent properties. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	
	AO7.2 Development retains existing overland flow paths and does not rely wholly on piped solutions to manage major flows.	**NA**
	AO7.3 Development which creates a new overland flow path or significantly modifies an existing overland flow path via earthworks does not materially worsen hydraulic hazard on the site from existing conditions. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	**NA**
PO8 Development for filling or excavation in an area affected by creek/waterway flooding does not directly, indirectly or cumulatively cause any material increase in flooding or hydraulic hazard or involve significant redistribution of flood storage	**AO8** Development ensures that no filling or excavation greater than 100mm is located in the Creek/waterway flood planning area 1, 2 or 3 sub-categories if contained in the 5% AEP flood extent of any Creek/waterway flood planning area	**AO8 addressed** **No excavation or filling is proposed for the development.**

from high to lower areas in the floodplain. Note—This can be demonstrated by undertaking earthworks in compliance with the Compensatory earthworks planning scheme policy. Note—This part of the code applies to all development other than a dwelling house and any secondary dwelling which involves filling or excavation, whether or not the development application comprises a separate development application for operational work involving filling or excavation.	sub-category for which no waterway corridor has been mapped in the Waterway corridors overlay.	
PO9 Development ensures that the building and site design: (a) maintains the conveyance capacity of existing overland flow paths and creek/waterways; (b) ensures floodwaters and flood debris can pass predominantly unimpeded under a structure or building to minimise property or building damage, including for a flood larger than the defined flood event; (c) mitigates flood impacts by ensuring that filling, excavation and location of services are designed to allow for the conveyance of floodwater across the site. Note—The Flood planning scheme policy provides guidance on relevant considerations in determining minimum undercroft clearances and treatment of ground level in undercroft areas where floodwater conveyance is required underneath development.	**AO9.1** Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub-category: (a) complies with the minimum building undercroft clearance requirements in Table 8.2.11.3.E; (b) not located directly above any part of a waterway corridor as mapped in the Waterway corridors overlay.	**AO9.1 addressed.** **Minimum undercroft clearances have been met in accordance with Table 8.2.11.3.E.**
	AO9.2 Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub category: (a) has a ground level within the undercroft area is free draining; (b) does not involve excavation below ground level of more than 300mm within the undercroft area.	**AO9.2 addressed.** **The undercroft area is to remain free draining and not involve excavation.**
PO10 Development for vulnerable uses, difficult to evacuate uses or assembly uses optimises vehicular access and efficient evacuation from the development to parts of the road network unaffected by flood hazard, in order to:	**AO10** Development for vulnerable uses, difficult to evacuate uses or assembly uses: (a) is not isolated in any event up to the relevant flood planning level specified in Table 8.2.11.3.L; or	**AO10 addressed** **Development is not isolated during a flood event.**

(a) protect safety of users and emergency services personnel; (b) support efficient emergency services access and site evacuation with consideration to the scale of development. Note—A flood risk assessment may be required to address the performance outcomes or acceptable solutions which deal with evacuation and isolation arrangements, and the ability to take refuge. The Flood planning scheme policy provides information for undertaking flood risk assessments.	(b) has direct vehicle access to a critical route or interim critical route in the Critical infrastructure and movement network overlay for evacuation in a flood; or (c) can achieve vehicular evacuation to a suitable flood-free location. Note—A suitable flood-free location is of a size and nature sufficient to provide for the size and characteristics of the population likely to need evacuation to that area.	
PO11 Development has access which, having regard to hydraulic hazard, provides for safe vehicular and pedestrian movement and emergency services access to adjoining roads.	**AO11.1** Development provides an access or driveway into the site which is:(a) trafficable during the defined flood event; (b) not located in the Creek/waterway flood planning area 1 sub-category; c) not located in the Overland flow flood planning area sub-category if the hydraulic hazard is unsafe in the defined flood event; (d) the access or driveway is not inundated by a 10% AEP flood.	**NA**
	AO11.2 Development located in the Creek/waterway flood planning area 1, 2, 3 or 4 sub-categories locates any disabled access in the highest part of the site. Note—explanation of hydraulic hazard provided in the Flood planning scheme policy.	**NA**
PO12 Development involving a new road, a bridge or culvert is designed to minimise impacts to flood behaviour, minimise disruption to traffic during a flood and allow for emergency access.	**AO12** Development involving a new road complies with the flood planning levels in Table 8.2.11.3.F.	**NA**
PO13	**AO13.1**	**NA**

Development for pedestrian and cyclist paths: (a) provides a suitable level of trafficability; (b) manages the impacts of flooding on asset life and ongoing maintenance costs; (c) balances route availability with recreational and transport connectivity benefits to the city.	Development for cyclist and pedestrian facilities other than on public roads, including those traversing through a park and adjacent to a watercourse and overland flow path, are located above the 39% AEP (2 year ARI) flood immunity from all flooding sources. Note—If the site is subject to more than one type of flooding, the requirement that affords the greatest level of protection will apply.	
	AO13.2 All new on-road cyclist and pedestrian facilities comply with the flood planning levels and trafficability standards for the applicable category of road in Table 8.2.11.3.F or Table 8.2.11.3.K.	**NA**
PO14 Development which increases the residential population within the Brisbane River flood planning area sub-categories minimises the risk to people in all flood events with consideration to flood hazard, including warning time.	**AO14** Development in the Brisbane River flood planning area sub-categories in areas where the residential flood level is greater than 12.8m AHDinvolving: (a) an increase in the number of residential dwellings; or (b) additional residential lots; or (c) is not subject to an unsafe hydraulic hazard in the 0.2% AEP flood event. Note—Explanation of a hydraulic hazard is provided in the Flood planning scheme policy.	**NA**

Appendix 11

Stormwater Management Plan

Department of Housing and Public Works

Queensland Government

FERNY GROVE STATE HIGH SCHOOL

26 MCGINN ROAD, FERNY GROVE

SITE-BASED STORMWATER MANAGEMENT PLAN

22 March 2018

ACN 105 078 377
5/541 Old Cleveland Rd, CAMP HILL QLD 4152
Ph (07) 3398 4992 Fax (07) 3398 4993
www.stormw.com.au

STORM Water Consulting Pty Ltd

Job No: J5974

Job Name: Ferny Grove State High School – 26 McGinn Road, Ferny Grove

Report Name	Date	Report No.
Site-Based Stormwater Management Plan	22 March 2018	5974-1.0

Project Engineer: Steve Hughes
BE Civil, MIEAust, CPeng, RPEQ
E steve@stormw.com.au

Reviewed By:

Darren Rogers
BE Civil (Hons), MIEAust, RPEQ 5016
Director
E darren@stormw.com.au
M 0410 314 115

Downloadable Files:

Report File	J5974 Report 1.0.pdf
MUSIC Files	J5974 MUSIC 1.0.zip
URBS Files	J5974 URBS 1.0.zip

Download Location: www.stormw.com.au/jobs/5974/1.0

Username:	5974
Password:	Mcgn5974

Table of Contents

1.0 INTRODUCTION

Storm Water Consulting Pty Ltd was commissioned by Honeywill Consulting Pty Ltd to prepare a Site-Based Stormwater Management Plan for the proposed development at Ferny Grove State High School.

This Site-Based Stormwater Management Plan has been prepared to address the following issues:

- Demonstrate that the proposed development would not create an adverse impact on neighbouring properties;
- Nominate a lawful point of discharge for the site;
- Size a treatment train to meet water quality objectives;

A locality plan for the site is presented in Figure 1, Appendix A.

2.0 SITE CONDITIONS

2.1 Existing Site

The subject site is a school facility. The school is bordered by McGinn Road to the north and Cedar Creek to the west, south and east. Runoff from the school discharges into the stormwater system in McGinn Road and into Cedar Creek. An existing site plan is presented in Figure 2, Appendix A.

2.2 Developed Site

The proposed development consists of two stages. Stage 1 includes the demolition of several buildings (in the north western corner of the school) and the construction of a new building in the north western corner of the school. The existing carpark located in the north western corner of the school will be moved and extended. Stage 2 includes the construction of a new building (used as a hall) in the south eastern corner of the school. The locations of the proposed building works is presented in Figure 3, Appendix A.

Runoff from Stage 1 of the development will be discharged to Council's stormwater system in McGinn Road. Runoff from Stage 2 of the development will be discharged to the existing stormwater infrastructure on the school oval, which discharges into Cedar Creek.

On-site detention is not proposed for the site as the proposed development would have a negligible impact on the peak discharges from the site. Detailed hydrologic modelling has been undertaken to quantify the impacts of development. The hydrologic modelling is presented in Section 3.0 of this report.

The development triggers the State Planning Policy (SPP). A treatment train has therefore been sized to meet water quality objectives for development. The treatment train consists of two bio-retention basins. Details for the treatment train are presented in Section 5.2 of this report.

3.0 HYDROLOGIC MODELLING

3.1 Cedar Creek

An URBS rainfall-runoff model was set up to determine the hydrologic impacts in Cedar Creek (Point 2) as a result of development of the site. The following sections present the analysis and results of the URBS modelling.

3.1.1 Existing Scenario (Ex)

The URBS model represents sub-catchments contributing flows to Cedar Creek, south of the site. A schematic representation of the existing URBS model is presented in Figure 4, Appendix A. Alpha and Beta values were left as default parameters of 1.2 and 0.8 respectively. The continuing loss was set at 2.5mm/hr. The initial losses were set at 15mm/hr for the 1yr ARI to the 50yr ARI events, in accordance with recommendations from the Queensland Urban Drainage Manual (QUDM) and Australian Rainfall and Runoff. The initial loss for the 100yr ARI event was set to 0mm/hr. The catchment properties were a mix of low density residential and forested land. Detailed catchment properties are presented in Appendix C of this report. A summary of the parameters used in the existing scenario URBS model is presented in Table 3.1 below.

Table 3.1 –URBS Model Parameters

ARI	Storage Coefficient	Non-Linearity Index	Initial Rainfall Loss	Continuing Rainfall Loss
years	α	β	mm	mm/hr
1	1.2	0.8	15	2.5
2	1.2	0.8	15	2.5
5	1.2	0.8	15	2.5
10	1.2	0.8	15	2.5
20	1.2	0.8	15	2.5
50	1.2	0.8	15	2.5
100	1.2	0.8	0	2.5

A summary of the peak discharges in Cedar Creek at Point 2 (shown in Figure 4) is presented below.

Table 3.2 –URBS Model Results

ARI	Existing Flows
years	m^3/s
1	27.9
2	43.1
5	65.3
10	79.9
20	102.6
50	135.1
100	208.0

3.1.2 Developed Scenario (Dev)

It is proposed to discharge runoff from the new building (being constructed for Stage 2) into the existing stormwater infrastructure on the sports oval. The stormwater system on the sports oval discharges to Cedar Creek at the rear of the site. The existing URBS model was modified to represent development of Sub-catchment 8. The fraction impervious of Subcatchment-8 was increased from 15% to 19%. A comparison between the existing and developed URBS model flows in Cedar Creek (Point 2) is presented in Table 3.3 below.

Table 3.3 – Flows in Cedar Creek (Point 2)

ARI	Existing URBS Model Flows	Developed URBS Model Flows	Difference	Difference
years	m^3/s	m^3/s	m^3/s	%
1	27.902	27.904	0.002	<0.001
2	43.080	43.082	0.002	<0.001
5	65.340	65.342	0.002	<0.001
10	79.886	79.888	0.002	<0.001
20	102.613	102.615	0.002	<0.001
50	135.144	135.146	0.002	<0.001
100	207.988	207.990	0.002	<0.001

Results from the URBS analysis shows that the proposed development would increase the peak discharge in Cedar Creek (at Point 2) by less than 0.0001%. This is a minute increase in flows and is not expected to create an adverse impact to downstream properties. It is not proposed to provide on-site detention to mitigate this minute increase in peak discharge from Stage 2 of the proposed development.

3.2 McGinn Road

An URBS rainfall-runoff model was set up to determine the hydrologic impacts on McGinn Road (Point 2) as a result of development of the site. The following sections present the analysis and results of the URBS modelling.

3.2.1 Existing Scenario (Ex)

The URBS model represents sub-catchments contributing flows to McGinn Road, north of the site. A schematic representation of the existing URBS model is presented in Figure 5, Appendix A. Alpha and Beta values were left as default parameters of 1.2 and 0.8 respectively. The continuing loss was set at 2.5mm/hr. The initial losses were set at 15mm/hr for the 1yr AR to 50yr ARI events, in accordance with recommendation from the Queensland Urban Drainage Manual (QUDM) and Australian Rainfall and Runoff guidelines. The initial loss for the 100yr ARI event was set to 0mm/hr. The catchment properties were a mix of low and high density residential land. Detailed catchment properties are presented in Appendix C of this report. A summary of the parameters used in the existing scenario URBS model is presented in Table 3.4 below.

Table 3.4 –URBS Model Parameters

ARI	Storage Coefficient	Non-Linearity Index	Initial Rainfall Loss	Continuing Rainfall Loss
years	α	β	mm	mm/hr
1	1.2	0.8	15	2.5
2	1.2	0.8	15	2.5
5	1.2	0.8	15	2.5
10	1.2	0.8	15	2.5
20	1.2	0.8	15	2.5
50	1.2	0.8	15	2.5
100	1.2	0.8	0	2.5

A summary of the peak discharges on McGinn Road at Point 1 (shown in Figure 5) is presented below.

Table 3.5 –URBS Model Results

ARI	Existing Flows
years	m^3/s
1	1.3
2	1.9
5	2.8
10	3.1
20	3.8
50	4.1
100	4.8

3.2.2 Developed Scenario (Dev)

It is proposed to discharge runoff from the new building and carpark being constructed as Stage 1 of the development, into a bio-retention basin (discussed in Section 5.0) which discharges into Council's stormwater drainage system in McGinn Road. The existing URBS model was modified to represent development of Sub-catchment 22. The fraction impervious of Subcatchment-22 was increased from 30% to 100%. Sub-catchment 22 was also rerouted to be directed to the located of the bio-retention basin. A comparison between the existing and developed URBS model flows to McGinn Road (Point 1) is presented in Table 3.6 below.

Table 3.6 – Flows in McGinn Road (Point 1)

ARI	Existing URBS Model Flows	Developed URBS Model Flows	Difference	Difference
years	m^3/s	m^3/s	m^3/s	%
1	1.328	1.323	-0.005	-0.004
2	1.927	1.915	-0.012	-0.006
5	2.769	2.763	-0.006	-0.002
10	3.089	3.082	-0.007	-0.002
20	3.756	3.757	0.001	0.000
50	4.139	4.142	0.002	0.001
100	4.849	4.850	0.001	0.000

Results from the URBS analysis shows that Stage 1 of the proposed development would increase the peak discharge on McGinn Road by up to 2L/s during a 50yr ARI event. Results from the URBS analysis also show that the peak discharge on McGinn Road at Point 1 is reduced during the 1-10yr ARI events. The minute increase in flows is not expected to create an adverse impact to downstream properties. It is therefore not proposed to provide on-site detention to mitigate the increase in peak discharge from the Stage 1 part of the development.

4.0 WATER QUALITY

4.1 State Planning Policy (July 2017)

The introduction to the State Planning Policy states: "The State Planning Policy (SPP) is a key component of Queensland's land use planning system, which enables development, protects our natural environment and allows communities to grow and prosper. The SPP provides a comprehensive set of principles which underpin Queensland's planning system to guide local government and the state government in land use planning and development assessment."

In terms of water quality, the SPP seeks to protect and enhance the environmental values and quality of Queensland waters. A development application for any of the criterion listed in Table 4.1 below requires compliance with the assessment benchmarks in accordance with Part E under the SPP.

Table 4.1 – Development Applications affecting Receiving Waters

State Planning Policy Criteria	Application to Development
(1) A material change of use for urban purposes that involves a land area greater than 2500 square metres that: (a) will result in an impervious area greater than 25 per cent of the net developable area, or	Criterion is applicable to development.
(b) will result in six or more dwellings, or	Criterion is NOT applicable to development.
(2) Reconfiguring a lot for urban purposes that involves a land area greater than 2500 square metres and will result in six or more lots, or	Criterion is NOT applicable to development.
(3) Operational works for urban purposes that involve disturbing more than 2500 square metres of land.	Criterion is applicable to development.

The development triggers the assessment benchmarks for receiving waters and therefore requires the stormwater management design objectives to be met in accordance with Appendix 2 of the SPP.

4.2 Water Quality – Construction Phase

During the construction phase of a development, the pollutants listed in Table 4.2 are typically generated. Measures are required during the construction phase to manage each of these pollutants. These measures may include but are not limited to; bins and mini-skips, erosion and sediment control measures (discussed below), wash down and spill containment areas, bunds, spill clean-up kits, street sweeping and chemical agents.

Table 4.2 – Pollutants Generated during the Construction Phase

Pollutant	Source
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts
Sediment	Unprotected exposed soils and stockpiles during earthworks and building operations
Hydrocarbons	Fuel and oil spills leaks from construction equipment
Toxic materials	Cement slurry, asphalt primer, solvents, cleaning agents, wash waters (e.g. from tile works)
pH altering substances	Acid sulphate soils, cement slurry and wash waters

4.3 Erosion and Sediment Control

During the construction phase of the development, an Erosion and Sediment Control Program (E&SCP) is required to minimise water quality impacts. Such an E&SCP should provide complete and detailed instructions on the following procedures;

- Before construction activities begin, sediment fences should be constructed on the downstream site boundaries and at the base of all proposed soil stockpiles;
- Areas for plant and construction material storage should be designated. Runoff from these areas should be directed to small holding ponds in case of spillages;
- Catch drains at the downstream boundary of construction activities should also be created to ensure that any sediment-laden runoff is contained and directed into a sediment basin and not permitted to flow unmitigated to downstream areas;
- Sediment basins should be constructed at appropriate locations to collect sediment at the downstream ends of the catch drains that convey runoff from exposed areas;
- Site personnel should be educated on the sediment and control measures implemented on site; and
- Following rainfall events greater than 20mm, inspection of silt fences, sedimentation basins and other erosion control measures should be carried out. Where necessary, collected material should be removed and damaged equipment should be replaced immediately.

4.4 Water Quality – Operational Phase

During the operational (post-construction) phase of the proposed development, the following pollutants are typically generated;

- Sediment,
- Litter,
- Faecal coliforms,
- Hydrocarbons,
- Heavy Metals,
- Thermal Pollution,
- Nutrients (N & P) and
- Surfactants.

4.4.1 Water Quality Objectives

Key pollutant levels would be reduced to the levels indicated in Table 2.2 of the *Urban Stormwater Quality Planning Guidelines 2010* by the Department of Environment and Resource Management (DERM). The Water Quality Objectives are summarised in Table 4.3 below.

Table 4.3 – Water Quality Objectives from DERM

Parameter	Load-based Reduction
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants	90%

5.0 WATER QUALITY MODELLING

Two bio-retention basins have been sized to meet the WQOs stated in Section 4.4.1. A separate bio-retention basin is proposed to treat stormwater runoff from each Stage of the development. The locations of the bio-retention basins are presented in Figure 6, Appendix A. Parameters used in the MUSIC model are presented below.

5.1 Source Nodes

The development catchment areas and impervious proportions are as summarised in Table 5.1.

Table 5.1 – Source Node Fractions Impervious

Source Nodes	Learning Centre	Carpark	Hall
Total Area (ha)	0.159	0.145	0.227
Catchment Type	Commercial Roof	Commercial Road	Commercial Roof
Fraction Impervious	100%	100%	100%

Rainfall-runoff parameters were assigned to the source nodes in accordance with the Water by Design MUSIC Modelling Guidelines Version 1.0 – 2010 Commercial Use of the site. These parameters are summarised in Table 5.2.

Table 5.2 – Rainfall – Runoff Parameters

Parameter		Commercial
Impervious Area Properties	Rainfall threshold (mm/day)	1
Pervious Area Properties	Soil storage capacity (mm)	18
	Initial storage (% of capacity)	10
	Field Capacity (mm)	80
	Infiltration Capacity Coefficient – a	243
	Infiltration Capacity Exponent – b	0.6
Groundwater Properties	Initial depth (mm)	50
	Daily recharge rate (%)	0
	Daily base flow rate (%)	31
	Daily deep seepage rate (%)	0

Pollutant export parameters were assigned according to the Water by Design MUSIC Modelling Guidelines Version 1.0 – 2010. The pollutant export parameters adopted in the MUSIC model are summarised in Table 5.3

Table 5.3 – Pollutant Export Parameters

Source		Log_{10} TSS (mg/L)		Log_{10} TP (mg/L)		Log_{10} TN (mg/L)	
		Base flow	Storm flow	Base flow	Storm flow	Base flow	Storm flow
Commercial Roof	Mean	NA	1.30	NA	-0.89	NA	0.37
	Std Dev	NA	0.38	NA	0.34	NA	0.34
Commercial Carpark	Mean	0.78	2.43	-0.60	-0.30	0.32	0.37
	Std Dev	0.39	0.38	0.50	0.34	0.30	0.34

5.2 Treatment Node – Bio-Retention Basins

A separate bio-retention basin is proposed to treat stormwater runoff from each stage of the development. The bio-retention basins should be fenced to prevent children from entering the basins. A conceptual location for each bio-retention basin is presented in Figure 6, Appendix A. The final location of the bio-retention basins should be determined in the detailed design stage of the project. Parameters for the bio-retention basins are presented in Table 5.4 below.

Table 5.4 – Bio-Retention MUSIC Parameters

Parameter	Bio-Retention Stage 1	Bio-Retention Stage 2
Extended Detention Depth	0.3m	0.3m
Surface Area	34m²	55m²
Filter Area	34m²	55m²
Filter Depth	0.6m	0.6m
Saturated Hydraulic Conductivity	180mm/hr	180mm/hr
Overflow Weir Width	2.0m	2.0m

Maintenance checklists are presented in Appendix D.

6.0 MUSIC ANALYSIS

The quality of stormwater runoff and the impact of the bio-retention basin was analysed using MUSIC version 6.1 in accordance with the water quality objectives from Table 2.2 of the *Urban Stormwater Quality Planning Guidelines 2010*. The MUSIC model was based on the 1980 to 1989 rainfall series for Brisbane (40214) with 6 minute time steps. The MUSIC model schematic and results are presented below.

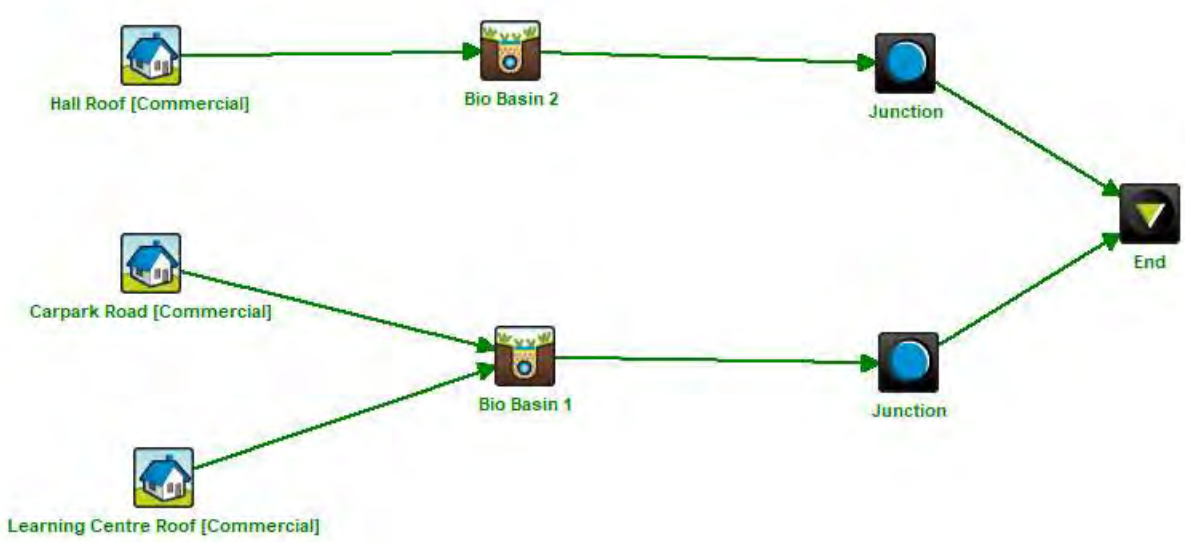


Figure A – MUSIC model schematic

Table 6.1 – MUSIC model results

Indicator	Annual Loads (kg/yr)		Reduction	
	Without SQIDs	With SQIDs	Actual	Target
TSS	792	154	81%	80%
TP	1.86	0.49	73%	60%
TN	18.3	7.4	60%	45%
GP	133	0	100%	90%

The results above indicate that the required water quality objectives for the site would be met for the development through the selected stormwater treatment. The bio-retention basins have also been sized to meet water quality objectives for each stage of the development.

6.1 Lawful Point of Discharge

Runoff from Stage 1 of the development will be discharged to Council's stormwater system in McGinn Road. Runoff from Stage 2 of the development will be discharged to the existing stormwater infrastructure on the sports oval. Figure 6, Appendix A illustrates the proposed stormwater discharge locations. Council's stormwater drainage system and the schools existing stormwater drainage system constitute the lawful point of discharge for the development.

7.0 CONCLUSIONS

This Site-based Stormwater Management Plan has been prepared to address the following issues:

- Demonstrate that the proposed development would not create an adverse impact on neighbouring properties;
- Nominate a lawful point of discharge for the site;
- Size a treatment train to meet water quality objectives;

The proposed development consists of two stages. Stage 1 includes the demolition of several buildings (in the north western corner of the school) and the construction of a new building in the north western corner of the school. The existing carpark located in the north western corner of the school will be moved and extended. Stage 2 includes the construction of a new building (used as a hall) in the south eastern corner of the school. The locations of the proposed building works is presented in Figure 3, Appendix A.

Runoff from Stage 1 of the development will be discharged to Council's stormwater system in McGinn Road. Runoff from Stage 2 of the development will be discharged to the existing stormwater infrastructure on the school oval, which discharges into Cedar Creek.

On-site detention is not proposed for the site as the proposed development would have a negligible impact on the peak discharges from the site. Detailed hydrologic modelling has been undertaken to quantify the impacts of development. The hydrologic modelling is presented in Section 3.0 of this report.

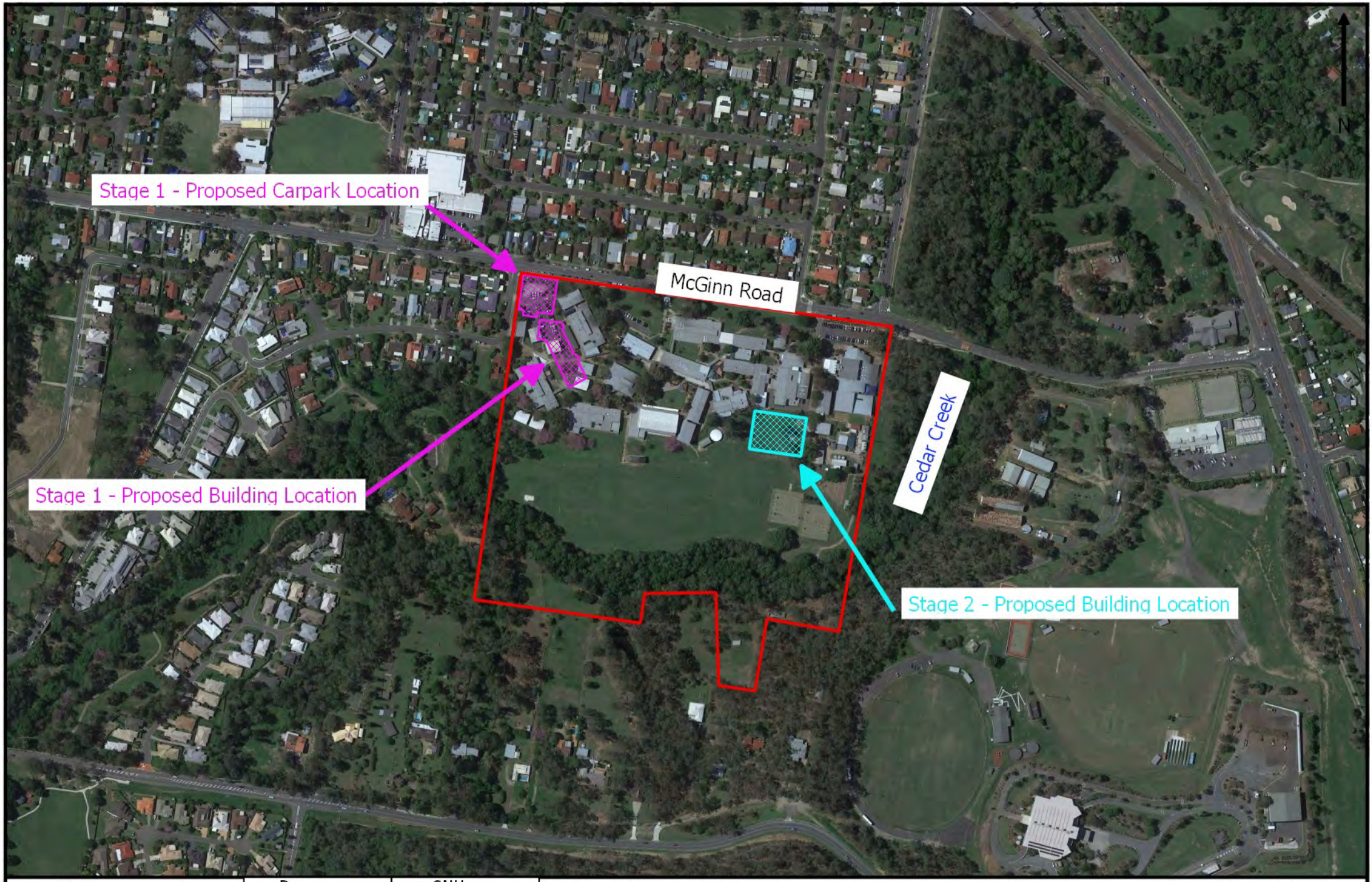
The development triggers the State Planning Policy (SPP). A treatment train has therefore been sized to meet water quality objectives for development. The treatment train consists of two bio-retention basins. Details for the treatment train are presented in Section 5.2 of this report.

Darren Rogers
BE Civil (Hons), MIE Aust, RPEQ 5016
Director

LIST OF APPENDICIES

APPENDIX A

Figures



STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:5,000

Ferny Grove State High School

Job No.	J5974

Figure 1
Locality Plan

STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:2,500

Ferny Grove State High School

Job No.	J5974

Figure 2
Existing Site Plan

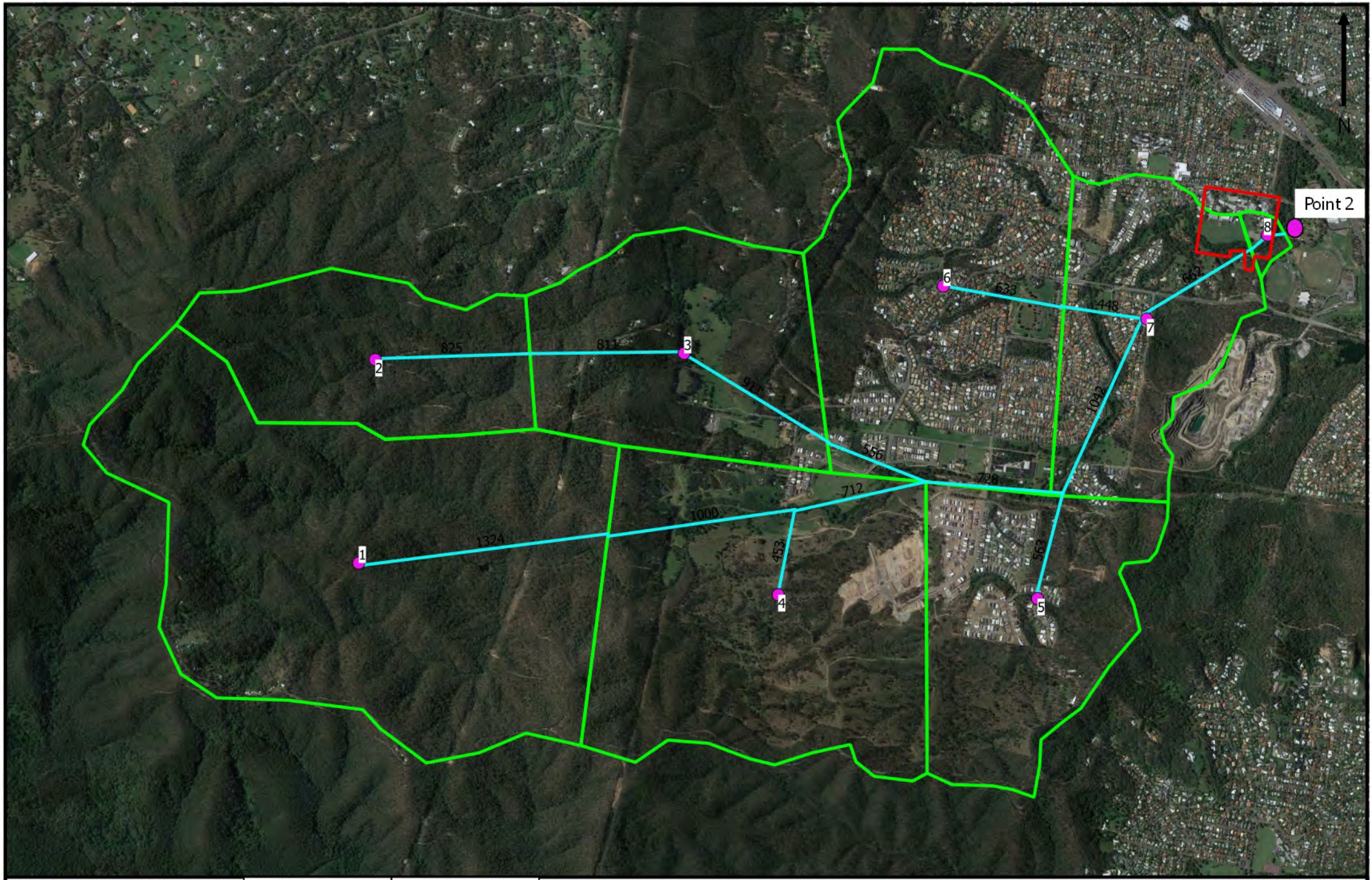
STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:2,500

Ferny Grove State High School

Job No. J5974

Figure 3
Development Plan



STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:25,000

Ferny Grove State High School

Job No.	J5974

Figure 4

URBS Model Layout - Cedar Creek

STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:2,500

Ferny Grove State High School

Job No.	J5974

Figure 5

URBS Model Layout - McGinn Road

STORM Water Consulting
5/541 Old Cleveland Rd,Camp Hill,
QLD, 4152, Phone (07)3398 4992

Drawn	SNH
Checked	DWR
Date	22/03/18
Scale	1:2,500

Ferny Grove State High School

Job No.	J5974

Figure 6

Bio-retention Basin and Stormwater Discharge Locations

APPENDIX B

Photographs

Photograph 1 – Looking west at the location of the proposed bio-retention basin for Stage 1.

Photograph 2– Looking west across the sports oval at the rear of the school.

APPENDIX C

Hydrologic Analysis

5974_EX.DAT – Stage 2

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#3,1.63199,1.00,0.00,0.00
#4,2.71132,1.00,0.00,0.00
#5,1.51886,0.70,0.30,0.20
#6,2.67340,0.30,0.70,0.50
#7,1.36122,0.50,0.50,0.25
#8,0.05081,0.50,0.50,0.15

5974_EX.U – Stage 2

Cedar Creek - Existing
MODEL: Basic
USES: L, U
Default Parameters: alpha=1.20 m=0.8
Catchment File=5974_Ex.dat

Rain #1 L=1.324
Route thru #4 L=1.000
Store.
Rain #4 L=0.453
Get.
Route thru #4 L=0.712
Store.
Rain #2 L=0.825
Route thru #3 L=0.811
Add Rain #3 L=0.911
Route thru #4 L=0.556
Get.
Route thru #5 L=0.728
Store.
Rain #5 L=0.563
Get.
Route thru #8 L=1.042
Store.
Rain #6 L=0.633
Route thru #7 L=0.448
Get.
Add Rain #7 L=0.662
Route thru #8 L=0.113
Add Rain #8 L=0.091
Print. Point-1
end of catchment details.

5974_Dev.DAT – Stage 2

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#4,2.71132,1.00,0.00,0.00
#5,1.51886,0.70,0.30,0.20
#6,2.67340,0.30,0.70,0.50
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5974_Dev.U – Stage 2

Cedar Creek - Dev
MODEL: Basic
USES: L, U
Default Parameters: alpha=1.20 m=0.8
Catchment File=5974_Dev.dat

Rain #1 L=1.324
Route thru #4 L=1.000
Store.
Rain #4 L=0.453
Get.
Route thru #4 L=0.712
Store.
Rain #2 L=0.825
Route thru #3 L=0.811
Add Rain #3 L=0.911
Route thru #4 L=0.556
Get.
Route thru #5 L=0.728
Store.
Rain #5 L=0.563
Get.
Route thru #8 L=1.042
Store.
Rain #6 L=0.633
Route thru #7 L=0.448
Get.
Add Rain #7 L=0.662
Route thru #8 L=0.113
Add Rain #8 L=0.091
Print. Point-1
end of catchment details.

5974_EX.DAT – Stage 1

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#8,0.00548,1.00,0.00,0.70
#9,0.00218,1.00,0.00,0.30
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#12,0.00303,1.00,0.00,0.70
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5974_EX.U – Stage 1
Cedar Creek - Existing
MODEL: Basic
USES: L, U
Default Parameters: alpha=1.20 m=0.8
Catchment File=5974_Ex.dat

Rain #1 L=0.044
Route thru #2 L=0.064
Store.
Rain #2 L=0.039
Get.
Route thru #6 L=0.056
Add Rain #6 L=0.055
Store.
Rain #4 L=0.022
Route thru #5 L=0.034
Add Rain #5 L=0.044
Get.
Print. B4Loss
Loss C=0.8 F=0 Q=1 BYPASS=Pipe
Print. AfLoss
Route thru #10 L=0.044
Add Rain #10 L=0.041
Route thru #14 L=0.056
Add Rain #14 L=0.049
Store.
Rain #21 L=0.044
Store.
Rain #3 L=0.035

Route thru #7 L=0.030
Store.
Rain #22 L=0.016
Route thru #7 L=0.020
Get.
Add Rain #7 L=0.029
Route thru #8 L=0.023
Add Rain #8 L=0.026
Route thru #11 L=0.018
Add Rain #11 L=0.016
Route thru #12 L=0.016
Add Rain #12 L=0.036
Route thru #13 L=0.021
Store.
Rain #9 L=0.023
Route thru #13 L=0.035
Add Rain #13 L=0.034
Get.
Route thru #15 L=0.038
Store.
Rain #17 L=0.015
Route thru #16 L=0.018
Add Rain #16 L=0.021
Route thru #15 L=0.021
Get.
Add Rain #15 L=0.048
Store.
Rain #18 L=0.031
Route thru #19 L=0.018
Add Rain #19 L=0.016
Route thru #20 L=0.023
Add Rain #20 L=0.054
Get.
Get.
Get.
Print. Point-1
end of catchment details.

5974 Dev.DAT – Stage 1

"Index","Area","UH","UL","I"
#1,0.00456,0.00,1.00,0.70
#2,0.00611,0.00,1.00,0.70
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#21,0.00119,1.00,0.00,0.70
#22,0.00057,1.00,0.00,1.00

5974 Dev.U – Stage 1

Cedar Creek - Dev
MODEL: Basic
USES: L, U
Default Parameters: alpha=1.20 m=0.8
Catchment File=5974_Dev.dat

Rain #1 L=0.044
Route thru #2 L=0.064
Store.
Rain #2 L=0.039
Get.
Route thru #6 L=0.056
Add Rain #6 L=0.055
Store.
Rain #4 L=0.022
Route thru #5 L=0.034
Store.
Rain #22 L=0.014
Route thru #5 L=0.055
Get.
Add Rain #5 L=0.044
Get.
Print. B4Loss
Loss C=0.8 F=0 Q=1 BYPASS=Pipe
Print. AfLoss
Route thru #10 L=0.044
Add Rain #10 L=0.041
Route thru #14 L=0.056
Add Rain #14 L=0.049
Store.
Rain #21 L=0.044
Store.
Rain #3 L=0.035
Route thru #7 L=0.030

Add Rain #7 L=0.029
Route thru #8 L=0.023
Add Rain #8 L=0.026
Route thru #11 L=0.018
Add Rain #11 L=0.016
Route thru #12 L=0.016
Add Rain #12 L=0.036
Route thru #13 L=0.021
Store.
Rain #9 L=0.023
Route thru #13 L=0.035
Add Rain #13 L=0.034
Get.
Route thru #15 L=0.038
Store.
Rain #17 L=0.015
Route thru #16 L=0.018
Add Rain #16 L=0.021
Route thru #15 L=0.021
Get.
Add Rain #15 L=0.048
Store.
Rain #18 L=0.031
Route thru #19 L=0.018
Add Rain #19 L=0.016
Route thru #20 L=0.023
Add Rain #20 L=0.054
Get.
Get.
Get.
Print. Point-1
end of catchment details.

APPENDIX D

Maintenance Checklist

BIORETENTION BASIN DESIGN ASSESSMENT CHECKLIST			
Asset I.D.		DA No.	
Basin Location:			
Hydraulics:	Minor Flood (m^3/s):	Major Flood (m^3/s):	
Area:	Catchment Area (ha):	Bioretention Area (ha):	

TREATMENT	Y	N
Treatment performance verified from curves?		
BIORETENTION MEDIA AND UNDER-DRAINAGE	**Y**	**N**
Design documents bioretention area and extended detention depth as defined by treatment performance requirements.		
Overall flow conveyance system sufficient for design flood event(s)?		
Where required, bypass sufficient for conveyance of design flood event?		
Where required scour protection provided at inflow point to bioretention?		
Bioretention media specification includes details of filter media, drainage layer and transition layer (if required)?		
Design saturated hydraulic conductivity included in specification?		
Transition layer provided where drainage layer consists of gravel (rather than coarse sand)?		
Perforated pipe capacity > infiltration capacity of filter media?		
Selected filter media hydraulic conductivity > 10 x hydraulic conductivity of surrounding soil?		
Liner provided if selected filter media hydraulic conductivity < 10 x hydraulic conductivity of surrounding soil?		
Maximum spacing of collection pipes <1.5m?		
Collection pipes extended to surface to allow inspection and flushing?		
*Maximum upstream flood conveyance complies with QUDM?		
*Overflow pit has set down of at least 50mm below kerb invert? (where conventional gully/lintel used downstream of bioretention then no overflow pit required)		
BASIN	**Y**	**N**
Bioretention area and extended detention depth documented to satisfy treatment requirements?		
Overflow pit crest set at top of extended detention?		
Maximum ponding depth will not impact on public safety?		
Maintenance access provided to surface of bioretention system (for larger systems)?		
Protection from coarse sediments provided (where required) with a sediment forebay?		
Protection from gross pollutants provided (where required)?		
LANDSCAPE	**Y**	**N**
Plant species selected can tolerate extended dry periods, periodic inundation and design velocities?		
Bioretention design and plant species selected integrate with surrounding landscape or built environment design?		
*Planting design conforms with acceptable sight line and safety requirements?		
COMMENTS		

*Streetscape application only

BIORETENTION BASIN CONSTRUCTION INSPECTION CHECKLIST

Asset I.D.		Inspected By:	
Site:		Date:	
		Time:	
Constructed By:		Weather:	
		Contact During Visit:	

Items inspected	Checked Y	Checked N	Satisfactory Y	Satisfactory N	Items inspected	Checked Y	Checked N	Satisfactory Y	Satisfactory N
DURING CONSTRUCTION & ESTABLISHMENT									
A. FUNCTIONAL INSTALLATION					Structural components				
Preliminary Works					15. Location and configuration of inflow systems as designed				
1. Erosion and sediment control plan adopted					16. Location and levels of overflow pits as designed				
2. Temporary traffic/safety control measures					17. Under-drainage connected to overflow pits as designed				
3. Location same as plans					18. Concrete and reinforcement as designed				
4. Site protection from existing flows					19. Set down to correct level for flush kerbs (streetscape applications only)				
Earthworks and Filter Media					20. Kerb opening width as designed				
5. Bed of basin correct shape and slope									
6. Batter slopes as plans					B. SEDIMENT & EROSION CONTROL (IF REQUIRED)				
7. Dimensions of bioretention area as plans					21. Stabilisation immediately following earthworks and planting of terrestrial landscape around basin				
8. Confirm surrounding soil type with design					22. Silt fences and traffic control in place				
9. Confirm filter media specification in accordance with Step 4					23. Temporary protection layers in place				
9. Provision of liner (if required)									
10. Under-drainage installed as designed					C. OPERATIONAL ESTABLISHMENT				
11. Drainage layer media as designed					24. Temporary protection layers and associated silt removed				
12. Transition layer media as designed (if required)					Vegetation				
14. Extended detention depth as designed					25. Planting as designed (species and densities)				
					26. Weed removal and watering as required				

FINAL INSPECTION									
1. Confirm levels of inlets and outlets					6. Check for uneven settling of banks				
2. Confirm structural element sizes					7. Under-drainage working				
3. Check batter slopes					8. Inflow systems working				
4. Vegetation as designed					9. Maintenance access provided				
5. Bioretention filter media surface flat and free of clogging									

COMMENTS ON INSPECTION
ACTIONS REQUIRED
Inspection officer signature:

BIORETENTION BASIN MAINTENANCE CHECKLIST				
Inspection Frequency:	1 to 6 monthly	Date of Visit:		
Location:				
Description:				
Asset I.D.				
Site Visit by:				
INSPECTION ITEMS:		Y	N	Action Required (details)
Sediment accumulation at inflow points?				
Litter within basin?				
Erosion at inlet or other key structures?				
Traffic damage present?				
Evidence of dumping (e.g. building waste)?				
Vegetation condition satisfactory (density, weeds etc)?				
Watering of vegetation required?				
Replanting required?				
Mowing/slashing required?				
Clogging of drainage points (sediment or debris)?				
Evidence of ponding?				
Damage/vandalism to structures present?				
Surface clogging visible?				
Drainage system inspected?				
Resetting of system required?				
COMMENTS				

BIORETENTION BASIN ASSET TRANSFER CHECKLIST			
Asset I.D.			
Asset Location:			
Construction by:			
'On-maintenance' Period:			
TREATMENT		Y	N
System appears to be working as designed visually?			
No obvious signs of under-performance?			
MAINTENANCE		Y	N
Maintenance plans and indicative maintenance costs provided for each asset?			
Vegetation establishment period completed (2 years)?			
Inspection and maintenance undertaken as per maintenance plan?			
Inspection and maintenance forms provided?			
ASSET INSPECTED FOR DEFECTS AND/OR MAINTENANCE ISSUES AT TIME OF ASSET TRANSFER		Y	N
Sediment accumulation at inflow points?			
Litter within basin?			
Erosion at inlet or other key structures?			
Traffic damage present?			
Evidence of dumping (e.g. building waste)?			
Vegetation condition satisfactory (density, weeds etc)?			
Watering of vegetation required?			
Replanting required?			
Mowing/slashing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
COMMENTS/ACTIONS REQUIRED FOR ASSET TRANSFER			
ASSET INFORMATION		Y	N
Design Assessment Checklist provided?			
As constructed plans provided?			
Copies of all required permits (both construction and operational) submitted?			
Proprietary information provided (if applicable)?			
Digital files (e.g. drawings, survey, models) provided?			
Asset listed on asset register or database?			

Appendix 12

Traffic Assessment

Department of Housing and Public Works

Queensland Government

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

DATE 21 May, 2018

CONTACT MARK BOOTH

Ferny Grove State High School
Traffic Impact Assessment
For Honeywill Consulting Pty Ltd

TABLE OF CONTENTS

Document Control Page

Revision	Date	Description	Author	Signature	Verifier	Signature	Approver	Signature
1	21/05/18	DRAFT	MB		SW		SW	
2	24/05/18	FINAL	MB		SW		SW	

1.0 INTRODUCTION

Lambert & Rehbein has been commissioned by Honeywill Consulting Pty Ltd to undertake a Traffic Assessment of the existing Ferny Grove State High School (FGSHS).

To accommodate future student enrolments, FGSHS proposes to construct a Senior Learning Centre and provide covered link access from the new building to the spine of the school. At the February 2017 census, the enrolment count at FGSHS was 1,772 students. From information made available to us we understand that the school's current Built Capacity is 2,122 and the current Student Enrolment Capacity is 1,745. It is currently forecast that the School's student enrolment capacity could grow up to 2,094 students by the year 2020 and Built Capacity increase to 2,546. The current proposal will increase the scale and intensity of the existing School through the following:

- Construction of a Senior Learning Centre (removal of three modular buildings);
- Net total of 20 new General Learning Areas (GLA);
- Approximate increase of 345 students based on the school's current student enrolment capacity at completion of the works; and
- Future planning for the construction of a Hall;

The primary access for the FGSHS is located at 26 McGinn Road, Ferny Grove. The property is formally described as Lot 106 on SP259861 with a total site area of approximately 13.84 hectares. The site has frontages along Brisbane City Council (BCC) controlled McGinn Road and Persimmon Street, with site plans included in **Appendix A**, prepared by ArkLAB Architecture.

The report has been compiled in a clear and concise manner and is set out as follows:

Section 2 discusses the existing land use and traffic arrangements in the vicinity of the proposed development site.

Section 3 provides details of the school's proposed additional facilities and increase in enrolment.

Section 4 displays the calculations and assumptions used to establish the required parking provision for the increase in students and the forecasted generation and distribution of the proposed development traffic. This section also discusses any infrastructure improvements that may be required as a result of the proposed development.

Section 5 summarises the key outcomes of the traffic investigation.

Lambert & Rehbein has derived the data in this report primarily from the data provided by the Client, traffic survey volumes collected as part of this project and a field inspection conducted in March 2018.

This report has been prepared on behalf of the Client, and is subject to and issued in connection with the provisions of the agreement between Lambert & Rehbein and the Client. Lambert & Rehbein has undertaken this work on behalf of the client to inform the future stages of the development of the subject school proposal. While we recognise that this report may be made available to third parties, Lambert & Rehbein accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party. Any third party that intends to rely on the findings of this report should make its own enquiries with respect to the content of same.

2.0 CONTEXT OF PROPOSED DEVELOPMENT

This section of the report describes the context of the proposed development and includes a description of the existing road network, adjacent land uses and existing public transport facilities servicing the site.

2.1 DEVELOPMENT SITE

The Ferny Grove State High School (FGSHS) is located within the BCC suburb of Ferny Grove. McGinn Road borders the FGSHS to the north, Brisbane Tramway Museum to the east, Cedar Creek to the south and Persimmon Street to the west. FGSHS, as highlighted in black, in relation to Ferny Grove State School (FGSS), highlighted in yellow, is illustrated in **Figure 2-1**.

Figure 2-1 School Site Location

Source: www.maps.google.com.au

The School currently has approximately 1,722 enrolled students, 127 teaching staff and 47 non-teacher staff, as per the February 2017 census, within a catchment area as defined in **Figure 2-2**.

Figure 2-2 FGSHS Catchment Area

Source: http://www.qgso.qld.gov.au/maps/edmap/

Within the site's grounds there are three (3) formal staff only parking areas, highlighted in red and numbered #1-3 in **Figure 2-3**, providing a total of 96 formal parking bays on-site, and two (2) informal parking areas used by staff members only, highlighted in **Figure 2-3** via yellow and numbered #4 & #5. A 2min max set down / pick up on facility operates along the School's frontage as highlighted in **Figure 2-3** via blue and numbered #6.

Figure 2-3 Location of Parking Facilities

2.2 EXISTING ROAD NETWORK

Inspection of the land use, road condition of the fronting roads, public transport facilities, pedestrian access, and cyclist provisions surrounding the proposed development site were undertaken in April 2018. This was completed to collect information about the road network operation, safety characteristics, and public transport network associated with the School.

2.2.1 MCGINN ROAD

McGinn Road, as illustrated in **Figure 2-4**, runs along the southern frontage of the School, and has the following key characteristics:

- Designated as a District Road in BCC's Road Hierarchy Plan;
- Undivided sealed two (2) lane, two-way road;
- Pedestrian Footpath along the southern verge connects to the school via an patrolled zebra crossing, as illustrated in **Figure 2-4**;
- Kerbside parking, within the provided shoulders, is available along both sides of McGinn Road. Along the School's frontage (southern boundary of McGinn Road) parking is generally restricted to 'Loading Zone 2min max'. Unrestricted kerbside parking is available along the northern border.
- Posted speed limit is 40 km/hr during school peak hours of 7:00am to 9:00am and 2:00pm to 4:00pm, reverting to 60km/hr outside these hours;
- McGinn Road connects with Samford Road (Arterial Road) east of the subject site, and services the Ferny Grove State School west of the subject site; and
- McGinn Road / Persimmon Street and McGinn Road / Arbor Street intersection counts were commissioned on 22nd March, 2017 and the following two-way volumes along McGinn Road were observed during the peak periods:
    - AM Peak 428 veh/hr (8:00am-9:00am); and
    - PM Peak 693 veh/hr (2:30pm-3:30pm).

Figure 2-4 View of First Avenue along the School's frontage (northern boundary) looking to the east

2.2.2 PERSIMMON STREET

Persimmon Street, as illustrated in **Figure 2-4**, runs along the western frontage of the School, and has the following key characteristics:

- Designated as a Neighbourhood Road in BCC's Road Hierarchy Plan;
- Undivided sealed two (2) lane, two-way road;
- Pedestrian footpath runs along the School's western frontage;
- Unrestricted Kerbside parking is provided predominately along Permission Street. Parking is restricted from the School's car park access to the McGinn Road / Permission Street intersection along eastern boundary;
- Posted speed limit is 40 km/hr during school peak hours of 7:00am to 9:00am and 2:00pm to 4:00pm, reverting to 50km/hr outside these hours; and
- Persimmon Street connects with McGinn Road.

Figure 2-5 View of Persimmon Street along the School's frontage (western boundary) looking to the south

2.3 PUBLIC TRANSPORT

FGSHS has several bus stops within close proximity of the School's grounds, as illustrated in **Figure 2-6**. The bus stops located on the southern side of Tramway Street (#011309) and bus stop located on the northern side of McGinn (#030050) are heavily utilised by students, although no accurate modal share data is available for analysis. The Translink bus routes that service these bus stop is documented in **Table 2-1**.

There are some other Translink kerbside bus stops are located along the roads within the close proximity as illustrated in **Figure 2-6** and listed below:

- McGinn Road bus stop #006613;
- Archdale Road bus stops #006614, #006286, and #010401.

These bus stops are servicing Translink's bus routes #367, #397, and #398 as documented in **Table 2-1**.

Ferny Grove Train Station (#600389 and #600390) is also in the close proximity, this station is an integrated public transport hub of the region that services two (2) main train lines: Ferny Grove and Beenleigh lines, a school bus route 912 (St Andrew – Ferny Hills) and Translink's bus route #398.

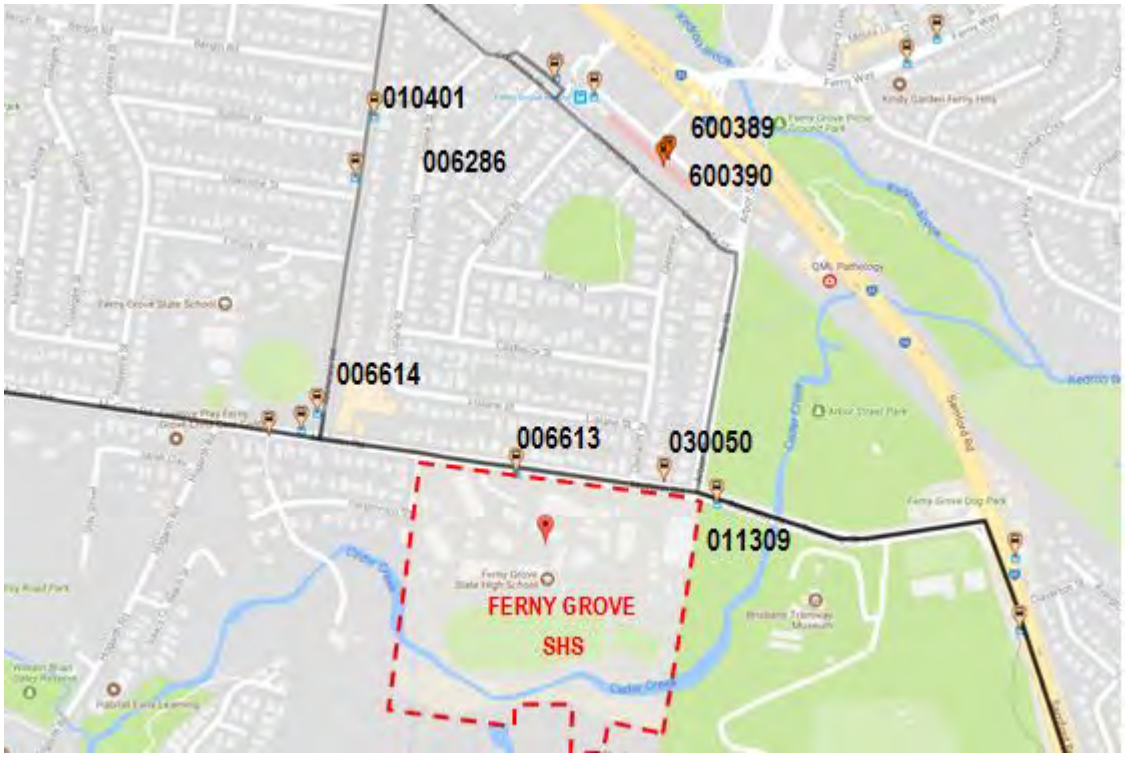

Figure 2-6 Location of surrounding public transport stops

Currently large volumes of students utilise the existing bus stops on Tramway Street: stop #011309), as illustrated in **Figure 2-7,** and on McGinn Road (#030050), as illustrated in **Figure 2-8**.

Figure 2-7 Tramway Street Bus Stop #011309

Figure 2-8 McGinn Road Bus Stop #030050

As illustrated in **Figure 2-7,** the Translink bus stop #011309 on Tramway Street provides multiple shelters for the storage of students. To increase safety, queueing control fencing could be installed at the bus stops. All fencing would be required to be set back sufficiently to prevent damage to buses pulling in and out of the stops, this would ensure a safer waiting area for students and ensure students board and alight in a controlled orderly fashion.

Currently the existing Translink bus stop #030050 on McGinn Road, provides no shelter and limited storage capacity for students, as illustrated in **Figure 2-8**. It was observed that students store across the pedestrian path at times close to the road's edge due to the limitation of storage (distance from the road to the property line) and the demand for the bus services. A staff member does supervise the students at this stop to ensure students board and alight in a controlled orderly fashion. To increase safety, bus cantilevered shelter and queueing control fencing could be installed at this stop. All fencing would be required to be set back sufficiently to prevent damage to buses pulling in and out of the stops, this would ensure a safer waiting area for students and ensure students board and alight in a controlled orderly fashion

Table 2-1 Available Bus Service Routes by Bus Stop

Translink Bus Stop	Bus Route #	Service Route
#006613	396	Arana Hills to Mitchelton servicing Arana Hills, Everton Hills and Mitchelton. Operates Monday to Friday only.
	397	Ferny Grove to Mitchelton servicing Ferny Grove, Ferny Hills,

Translink Bus Stop	Bus Route #	Service Route
		Arana Hills, Everton Hills, Everton Park and Mitchelton. Operates 7 days.
	398	Ferny Grove to Mitchelton servicing Ferny Grove, Ferny Hills, Arana Hills, Keperra and Mitchelton. Operates 7 days.
#011309	367	Ferny Grove to Upper Kedron servicing Ferny Grove and Upper Kedron. Operates Monday to Friday only.
	397	Ferny Grove to Mitchelton servicing Ferny Grove, Ferny Hills, Arana Hills, Everton Hills, Everton Park and Mitchelton. Operates 7 days.
	398	Ferny Grove to Mitchelton servicing Ferny Grove, Ferny Hills, Arana Hills, Keperra and Mitchelton. Operates 7 days.
	904	School bus Ferny Grove SS – Keprra Station
	S767	School bus The Gap High School – Upper Kedron
#030050	912	School bus St Andrews - Ferny Hills
	919	School bus Ferny Grove SS – Glengarry Road
	S767	School bus The Gap High School – Upper Kedron

Additionally private bus companies Brisbane Buses service the school in the morning and afternoon peaks and school sport days.

2.4 ACTIVE TRANSPORT

With the use of Brisbane City Councils (BCC) Interactive Mapping tool, the following transport related overlays and maps appear to have application over the subject development:

- Bicycle Network – FGSHS is adequately serviced by existing cycling infrastructure within the surrounding area.

  To the north, a secondary cycle route runs along McGinn Road and Arbor Street, as highlighted via a light green dashed line in **Figure 2-9**, connecting to a primary cycle route (highlighted as dark green dashed line) runs along Samford Road to the east.

  To the south and east, a cycleway (secondary cycle route) follows the alignment of the Cedar Creek. This cycle way runs along the eastern and southern boundary of the

FGSHS and residential lots connecting to Upper Kedron Road, as highlighted via a light green dashed line in **Figure 2-9**. Orange dashed lines represent surrounding local cycle routes.

The school provides bicycle storage throughout the school, such as bicycle storage areas near the science building and the auditorium.

Figure 2-9 BCC Existing Bicycle and Pedestrian Routes

- Pedestrian Network – FGSHS is adequately serviced by existing pedestrian paths that span along both sides of McGinn Road, as highlighted via blue arrows in **Figure 2-10**. The existing pedestrian paths provide connectivity to two (2) pedestrian zebra crossings paths cross McGinn Road and the Ferny Grove Shopping Village, as highlighted via red arrows in **Figure 2-10**. It is also noted that there are some unpatrolled pedestrian crossing the carpark accesses and minor roads, as highlighted via yellow arrows in **Figure 2-10**.

Figure 2-10 Location of existing pedestrian facilities

2.5 EXISTING NETWORK OPERATIONS

As is common for road network's servicing multiple schools, congestion occurs during the morning and afternoon school peaks. Due to the close proximity of the two Ferny Grove schools, the primary school (FGSS) and secondary school (FGSHS) as illustrated in **Figure 2-1**, traffic traveling to and from both schools via McGinn Road can result in congestion in the network during morning and afternoon school operating peaks. The following is a review based on site observations:

Operation of Side Streets

Due to the limited provision of on-site parking for parents, parents were observed to utilise available on-street parking on the side roads, highlighted in **Figure 2-11** (i.e Arbor Street, Castlecor Street, Glenariff Street, Lislane Street and Persimmon Street) . This need for parents to utilise on-street parking close to the school, leads to congestion throughout the local street network during school operating peak hours. Parked vehicles on both sides of the streets, narrows the carriageways and can force roads to operate under uncontrolled one-way conditions.

Figure 2-11 Surrounding On-Street Parking Restrictions

It appears that Council has attempted to combat this by installing parking restrictions on Persimmon Street (3P parking on school days 10am-3pm), Glenariff Street (2P parking on school days 8am-5pm) and Castlecor Street (3P parking on school days 10am-3pm) and banned parking near intersections such as McGinn Road / Persimmon Street and McGinn Road / Glenariff Street on school days, as illustrated in **Figure 2-11**.

Although these side streets do experience an increase in traffic directly due to School generated traffic (Persimmon Street traffic increases due to on-street parking and western staff car park, Glenariff Street traffic increases from on-street parking on Glenariff Street, Castlecor Street and Lislane Street), the intersections' performances are generally hampered by the stop start nature operation of the surrounding pedestrian crossings, 40km/hr speed environment, delays caused by vehicles attempting to enter side roads against platoon traffic and vehicles entering and leaving available on-street parking.

McGinn Road & Glenariff Street

Operationally, the flow of traffic along McGinn Road is hindered by vehicles attempting to turn into the side roads, such as Glenariff Street, to access on-street parking. Due to McGinn Road's carriageway limit of one lane each way, a vehicle attempting to turn right into Glenariff Street, against traffic flowing east from FGSS, delays the flow of traffic along McGinn Road, as illustrated in **Figure 2-12**. This combined with the stop start nature of pedestrian crossing forms queues on McGinn Road that extend back into Tramway Street to the east, as illustrated in **Figure 2-12**.

Figure 2-12 Queue on McGinn Road due to right turn vehicle

Recommendation

The proposed increase of on-site parking for staff, as detailed in **Section 3.0**, can present the opportunity to increase the School's 2min loading zone along the entire McGinn Road frontage of the school, as highlighted via red dash in **Figure 2-13**. Enforcement of the 2min max parking at all set down / pickup facilities is critical to ensure each set down / pick up bay can service in the order 20-30 vehicles per hour. This increase in availability and serviceability will promote the movement of through traffic along McGinn Road and reduce the reliance surrounding roads on-street parking.

Banning right turns, during the afternoon school peak 2:30pm-3:30pm, into Glenariff Street (from McGinn Road) would eliminate queueing and delays generated by this manoeuvre, at this intersection and again promote the use of 2min loading zone parking along the entire McGinn Road frontage.

Providing parking restrictions (1/4P during 2:30pm-3:30pm), as highlighted via pink dash in **Figure 2-13**) on Arbor Street could also increase availability of parking near the school on Arbor Street for the purpose of student pickup / set won in a more regulated manner. Due to the banned parking near McGinn Road / Arbor Street / Tramway Street, motorist on Tramway Street have the ability to pass a queued vehicle attempting to turn right into Arbor Street.

Figure 2-13 Proposed Street Parking Restrictions

Banning right turns, during the afternoon school peak 2:30pm-3:30pm, out of Glenariff Street (onto McGinn Road) would promote parents to find an alternative intersection to access McGinn Road. Although this can result in vehicles using adjacent neighbourhood roads to access McGinn Road, such as Arbor Street, the McGinn Road / Arbor Street / Tramway Street intersection is set up to accommodate queueing for both left and right turn vehicles, via a stand up lane for right turn vehicle and a left turn short lane, as illustrated in **Figure 2-14**.

Figure 2-14 McGinn Road / Arbor Street / Tramway Street Intersection Layout

Persimmon Street

It was observed that the an increase in traffic Persimmon Street, largely in a result of staff vehicle movements from the western staff car park and parents utilising on-street parking on Persimmon Street, during the peak periods struggled to make right turns out due to the limited available gaps to complete the require manoeuvre safely. Motorists queued behind the right turning vehicle, on Persimmon Street, were observed to attempt to pass queued vehicles by mounting the kerb, as illustrated in **Figure 2-15**.

Recommendation

Widening the intersection to allow a vehicle to pass a queued vehicle could be difficult due to the need for the pedestrian median and the property boundaries adjacent to the intersection. A 'Keep Clear' zone immediately adjacent to the intersection, as illustrated in **Figure 2-16**, could assist vehicles with entering McGinn Road during congestion. Another solution to be contemplated could be to instruct staff to delay their departure till after the school peak (3:30pm).

Figure 2-15 Motorist attempting to pass queued right turn vehicle

Figure 2-16 McGinn Road / Persimmon Street 'Keep Clear' Zone

Bus Operations

East of the school along Tramway Street, buses store in a 55m long bus bay, as illustrated in , while waiting to service the School's main bus stop (Tramway Street bus stop #011309) at the eastern corner of the School's grounds. Currently the demand (number of buses) is greater than the provision of storage. Queued buses were observed to overflow along the kerbside of Tramway Street, as illustrated in **Figure 2-17** and **Figure 2-18**. This queuing was observed to extend to the pedestrian median, illustrate in **Figure 2-18,** limiting motorist the ability to safely pass a queued bus causing delays and queues. It is understood that this can also occur on Arbor Street bus zone.

Recommendation

It is recommended that a review of the management of buses should be completed to limit queueing in the adjoining streets to ensure that the identified issues are minimises to the extent possible. The management of buses could include the consideration of the potential to stagger arrival times, use of both Arbor Street and Tramway Street bus zones and the potential for buses to store off-road at locations such as the Brisbane Tramway Museum.

Figure 2-17 Queued Buses Overflowing back to Samford Road

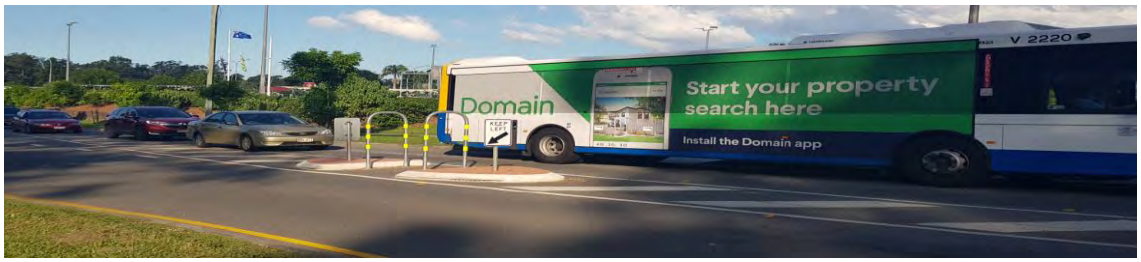

Figure 2-18 Queued Buses Blocking McGinn Road Flow

This will require consultation with the school, bus operators and local council.

3.0 PROPOSED DEVELOPMENT

To accommodate future student enrolments, Ferny Grove SHS proposes a new Senior Learning Centre and provide covered link access from the new building to the spine of the school.

The location and layout of the proposed development can be found in **Appendix A** in site plans prepared by ArkLAB Architecture, consisting of :

- Senior Learning Centre will provide a new three (3) level structure consisting of:
- New Hall;
- Extension of Western Staff Carpark to 54 parking bays in total (increase of 13 parking bays); and
- Additional Staff Carpark (77 parking bays).

The location of these proposed facilities are shown in **Figure 3-1**.

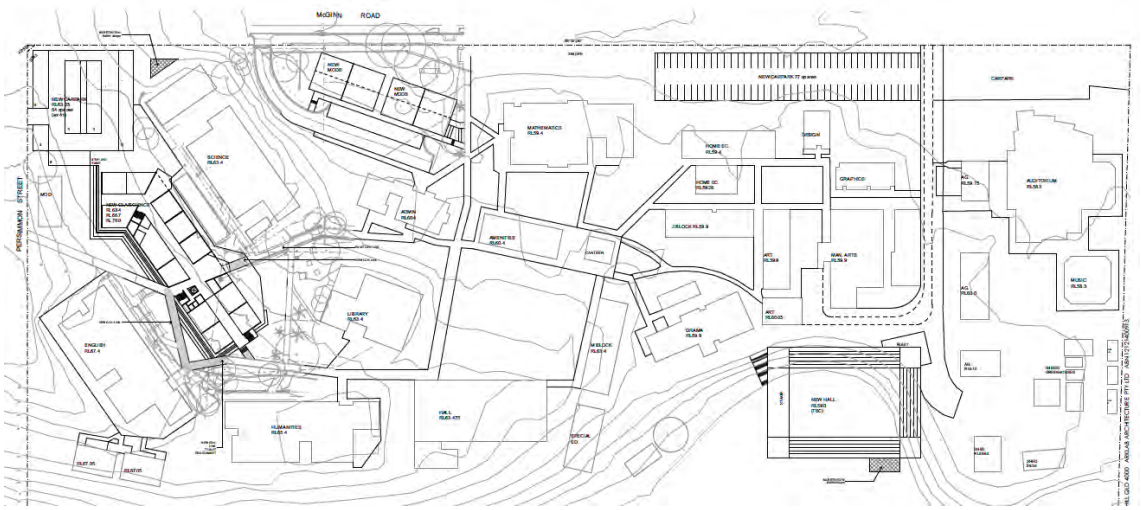

Figure 3-1 Location of Proposed New Facilities

It is our understanding that the new Senior Learning Centre building will be constructed in 2018 and have the potential to increase the School's enrolment by approximately 345 students to 2,090 by January 2020. No future growth beyond this increase of FGSHS has been anticipated in this report. Any future plans will need additional analysis to determine the impact future growth may have on parking demand and the operations of the surrounding road network.

4.0 IMPACT ASSESSMENT

This section of the report details an assessment of the impact that the increase in student capacity at the FGSHS will have in terms of parking requirements and impact to the surrounding road network. Currently the School has an enrolment of approximately 1,722 students with a current capacity of 2,122.

It is estimated that the addition of the proposed two buildings will increase the school's built capacity to 2,546 by 2020. FGSHS representatives estimate though, that the school by 2020 will only experience an increase in enrolment by approximately 345 students (total 2,094 students). This impact assessment has been completed to determine both the impact that the assumed enrolment (presumed increase of 345 students and an assumed increase in 32 staff members) will have on the surrounding road network.

4.1 CAR PARKING REQUIREMENTS

In regards to provision of parking, the assessment of the car parking requirements for FGSHS has been based on the requirements of the following documents:

- *Brisbane City Council's (BCC) Transport, Access, Parking and Servicing Planning Scheme Policy* ;
- *TMR's Planning for Safe Transport Infrastructure at Schools*; and
- *DET Design Standard for DETE Facilities*

Table 4-1 has outlined the parking requirements based on the above guidelines. It is noted that these parking requirements are based solely on the proposed future increase in staff and students and has not considered any existing short falls in parking on the site.

Table 4-1 Car Parking Provision (Estimated Student Enrolment)

Governing Body	Use	Rate	Increase per Use	Number of Car Park	Class of Car Park
BCC	Educational establishment, if a pre-preparatory, preparatory and primary school, secondary school or special education	1 space per staff	32	32	Staff Class 1
		plus 0.1 space per staff for visitors	32	3	Visitor Class 3
	Total Car Parks Required			**35**	
TMR	Long term parking (staff/visitor)	0.7 per staff member	32	22	Class 1/1A for staff and Class 2 for visitor only parking areas
	Short-term (15 minutes)	1 per 15 students	345	23	Class 3/3A
	Total Car Parks Required			**45**	
DET	Public Parking & Drop-Off/Set-Down Area	13% of total student numbers plus 10% of year 12 students*	345	49	
	Visitor Parking	1 per 15 students	345	23	
	Total Car Parks Required			**72**	

*Calculated year 12 students based of existing ratio (15.5%) provided by Census Data

The parking requirements associated with the predicted increase student population have been outlined in **Table 4-1**. As previously noted this has been based on an assessment of the predicted "increase" in the school population as proposed by DET only and has not contemplated parking requirements for the existing facility.

The details in **Table 4-1** show the requirements, citing the various available government references as noted. It can be seen from this information that to satisfy the DET Guidelines the site would need to provide an additional 72 parking spaces by 2020. If the requirement to satisfy BCC's on-site parking requirements were adopted the parking requirements for this scenario is 35 parking bays. If the requirements of the DTMR Planning for Safe Infrastructure at Schools guidelines were adopted the parking requirements for this scenario would be 45 spaces respectively.

It is recognised that the current expansion project proposes to increase the formal car parking bays on-site by an additional 90 parking bays, meeting the BCC, TMR and DET guidelines for the proposed growth while addressing some of the existing shortfall. To address existing deficiencies of parking, it is recommended that on-site parking/set down areas be increased along the school's frontage. It is also recommended to limiting the observed "stopping" duration at southern pick-up / drop-off by enforcing a 2min max parking during the school's peak operating hours, enforced by a staff member would place the onus on the parent to ensure their children are present at the facility. If managed correctly the existing 210m long 2min max zone and proposed 120m 2min max zone could service up to fifty (50) vehicles at time. Assuming the 2min max is enforced this can result in up to 600-750veh/hr depending on arrival and departure rates. This operation of the available parking along the school's frontage is critical to ensuring flow along McGinn Road is maintained as much as possible and limit parents use of the side roads.

External Use of the Hall

It is understood that the use of the proposed Hall by external parties will happen on a rare occurrence and outside school operating hours. **Table 4-2** outlines the parking requirements for a community hall based on BCC guidelines. It is noted that outside school operating hours, the school will provide 186 formal parking bays on-site and up to 50 vehicles can park along the School's McGinn frontage. If this is considered as a collection provision of parking for external use of the proposed school Hall the supply, totalling 236 parking bays, can be seen as meeting the BCC guidelines documented below.

Table 4-2 Car Parking Provision (New Hall)

Governing Body	Use	Rate	GFA	Number of Car Park
BCC	Community use, if a community centre or community hall	10 spaces per 100 m^2 gross floor area	2,200m^2	220

4.2 NETWORK IMPACT ASSESSMENT

4.2.1 BACKGROUND & FORECASTED TRAFFIC

A traffic survey was undertaken during March 2018 at the following intersections:

- McGinn Road / Persimmon Street;
- McGinn Road / Arbor Street / Tramway Street;
- Samford Road / Tramway Street; and
- Existing staff car parks that service the FGSHS.

Summary of the traffic count data is shown in **Figure 4-1** and details of traffic count data are included in **Appendix B**.

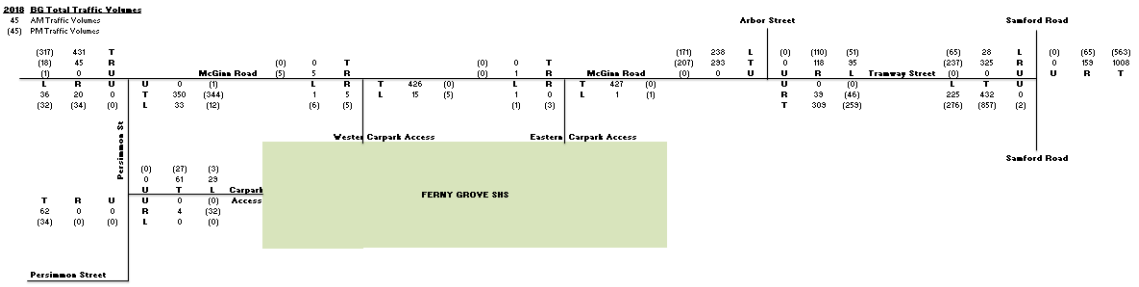

Figure 4-1: Summary of 2018 Background Traffic Count

A 2% growth rate (compounded annually) has been applied on all movements to capture future growth of the area, as illustrated in **Figure 4-2**.

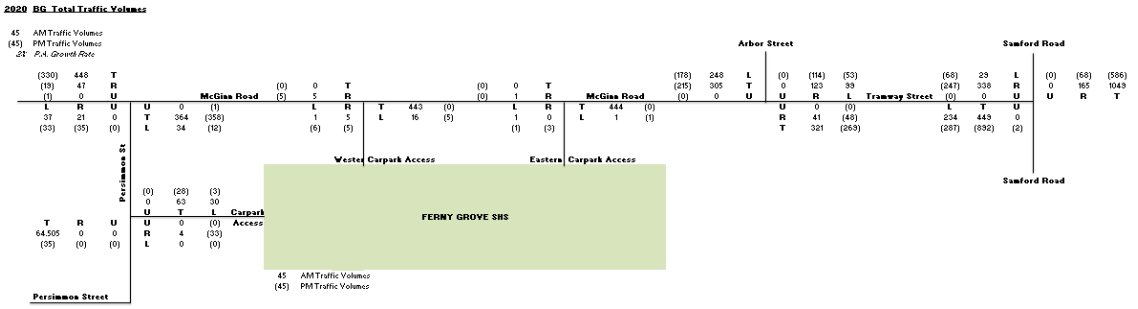

Figure 4-2: Summary of 2020 Forecasted Traffic

4.2.2 PROPOSED DEVELOPMENT TRAFFIC

In regards to traffic generated by the school, the FGSHS should been assessed against the following governing documents:

- *Appendix 3A of Chapter 3 of Main Roads' Road Planning and Design Manual* ; and
- *Trip Generation Manual, 9th Edition, ITE 2012*.

Table 4-3 documents the above governing bodies' guidelines to trip generation rates for secondary schools, such as FGSHS, and the estimated peak hour and daily traffic that the 345 additional students will generate onto the surrounding road network.

Table 4-3 Trip Generation Based on Increased Enrolment

Governing Body	Use	Rate	Increase in Students	Increase in Traffic Volumes
DTMR	State High School	0.12veh/student/hr	345	42 veh/hr
ITE	Secondary School	0.17veh/student/day	345	59 veh/day

The directional traffic distribution derived from current traffic patterns was adopted for the additional traffic. As such, the increased traffic volumes from FGSHS' predicted student growth is summarised in **Figure 4-3** at the key three external intersections.

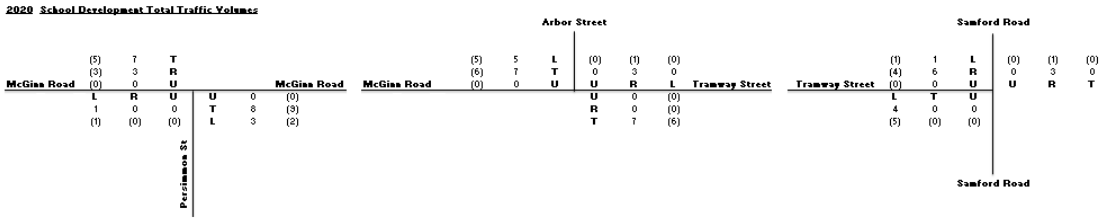

Figure 4-3: Summary of Increased Traffic Volumes from School

According to the Department of Transport and Main Roads' (TMR) *Guide to Traffic Impact Assessment (GTIA)*, a development is only considered to have a *significant impact* to the road network when the proportion of additional traffic to the background traffic for each movement is greater than 5%.

The percentage proportions of the forecasted additional school traffic compared to the forecasted (2020) background traffic volumes for McGinn Road / Persimmon Street intersection, McGinn Road / Arbor Street / Tramway Street intersection and Samford Road / Tramway Street intersection movements are summarised in **Figure 4-4**.

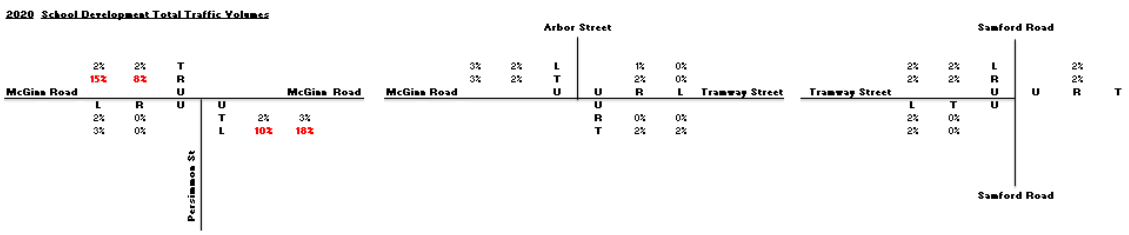

Figure 4-4: Summary of Increased Traffic Volumes from School

In 2020, the additional school related traffic equates to no more than 2% of the forecasted background traffic volumes at McGinn Road / Arbor Street / Tramway Street intersection and Samford Road / Tramway Street and as such, is not considered to have a significant impact to the future operation of these intersections.

In 2020, the additional school related traffic equates to more than 5% of the forecasted background traffic volumes at McGinn Road / Persimmon Street intersection. **Figure 4-5** summaries the 2020 forecasted + school growth McGinn Road / Persimmon Street intersection traffic volumes.

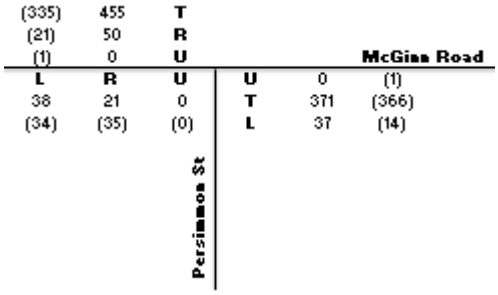

Figure 4-5: McGinn Road / Persimmon Street (2020 Forecasted + School Growth)

Intersection analysis has been completed and documented in **Section 4.2.3** to determine the impact the growth of the school may have on the intersection's performance

4.2.3 MCGINN ROAD / PERSIMMON STREET INTERSECTION

Analysis of the McGinn Road / Persimmon Street intersection has been undertaken using *SIDRA Intersection 7*. The following parameters have been applied to all SIDRA models:

- A Saturation Flow of 1,950 through car units per hour;
- A Peak Flow Period of 30 minutes, with a conservative Peak Flow Factor of 95%; and
- Gap acceptance parameters based on relevant Austroads Guidelines.

Table 4-4 documents the results of SIDRA analysis for McGinn Road / Persimmon Street intersection for 2018, 2020 Background traffic volumes and 2020 Background + Development traffic volumes.

Table 4-4 SIDRA Analysis Results

Scenario	Approach	AM Peak				PM Peak			
		DoS	Avg Delay (s)	LoS	95% Back of Queue (m)	DoS	Avg Delay (s)	LoS	95% Back of Queue (m)
Persimmon Street / McGinn Road 2018 Background Traffic Volumes	Persimmon Street (South)	0.08	8.3	LOS A	1.8	0.09	8.0	LOS A	2.1
	McGinn Road (East)	0.21	0.5	LOS A	0.0	0.19	0.2	LOS A	0.0
	McGinn Road (West)	0.27	1.0	LOS A	3.6	0.19	0.5	LOS A	1.3
	Intersection Summary	**0.27**	**1.2**	**LOS A**	**3.6**	**0.19**	**1.0**	**LOS A**	**2.1**
Persimmon Street / McGinn Road 2020 Background Traffic Volumes	First Avenue (East)	0.08	8.3	LOS A	1.8	0.09	8.2	LOS A	2.2
	Goodwin Drive (North)	0.21	0.5	LOS A	0.0	0.20	0.2	LOS A	0.0
	First Avenue (West)	0.27	1.0	LOS A	3.6	0.19	0.5	LOS A	1.4
	Intersection Summary	**0.27**	**1.2**	**LOS A**	**3.6**	**0.20**	**1.0**	**LOS A**	**2.2**
Persimmon Street / McGinn Road 2020 Background + Development Traffic Volumes	Persimmon Street (South)	0.08	8.4	LOS A	1.9	0.09	8.3	LOS A	2.2
	McGinn Road (East)	0.21	0.5	LOS A	0.0	0.21	0.2	LOS A	0.0
	McGinn Road (West)	0.28	1.0	LOS A	3.9	0.120	0.6	LOS A	1.6
	Intersection Summary	**0.28**	**1.3**	**LOS A**	**3.9**	**0.20**	**1.1**	**LOS A**	**2.2**

The results in **Table 4-4** show that the increased School's traffic has an inconsequential impact on the capacity of Persimmon Street / McGinn Road intersection at the year 2020.

5.0 SUMMARY AND CONCLUSION

Lambert & Rehbein has been commissioned by Honeywill Consulting Pty Ltd to undertake a Traffic Assessment of the existing Ferny Grove State High School (FGSHS) due to the proposed plans to provide additional facilities (Senior Learning Centre and future Hall) and increase the School's student enrolment build capacity from the current 1,149 (2018) to the projected build capacity of 2,546 (2020).

It is estimated that the addition of the proposed two buildings will increase the school's built capacity to 2,546 by 2020. FGSHS representatives estimate though, that the school by 2020 will only experience an increase in enrolment by approximately 345 students (total 2,094 students). As a consequence of the approximate increase of 345 students, **Table 4-1** cities the following requirements, to satisfy the DET, MBRC and DTMR various parking guidelines. It is recommended that further allowances be made for suitable on-site parking/set down areas in accordance with DTMR guidelines as a minimum.

Section 2.5 outlines a number of recommendations as follows:

- Ban right turns into Glenariff Street from McGinn Road;
- Ban right turns out of Glenariff Street into McGinn Road;
- Assign parking restriction on Arbor Street ;
- Keep clear zone adjacent to Persimmons Street;
- Increase 2min max parking zone on McGinn Road; and
- Limit buses queueing back on Tramway Street via management controls.

As a consequence of the maximum increase in student enrolments, it is estimated that the increase in traffic will generate minimal increase in delay (<42 seconds) at the existing Persimmon Street / McGinn Road intersection and does not require mitigation measures, as documented in **Section 4**. As outlined in **Section 4**, the increase in students will have minimal impact on the McGinn Road / Arbor Street / Tramway Street intersection and Samford Road / Tramway Street.

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

APPENDIX A

SITE LAYOUT

McGINN ROAD

PERSIMMON STREET

BIORETENTION BASIN 34sqm

NEW CARPARK RL63.25 54 spaces (ex 41)

NEW MODS

NEW MODS

MOD

STAIR AND RAMP

SCIENCE RL63.4

NEW GLA/SCIENCE RL63.4 RL66.7 RL70.0

ADMIN RL60.4

MATHEMATICS RL59.4

AMENITIES RL60.4

CANTEEN

EXIST. COV. LINK

NEW COV. LINK

NEW COV. LINK

LIBRARY RL63.4

ENGLISH RL67.4

HUMANITIES RL65.4

NEW COV. LINK TO SUIT REALIGNMENT

HALL RL63.475

SPECIAL ED.

M BLOCK RL63.4

DRAMA RL59.9

J BLOCK RL59.9

ART RL59.9

ART RL60.05

MAN. ARTS RL59.9

HOME EC. RL59.4

HOME EC. RL59.28

DESIGN

GRAPHICS

NEW CARPARK 77 spaces

CARPARK

AG. RL59.15

AUDITORIUM RL58.3

MUSIC RL58.3

AG. RL60.0

AG. RL61.0

SHEDS/ GREENHOUSES

SHED RL59.65

SHED 59.36

RL60.1

STAGE

NEW HALL RL59.0 (TBC)

BIORETENTION BASIN 55sqm

RL67.05

RL67.05

48°15'30"

394|43

89°22'30"

394|246

347|26

179°22'30"

1 SITE PLAN
1:500

N

arkLAB ARCHITECTURE
ALAN JORDAN MARCH
538 BOUNDARY ST SPRING HILL QLD 4000 ARKLAB ARCHITECTURE PTY LTD ABN 12121400913
P: 07 3236 9965 E: theLAB@arkLAB.com.au

GENERAL NOTES

1. Confirm details of setouts, levels, setbacks and critical dimensions on site prior to and during the works. Notify architect of any discrepencies discovered before proceeding.
2. All construction to comply with the building code of Australia and applicable Australian standards.
4. A signed original of this drawing is retained in the arkLAB Office for verification purposes.
5. These drawings are the copyright of arkLAB Architecture Pty Ltd and may not be used, retained or copied without written authority.
3. Do not scale from this drawing - use figured dimensions. Dimensions taken from structure (face of blockwork/stud) unless otherwise noted.

ADDITIONAL GENERAL NOTES

- Grid shown for reference purposes only. Measure off existing structure where indicated.
- Please verify all RL's prior to starting on site.

ID	DATE	ISSUE DETAILS	INT
01	09.05.18	PRELIM COORDINATION ISSUE	TM

SITE PLAN

FGSHS - LEARNING CENTRE

SCALE @ A1

CD 201742 / 0101 01

DET

MCGINN RD • FERNY GROVE SHS

DRAWN | CHECKED | APPROVED

Wednesday, 9 May 2018 4:22 pm • BIM Server: server - BIM Server 21/201742_DET_FER_CD2

LAMBERT & REHBEIN
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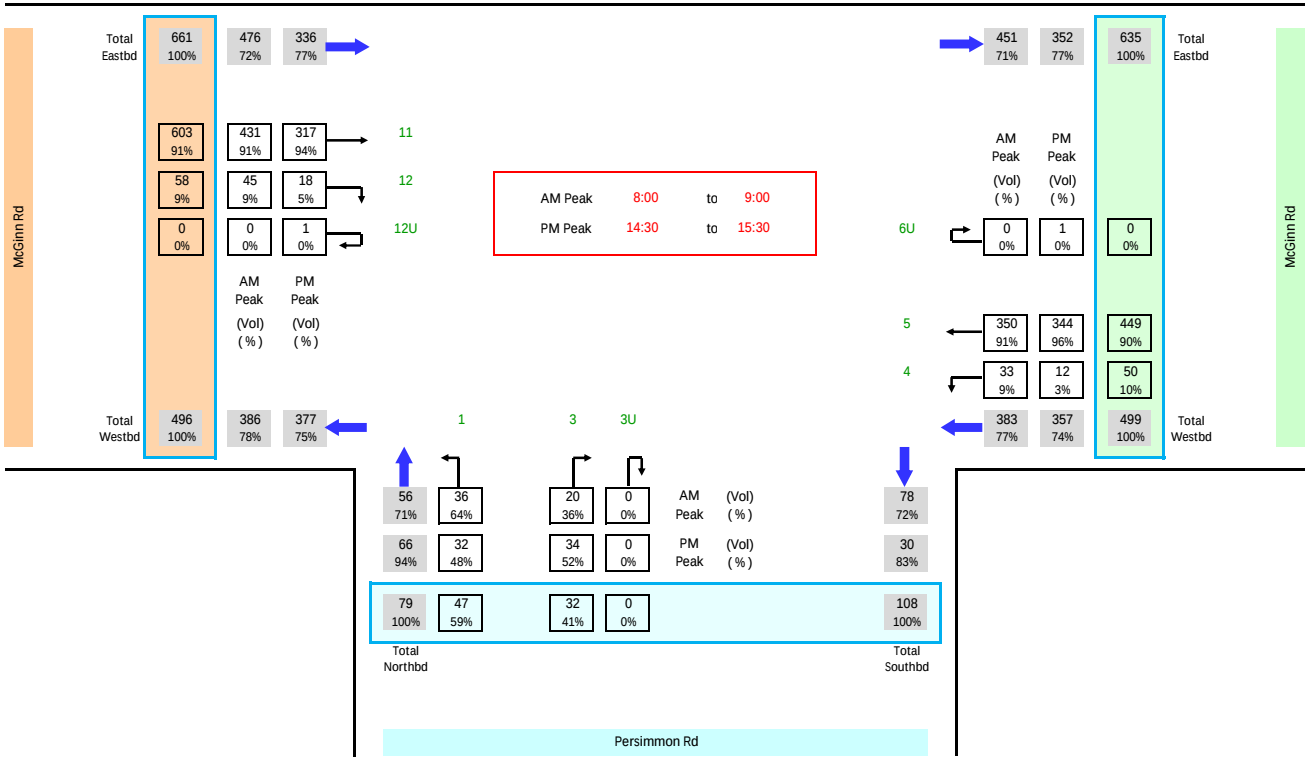
APPENDIX B

TRAFFIC COUNTS

Job No. : Q2057
Client : Lambert and Rehbein
Suburb : Ferny Grove SHS
Location : 1. McGinn Rd / Persimmon Rd

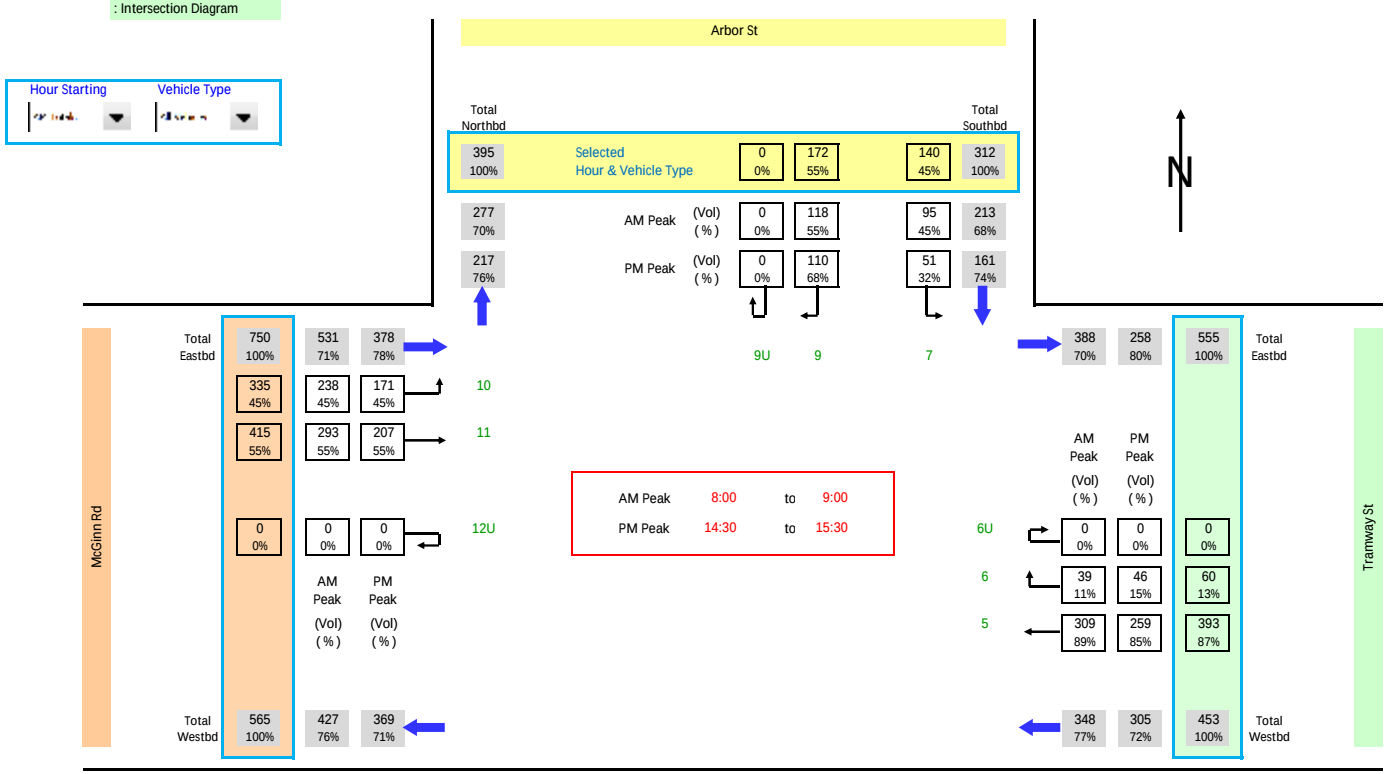
Day/Date : Thu, 22nd March 2018
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

Hour Starting | Vehicle Type



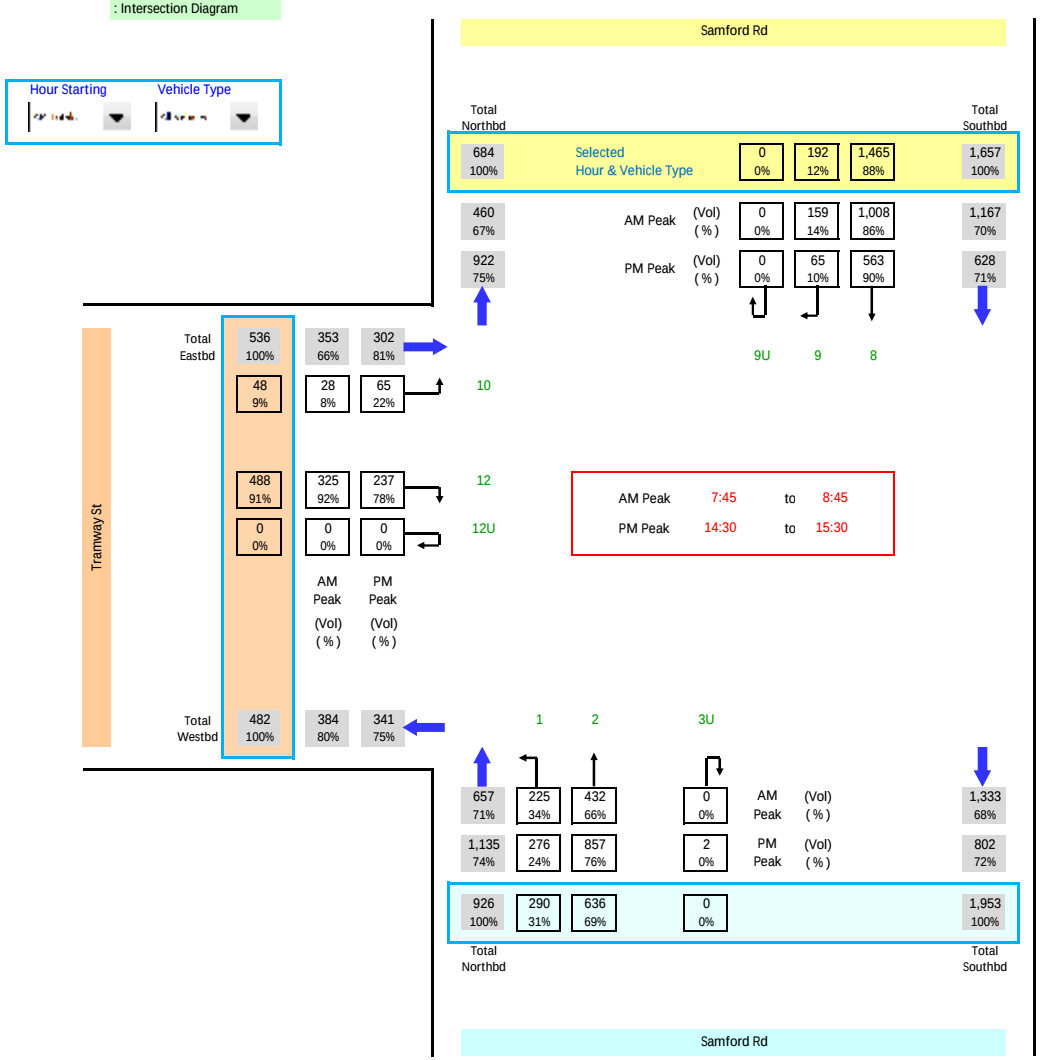
Job No. : Q2057
Client : Lambert and Rehbein
Suburb : Ferny Grove SHS
Location : 2. McGinn Rd / Arbor St

Day/Date : Thu, 22nd March 2018
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram



Job No. : Q2057
Client : Lambert and Rehbein
Suburb : Ferny Grove SHS
Location : 5. Samford Rd / Tramway St

Day/Date : Thu, 22nd March 2018
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram



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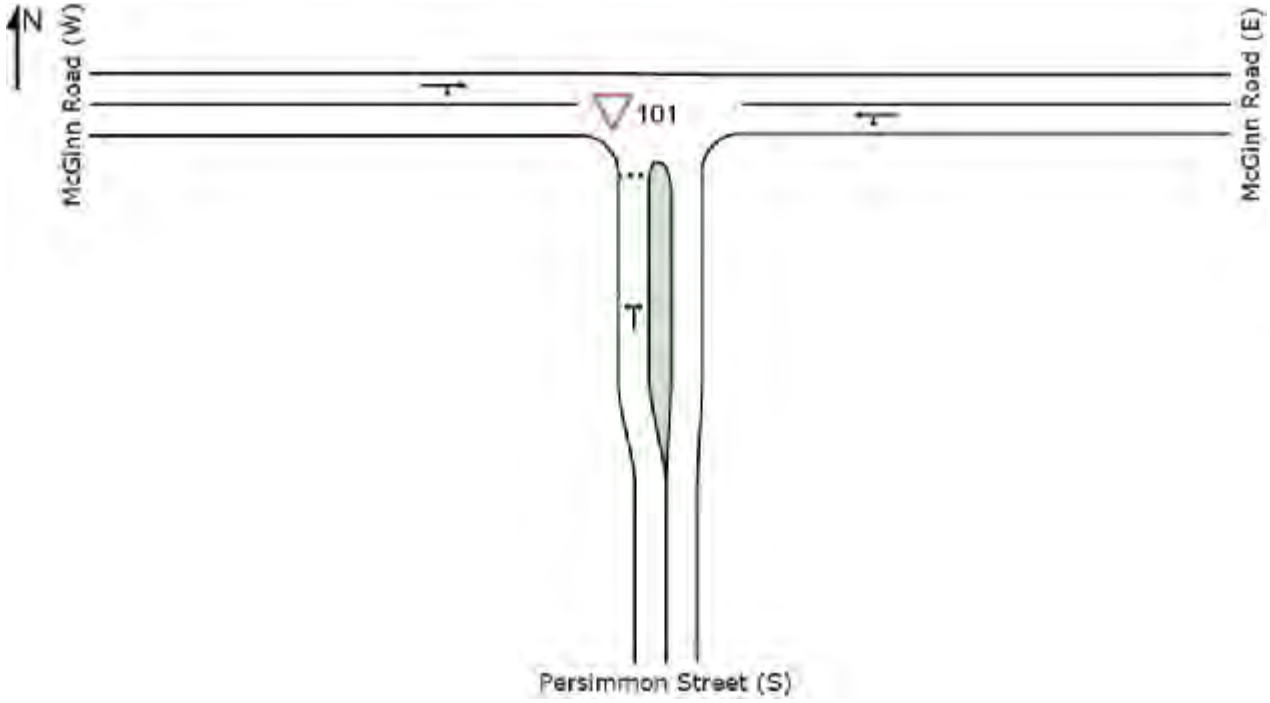
APPENDIX C

SIDRA OUTPUTS

SITE LAYOUT

Site: 101 [2018 AM Background]

Background Traffic Volume
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 101 [2018 AM Background]

Background Traffic Volume
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Persimmon Street (S)											
10	L2	38	0.0	0.075	6.8	LOS A	0.3	1.8	0.46	0.69	42.5
12	R2	21	0.0	0.075	10.8	LOS B	0.3	1.8	0.46	0.69	47.4
Approach		59	0.0	0.075	8.3	LOS A	0.3	1.8	0.46	0.69	44.7
East: McGinn Road (E)											
1	L2	35	0.0	0.210	5.6	LOS A	0.0	0.0	0.00	0.05	56.8
2	T1	368	2.3	0.210	0.0	LOS A	0.0	0.0	0.00	0.05	59.1
Approach		403	2.1	0.210	0.5	NA	0.0	0.0	0.00	0.05	58.8
West: McGinn Road (W)											
8	T1	454	1.2	0.272	0.3	LOS A	0.5	3.6	0.13	0.06	58.1
9	R2	47	0.0	0.272	7.5	LOS A	0.5	3.6	0.13	0.06	52.6
Approach		501	1.1	0.272	1.0	NA	0.5	3.6	0.13	0.06	57.6
All Vehicles		963	1.4	0.272	1.2	NA	0.5	3.6	0.10	0.10	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2018 PM Background]

Background Traffic Volume
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Persimmon Street (S)											
10	L2	34	0.0	0.086	6.8	LOS A	0.3	2.1	0.46	0.71	42.8
12	R2	36	0.0	0.086	9.2	LOS A	0.3	2.1	0.46	0.71	47.6
Approach		69	0.0	0.086	8.0	LOS A	0.3	2.1	0.46	0.71	45.7
East: McGinn Road (E)											
1	L2	13	0.0	0.194	5.6	LOS A	0.0	0.0	0.00	0.02	57.2
2	T1	362	0.9	0.194	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		375	0.8	0.194	0.2	NA	0.0	0.0	0.00	0.02	59.5
West: McGinn Road (W)											
8	T1	334	0.6	0.186	0.1	LOS A	0.2	1.3	0.07	0.03	58.9
9	R2	19	0.0	0.186	7.1	LOS A	0.2	1.3	0.07	0.03	53.6
Approach		353	0.6	0.186	0.5	NA	0.2	1.3	0.07	0.03	58.7
All Vehicles		797	0.7	0.194	1.0	NA	0.3	2.1	0.07	0.09	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2020 AM Background]

Forecasted Traffic Volume
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Persimmon Street (S)											
10	L2	39	0.0	0.080	6.9	LOS A	0.3	1.9	0.47	0.70	42.3
12	R2	22	0.0	0.080	11.2	LOS B	0.3	1.9	0.47	0.70	47.2
Approach		61	0.0	0.080	8.4	LOS A	0.3	1.9	0.47	0.70	44.5
East: McGinn Road (E)											
1	L2	36	0.0	0.215	5.6	LOS A	0.0	0.0	0.00	0.05	56.8
2	T1	377	2.2	0.215	0.0	LOS A	0.0	0.0	0.00	0.05	59.1
Approach		413	2.0	0.215	0.5	NA	0.0	0.0	0.00	0.05	58.8
West: McGinn Road (W)											
8	T1	472	1.1	0.283	0.3	LOS A	0.6	3.9	0.13	0.06	58.0
9	R2	49	0.0	0.283	7.6	LOS A	0.6	3.9	0.13	0.06	52.5
Approach		521	1.0	0.283	1.0	NA	0.6	3.9	0.13	0.06	57.6
All Vehicles		995	1.4	0.283	1.3	NA	0.6	3.9	0.10	0.10	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2020 PM Background]

Forecasted Traffic Volume
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Persimmon Street (S)											
10	L2	35	0.0	0.091	6.9	LOS A	0.3	2.2	0.47	0.72	42.6
12	R2	37	0.0	0.091	9.4	LOS A	0.3	2.2	0.47	0.72	47.4
Approach		72	0.0	0.091	8.2	LOS A	0.3	2.2	0.47	0.72	45.5
East: McGinn Road (E)											
1	L2	13	0.0	0.201	5.6	LOS A	0.0	0.0	0.00	0.02	57.2
2	T1	377	0.8	0.201	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		389	0.8	0.201	0.2	NA	0.0	0.0	0.00	0.02	59.5
West: McGinn Road (W)											
8	T1	347	0.6	0.194	0.2	LOS A	0.2	1.4	0.07	0.03	58.9
9	R2	20	0.0	0.194	7.2	LOS A	0.2	1.4	0.07	0.03	53.5
Approach		367	0.6	0.194	0.5	NA	0.2	1.4	0.07	0.03	58.7
All Vehicles		828	0.6	0.201	1.0	NA	0.3	2.2	0.07	0.09	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2020 AM With School Growth]

Forecasted Traffic Volume
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Persimmon Street (S)											
10	L2	39	0.0	0.080	6.9	LOS A	0.3	1.9	0.47	0.70	42.3
12	R2	22	0.0	0.080	11.2	LOS B	0.3	1.9	0.47	0.70	47.2
Approach		61	0.0	0.080	8.4	LOS A	0.3	1.9	0.47	0.70	44.5
East: McGinn Road (E)											
1	L2	36	0.0	0.215	5.6	LOS A	0.0	0.0	0.00	0.05	56.8
2	T1	377	2.2	0.215	0.0	LOS A	0.0	0.0	0.00	0.05	59.1
Approach		413	2.0	0.215	0.5	NA	0.0	0.0	0.00	0.05	58.8
West: McGinn Road (W)											
8	T1	472	1.1	0.283	0.3	LOS A	0.6	3.9	0.13	0.06	58.0
9	R2	49	0.0	0.283	7.6	LOS A	0.6	3.9	0.13	0.06	52.5
Approach		521	1.0	0.283	1.0	NA	0.6	3.9	0.13	0.06	57.6
All Vehicles		995	1.4	0.283	1.3	NA	0.6	3.9	0.10	0.10	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2020 PM With School Growth]

Forecasted Traffic Volume
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Persimmon Street (S)											
10	L2	36	0.0	0.094	6.9	LOS A	0.3	2.2	0.48	0.72	42.5
12	R2	37	0.0	0.094	9.6	LOS A	0.3	2.2	0.48	0.72	47.4
Approach		73	0.0	0.094	8.3	LOS A	0.3	2.2	0.48	0.72	45.4
East: McGinn Road (E)											
1	L2	15	0.0	0.207	5.6	LOS A	0.0	0.0	0.00	0.02	57.2
2	T1	385	0.8	0.207	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		400	0.8	0.207	0.2	NA	0.0	0.0	0.00	0.02	59.5
West: McGinn Road (W)											
8	T1	353	0.6	0.198	0.2	LOS A	0.2	1.6	0.08	0.04	58.8
9	R2	22	0.0	0.198	7.3	LOS A	0.2	1.6	0.08	0.04	53.4
Approach		375	0.6	0.198	0.6	NA	0.2	1.6	0.08	0.04	58.6
All Vehicles		847	0.6	0.207	1.1	NA	0.3	2.2	0.08	0.09	57.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix 13

Acoustic Assessment

Department of Housing and Public Works

Queensland Government

Acoustics Noise Vibration
122 Arrabri Ave
Mt Ommaney QLD 4074

0466 300 931
david.borgeaud@acousticsnv.com.au
www.acousticsnv.com.au
ABN: 23102422446

30 March 2018
Ref: 0204 Ferny Grove SHS new bldg AIA Rpt 01

Attention: David Honeywill

Honeywill Consulting Pty Ltd
1 Fort Lane
Milton QLD 4064

Dear Sir,

RE: FERNY GROVE STATE HIGH SCHOOL – NEW BUILDINGS

– ACOUSTIC IMPACT ASSESSMENT

This report presents the results of the acoustic impact assessment undertaken by Acoustics Noise Vibration for the proposed new buildings at Ferny Grove State High School.

INTRODUCTION

The Department of Education and Training proposes to build two new buildings at Ferny Grove State High School. Figure 1 shows the location of the new buildings on the school site. The new Learning Centre building comprises three floors with science laboratories, teaching spaces, staff areas, and an undercroft space on ground level that may be developed in the future into additional teaching spaces. The three storey building will be located near the existing science and english buildings. The new Hall is proposed to be located near the school oval. The brief for the new hall is still being developed and drawings are not available for the hall at this stage.

The Learning Centre building will have off-site noise sensitive receptors (houses) located on Persimmon Street (40m to nearest residential boundary) that may be affected by school noise. Houses are also located across McGinn Road, but these are further from the new building and McGinn Road is considerably busier than Persimmon Street. The houses on Persimmon Street would presently experience school noise from:

- the existing modular teaching building on Persimmon Street (20m from the residential boundary) and English building (15m from the school/residential boundary);
- staff cars in the staff car park (30m from the residential boundary); and
- students and staff entering the school ground via the Persimmon Street gate.

This assessment considers potential noise impacts that may be caused by the Learning Centre building on houses along Persimmon Street. The new Hall is located a considerable distance (over 150m) from the nearest residential boundary across the school oval, and is not assessed further in this report.

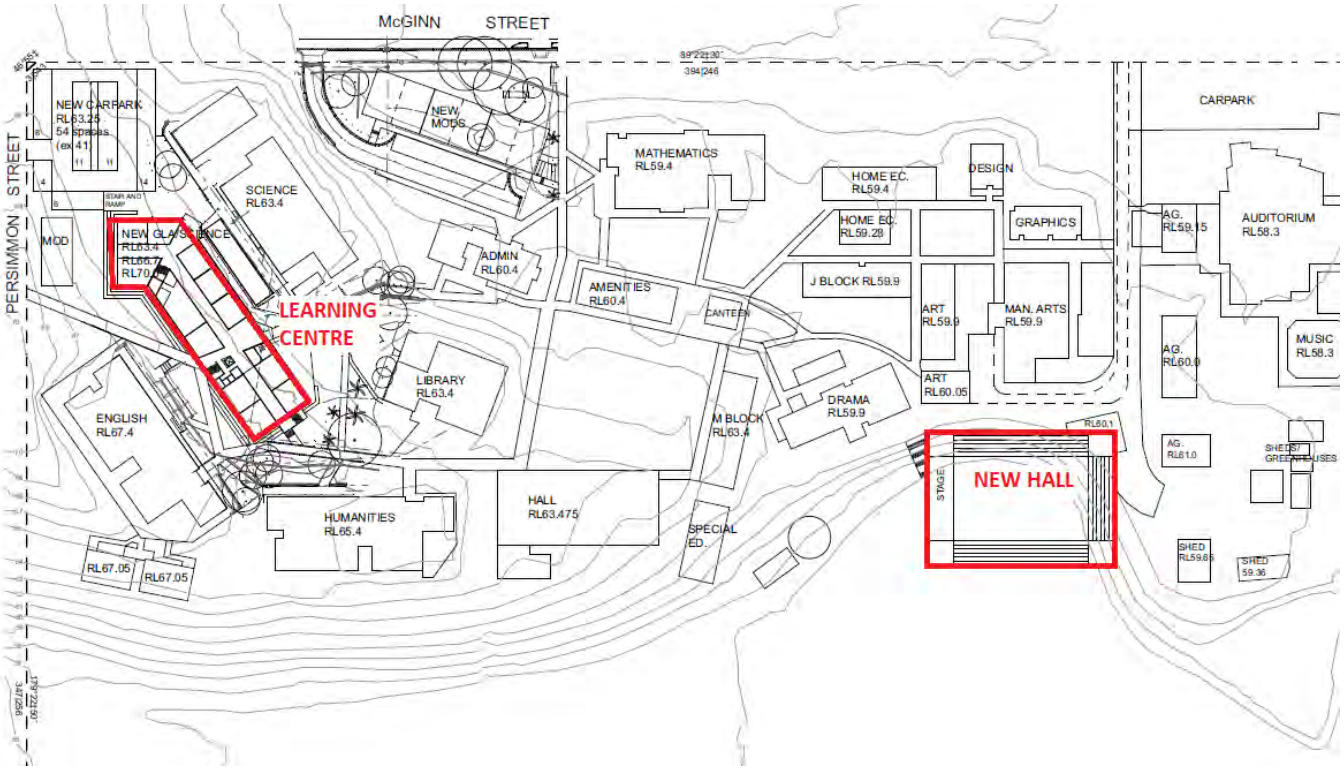


Figure 1 Site Plan

NOISE MONITORING

Ambient noise monitoring was undertaken from 27 February – 2 March 2018, at Location L1 as shown in Figure 2. The location was chosen to be representative of the nearest residential premises along Persimmon Street. Noise levels at the logger location included traffic on McGinn Road, birds, aircraft flyover and occasional distant voices from students.

Figure 2 Locality Plan and Noise Monitoring Location

Background (BG or L_{A90}) noise data was processed in accordance with Brisbane City Council's *Brisbane City Plan 2014, Noise Impact Assessment Planning Scheme Policy* to calculate the Rating Background Level (Department of Environment and Heritage Protection's document *Planning for Noise Control* uses a similar procedure). Meteorological data from the Bureau of Meteorological Brisbane station was used in the validation of the background noise data.

The background noise levels expressed as Rating Background Levels[1] are presented in Table 1.

Table 1 Rating Background Levels dB(A)

Location	Day 7am – 6pm	Evening 6pm – 10pm	Night 10pm – 7am
L1	44	44	37

[1] The rating background level is a single figure for each time period that represents the typical minimum LA90 levels for day, evening and night time periods. It is the median of the lowest 10th percentile of the LA90 levels.

NOISE CRITERIA

The assessment has considered both DEHP and BCC criteria. In *Brisbane City Plan 2014*, the school site is zoned Community Facilities – Education Purpose, and the nearest residential lots on Persimmon Street are zoned Low Density residential. The *Community Code* sets criteria based on $L_{A\ eq\ adj}$ = BG + 3dBA, with upper limits for the criteria of: Low Density residential zone = 55dBA day, 45dBA evening, 40dBA night.

The *Environmental Protection Act* section *440U Air Conditioning Equipment* – sets criteria of BG + 5dB(A), 7am to 10pm, and BG + 3dB(A) from 10pm to 7am. Section *440W Indoor Venues* sets the criteria of BG + 5dB(A), 7am to 10pm, and BG + 3dB(A) from 10pm to Midnight, and "inaudible" from Midnight to 7am. However 440W notes that the 7am – 10pm criteria do not apply if the "building is, or is part of, an educational institution, and the use of the building as an indoor venue is organized by or for the educational institution for non-commercial purposes of the institution". The *Environmental Protection (Noise) Policy* sets acoustic quality objectives for residential and other uses. The external acoustic objective for a dwelling is 50dB(A) for day and evening periods. These can be used to set upper limits for noise criteria developed using the Environmental Protection Act.

The Learning Centre building is expected to be used during the day time period (7am to 6pm) and the noise assessment is based on the criteria that apply during this period.

Using the measured rating background levels, the project criteria are presented in Table 2.

Table 2 Noise Criteria dB(A)

Criteria Source	**Day** **7am – 6pm**
DEHP EP Act & EPP Noise	49
BCC City Plan 2014	47
PROJECT CRITERIA	47

NOISE ASSESSMENT

The Learning Centre building will include sixteen new teaching spaces, four science labs, outdoor collaborative spaces and staff room on Levels 1 and 2, and an undercroft space on the ground level that will be used as an area for students during recess and may be developed in the future into ten additional teaching spaces. The typical floor plan is shown in Figure 3, and a section is shown in Figure 4.

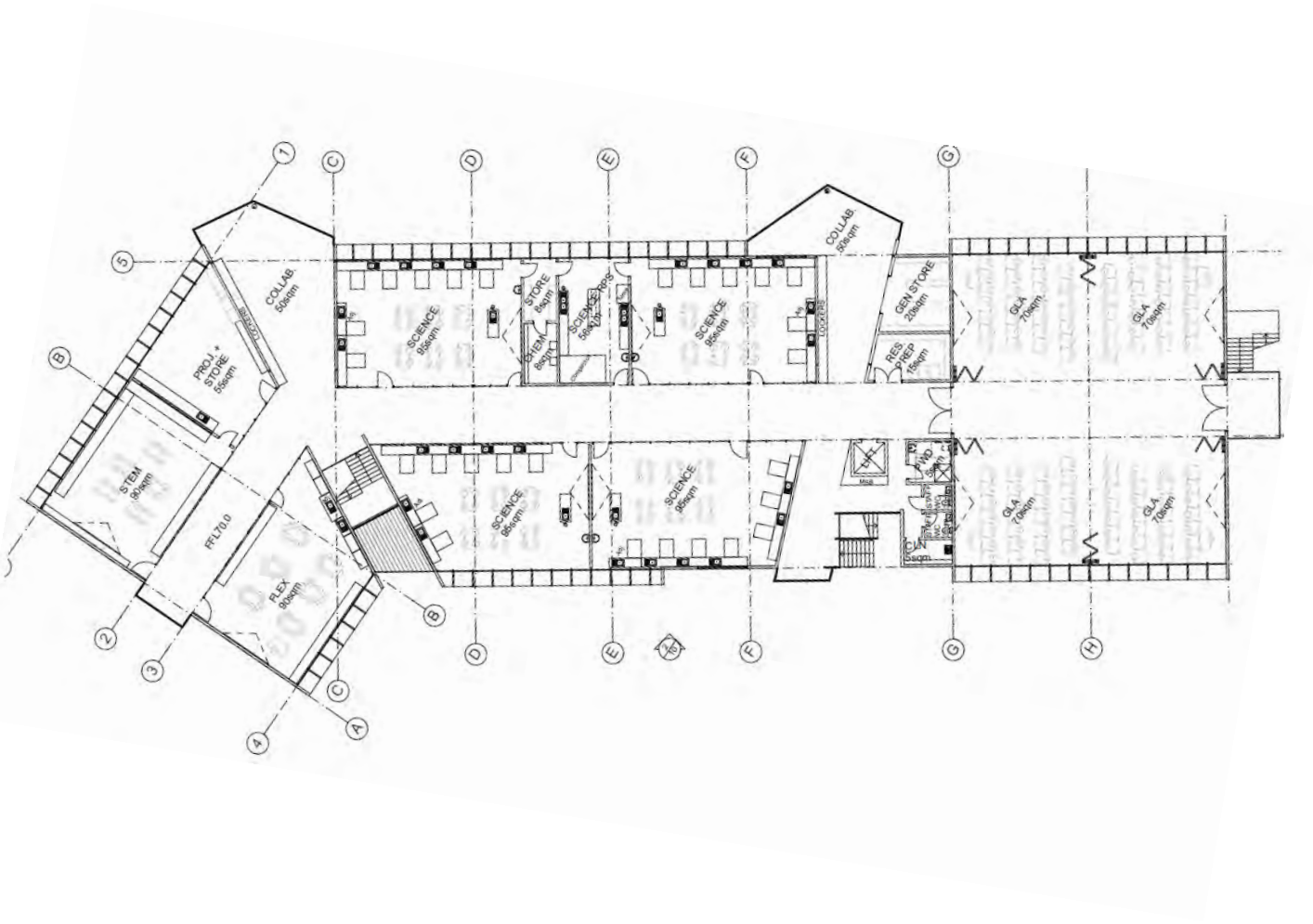


Figure 3 Typical Floor Plan

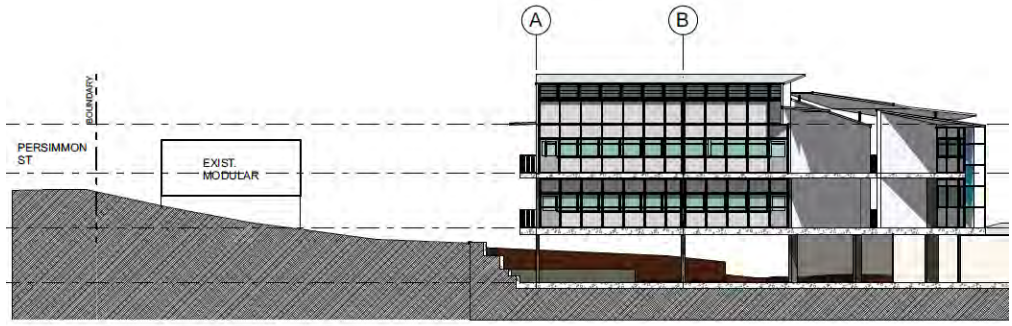


Figure 4 Section through Learning Centre to Persimmon Street

Noise generated by the Learning Centre building will include:

- Students and teachers in classes on Levels 1, 2 and Ground level in the future;
- Students and teachers in the collaboration spaces and corridors on Levels 1 and 2;
- Students in the undercroft on the ground floor and on the terraced retaining walls around the building (as shown in Figure 4); and
- Mechanical Plant.

Teaching Spaces

Noise from students and staff inside the teaching spaces and laboratories is not expected to be significant at houses along Persimmon Street as the building has solid walls facing in this direction, and the combination of cutting the building into the ground and retaining the existing modular building will reduce noise levels at the residential boundary. The rooms may be air conditioned in the future which will further reduce any noise radiating from the rooms.

Collaboration Spaces and Corridors

Noise from students and teachers in the covered collaboration spaces on Levels 1 and 2, will be reduced at the nearest houses due to the design of the building. Collaboration spaces have been located to face away from the houses towards the science building. Noise from students and staff in the corridors on Level 1 will be reduced by the combination of cutting the building into the ground and retaining the existing modular building which will act as a noise barrier. The Level 2 corridor may have line of sight over the modular building to the residential boundary, however student noise will only occur for short periods between classes. The corridor construction may include acoustic absorption panels to reduce the buildup of reverberant noise, which will further reduce student and staff noise radiating to houses.

Undercroft and Terraces

Noise from students in the undercroft and on the terraced retaining walls near the new building will be reduced by the combination of cutting the building into the ground and retaining the existing modular building which will act as a noise barrier. It is expected that these spaces will mainly be used during recess between classes. The ceiling construction to the undercroft may include acoustic absorption panels to reduce the buildup of reverberant noise.

Mechanical Plant

Plant associated with air conditioning and ventilation for the new building will be located and selected to meet the noise criteria provided in Table 1, at the nearest residences. The condenser plant is planned to be located away from the nearest houses, and the combination of cutting the building into the ground and retaining the existing modular building will act as a noise barrier.

CONCLUSIONS

It is concluded that school noise from the new building can be minimized and mechanical plant can be selected to meet the Environmental Protection Act, Environmental Protection Policy and Brisbane City Council criteria, with the constructions described in this report.

RECOMMENDATIONS

It is recommended that the building constructions described in this report be incorporated into the building design, documentation and construction, and that mechanical plant be selected to achieve the noise criteria at the nearest houses on Persimmon Street.

Yours sincerely,
Acoustics Noise Vibration

David Borgeaud
Principal Acoustics Engineer

Appendix 14

Koala Self-Assessable Management Plan

Department of Housing and Public Works

Queensland Government

KOALA SELF-ASSESSABLE MANAGEMENT PLAN

FERNY GROVE STATE HIGH SCHOOL
ADDITIONAL ACCOMMODATION

FOR

DEPARTMENT OF EDUCATION

JUNE 2018

PN: 84250
SN: 21097

DOCUMENT CONTROL

Koala Self-Assessable Management Plan

Project:	Additional Accommodation	Project number:	84250
Site:	26 McGinn Road, Ferny Grove	Site number:	21097

Version	Date	Status	Key changes	Author/s	Reviewer/s	Approver
Rev 0	11/06/2018	Initial Issue	-	Azadeh NIA	Norman WONG	Norman WONG

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1.0 INTRODUCTION

The *State Government Supported Community Infrastructure Koala Conservation Policy 2017* (The Policy) regulates the planning and delivery of all Queensland Government supported infrastructure projects, as listed under Schedule 5 of the *Planning Regulation 2017*, within the South East Queensland Koala Protection Area (SEQKPA)[1] which result in:

- The clearing of native vegetation that will result in a total cleared area of less than 500m^2
- A new building and any reasonably associated infrastructure with a total development footprint of less than 500m^2
- An extension to an existing building and any reasonably associated infrastructure if the extension results in a total development footprint of less than 500m^2
- Extracting gravel, rock or sand from an area of less than 5000m^2
- Excavating or filling an area of less than 5000m^2

This Koala Self-Assessment and Management Plan, details actions that must be implemented in order to meet the requirements and outcomes of The Policy. The responsibilities of Government supported Community Infrastructure providers under The Policy are:

- Self-assess their obligations under this policy and in accordance with any associated guidelines;
- Maintain accurate records of self-assessment appropriate for assessment and reporting purposes;
- Provide access to those records and any other relevant information used in the self-assessment of infrastructure requirements under the policy for the purposes of an annual review and assessment process;
- Provide environmental offsets as specified in the Environmental Offsets Offset Policy; and
- Where offsets are provided by planting new koala trees, ensure plantings are secured in a way consistent with section 29 of *Environmental Offsets Act 2014*.

This management plan provides strategies to address the objectives and intended outcomes of The Policy, taking into consideration the Koala habitat and connectivity values as determined under Schedule 2 of The Policy. This management plan must be considered in all relevant phases of the project and a copy of the document must be provided to relevant people involved in the project including project managers, principal design consultants, landscape architects and construction contractors. Records to demonstrate implementation of measures are to be kept.

[1] The SEQKPA includes the following local government areas:

- Sunshine Coast Regional Council
- Moreton Bay Regional Council
- Brisbane City Council
- Redland City Council
- Ipswich City Council
- Logan City Council
- Gold Coast City Council
- Noosa Shire Council

2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

Department of Education propose to establish additional accommodation on the site of the existing Ferny Grove State High School (SHS). It is anticipated that a growth in student numbers will be expected over the coming years and therefore there is a need to cater for this additional capacity.

Ferny Grove SHS is located at 26 McGinn Road, Ferny Grove within the Brisbane City Council local government area. It is described as Lot 106 on SP259861. The School is consisted of an irregular-shaped allotment which is bound by McGinn Road to the north, residential dwellings to the west, Brisbane Tramway Museum to the eat and rural residential allotments to the south. Cedar Creel crosses the school site and runs along the southern boundary of the site to the south of the school oval. The southern section of the site along the creek is vegetated which is connected to the vegetated areas to the east and west of the site. the northern section of the site supports existing school buildings and scattered trees. The project scope includes the following:

a) Construct a new multi-storey Senior Learning Centre;
b) Learning spaces to be flexible and open, include lots of glass and adaptable spaces that can open up to provide a large area of senior testing;
c) Provide covered link access from the new building to the spine of the school;
d) Remove relocatable buildings 34 (1 science space) and 21 (2 GLAs), plus 04 (2 GLAs) if required, to create a building platform;
e) Consideration needs to be given to redirecting student traffic, or creating pedestrian access through the building as this area is currently a thoroughfare;
f) Provide 3 or 5 spaces in hire buildings to decant classes to (number is dependent on whether building 04 needs to be removed).
g) Note – additional hire facilities may be required for the start of school in 2019 so consideration should be given to fitting as many hire spaces as possible in this footprint.

Figure 1. Ferny Grove State High School – Aerial Imagery (Google)

3.0 COMMUNITY INFRASTRUCTURE ASSESSMENT

The proposed works will have a total development footprint of more than 500 square metres (m^2), therefore, the development is regulated by The Policy and requires assessment against the criteria listed in Table 1 of that Policy with consideration given to the Koala Habitat in South East Queensland Map (SEQ) (State Planning Policy (SPP) Mapping).

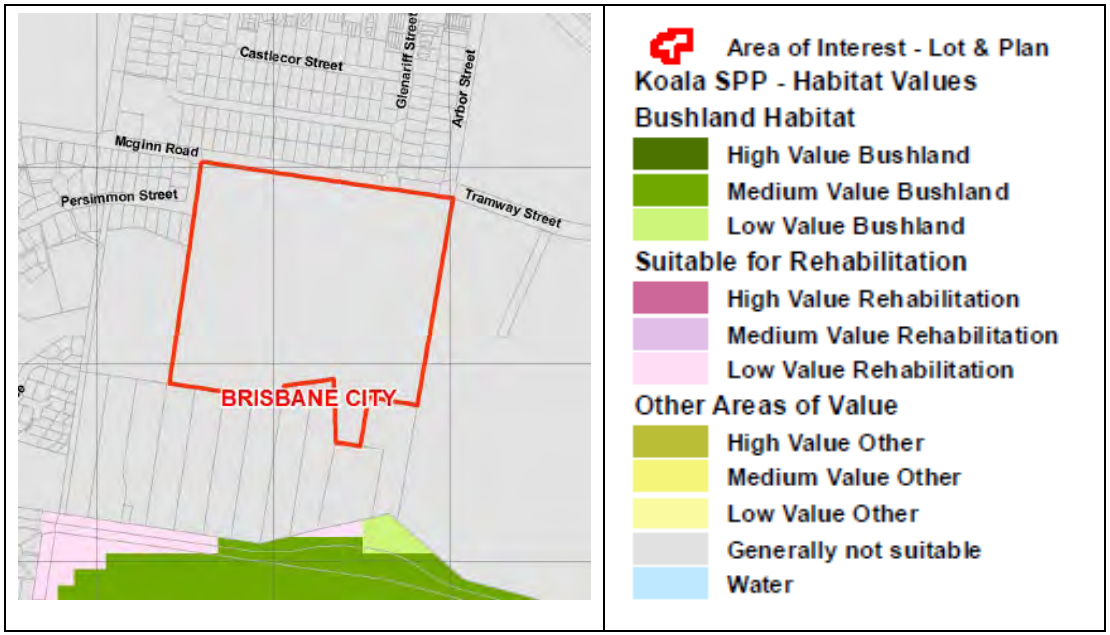
Criteria	Outcome
1. Site design must avoid clearing Non-juvenile Koala Habitat Trees (NJKHTs) in areas of bushland habitat, high value rehabilitation habitat, and medium value rehabilitation, with any unavoidable clearing minimised and offset: - The size and other characteristics of the offset must be as required by the Environmental Offset Policy; and - Where an offset is delivered as a land-based offset, the site must be secured as a legally secured offset area as defined by Section 29 of the *Environmental Offsets Act 2014*.	• The entire site is mapped as 'Generally not suitable' for Koala on the Koala Habitat Map (SPP). However, the southern part of the site supports areas of mapped 'least-concern' and 'of-concern' regional ecosystems that are essential habitat for Koala. Proposed development is not within this mapped area. • Under the *Environmental Offsets Act 2014*, offsetting is not required in the 'Generally not suitable' area. Clearing of NJKHTs within this area would not trigger offset requirements.
2. Site design provides safe Koala-movement opportunities, including Koala-movement infrastructure, as appropriate to the development type and habitat connectivity values of the site determined by reference to the factors for consideration in Schedule 3 of the Community Infrastructure Policy.	• The site and its immediate surroundings are mapped as generally not suitable for koala. Vegetation on site is however mapped as essential habitat for koala and is connected to mapped bushland habitat areas to the south of the school. • The area of the site subject to this assessment supports existing school buildings and is heavily disturbed; however, the southern part of the site supports vegetation (along the creek) which is connected to vegetated areas to the south, west and east of the site. These areas are not identified as koala habitat However, they provide connection between the school site and mapped bushland habitat for koala.
3. Native vegetation clearing is undertaken as sequential clearing and under the guidance of a Koala spotter where the native vegetation is a NJKHT.	• The site does not support areas of mapped koala habitat. • Any vegetation clearing on site should be towards the vegetated area and away from school buildings to provide opportunity for fauna including koala (if any) to leave the site.
4. During construction phases: • Measures are taken in construction practices to not increase the risk of death or injury to Koalas; and • Native vegetation that is cleared and in an area intended to be retained for safe Koala movement opportunities is progressively restored and rehabilitated.	• In case of vegetation clearing, the measures described in this report are to be implemented during the construction phase including: - Vegetation that does not require removal must be clearly identified and protected from construction activities; - Immediately prior to any vegetation clearing activity on the site (and no more than 24 hours before clearing commences), a QPWS licenced fauna spotter/catcher in possession of a valid

	Rehabilitation Permit, must inspect vegetation for the presence of Koalas and other fauna. The QPWS fauna spotter/catcher must continue to monitor vegetation for fauna for the duration of clearing activities; - Vegetation should be cleared towards areas of mature vegetation that may be suitable as refuge to allow fauna in residence time to move from the proposed development portion of the site.
5. Landscaping activities provide food, shelter and movement opportunities for Koalas consistent with the site design (if applicable).	• Landscaping included in project designs to consider the inclusion of Koala habitat tree species (including any species from the genus Eucalyptus, Corymbia, Angophora, Lophostemon and Melaleuca); and

4.0 KOALA HABITAT AND CONNECTIVITY VALUE ASSESSMENT

This section has been prepared to in accordance with Schedule 2 of The Policy, using the Koala Habitat in SEQ Map. The figure below is an excerpt from the Koala Habitat in SEQ Map which indicates the site is mapped as 'Generally Not Suitable' for Koalas (refer to Attachment E).

The table below has been developed to determine the habitat connectivity values of the site, taking into account factors described under Schedule 2 of The Policy:



The Site's location with regards to the following:		
Criteria	Condition Assessment	Management Strategy
a. areas of vegetation that are a koala habitat type—with particular focus on bushland habitat, high value rehabilitation habitat, and medium value rehabilitation habitat	The site supports as existing school, is mapped as 'Generally not suitable' for koala.	Prior to the commencement of construction, prepare a Construction Management Plan (CMP) which addresses the requirements of the environmental checklist report prepared for the proposed development by BAS Town Planning and Environment Team (November 2017).
b. areas that are remnant or regulated regrowth regional ecosystems where koalas are known to occur	Vegetation along the creek running across the southern part of the site is mapped as 'of- concern regional	Remnant vegetation on site is not identified as koala habitat. Development is proposed to be away from this area. works should address the requirements of the

	ecosystem' and it is of 'High ecological significance' under the planning scheme (Attachment E)	environmental checklist report prepared for the proposed development by BAS Town Planning and Environment Team (November 2017).
c. areas of ecological significance	Yes, refer above	Refer above
d. waterway and ecological corridors.	Yes, refer above	Refer above
The attributes of the site, including the following:		
Criteria	Condition Assessment	Management Strategy
a. presence of koalas	There are no records available indicating the presence of Koala on site. However, the southern portion of the site supports vegetation that is essential habitat for koala.	Before work begins, identify the contact details of: - The nearest qualified veterinary clinic that has experience in handling and treating Koalas. The practice must have a valid Rehabilitation Permit, issued under the Nature Conservation Act 1992 by EHP, and must comply with established standards for the rehabilitation and release of Koalas; and - A QPWS licensed fauna spotter/catcher. If a Koala (or other fauna) is present on the site: - The tree in which a Koala is present cannot be cleared, and no tree with a crown overlapping the tree can be cleared; - Works are to cease and the Koala is to be allowed to move away from the development site of its own accord; - No clearing is to be undertaken for a period of at least 12 hours (starting at 6pm on a day and finishing at 6 am on the following day); - The QPWS fauna spotter/catcher must be consulted regarding further actions required for any Koala identified on the site; and - The QPWS fauna spotter/catcher must be consulted regarding any actions required in regard to the relocation of any other resident fauna species; and - If a Koala is injured, the QPWS fauna spotter/catcher is to provide direction on how the animal is to be taken to the veterinary practice identified.

b. condition of the habitat	Poor in the proposed area High ecological significance in the southern part of the site which is not to be disturbed in accordance with the project brief.	Extra care such as sediment control (in accordance with the project Erosion and Sediment Control Management Plan), runoff, dust and noise do need to be taken into consideration to make sure that the high ecological significant areas will not be impacted on by the proposed development.
c. the presence of any of the following on the site: i. waterway and ecological corridors ii. areas that are remnant or regulated regrowth regional ecosystems where koalas are known to occur.	Yes, Cedar creek runs across the southern section of the site (refer to Attachments E and F)	Refer above
Any factors which diminish the site's habitat connectivity value for koala movement, including:		
Criteria	Condition Assessment	Management Strategy
a. edge effects and other indirect impacts of development on ecological features	The site is surrounded by vegetated areas. Vegetation on site and adjacent to the site is not mapped as koala habitat. However, it is connected to the mapped koala habitat areas.	The proposed development should be undertaken considering requirements of the Environmental Checklist Report prepared for the proposed development to ensure environmental obligations are met under the *Environmental Protection Act 1994* and to prevent causing environmental harm.
b. the presence of infrastructure and services, such as roads, which present barriers for koala movement and dispersal.	The site is mapped as 'Generally not suitable' for koala.	Due to the connection between the vegetation on the site and koala habitat areas mapped to the south of the site, it is advised to consider koala friendly fencing for the school (at least the southern half of the site) to allow potential koala movement and ensure koalas are not trapped inside the school site in case they entre the site. This could be achieved by positioning a small number of timber poles (at least 125mm in width or diameter) against the western and eastern fence are recommended to be positioned at an angle to the fence to assist koalas to leave the site (refer to example below) and enter koala habitat areas.

			Figure 1: Koala-friendly fencing additions (source: KSD Guideline - Department of Environment and Science)

ATTACHMENTS – SITE INFORMATION

- Aerial Photograph
- Proposed Development
- Vegetation Management Report
- Koala Habitat Mapping


McGINN ROAD
PERSIMMON STREET
ARBOR STREET
Ferny Grove State High School
© State of Queensland 2017
Google earth
Tour Guide
2001
Imagery Date: 7/19/2017 27°24'26.05" S 152°56'02.22" E elev 59 m eye alt 650 m

Queensland
Government

Ferny Grove State High School

Facilities Brief
Additional Accommodation
6 Full Cohort Program

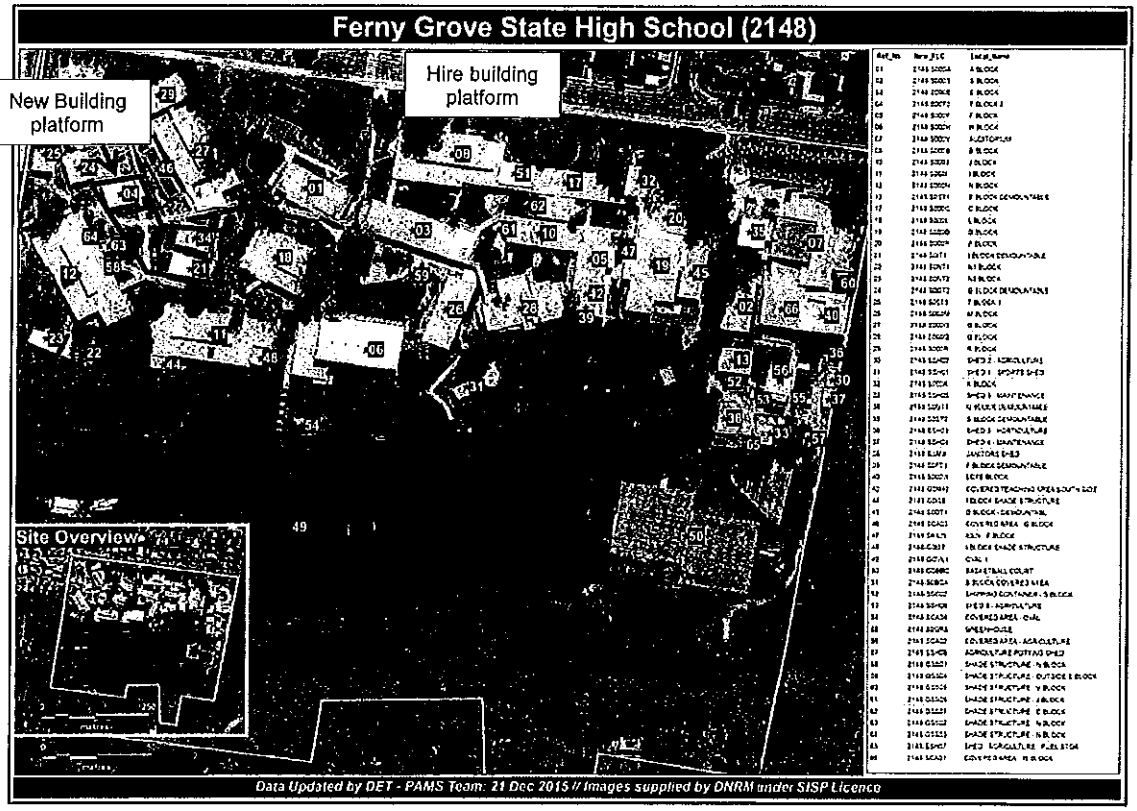
November 2017

Contents

Project Scope

Functional Requirements

a) Construct a new multi-storey Senior Learning Centre as detailed in the Space Allocation table;
b) Learning spaces to be flexible and open, include lots of glass and adaptable spaces that can open up to provide a large area for senior testing;
c) Provide covered link access from the new building to the spine of the school.
d) Remove relocatable buildings 34 (1 science space) and 21 (2 GLAs), plus 04 (2 GLAs) if required, to create a building platform.
e) Consideration needs to be given to redirecting student traffic, or creating pedestrian access through the building as this area is currently a thoroughfare.
f) Provide 3 or 5 spaces in hire buildings to decant classes to (number is dependent on whether building 04 needs to be removed).
g) Note – additional hire facilities may be required for the start of school in 2019 so consideration should be given to fitting as many hire spaces as possible in this footprint.



Project Overview

Centre Information

Campus:	Ferny Grove State High School
Region:	Metropolitan Region
Project Numbers:	34-151018
Project Description:	Additional Accommodation – 6 Full Cohort Program
Project Status:	Planning and Construction

Purpose

The purpose of this facilities brief is to identify and outline the functional spaces required at the enrolment managed Ferny Grove State High School. This will enable Infrastructure Delivery to engage consultants to prepare a Schematic Design Project Proposal (SDPP) and Contract Documentation including a cost estimate and project program for the works outlined in the brief.

Background

Ferny Grove State High School is located on McGinn Road, Ferny Grove.

In 2007 the non-compulsory Prep Year was introduced to Queensland schools and in the following year the Year 1 starting age was subsequently raised. Consequently, a smaller cohort of students, often referred to as the half cohort, was introduced to Queensland state schools.

Over the following years this cohort of students has increased in size and across the state schooling sector now reflects approximately two thirds the size of a usual year level cohort.
In 2015, this smaller cohort of students entered Year 8 along with the first group of Year 7 students in secondary schools as part of the Flying Start suite of reforms. The half cohort, currently in Year 10, will enter Senior Secondary in 2018 and will exit the system at the end of the 2019 school year, creating six full cohorts across secondary schools for the first time in 2020.

An analysis of infrastructure requirements for 2020 indicates additional capacity is needed in number of schools across the State, including Ferny Grove State High School. To accommodate the six full cohorts in 2020, it is proposed to provide the school with a new Learning Centre incorporating a number of learning spaces and associated spaces as detailed in the Space Allocation table in section 2 below.

Demographic/Enrolment Data

At the February 2017 census, the enrolment count at Ferny Grove SHS was 1772 students. The school's current Built Capacity is 2122 and the current Student Enrolment Capacity is 1745. It is forecast that the school will grow to beyond 2080 students by the year 2020.

Space Allocation

The table below details the space allocation required for the new Senior Learning Centre at Ferny Grove State High School.

Functional Spaces	Number of Spaces	Area M² / Space	Total Enclosed Area	Total Unenclosed Area
LEVEL 2				
General Learning Area	4	70	280	
Resource Prep & Store	1	40	40	
STEM Studio	2	90	180	
Project Store	1	30	30	
Collaborative Space	2	50		100
Science laboratory	3	95	285	
Preparation Room - Science	1	40	40	
Chemical Store	1	8	8	
Resource Store – Science	1	8	8	
Flexible Learning Area	1	90	90	
PWD Toilet with shower	1	5	5	
Staff Toilet – unisex	1	3	3	
Cleaners Store	1	5	5	
General Store	1	20	20	
Total – Level 2			**994**	**100**
LEVEL 1				
General Learning Area	10	70	700	
Resource Prep & Store	1	40	40	
General Store	1	20	20	
Collaborative Space	2	50		100
Staff Work Room	1	75	75	
Office - HOD	1	12	12	
Office – Year coordinator	1	12	12	
Interview Room	1	12	12	
Kitchenette	1	5	5	
Staff Toilet - unisex	1	3	6	
PWD Toilet	1	5	5	
Data Room	1	15	15	
Cleaners Store	1	5	5	
Total – Level 1			**907**	**100**
GROUND				
Male Student Toilets	4	3	12	
Female Student Toilets	4	3	12	
Handwashing Area	2	8		16
Under croft* – future proofed and designed for further 10 learning spaces with associated spaces and				**1000**

circulation				
Total – Ground Level			**24**	**1016**
TOTAL FUNCTIONAL AREA			**1925**	**1216**

*Under croft is required to be a minimum of 3.3 metres from ground to ceiling to allow for services for future classroom fit outs.

Built Environment Considerations

Consideration needs to be given to the following built environment considerations:

- The general requirements of construction, materials and planning are to comply with latest version of DET Design Standards.
- The building design solution is to deliver educationally functional, fit for purpose, comfortable, healthy facilities that inspire student learning and support the delivery of modern curriculum initiatives.
- The design and construction is to be an appropriate mix of innovation and cost effective solutions, which take into account the character of the site landscape and the existing buildings whilst achieving a contemporary feel.
- Materials, finishes and services need to be durable and low maintenance consistent with the high wear and tear encountered in the school environment. Particular attention must be given to the durability of wall surfaces where students lean on and kick.
- High wear surfaces such as balustrades and columns where galvanised should be left unpainted.
- Minimisation of life-cycle costs is a priority when considering capital cost. Refer to DET Design Standards 4.1.4.2 regarding Life Cycle Durability.
- Site planning, site services and building design solutions should be responsive to the local environment and incorporate where feasible the principles of Environmental Sustainable Development (ESD). The building fabric, thermal insulation, sun shading and natural ventilation measures are to be designed to maximise passive thermal performance to achieve optimal comfort conditions taking into account the climatic conditions in the locality. Roof rainwater should be connected to existing rainwater collection system.
- Direct sun penetration should be excluded from Classroom spaces between 9am and 3pm. External sun shading devices are to be designed to effectively exclude direct sun while still allowing daylight into the rooms and view to outside.
- Disabled access is to comply with the requirements of AS 1428.1 and the requirements of the Disability Discrimination Act as recommended by an acknowledged expert consultant in this field.
- The design of landscaping between and around buildings is to take into consideration the heavy wear encountered in the school environment, the impact on maintenance and the long term viability of planting and grassed areas.
- Generally the extent of garden beds to be kept to a minimum and pedestrian paths are to be located to suit logical traffic routes. Attention needs to avoiding gardens and mulching up against buildings to achieve termite control.
- The design of the covered links is to maintain protection from weather, particularly the wind driven rain.
- Covered links also need to be designed to prevent birds roosting on exposed roof framing and also to prevent people from swinging on frames.
- Downpipes and their fixings to support frames are to be durable and robust. Hot dip galvanized steel pipe with recessed fixings is a preferred solution.
- The buildings and associated structures such as stairs, verandas, bag racks, sunscreens, handrails etc must be designed to discourage unauthorised climbing on to roofs.

Indicative Cost Plan Budget Allocations

Total Project Budget
$13,600,000

Furniture, Equipment and Resource Allowance
A notional budget of $220,000 should be allowed in the project budget to provide for new furniture and equipment.

Resource Grant
The project budget is to include a cash grant to the school of $115,000 for the purchase of essential educational and operational resources to ensure that the new facilities are functional upon opening.

Network Hardware
An allowance of $20,000 should be made in the cost plan.

Phone System
An allowance of $10,000 should be made in the cost plan.

Deliverables
The following is required:

- Site plan showing location of new infrastructure;
- Schematic Design Project Proposal (SDPP) including a preliminary floor plan layout and Indicative Cost Schedule for each building;
- Indicative Program for delivery.

Timeframe
Subject to financial approvals, all infrastructure is required for the start of the 2019 school year if achievable, or as early as possible if not.

Further Information/Contact
For any further information regarding this facilities brief, please contact:

Ariane Moore
Infrastructure Programs and Delivery
Department of Education and Training
☎ 3034 4813
☎ 0401 676 033
ariane.moore@det.qld.gov.au

Endorsement

This Brief is endorsed by:

Mark Breckenridge School Principal	*Signature*	2/11/17 *Date*
Loretta Mooney Infrastructure Advisor	*Signature*	7/11/2017 *Date*
Ariane Moore Planning Officer	*Signature*	*Date*

Koala Habitat in South East Queensland

Lot and Plan

Koala SPP - Habitat Values

Bushland Habitat
- High Value Bushland
- Medium Value Bushland
- Low Value Bushland

Suitable for Rehabilitation
- High Value Rehabilitation
- Medium Value Rehabilitation
- Low Value Rehabilitation

Other Areas of Value
- High Value Other
- Medium Value Other
- Low Value Other
- Generally not suitable
- Water

South East Queensland Koala Habitat Values western SEQ
- Bushland Habitat
- Suitable for rehabilitation
- Other areas of value
- Generally not suitable
- Water
- Cadastral Boundaries
- Local Government Boundaries

LOCALITY DIAGRAM

N

0 130 260 390 520 650 m

This product is projected into GDA 1994 MGA Zone 56

Based on or contains data provided by the State of Queensland 2010.

Note - These maps are not regulatory. Regulatory maps and requirements can be downloaded from the EHP website. Further information in relation to regulatory requirements for development and planning activities should be sought from the relevant Local Government Authority or the Department of Environment and Heritage Protection.

Appendix 15

Bushfire Assessment and Management Plan

Department of Housing and Public Works

Queensland Government

NATURAL HAZARD ASSESSMENT - BUSHFIRE
Ferny Grove SHS - 26 McGinn Road, Ferny Grove

Client:	Department of Education and Training
Ref:	S50404ER001 Bushfire Assessment
Date:	1st May 2018

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Appendix B Bushfire Hazard Map (State Planning Policy, 2017)

Appendix C *City Plan 2014* - Bushfire Hazard Overlay BCC PSP Bushfire Hazard Table 1—Hazard Scores and Associated Fire Behaviours For Vegetation Communities

Quality Control

Prepared for: Department of Education and Training
Prepared by: S5 Consulting Pty Ltd (ABN: 74 600 187 844)
PO Box 602
Lutwyche, QLD, 4030
T (07) 3356 0550
www.s5consulting.com.au
Date: 1st of May, 2018

Version	Description	Date	Author	Verifier	Approver
01	Final	01/05/2018	TH/RS	RS	RS

Disclaimer

S5 Consulting Pty Ltd trading as S5 Environmental has developed this Bushfire Hazard and Bushfire Attack Level Assessment, taking into consideration the Australian Standard (AS 3959-2009) - Construction of building in bushfire-prone areas, the State Planning Policy and relevant local authority policies and guidelines. However, there can be no guarantee that following the recommendations made in this assessment can guarantee safety of property and human life.

Fire is an element of nature, and as such fire events (small or large) can have disastrous outcomes even with the best planning in place. The authors of this report and S5 Consulting Pty Ltd accept no responsibility for any harm to property or human life caused by fire or any other cause to persons utilising property or structures.

Abbreviations

AS	Australian Standard
BAL	Bushfire Attack Level
BCC	Brisbane City Council
BHU	Bushfire Hazard Sub-Unit
BMP	Bushfire Management Plan
CFA	Country Fire Authority
DET	Department of Education and Training
FDI	Fire Danger Index
Ha	Hectares
PSP	Planning Scheme Policy
SEQ	South East Queensland
SHS	State High School
SPP	*State Planning Policy*

1.0 INTRODUCTION

S5 Environmental was commissioned by the Department of Education and Training (DET) to conduct a Natural Hazard Assessment- Bushfire of the property located at 26 McGinn Road, Ferny Grove (Ferny Grove State High School). The property is further described as Lot 106 on SP259861 and is 13.48 hectares (ha) in area. DET proposes a new Multipurpose Hall and a new multi-storey Senior Learning Centre for the School.

The property will herein be referred to as the 'site' and is located within the Brisbane City Council (BCC) Local Government Area. This Bushfire Hazard Assessment has been compiled as environmental supporting documentation to support a Development Application to be submitted for the proposed new Multipurpose Hall and Senior Learning Centre. S5 Environmental understands that the site is mapped to contain areas of bushfire hazard within the State Planning Policy (SPP) and the BCC Bushfire Hazard overlay.

1.1 Site Description

The site is located in the suburb of Ferny Grove, which is located approximately 12 kilometers to the north west of the Brisbane Central Business District. Figure 1 below locates the site within Ferny Grove. The suburb of Ferny Grove is predominantly characterised by Low-density Residential allotments with patches of Environmental Management, Conservation, Emerging Community and Community Facilities. The entirety of the site is zoned as Community Facilities (Education Purpose) under the BCC *City Plan 2014*. The purpose of the Community Facilities Zone is to "*provide for community-related uses, activities and facilities, whether publicly or privately owned, including, for example: education establishments; hospitals; transport and telecommunication networks; and utility installations*".

A review of recent aerial photography of the subject site, shown below in Figure 2, identified that the northern half of the site contains the existing school infrastructure including multiple buildings, cement carparks and walkway access paths. Areas within the southern half of the site contain a large mown grass oval, two sporting courts and a dense Open Eucalypt Forest with Cedar Creek waterway traversing through. The site is bound to the north by McGinn Road, to the east by Cedar Creek waterway and the Brisbane Tramway Museum, to the south by large Residential allotments and to the west by large and small Residential Lots as well as Persimmon Street.

Vegetation in and around the school buildings within the northern half of the site consisted of scattered mature native canopy species as well as landscaped species. Species within this area included, but were not limited to Cadaghi (*Corymbia torreliana*), Jacaranda (*Jacaranda mimosifolia*), Foxtail Palm (*Wodyetia bifurcate*), Fig (*Ficus* spp.), *Casuarina* spp., Forest Red Gum (*Eucalyptus tereticornis*) and Leopard Tree (*Libidibia ferrea*). The densely vegetated area to the south of the site associated with the Cedar Creek waterway contained native and weed species including Camphor Laurel (*Cinnamomum camphora*), Chinese Elm (*Ulmus parviflora*) and Silky Oak (*Grevillea robusta*). Refer to Site Aerial in Figure 2.

Figure 1 Site Location

Source: Google Earth Pro. 2018.

Figure 2 Site Aerial

Source: Google Earth Pro. 2018.

1.2 Proposed Development

S5 Environmental understands that the DET are proposing a new Multipurpose Hall and Senior Learning Centre. The proposed new Multipurpose Hall development footprint will be approximately 0.23 ha in area and situated to the immediate north of the existing sporting oval and courts. For the second new building, the new Senior Learning Centre, the development footprint will be approximately 0.22 ha in area and located within the north west corner of the site over existing demountable buildings and landscaped areas. The proposed developments will provide multiple learning spaces, staff areas, amenities and storage areas for the existing SHS. Refer to the ArkLab Site Plan in Figure 3 below and in detail in the Figures Section of this report.

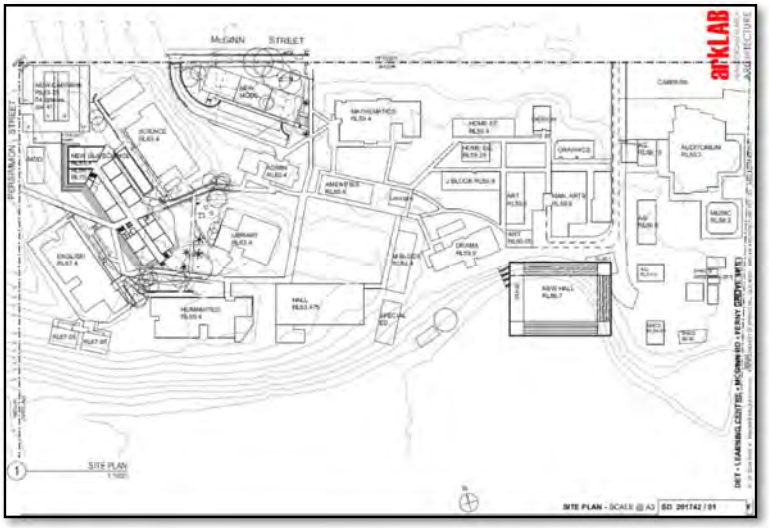

Figure 3 Site Plan

Source: Arklab Architecture (Drawing No. SD 201742/01, not dated).

1.3 Development Summary

In accordance with the Terms of Reference the following is a summary of the current and proposed Development:

Table 1 Description of Existing and Proposed Facilities

Item	Description
Site	Ferny Grove State High School
Real Property Description	Lot 106 on SP259861
Site Address	26 McGinn Road, Ferny Grove
Location and size of Existing Facilities	The existing State High School (SHS) and grounds are 13.48 ha in area. Existing facilities include classrooms, gymnasium, sports hall, library, agriculture farm, administrative buildings, covered walkways and paths, sports ovals, courts, and car parking and drop off areas.
Location and size of Proposed Facilities	The proposed facilities are a new Multipurpose Hall (approximately 2,300m^2 in area) and Senior Learning Centre (approximately 2,200m^2 in area). The size of the combined development footprint for the two new proposed facilities is approximately 4,500m^2 (refer to Figure 3 above).
Description of the boundary area by reference to Map Grid of Australia 1994 coordinates and zone references	The proposed new Multipurpose Hall facility has the following GDA94/MGA Zone 56 coordinates (x, y): 493547.9, 6968501.5; 493602.0, 6968494.7; 493595.1, 6968455.6; and 493540.5, 6968462.3.

	The proposed new Senior Learning Centre facility has the following GDA94/MGA Zone 56 coordinates (x, y): 493316.73, 6968608.61; 493311.57, 6968577.22; 493322.49, 6968575.65; 493347.61, 6968526.02; 493370.23, 6968537.24; and 493337.1, 6968605. Refer to Figure 3 above.

2.0 STATUTORY REQUIREMENTS

Bushfire Hazard management in Queensland is managed at the State and Local Government levels. At the State Level, Natural Hazards including Bushfire are addressed under the single State Planning Policy (SPP). The current SPP commenced on the 3rd of July, 2017 and replaced the SPP April 2016. The SPP outlines 17 State interests that must be considered in every planning scheme across Queensland and is divided into a number of themes.

Bushfire Hazard management is addressed under the Safety and Resilience to Hazards theme, which includes Natural Hazards, Risk and Resilience relating to Flood, Landslide, Bushfire Hazards, Coastal Erosion and Storm Tide Inundation. The SPP provides State Interest Polices and Benchmarks for each State Interest.

With specific regard to Natural Hazard and Bushfire, the SPP seeks to ensure that "*natural hazards are properly considered in all levels of the planning system. This includes avoiding or mitigating the risks associated with natural hazards to an acceptable or tolerable level, increasing community resilience, and decreasing the burden for emergency management."* The Benchmarks for Natural Hazards are that development "*in bushfire, flood, landslide, storm tide inundation or erosion prone natural hazard areas:*

a) avoids the natural hazard area; or
b) where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level."

And that *"Community infrastructure is located and designed to maintain the required level of functionality during and immediately after a natural hazard event."*

At the Local level, the site falls within the BCC Local Government Area. BCC has a Bushfire Hazard Planning Scheme Policy, effective from 30 June 2014, that provides "*information required for a development application and guidance and advice for satisfying an assessment criteria for the preparation of a site-specific bushfire hazard assessment and bushfire management plans*".

Accordingly, the Site-specific Bushfire Hazard Assessment for the site has been completed in general accordance with the BCC Bushfire PSP.

In addition, in March 2009, the Australian Standard (AS) 3959-2009 *Construction of Buildings in Bushfire Prone Areas* came into effect. This Standard puts in place a system of scoring a site's Bushfire Attack Level (BAL) based on the distance of a construction site to specific vegetation types. This Score is used to ascertain building and construction requirements for any buildings on the site.

BAL Scores are generated using the procedure specified in Section 2.0 of the AS 3959-2009, Determining the Bushfire Attack Level and are classified into the following Score categories from highest attack level to the lowest:

- BAL - Flame Zone (FZ);
- BAL - 40;
- BAL - 29;

- BAL - 19;
- BAL - 12.5; and
- BAL - LOW.

The AS 3959-2009 then provides guidance on appropriate construction materials and methods based on the BAL Score.

3.0 METHODOLOGY

The intent of this report is to provide an informed assessment of the potential bushfire hazard within the site and surrounding areas in relation to the proposed new Senior Learning Centre and Multipurpose Hall. Accordingly, S5 Environmental's approach involved both quantitative and qualitative assessments of the site in general accordance with BCC's Planning Scheme Policy. S5 Environmental's Principal Environmental Scientist and Graduate Ecologist conducted a review of the site and surroundings lands, vegetation communities, slope angles and aspects on Friday 13th of April, 2018.

A measured walkover of the entire site was achieved with a particular focus on the areas of the site mapped within a Bushfire Hazard Area. Vegetation communities were inspected in order to assess their structure, dominance, associations and connectivity to adjoining bushland. The vegetation community structure, fuel loads and potential hazards were also assessed and documented.

S5 Environmental utilised the elevations and contours indicated in the ArkLab Site Plan (attached in the Figures Section of this report) and BCC Contours from their Interactive Mapping Tool in order to complete the quantitative assessment.

Aerial photography was utilised to discern connectivity of the site to bushland areas in the locality. The *Brisbane City Plan 2014* Bushfire Hazard Overlay Map and the SPP 2017 Bushfire Hazard Area Map were reviewed prior to the field assessment in order to identify potential bushfire hazard areas.

The site-specific Natural Hazard Assessment – Bushfire (including the BAL Assessment) have been completed in accordance with the following Policies and Standards:

- BCC's *Bushfire Planning Scheme Policy* (PSP);
- SPP (1/03) Guideline Mitigating the Adverse Impacts of Flood, Bushfire and Landslide; and
- Australian Standard (AS 3959 – 2009) *Construction of buildings in bushfire prone areas*.

Accordingly, S5 Environmental's approach involved both quantitative and qualitative assessments of the site. The quantitative assessments included a review of the vegetation communities, slope and aspect. The qualitative assessments were based upon the known bushfire behaviour of the subject land.

4.0 BUSHFIRE HAZARD OVERLAYS

The *Brisbane City Plan 2014* mapping has development constraint overlays including a Bushfire Hazard Overlay map. This map and the SPP 2017 Bushfire Hazard Area Map (attached in Appendix A and B) were consulted to determine the preliminary bushfire hazard ratings of the site.

In accordance with the BCC's Bushfire Hazard Overlay, the site is mapped as containing areas of Medium Hazard and Medium Hazard Buffer associated with the Medium designation on and adjacent to the site. The Medium Hazard Area is mapped in the southern third with patches also on the western boundary. A High Hazard Buffer Area has additionally been mapped within the southern most extent of the site. Refer to Extract of BCC Bushfire Hazard Overlay in Figure 4 below.

The SPP Bushfire Hazard Area overlay has mapped areas of Medium, High and Very High Potential Bushfire Intensity with associated buffers. Areas of Medium Potential Bushfire Intensity have been mapped in three patches across the southern third with High and Very High Intensity areas being mapped within the south east corner of the site. Refer to Extract of SPP Bushfire Hazard Area Map in Figure 5 below. With respect to this project, due to areas within the school Lot being mapped as Medium Bushfire Hazard and Medium Buffer, the requirement for a site specific Bushfire Assessment is triggered.

Given this review of the available mapping, further investigation of the site-specific bushfire hazard characteristics of the site have been undertaken to determine the actual status of the site. This data is presented in Section 5.0 of this report.

Figure 4 Extract of BCC Bushfire Hazard Overlay
(BCC Interactive Mapping Tool, April 2018).

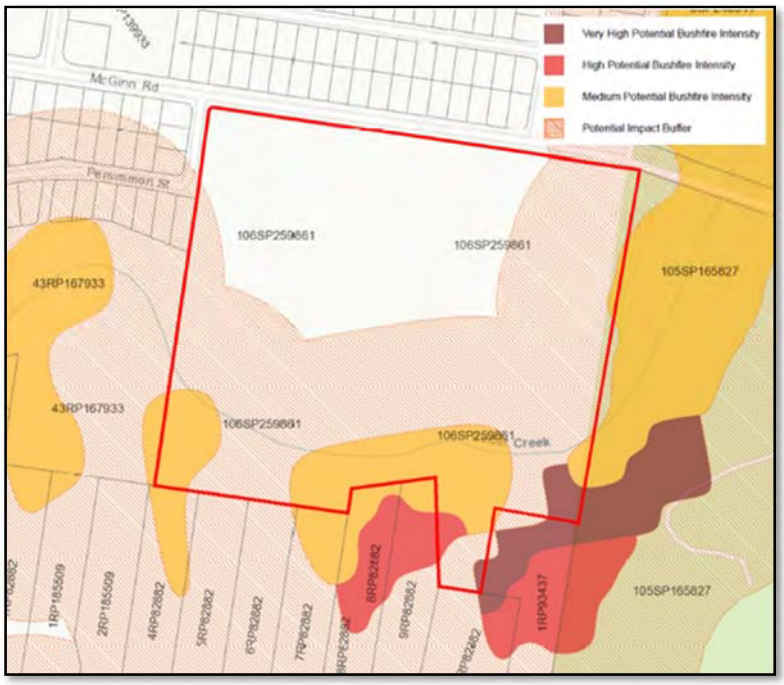

Figure 5 Extract of SPP Bushfire Hazard Area Map
(SPP Interactive Mapping Tool, April 2018).

5.0 SITE-SPECIFIC BUSHFIRE HAZARD ASSESSMENT

The following provides a detailed, site-specific, technical assessment of the site to determine the actual level of potential bushfire risk. It is understood that this assessment will be used as supporting documentation for the Development Application. Accordingly, this site-specific assessment has been prepared in accordance with the BCC Bushfire PSP. The Site-specific Bushfire Hazard Assessment involves a quantitative assessment utilizing a cumulative scoring system accounting for vegetation communities, aspect, and slope. The following sections are in accordance with this approach.

5.1 Current conditions

The subject site contains multiple buildings, sheds, agriculture area, paved carparks, covered walkway access paths, large sporting ovals and courts. The site is bound to the south by large lot residential allotments with Upper Kedron Road further south.

The Cedar Creek waterway and vegetated riparian corridor runs west to east across the site adjacent to the southern boundary. Lots to the west of the site include residential allotments and to the east the Brisbane Tramway Museum. To the north of the site is Mcginn Road with small sized residential allotments situated beyond. Vegetation connectivity exists to the west, south and east of the subject site.

The school is accessed by three separate internal paved carparks accessed via McGinn Road and Persimmon Street with pick up/drop off points also located on the sides of McGinn Road. A concrete walkway path also runs along the McGinn Road frontage of the school. Refer to Site Aerial in Figure 2 above.

The site of the proposed new Multipurpose Hall is currently a turfed batter to the school oval with approximately eight (8) trees consisting of *Casuarina* spp., Forest Red Gum and *Ficus* spp., potentially situated within the development footprint area. The proposed new Hall development will be positioned over a steep batter ranging from RL 55 m to 59 m AHD over a 12 m distance. Existing learning blocks and ancillary structures are currently positioned to the west, north and east of the proposed new Hall development area with the sporting oval and courts situated to the south. Further to the south, beyond the sporting oval, is an existing dense Open Eucalypt Forest vegetation community consisting of native and exotic species. This area appeared to be moist due to its proximity to the nearby traversing Cedar Creek waterway.

For the second proposed new development, the proposed Senior Learning Centre, existing infrastructure exists and includes a paved carpark, walkway access paths, picnic tables and learning blocks. The development footprint of the proposed new Senior Learning Centre currently consists of landscaped gardens, scattered retained native trees, walkways and mown turf areas. Across the balance of the school, the existing buildings and facilities are surrounded by mown lawns, landscaped and scattered retained canopy trees, and walkway access paths. The proposed new Senior Learning Centre will be bordered by existing learning blocks and walkway access paths. Refer to Figure 2 and 3 above.

5.2 Site Sub-units

An assessment of the vegetation community, slopes and aspects displayed across the site was undertaken with the goal of breaking the site down into areas referred to as 'sub-units'. Each sub-unit is essentially an area of land with a particular combination of vegetation, slope and aspect characteristics. Five (5) Bushfire Hazard Sub-Units (BHU) have been determined appropriate for the subject site based upon variation in vegetation communities and as the slope and aspect remain the same throughout.

Each BHU has been described below and represented in Figure 6 below and attached in the Figures Section of this report. It should be noted that the BHU's describe vegetation communities located within the site as well as on private property adjacent to the subject site. Additionally, it is important to have an understanding of the adjacent properties when developing a risk profile and management strategies for a site.

5.3 Assessment of Vegetation Communities

Hazard scores for the vegetation communities associated with each BHU have been extracted from BCC's Bushfire PSP *Table 1- Hazard scores and associated fire behaviours for vegetation communities*. Below is a description of vegetation communities within each BHU. Refer to Figure 6 below and attached in the Figures Section of this report.

Figure 6 Bushfire Hazard Sub-units

BHU 1 – Scattered Open Eucalypt Forest with Mown/Slashed Grass Understorey

This vegetation community was situated to the south of the site and spanned across a number of large lot residential allotments. The community had been modified with patches of retained and landscaped species over a mown/slashed grass understorey. Areas within the western half appeared more modified due to widespread areas of mown grass when compared to denser vegetation in the eastern half of the sub unit. BHU 1 contained a number of residences, ancillary structures, pools and driveways. The sub unit borders the southern boundary of the site and BHU 2 to the north, a large sporting oval to the east, Upper Kedron Road to the south and residential Lots to the west..

The canopy was dominated with scattered Eucalypt species consisting of Forest Red Gum, Northern Grey Ironbark (*Eucalyptus siderophloia*), Lemon-scented Gum (*Corymbia citriodora*) and Small-fruited Grey Gum (*Eucalyptus propinqua*). The sub canopy and shrub layer were present with species including Hoop Pine (*Araucaria cunninghamii*), juvenile eucalypts, Palms and Acacias. The ground cover throughout was predominantly maintained mown grass areas with patches of leaf litter. An incline of the slope was present within BHU 1 and increased in a north to south east direction from approximately RL 61 m to 96 m AHD. Refer to Bushfire Hazard Sub-units in Figure 6 above.

BHU 2A – Mixed Vegetation Community adjacent to Cedar Creek Waterway (to the north)

BHU 2A was situated in the southern third of the site and extended into the neighbouring eastern Lot. The sub unit was largely associated with the undulating elevation and vegetation on the northern side of the Cedar Creek waterway. The area appeared to have higher moisture levels than BHU 1 most likely due to the adjacent Cedar Creek waterway and the low lying nature of this BHU.

Vegetation within BHU 2A was denser than BHU 1 and contained a canopy, sub canopy, shrub and ground cover layer. A number of native, exotic and rainforest species existed in the sub unit and consisted of Camphor Laurel, Chinese Elm, *Casuarina* spp. and Silky Oak. Throughout the sub unit, the ground cover contained patches of grasses, weeds, fallen leaf litter and small wood debris. Monkey Rope Vine was also observed around a number of tree trunks.

In terms of bushfire threat, there was no evidence of historical fires within this community. Further, the school ovals form an effective bushfire buffer of approximately 80 m to the existing school buildings to the north (refer to Figure 6 above). The slope appeared to undulate throughout the sub unit with elevations ranging from RL 54 m to 58 m AHD. Refer to Plates 1 to 4 below.

Plate 1: A view of the northern boundary of BHU 2A with note of the mixed vegetation community.

Plate 2: A view of the dense vegetation layers within BHU 2A.

Plate 3: A perspective from the north of the large sporting oval separating the school buildings from BHU 2A (illustrating in the distance).

Plate 4: View of patchy weeds dominating the ground floor to the north of BHU 2A.

BHU 2B – Mixed Vegetation Community adjacent to Cedar Creek Waterway (to the south)

BHU 2B was situated to the south of BHU 2A and extended into the neighbouring eastern Lot. The sub unit was largely associated with the steep inclining elevation and vegetation to the south of the Cedar Creek waterway corridor. From a north west to south east direction, the elevation steeply increases from approximately RL 53 m to 69 m AHD over a 42 m distance. BHU 2B was bordered by BHU 2A to the north, Brisbane Tramway Museum to the east, BHU 1 to the south and BHU 3B to the west.

Vegetation within BHU 2B was similar to BHU 2A with the addition of a higher abundance of Eucalypt species situated on the higher elevations on the southern extent. Throughout the sub unit, the ground cover contained patches of grasses, weeds, fallen leaf litter and small wood debris. Monkey Rope Vine was also observed around a number of tree trunks.

BHU 3A – Mixed Vegetation Community adjacent to Cedar Creek Waterway with Dense Weed Understorey (to the north)

This vegetation community was similar to both BHU 2A and 2B, in terms of being adjacent to Cedar Creek waterway and vegetation structure, however differed due to the South facing aspect of the area. The elevation steeply decreased from a north to south direction from RL 67 m to 56 m AHD over a 32 m distance. BHU 3A was the smallest sub unit in area and was located adjacent to the western boundary of the school site. Cedar Creek waterway also traversed along the southern boundary of this sub unit.

Similarly to BHU 2A and 2B, vegetation within BHU 3A contained a mixed community of rainforest, native and exotic species. BHU 2A listed species were observed in BHU 3A with the addition of a dense weed understorey containing Lantana (*Lantana camara*). The ground cover was largely dominated by weed species with patches of grasses, fallen leaf litter and small wood debris. No fire evidence was observed in BHU 3A. Refer to Plates 5 and 6 below.

Plate 5: A view of dense Lantana and a juvenile Cocos Palm (*Syagrus romanzoffiana*) in BHU 3A.

Plate 6: A view of the western boundary of the site with BHU 3A illustrated in the distance with a particular note of the inclining slope to the north.

BHU 3B – Mixed Vegetation Community adjacent to Cedar Creek Waterway with Dense Weedy Understorey (to the south)

BHU 3B was situated to the south of BHU 3A and the traversing Cedar Creek waterway, to the west of BHU 2A and 2B, and to the north of BHU 1. BHU 3B elevations appeared to undulate throughout with elevations ranging from approximately RL 56 m to 64 m AHD. In terms of vegetation, BHU 3B contained a mixed vegetation community consisting of native, exotic, rainforest and weed species with similar species to those listed under the BHU 2A description. Ground cover within the sub unit included weeds, grasses, fallen leaf litter and small wood debris.

Table 2 Hazard Score and Associated Fire Behaviour for the Vegetation Community on the Site

Sub-unit	Vegetation Community	Veg Code	Bushfire PSP Description	Bushfire PSP Botanical Description	Comment	Hazard Score
BHU1	Scattered Open Eucalypt Forest with mown grass understorey surrounding existing residences to the south.	I12	Small-fruited grey gum/grey ironbark open-forest	*E. propinqua and E. siderophloia*	Vegetation community I12 is generally consistent with the mapped RE 12.11.5 and was generally consistent with the Scattered Open Eucalypt Forest with Mown Grass Understorey located immediately to the south of the subject site.	6
BHU2A	Mixed vegetation community to the north of Cedar Creek waterway within the south and to the east of the site.	E11	River oak/blue gum on creeks and rivers	*Casuarina cunninghamiana* and/or *E. tereticornis*	Vegetation community E11 is generally consistent with the mapped RE 12.3.7 however was only partially consistent with the Mixed Vegetation Community adjacent to the traversing Cedar Creek waterway due to the addition of rainforest, exotic and weed species.	4

Sub-unit	Vegetation Community	Veg Code	Bushfire PSP Description	Bushfire PSP Botanical Description	Comment	Hazard Score
BHU2B	Mixed vegetation community to the south of Cedar Creek waterway within the south and to the east of the site.	E11	River oak/blue gum on creeks and rivers	*Casuarina cunninghamiana* and/or *E. tereticornis*	Vegetation community E11 is generally consistent with the mapped RE 12.3.7 however was only partially consistent with the Mixed Vegetation Community adjacent to the traversing Cedar Creek waterway due to the addition of rainforest, exotic and weed species.	4
BHU3A	Mixed vegetation community to the north of Cedar Creek waterway within the west and to the west of the site.	E11	River oak/blue gum on creeks and rivers	*Casuarina cunninghamiana* and/or *E. tereticornis*	Vegetation community E11 is generally consistent with the mapped RE 12.3.7 however was only partially consistent with the Mixed Vegetation Community adjacent to the traversing Cedar Creek waterway due to the addition of rainforest, exotic and weed species.	4
BHU3B	Mixed vegetation community to the south of Cedar Creek waterway to the west of the site.	E11	River oak/blue gum on creeks and rivers	*Casuarina cunninghamiana* and/or *E. tereticornis*	Vegetation community E11 is generally consistent with the mapped RE 12.3.7 however was only partially consistent with the Mixed Vegetation Community adjacent to the traversing Cedar Creek waterway due to the addition of rainforest, exotic and weed species.	4

5.4 Assessment of Slope

The severity of a slope and location of the slope in relation to the subject site is relevant as fire travels faster upslope than downslope and steeper slopes can potentially increase the speed the fire travels. BCC contours were used to calculate the slope of the land under each BHU, as shown in Figure 7 below. Table 2 below indicates the Hazard Score for the slope measured on the site.

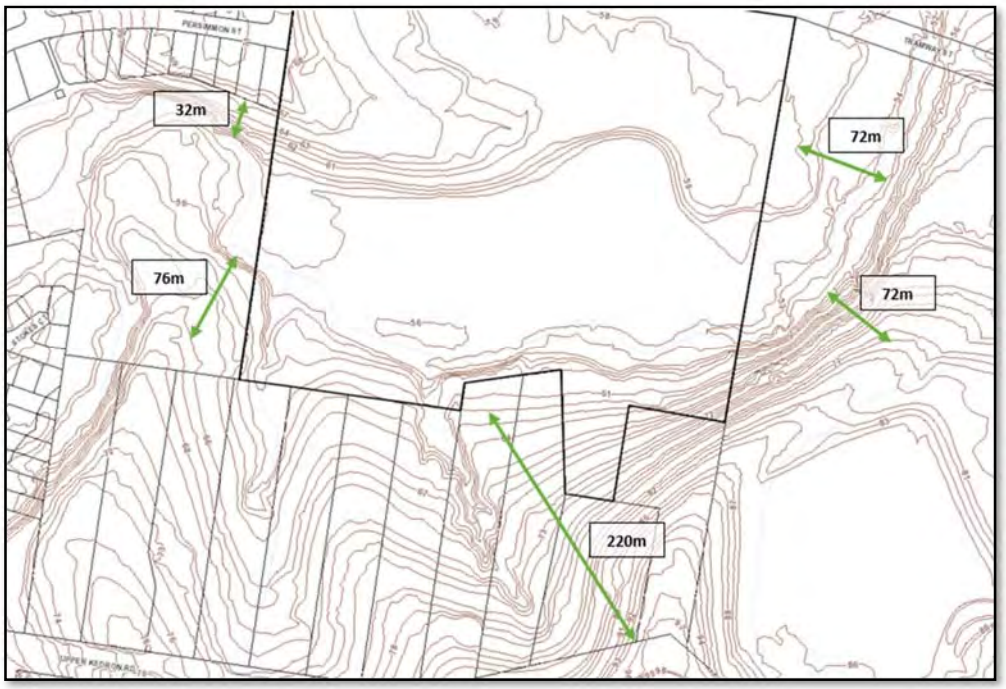

Figure 7 Extract of BCC Contour Mapping
(BCC Interactive Mapping Tool, April 2018).

Table 3 Hazard Score for Slope

Sub-unit	Slope	Hazard Score
BHU 1	Rolling Hills (>10 to 20%) - 14.55%	3
BHU 2A	Undulating (>5 to 10%) -5.56%	2
BHU 2B	Gorges and Mountains (>30%) -31.94%	5
BHU 3A	Gorges and Mountains (>30%) -34.38%	5
BHU 3B	Rolling Hills (>10 to 20%) -13.16%	3

5.5 Assessment of Aspect

The land generally undulates throughout the site with steep inclines situated within the middle third and southern boundary. Table 3 provides the Hazard Scores for the aspect occurring on the site.

Table 4 Hazard Scores for Aspect

Sub-unit	Aspect	Hazard Score
BHU 1	North to North-west	3.5
BHU 2A	East to south and all land under 5% slope	0
BHU 2B	North-west to west	3
BHU 3A	West to south	2
BHU 3B	North to east	1

5.6 Field Verification

As stated, S5 Environmental's Principal Environmental Scientist and Graduate Ecologist conducted a site inspection of the site and surroundings lands, vegetation communities, slope angles and aspects on Friday 13th of April, 2018 and verified the on ground site conditions.

5.7 Severity of Bushfire Hazard

In accordance with the BCC Bushfire PSP the scores for the individual factors determined for vegetation community, slope and aspect have been summed to provide a total for each sub-unit as follows:

Total Hazard Score = Vegetation Community Hazard Score + Slope Hazard Score + Aspect Hazard Score.

The total fire Hazard Scores calculated for the site as per the SPP1/03 Guideline are shown below in Table 5 below and also in Figure 8 Bushfire Hazard Rating for Site and Surrounding Areas attached in the Figures Section of this report.

The scores for the individual factors determined for vegetation communities, slope and aspect have been summed to provide a total for each sub-unit as follows:

Table 5 Sub-unit Hazard Score

Sub-unit	Vegetation Score	Slope Score	Aspect Score	Total Hazard Score	Hazard Rating
BHU 1	6	3	3.5	12.5	MEDIUM
BHU 2A	4	2	0	6	MEDIUM
BHU 2B	4	5	3	12	MEDIUM
BHU 3A	4	5	2	11	MEDIUM
BHU 3B	4	3	1	8	MEDIUM

In accordance with the Bushfire PSP, a total fire Hazard Score of 13 or greater is considered 'High', a total fire Hazard Score of 6 to 12.5 is considered 'Medium', and a Hazard Score of 1 to 5.5 is considered 'Low' bushfire hazard areas. Therefore, the entire site is a Medium bushfire hazard area.

5.8 Qualitative Review

S5 Environmental investigated any known bushfire behaviour during the site verification and identified recent evidence of fire within the vegetation on the north eastern corner of the school site. In addition, evidence of recent bushfire activity was evident in the Paperbark Heath to the north of Goodwin Drive. No formal information regarding past bushfire activity was available at the time of writing this report.

5.9 Safety Buffer

The final step for a Site-specific Bushfire Assessment in accordance with the Bushfire PSP is the inclusion of a safety buffer for 'Medium' rated bushfire hazard areas. It states that land within 50 m of an area identified as having a Medium bushfire severity classification should be included in the 'Medium' bushfire hazard area. Therefore, due to the areas within and adjacent to the site being assessed as a Medium bushfire hazard area, the proposed development falls within the Medium Bushfire Hazard Buffer Area. Refer to Figure 8 Bushfire Hazard Rating for Site and Surrounding Areas within the Figures Section of this report.

5.10 Overall Hazard Rating of the Site

It was clear during the field assessment that the *highest potential for Bushfire Attack* was from the retained Cedar Creek waterway corridor vegetation within and beyond the western and eastern boundary of the site.

S5 Environmental's Site-specific Bushfire Hazard Rating for the proposed new Senior Learning Centre and Multipurpose Hall is considered MEDIUM due to the addition of the buffer. However, it should be noted that whilst the vegetation to the south scored Medium, the actual Hazard from this vegetation *would be significantly lower* due to the widespread buffer from the existing sporting ovals and courts.

Figure 8 Bushfire Hazard Rating for Site and Surrounding Areas, attached below and in the Figures Section, details the Hazard Score of the site. Given the Medium Rating, a Bushfire Management Plan (BMP) has been prepared and is included in Section 7.0 below. These considerations have been made for the calculation of the BAL Score in Section 6.0 below.

Figure 8 Bushfire Hazard Rating for Site and Surrounding Areas

6.0 BUSHFIRE ATTACK LEVEL

In March 2009, the *Australian Standard (AS) 3959-2009 Construction of Buildings in Bushfire Prone Areas* came into effect. This Standard puts in place a system of scoring a site's Bushfire Attack Level (BAL) based on the distance of a construction site to specific vegetation types. This score is used to ascertain building and construction requirements for any buildings on the site.

BAL Scores were generated, using the procedure specified in Section 2.0 of AS 3959-2009, Determining the Bushfire Attack Level (Method 1). The following 5 steps are used in this method to determine the BAL Score of a construction site:

- Step 1 – Determine the relevant Fire Danger Index (FDI);
- 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 (2) under the classified vegetation type; and
- Step 5 – Determine the BAL from the appropriate tables within the AS 3959-2009 (Section 2.0).

Note: The sixth and final step is to use the BAL Score to determine the appropriate construction materials and requirements, however this is outside the scope of this Bushfire Hazard Assessment report.

BAL's are classified into the following Score categories from highest attack level to the lowest:

- BAL - Flame Zone (FZ);
- BAL - 40;
- BAL - 29;
- BAL - 19;
- BAL - 12.5; and
- BAL - LOW.

The proposal has been assessed, using the information and data gathered as part of the Site-Specific Bushfire Hazard Assessment and field investigations described in the sections above. The FDI is determined on a State or Regional basis, and the FDI for areas within Queensland is 40. 'Slope' in this method, is determined based on the slope of the land under the classified vegetation, not the slope of the land between the construction/building and the edge of the vegetation. It is noted that the AS 3959-2009 outlines a number of exclusions, however none apply in this instance.

Upon review of vegetation communities, surrounding the site, vegetation subject of this BAL assessment are those communities in BHU 1, BHU 2A, BHU 2B, BHU 3A and BHU 3B. As such, this BAL assessment has utilised the vegetation in all categorized BHU's for the site and surrounding areas as the Classifiable Vegetation for the purpose of this assessment. Accordingly, Figure 9 and Table 6 below presents the BAL assessment against the vegetation on the western, southern and eastern façade of the proposed new Senior Learning Centre and Multipurpose Hall in accordance with the ArkLab Architecture, Ferny Grove SHS Site Plan attached in the Figures Section of this report.

Figure 9 BAL Assessment: Classifiable Vegetation Distances

Table 6 Summary of Bushfire Attack Level of the Proposed Development

Assessment & Building #	Vegetation Class	Distance (approximate)	Slope	Effective Slope	BAL Score
A Senior Learning Centre	Open Forest	66 m from the proposed western facade of the proposed Senior Learning Centre	19.7°	Downslope	12.5
B Multipurpose Hall- Southern Facade	Open Forest	76 m from the proposed southern façade of the proposed Multipurpose Hall	3.18°	Downslope	12.5
C Multipurpose Hall- Eastern Facade	Open Forest	71 m from the proposed eastern façade of the proposed Multipurpose Hall	3.18°	Downslope	12.5

6.1 Construction Requirements

The AS 3959-2009 specifies requirements for construction of buildings that achieve a BAL Score of BAL 12.5 or greater. Accordingly, the Australian Standard advises the following with regard to the below score:

- BAL – 12.5 indicates that classified vegetation is within 100 m of the site and heat flux exposure thresholds are ≤12.5 kW/m^2 and predicted ember attack risk. The Australian Standard AS 3959-2009 provides advice on acceptable construction methodologies and materials for each BAL score. The sections of the Standard relevant to BAL 12.5 are *Construction Sections 3 and 5.*

7.0 BUSHFIRE MANAGEMENT PLAN

Due to the school site scoring a Medium Bushfire Hazard, this Bushfire Management Plan (BMP) has been developed to mitigate the risk. The BMP has identified a variety of bushfire mitigation measures based on the risks identified in the Bushfire Hazard Assessment in Section 4 and 5 of this report. The mitigation measures emphasize resilience to bushfire. Mitigation measures outlined below include the following strategies:

- Assessment of site characteristics (future);
- Bushfire education and evacuation plans;
- Vegetation Management (including clearing buffers and landscaping for bushfire);
- Road access;
- Water supply and firefighting infrastructure; and
- Bushfire Attack Levels and construction requirements.

The following BMP is in accordance with the BCC Bushfire PSP.

7.1 BUSHFIRE BEHAVIOUR

Understanding bushfire behaviour is imperative when planning new development. There are three (3) main factors which influence fire behaviour as follows:

1) Topography;
2) Weather conditions; and
3) Vegetation.

Topography

Slope influences the speed and intensity of a fire. Fire is known to burn faster uphill as flames and radiant heat preheat the vegetation ahead of the fire, drying it out and making it increasingly flammable. As a rule of thumb, for every 10 degrees slope, fire doubles in speed. Refer to Figure 10 below.

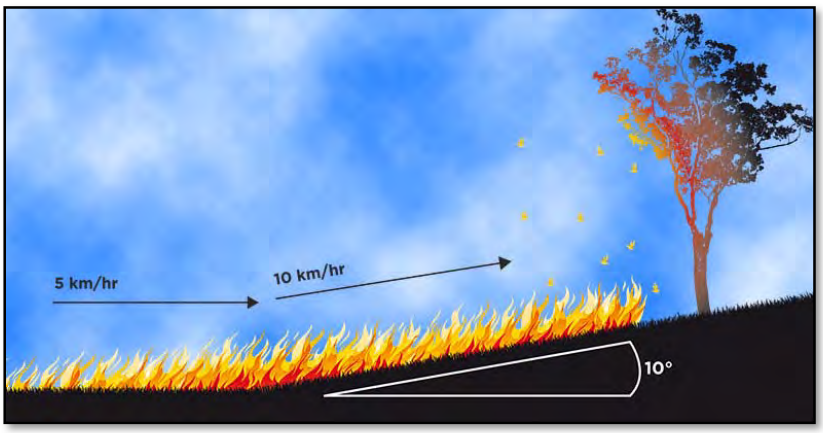

Figure 10 Effects of Topography on Bushfire

Source: Country Fire Authority

Weather Conditions

Bushfire weather conditions are fundamentally defined by temperature, humidity, wind, atmospheric conditions and past rainfall. For example, summer weather conditions increase the flammability of vegetation. Wind influences the speed and direction in which fire travels, fire intensity and possibility of spot fires from burning debris. A measure of weather conditions is the Forest Fire Danger Index (FFDI) and Grassland Fire Danger Index (GFDI). These measures are useful in determining the fire danger rating (refer to Fire Danger Rating in Figure 11 below).

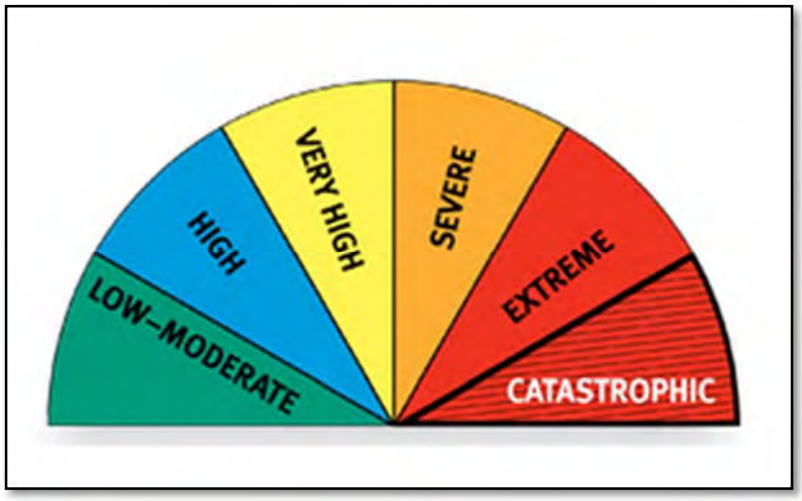

Figure 11 Fire Danger Rating
Source: Queensland Government, Emergency Services and Safety

Vegetation

Vegetation is the source of fuel for a bushfire. The amount of fuel surrounding a building can directly impact a buildings survival. Vegetation management, landscaping for bushfire and breaking the continuity of vegetation can limit the spread of fire.

7.2 BUSHFIRE DAMAGE SOURCES

The Country Fire Authority (2018) states, “Bushfires can vary in intensity and scale across the landscape”. As the past bushfire events throughout Australia have illustrated, bushfires can be devastating and lead to long-running fires which are difficult to suppress. Building survival is influenced by many interacting factors. The 4 main ways buildings are destroyed during a bushfire are:

- Ember attack;
- Radiant heat;
- Direct flame contact; and
- Fire-driven wind.”

Ember Attack

Research indicates that the most common way buildings to catch on fire is through ember attack (80% of house loss). Ember attack is when small burning twigs, bark, leaf are carried by wind and land in and around a building. Burning embers can ignite flammable plants, leaf litter, fences, outdoor furniture and sheds (refer to Figure 12 Ember Attack below). Ember attack is addressed within the AS 3950-2009 through the requirement of construction standards.

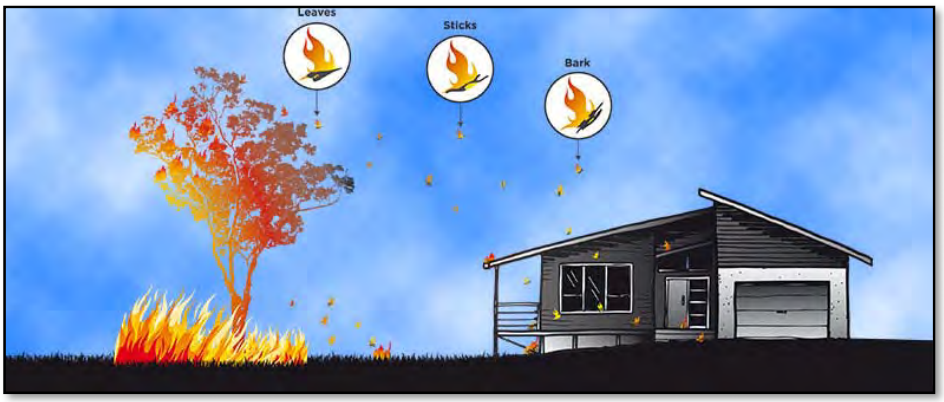

Figure 12 Ember Attack

Source: Country Fire Authority

Radiant Heat

Radiant heat is the heat created from burning fuel during a bushfire. Radiant heat can ignite surfaces without direct flame contact or ember attack, dry out vegetation ahead of the bushfire, crack glass (allowing embers to enter a building) and distort and melt materials (refer to Figure 13 Radiant Heat below). The most common cause of loss of human life is via radiant heat (CFA, 2018).

Figure 13 Radiant Heat

Source: Country Fire Authority

Direct Flame Contact

Direct flame contact occurs when a fire front reaches a building, this is referred to as the 'Flame Zone'. Approximately 20 % of house loss occurs when houses/buildings are directly adjacent to bushland.

Fire-driven Wind

Fire-driven wind can carry embers, cause trees to fall onto buildings, can break windows and destroy structures. The closer a building is to a fire front the more severe the impact of fire-driven wind.

7.3 Assessment of Site Characteristics (Future)

Increase in Student Numbers

The site currently supports the Ferny Grove SHS. The proposed new Senior Learning Centre is planned to manage the increased General Learning Areas required to accommodate the Year 6 Full Cohort Program. It is understood that the current enrollment count is 1,772 students and is forecast to grow to 2,080 students by the year 2020.

To accommodate this growth, the DET proposed the following new facilities at Ferny Grove SHS:

- Construct a new multi-storey Senior learning Centre that considers opportunities for flexible spaces that open up to provide large areas to meet the new external senior testing requirements, where possible; and
- Construct a new single court hall with a stage, fixed tiered seating and related support spaces, to enhance curriculum delivery and educational outcomes.

Traffic Movement Patterns

It is understood that the construction of the proposed new Senior Learning Centre and Multipurpose Hall will not have a tangible impact on current traffic movement patterns at the school. Forecast growth over the next two years is predicted, but not as a result of the new facilities.

7.4 Emergency Response and Evacuation

It is understood that the School has a well-developed Emergency Response and Evacuation Procedure in place. It is highly recommended that Bushfire Risk be included in the Evacuation Procedures.

7.5 Vegetation Management

Vegetation management at Ferny Grove SHS will be the main management measure to mitigate the risk from bushfire to students, staff and campus facilities. Currently, large expanses of mown turf in the form of school ovals, mown strips and sporting courts, internal driveways and carparking effectively create buffers to hazardous vegetation. Maintenance of these setbacks shall be vital in mitigating bushfire risk.

The vegetation located within these bushfire buffer areas must be maintained and managed to ensure fuel loads do not built up over time. Further the presence of weeds adds to the ground and shrub layer fuel load build up, adjacent and within the site. This is particularly relevant to the strip of vegetation along the western boundary and that vegetation community protruding into the site from the western boundary.

Vegetation management and maintenance should occur year-round. Limiting fuel accumulation on and adjacent to the school and ensuring landscape design considers low flammability treatments will ensure bushfire hazards on the site are reduced.

Bushfire Buffers

Currently the turfed school ovals and mown strip surrounding existing buildings acts as an effective bushfire buffer strip and should be regularly maintained and retained in its current low fuel state.

Weed Management

Weed loads in and adjacent to the proposed development site should be managed to reduce fuel loads. This is particularly relevant to the vegetation identified as BHU 2A and within and adjacent to the Cedar Creek waterway corridor. During the site inspection, weed infestations through this vegetation appeared relatively high.

Landscaping

Landscaping plays an important role in increasing a buildings' ability to endure bushfire attack. Landscaping for bushfire reduces the risk of ember attack which is the most common cause of house loss during bushfire. To that end, any landscaping proposed around the new Senior Learning Centre and the Multipurpose Hall should utilize low flammability treatments. This may include rock mulches, concrete retaining blocks, and appropriate plantings, e.g. non-fibrous plants and low leaf litter generating species.

The Victorian Country Fire Authority (CFA) have produced an online Plant Selection Key which facilitates landscape designers and property owners to select fire wise garden plants. The CFA have also produced the publication 'Landscaping for Bushfire: Garden Design and Plant Selection' (CFA, 2011). The publication outlines planning, designing, choosing suitable plants, maintaining gardens and provides a Plant Selection Key, and can be obtained from their website (refer to Reference Section).

7.6 Road Design and Layout

No new roads are proposed as part of the development of the new Senior Learning Centre and Multipurpose Hall.

7.7 Water Supply and Firefighting Infrastructure

The site is connected to reticulated water supply. In July 2013, a set of consolidation Design and Construction Standards came into effect in South East Queensland (SEQ). These standards are the SEQ Water Supply & Sewage Design & Construction Code, also known as the 'SEQ Code'. It is anticipated that the reticulated water network for the proposed development complies with the provisions outlined in the SEQ Code.

Firefighting Appliances

Firefighting appliances (such as fire extinguishers and internal sprinklers) are to be incorporated within the design. However, firefighting appliances have limitations and should not be used in cases where evacuation is considered the appropriate action.

8.0 RISK ASSESSMENT

To satisfy the outcomes of the SPP 2017, a simple risk assessment in general accordance with Australian Standard ISO 31000:2018 Risk Management – Guidelines has been completed below. ISO 31000:2018 provides principles and generic guidelines on risk management and can be applied to any type of risk, whatever its nature, whether having positive or negative consequences.

8.1 Bushfire Risk Assessment

Risk is a product of Likelihood and Consequence. When considering the risk of bushfire on human assets such as residences, schools, bridges etc., the methodology used to assess the level of bushfire risk will be based on the following:

- Likelihood Rating – The chance of bushfire igniting, spreading and reaching the asset; and
- Consequence Rating – The outcome or impact of a bushfire event on an asset, as measured by the threat posed by the hazard vegetation and the vulnerability of the asset.

Human assets are generally defined as one of the following Asset Subcategories:

- Residential – Residential areas, including rural properties and urban interface areas;
- Places of Temporary Occupation – Commercial districts and industrial areas, mining sites or camps, and other locations where people may work or gather that are located away from towns and population centres; and
- Special Risk and Critical Facilities – Locations and facilities where the occupants may be more vulnerable to bushfire for one or more of the following reasons:
  - Occupants may have limited knowledge about the impact of bushfire;
  - Occupants may have a reduced capacity to evaluate risk and respond adequately to bushfire threat;
  - Occupants may be more vulnerable to stress and anxiety arising from bushfire threat or the effects of smoke;
  - There may be significant communication barriers; or
  - Relocation and/or management of occupants may present unique challenges or difficulties such as transportation of occupants, or providing alternative accommodation, healthcare or food supplies.

Accordingly, new Schools or new structures within an existing School fall into the Special Risk and Critical Facilities Asset Subcategory.

To determine the Risk on the Special Risk and Critical Facility, being in this case the proposed new Senior Learning Centre and Multipurpose Hall, the Likelihood and Consequence needs to be determined in accordance with the following Tables and definitions:

Table 7 Ranking Risk Assessment by Likelihood

Likelihood Ranking	Frequency of Occurrence
Almost Certain (Sure to Happen)	Is expected to occur in most circumstances; High level of recorded incidents and/or strong anecdotal evidence; and/or Strong Likelihood the event will reoccur; and/or May occur more than once in 5 years.
Likely (Probable)	Regular recorded incidents and strong anecdotal evidence; and/or May occur at least once in 5 years.
Possible (Feasible but less than probable)	Should occur at some stage; and/or Few, infrequent, random recorded incidents or little anecdotal evidence.
Unlikely (Improbable, not likely)	Would occur under exceptional circumstances.

Table 8 Ranking Risk Assessment by Consequence

Consequence Ranking	Severity of Consequence
Catastrophic	Multiple fatalities and/or extensive cases of serious injury; Extensive damage to assets across school facility requiring significant ongoing asset recovery; and School partially functioning with widespread inconvenience.
Major	Potential fatalities and/or multiple cases of serious injury; Significant damage to assets across school facility requiring ongoing recovery; and School partially functioning with widespread inconvenience.
Moderate	No Fatalities, possible isolated injuries; Localised damage of assets across school facility; and School continues to function as normal with some inconvenience.
Minor	No Fatalities; Near misses or minor first aid treatment possibly required; and Inconsequential or no damage to an asset.

Rating the Likelihood and Consequence for Ferny Grove State High School

To determine the Likelihood rating for an asset the following is considered:

- Do Fires occur frequently? – Yes or No - NO;
- If a fire occurs, is it expected to spread and reach the asset? – Yes or No - NO.

Table 9 Determination of Likelihood Rating

		If a Fire occurs, is it expected to spread to each Asset?	
		No	Yes
Do Fires occur frequently?	Yes	Possible	Almost Certain
	No	UNLIKELY	Likely

To determine the Consequence rating for an asset the following is considered:

- Threat – The threat posed by the hazard vegetation? - Moderate;
- Vulnerability – The vulnerability of the asset? – Moderate.

Accordingly, based on the below Risk Matrix, the proposed new Music/Learning Centre at Ferny Grove SHS scores a *Low Bushfire Risk Rating*, however the management measures described in Section 7.0 should be applied to maintain this risk at Low.

Table 10 Risk Matrix

Likelihood	Consequence			
	Minor	Moderate	Major	Catastrophic
Almost Certain	High	Very High	Extreme	Extreme
Likely	Medium	High	Very High	Extreme
Possible	Low	Medium	High	Very High
Unlikely	Low	Low	Medium	High

9.0 CONCLUSIONS

This Bushfire Hazard Assessment has completed a quantitative and qualitative bushfire hazard assessment of the site and surrounding areas. The assessment indicated 'Medium' Bushfire Hazard Areas over all BHU's categorized for the site and surrounding areas, with an associated 50 m buffer that extends over the western, southern and eastern boundaries of the. Accordingly, a BMP was developed to address this increased hazard rating.

The BMP identified initial and ongoing vegetation and weed management as the most effective management measure to reduce the risk of a bushfire event resulting in harm to students, staff, and/or damage to campus facilities at the Ferny Grove SHS.

A number of informal bushfire setbacks currently exist at the SHS and include large areas of mown turf, playing fields, internal driveways and carparking. Regular and ongoing maintenance of these setbacks, as described above, will be the most effective hazard mitigation measure for the ongoing operation of the School.

To ensure an initial reduction of fuel loads, eradication of weeds at the ground and shrub layer is recommended for the strip of vegetation along the western boundary as well as the vegetation community protruding into the site from the west. S5 Environmental recommend that the weedy understorey in these areas be entirely eradicated and replaced with a suitable low flammability species palette or mown turf. Furthermore, in relation to the proposed new Senior Learning Centre and Multipurpose Hall, landscaping measures should include the utilization of low flammability treatments such as rock mulches, concrete retaining blocks and appropriate plantings.

The BAL and Risk Assessment concluded a BAL of 12.5 for the proposed new Senior Learning Centre and Multipurpose Hall. Accordingly, Construction Sections 3 and 5 under the Australian Standard 3959-2009 apply. Finally, the risk assessment determined the proposed new Senior Learning Centre and Multipurpose Hall had a Low Bushfire Risk Rating.

Based on this report, a variety of recommendations and mitigation measures have been provided to address the potential risk of bushfire attack on the proposed new Senior Learning Centre and Multipurpose Hall.

10.0 REFERENCES

CFA (2011) Landscaping for Bushfire [online], <https://www.cfa.vic.gov.au/plan-prepare/landscaping>, Country Fire Authority, Victoria.

CFA (2018) How Fire Behaves [online], <https://www.cfa.vic.gov.au/plan-prepare/how-fire-behaves>, Country Fire Authority, Victoria.

DILGP (2017) State Planning Policy Interactive Mapping System [online], <https://planning.dsdmip.qld.gov.au/maps>, Department of Local Government, Racing and Multicultural Affairs, Brisbane.

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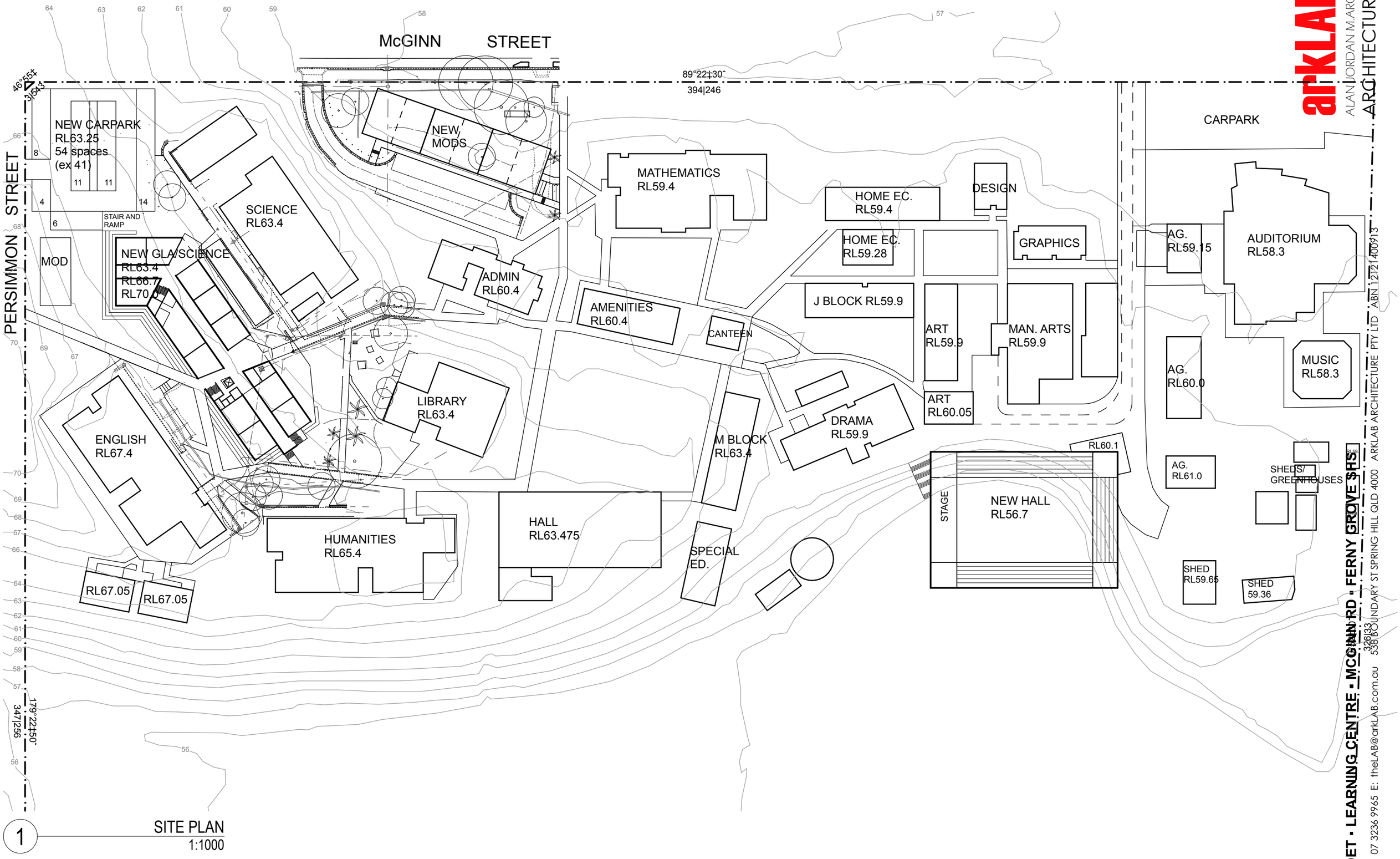
SEQ (2013) SEQ Water Supply and Sewerage Design and Construction Code [online], <http://www.seqcode.com.au/>, South East Queensland.

Standards Australia Committee FP – 020 (2009) Australian Standard – Construction of buildings in bushfire-prone areas (AS3959-2009), Council of Standards Australia, Sydney.

FIGURES –

Figure 3 Site Plan (ArkLab Architecture, Ferny Grove SHS, not dated)
Figure 6 Bushfire Hazard Sub-units



1 SITE PLAN
1:1000

N

SITE PLAN - SCALE @ A3 | **SD 201742 / 01** | **F**

arkLAB ARCHITECTURE
ALAN JORDAN M.ARCH

DET - LEARNING CENTRE - MCGINN RD - FERNY GROVE SHS

arkLAB ARCHITECTURE PTY LTD ABN 12121400913
P: 07 3236 9965 E: theLAB@arkLAB.com.au 538 BOUNDARY ST SPRING HILL QLD 4000 ARKLAB ARCHITECTURE

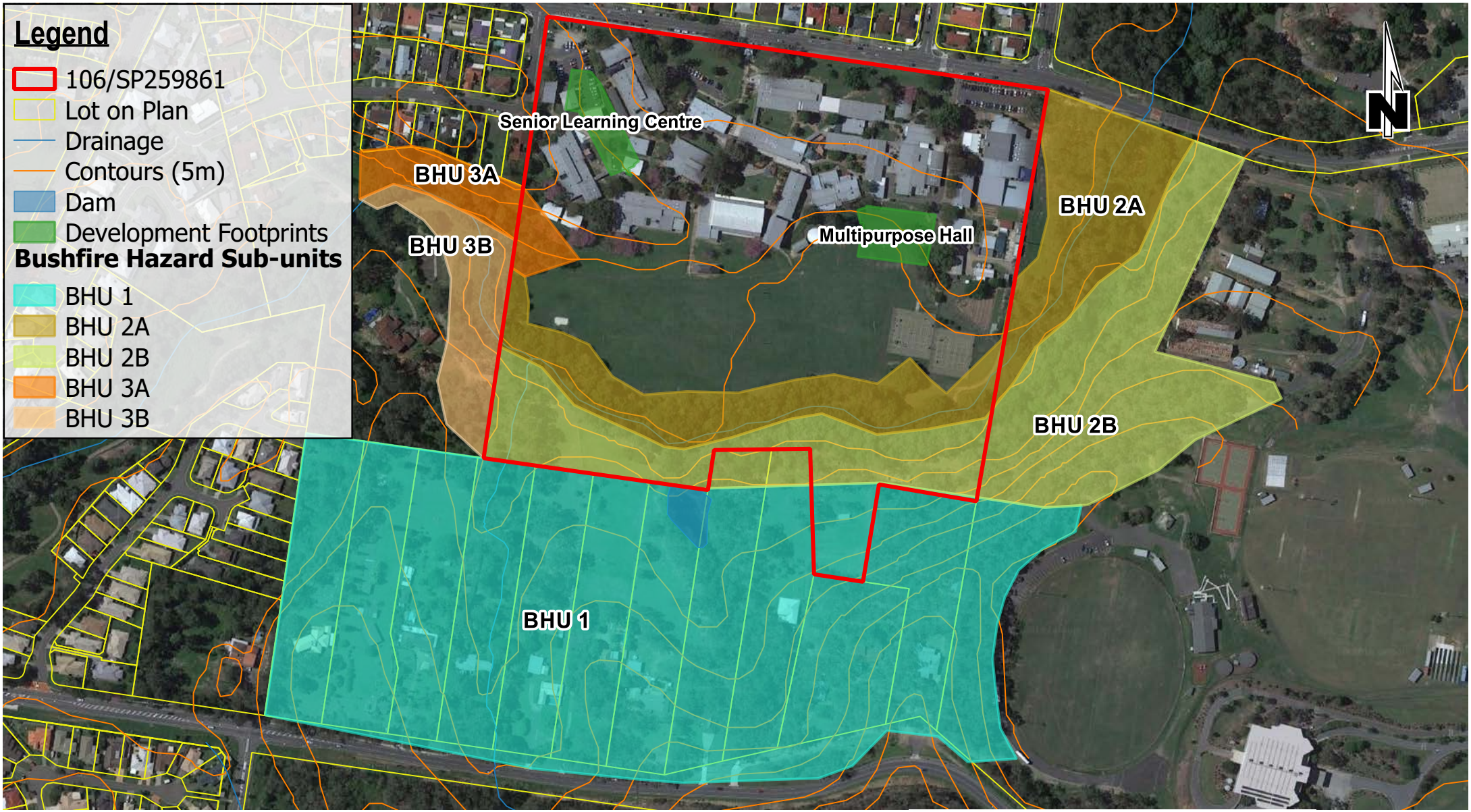


Figure 6 - Bushfire Hazard Sub-units

Proposed new Multipurpose Hall and Senior Learning Centre - 26 McGinn Road, Ferny Grove
Prepared for the Department of Education and Training

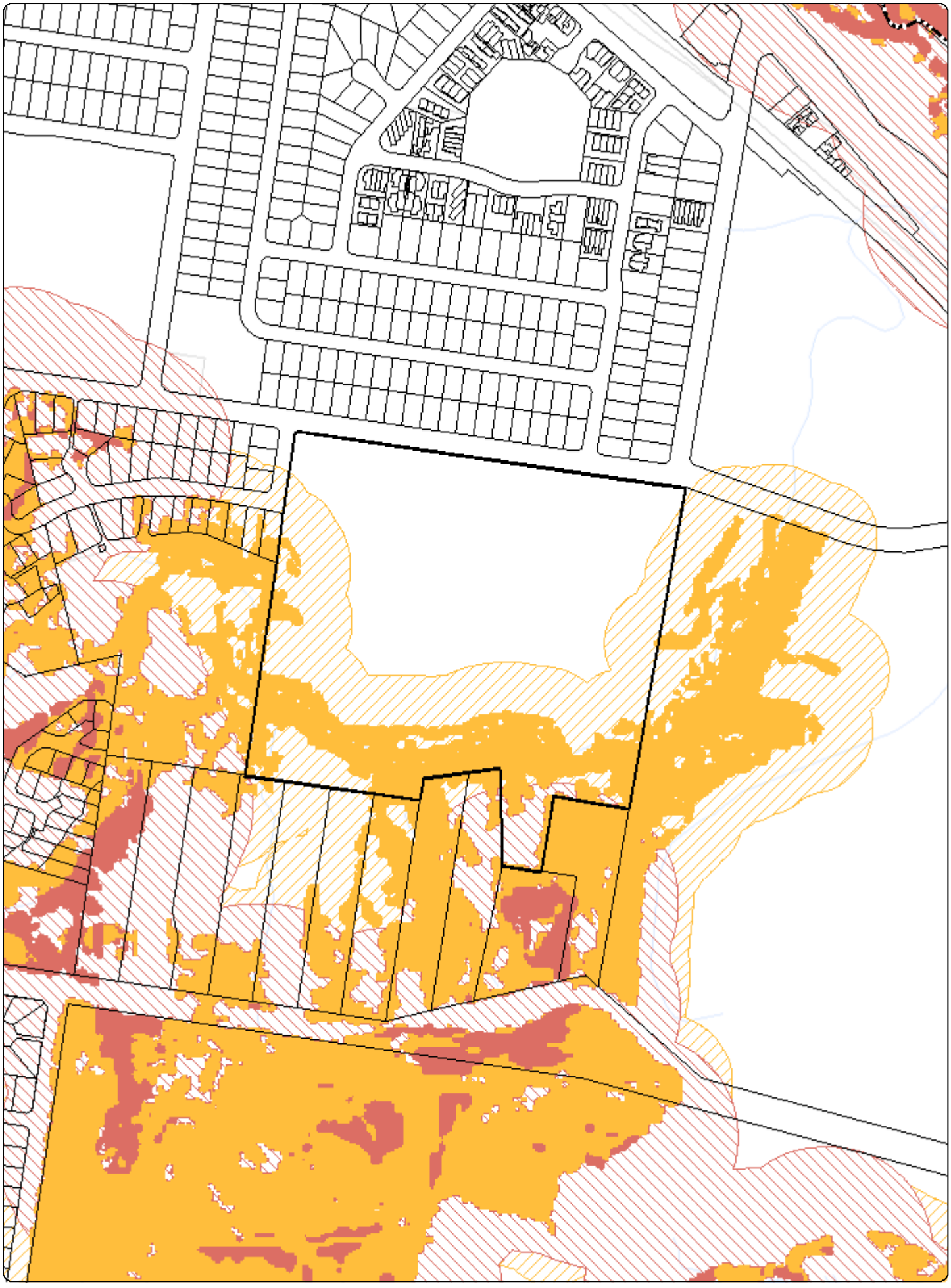
Job Number: S50404;
D:\S5 Consulting Server\S5 Projects\S5 Projects\S50404 Ferny Grove SHS\04 Drawings\PDF\Figure6
Author: TH; Date: 24 April 2018
Data: Digital Cadastral Database (c) - State of Qld 2015, and Aerial Photography - Google Satellite. 2018. BHU's were determined by S5 Environmental Ecologists' from ground truthing the site.
CRS: MGA94 Z56
This plan may only be relied upon in relation to the project and purpose for which it was commissioned.

S5 ENVIRONMENTAL

Scale: approx 1:4000 @A4

100 0 100 200 300 400 m

Appendix A – *BCC City Plan 2014* Bushfire Hazard Overlay



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: 12/04/2018

Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

NOTES

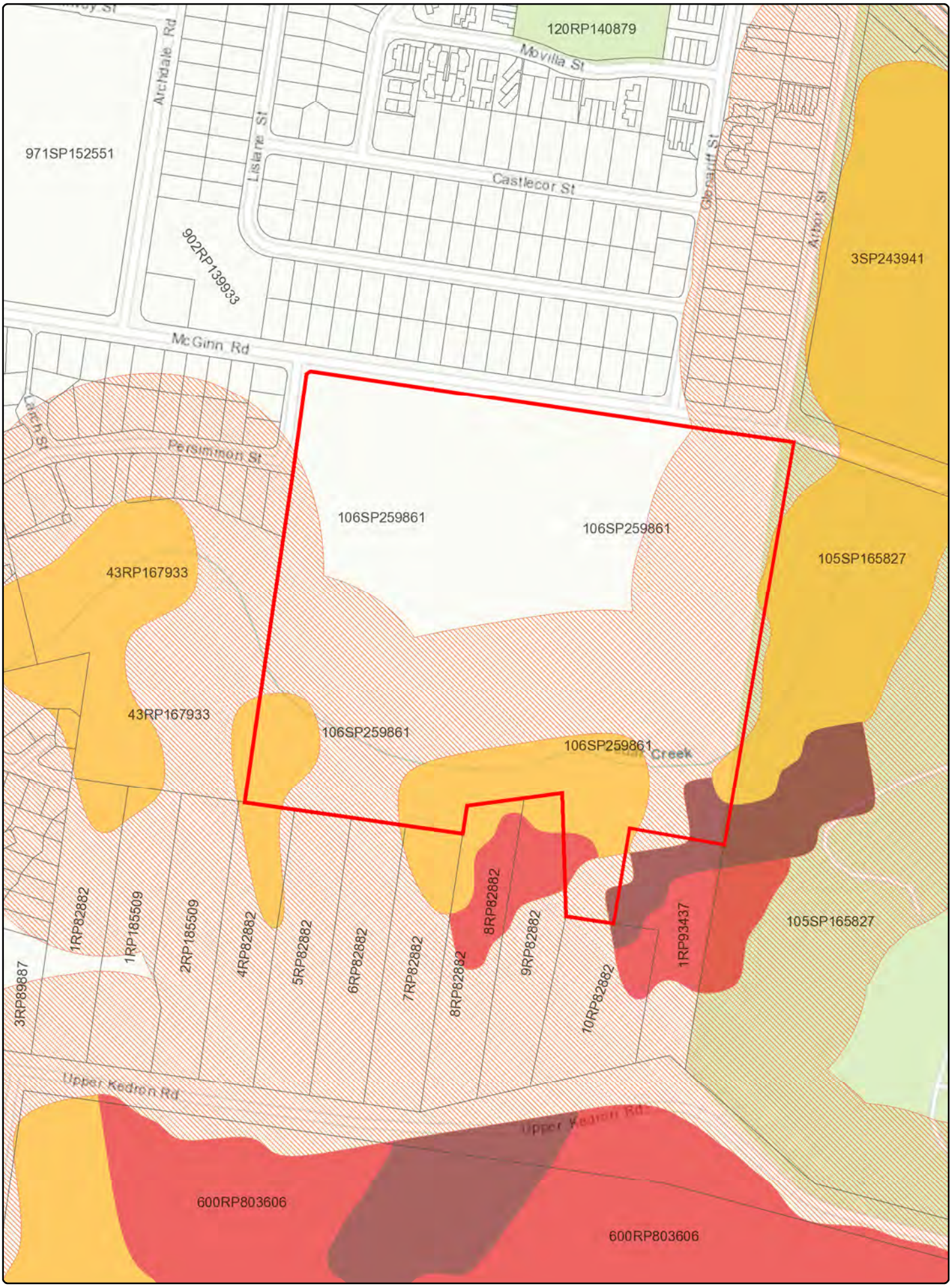
This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will 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: 12/04/2018

Appendix B – SPP Bushfire Hazard Area Map



State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure

Date: 12/04/2018

Department of State Development, Manufacturing, Infrastructure and Planning

Queensland Government

0 70 140 210 280

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.

Legend

Drawn Polygon Layer

Override 1

Cadastre (5k)

Cadastre (5k)

Bushfire prone area

Very High Potential Bushfire Intensity

High Potential Bushfire Intensity

Medium Potential Bushfire Intensity

Potential Impact Buffer

Date: 12/04/2018

State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure

Department of State Development, Manufacturing, Infrastructure and Planning

Queensland Government

Appendix C – Bushfire Hazard Table 1—Hazard Scores and Associated Fire Behaviours For Vegetation Communities

Table 1—Hazard Scores and Associated Fire Behaviours For Vegetation Communities

Veg code	Description	Botanical descriptions	Hazard score
G22	Flooded gum/tallowwood/brush box tall open forest	*Eucalyptus grandis*, frequently with *E. microcorys, Lophostemon confertus*	10
H12	Blackbutt/brown bloodwood/tallowwood open forest on the Helidon Hills	*E. pilularis*, with *Corymbia trachyphloia, E. microcorys*	10
C2	Paperbark swamp, usually in pure stands	*Melaleuca quinquenervia*	8
C3	Paperbark swamp, with swamp mahogany	*Melaleuca quinquenervia* and *E. robusta*	8
C4	Paperbark swamp, with blue gum and swamp box	*Melaleuca quinquenervia, E. tereticornis* and *Lophostemon suaveolens*	8
C6a	Swamp banksia/pricklyleaf paperbark heathlands, sometimes with patches of sedgeland	a. *Banksia robur*	8
C6b	Swamp banksia/pricklyleaf paperbark heathlands, sometimes with patches of sedgeland	b. *Melaleuca nodosa*	8
D2	White mahogany/pink bloodwood open-forest on coastal lowlands	*E. acmenoides* and *Corymbia intermedia*	8
D8	Scribbly gum/pink bloodwood/smooth-barked apple woodland on coastal lowlands	*E. racemosa, C. intermedia, Angophora leiocarpa*	8
D8a	Scribbly gum/pink bloodwood/smooth-barked apple woodland on coastal lowlands	a. *E. racemosa, C. intermedia, Angophora leiocarpa* with grassy ground layer	8
D8b	Scribbly gum/pink bloodwood/smooth-barked apple woodland on coastal lowlands	b. *E. racemosa, C. intermedia, Angophora leiocarpa* with heathy ground layer	8
D9	Broad-leaved white mahogany/bloodwood/smooth-barked apple woodland on coastal lowlands	E. *umbra, C. trachyphloia* and/or C. *intermedia, Angophora leiocarpa*	8
H14	Queensland white stringybark/pink bloodwood/grey ironbark open forest	*E. tindaliae, C. intermedia, E. siderophloia*	8
H20	Spotted gum/white mahogany/brown bloodwood woodland on the Helidon Hills	*C. citriodora, E. acmenoides, C. trachyphloia*	8
H21	Grey gum/broad-leaved white mahogany/grey ironbark woodland	*E. major, E. carnea, E. siderophloia*	8
H24	White mahogany/brown bloodwood/smooth-barked apple woodland on coastal foothills	*E. acmenoides* and *C. trachyphloia*, with *Angophora leiocarpa*	8
H25	White mahogany/brown bloodwood/smudgee woodland on the Helidon Hills	*E. acmenoides, C. trachyphloia* with *Angophora woodsiana*	8
H34	Scribbly gum/pink bloodwood woodland on sandstone hillslopes	*E. racemosa* and *C. intermedia*	8
H39a	Nerang—Beenleigh alliance	a. *E. carnea, E. tindaliae*	8
H39b	Nerang—Beenleigh alliance	b. *E. acmenoides*	8

H39c	Nerang—Beenleigh alliance	c. *E. microcorys, E. propinqua, Lophostemon confertus*	8
H39e	Nerang—Beenleigh alliance	e. *C. citriodora, E. carnea, E. tindaliae, E. propinqua, C. henryi, E. crebra*	8
H39h	Nerang—Beenleigh alliance	h. *E. planchoniana*, often with *E. baileyana*	8
H39j	Nerang—Beenleigh alliance	j. *E. seeana, sometimes with E. racemosa*	8
I10	White mahogany/brown bloodwood/narrow-leaved ironbark woodland at Bania State Forest	*E. acmenoides, C. trachyphloia* with *E. crebra*	8
J6	Scribbly gum/red bloodwood/Queensland white stringybark woodland on rhyolite ranges	*E. racemosa, C. gummifera* and *E. tindaliae*	8
J12	White mahogany/brown bloodwood/smooth-barked apple woodland at moderate altitude away from the coast	*E. acmenoides, C. trachyphloia* with *Angophora leiocarpa*	8
J13	White mahogany/spotted gum/brown bloodwood woodland on granite ranges	*E. acmenoides, C. citriodora, C. trachyphloia*	8
J22	Broad-leaved white mahogany/brush box low open-woodland	*E. carnea* and *Lophostemon confertus*	8
G26	Blue gum/yellow box/grey gum open forest	*E. tereticornis* and *E. melliodora* with *E. biturbinata* or *E. longirostrata*	6
G32	Narrow-leaved ironbark/silver-leaved ironbark/yellow box woodland, without white box	*E. crebra, E. melanophloia* with *E. melliodora*	6
G39	Blue gum/pink bloodwood woodland on red kraznozem soil	*E. tereticornis, C. intermedia*	6
H16	Smooth-barked apple/spotted gum woodland	*Angophora leiocarpa* with *C. citriodora*	6
H19	Spotted gum/narrow-leaved ironbark woodland	*C. citriodora* and *E. crebra*	6
H22	Pink bloodwood/swamp box woodland	*C. intermedia* often with *Lophostemon suaveolens*	6
H27	Narrow-leaved ironbark/smooth-barked apple woodland on sandy hills	*E. crebra* and *Angophora leiocarpa*	6
H29	Broad-leaved ironbark woodland	*E. fibrosa* subsp. *fibrosa*	6
H36	Narrow-leaved red gum/pink bloodwood woodland	*E. seeana* and *C. intermedia*	6
H39d	Nerang—Beenleigh alliance	d. *C. gummifera*	6
H39i	Nerang—Beenleigh alliance	i. *E. moluccana*, sometimes with *C. citriodora, E. crebra, E. tereticornis, C. intermedia, C. tessellaris*	6

H39k	Nerang—Beenleigh alliance	k. *E. fibrosa, C. citriodora, C. henryi* with *Angophora leiocarpa*	6
I13	Narrow-leaved ironbark/silver-leaved ironbark woodland	E. *crebra* with *E. melanophloia*	6
I12	Small-fruited grey gum/grey ironbark open-forest	*E. propinqua* and *E. siderophloia*	6
I13	Narrow-leaved ironbark/blue gum woodland on lower hillslopes	*E. crebra* and *E. tereticornis*	6
G22/17	G22 (see G22) / Notophyll vine forest or notophyll feather palm vine forest ('gully rainforest') of mango bark, yellow carabeen, soft corkwood, rose marara, crabapple, booyong, domatia tree, with emergents of figs, brush box, eucalypts, hoop and bunya pine, often with an understorey of piccabeen palms	G22 (see G22) / NVF or NFPVF of *Canarium australasicum, Sloanea woollsii, Caldcluvia paniculosa, Pseudoweinmannia lachnocarpa, Schizomeria ovata, Argyrodendron* spp., *Endiandra discolor* with *Ficus* spp., *Lophostemon confertus, Eucalyptus* spp., *Araucaria cunninghamii* and *A. bidwillii*, and *Archontophoenix cunninghamiana*	4
E1/E11	E1 (see E1) / E11 (see E11)	*E1 (see E1) / E11 (see E11)*	4
E7	Gum-topped box communities	*E. moluccana*	4
E7a	Gum-topped box communities		4
E9	Blue gum flats, often with grey ironbark, in near-coastal areas	*E. tereticornis* and *E. siderophloia*	4
E10	Blue gum flats, without grey ironbark, away from the coast	*E. tereticornis*	4
E10c	Blue gum flats, without grey ironbark, away from the coast		4
E11	River oak/blue gum on creeks and rivers	*Casuarina cunninghamiana* and/or *E. tereticornis*	4
C8	Twigrush/spikerush sedgelands		2
C8d	Twigrush/spikerush sedgelands		2
C10	Natural freshwater bodies		2
A2	Swamp she-oak woodland adjoining mangroves/saltmarshes	*Casuarina glauca*	1
C10	Swamp she-oak open-forest in swamps	*Casuarina glauca*, often with *Melaleuca quinquenervia, E. tereticornis*	1
E1	Complex notophyll and araucarian notophyll vine forests of white booyong, giant water gum, silky oak, with black bean/weeping lilly pilly locally dominant. Emergent figs and hoop pine.	A/CNVF of *Argyrodendron trifoliolatum, Syzygium francisii, Grevillea robusta* with *Castanospermum australe, Waterhousea floribunda* ± *Ficus* spp., *Araucaria cunninghamii*	1
G1/G10	Complex notophyll vine forest ('warm subtropical rainforest') of booyong, rose marara / G10 (see G10)	CNVF of *Argyrodendron trifoliolatum, Pseudoweinmannia lachnocarpa* / G10 (see G10)	1
G10	Araucarian notophyll and notophyll/microphyll vine forests of booyong, rose marara and/or	ANVF and AN/MVF of *Argyrodendron trifoliolatum, Pseudoweinmannia lachnocarpa* and/or *Choricarpia subargentea*	1

	giant ironwood and/or hauer. Emergents of hoop and bunya pine	and/or *Dissiliaria baloghioides* with *Araucaria cunninghamii* and *A. bidwillii*	
A1	Mangrove communities	*Avicennia marina, Aegiceras corniculatum, Bruguiera gymnorhiza, Rhizophora stylosa, Excoecaria agallocha* or *Ceriops tagal*	0
A3	Saltmarsh and fringing communities		0

Appendix 16

Geotechnical Report

Department of Housing and Public Works

Queensland Government

Pacific Geotech
Consulting Geotechnical Engineers

GEOTECHNICAL REPORT: Proposed Building

McGinn Road

Ferny Grove

Honeywill Consulting Pty Ltd

February 2018

PG-1173

P: (07) 5636 4680 | **F:** (07) 5636 0286
E: info@pacgeo.com.au
A: 47 Brisbane Rd, Biggera Waters QLD 4216
Postal: PO Box 499, Paradise Point QLD 4216
www.pacgeo.com.au ABN: 62 615 248 952

Pacific Geotech
Consulting Geotechnical Engineers

Ref: PG-1173, 2018-02-05, GR VER 1
Author: Samuel Downie

13th February, 2018

Honeywill Consulting Pty Ltd
Email: david@honeywill.com.au

ATTN: DAVID HONEYWILL

Dear Sir,

GEOTECHNICAL INVESTIGATION – PROPOSED BUILDING
MCGINN ROAD, FERNY GROVE

Enclosed is a copy of our report for the above project dated February 2018. An electronic copy of the report has been issued.

Should you have any queries regarding this report, please do not hesitate to contact Peter Elkington at this office.

Yours faithfully,

P. ELKINGTON (RPEQ 7226)

For and on behalf of
PACIFIC GEOTECH PTY LTD

P: (07) 5636 4680 F: (07) 5636 0286 E: info@pacgeo.com.au
47 Brisbane Road, Biggera Waters, Qld, 4216 | PO Box 499, Paradise Point, Qld, 4216
www.pacgeo.com.au
ABN: 62 615 248 952

TABLE OF CONTENTS

Appendices

1.0 INTRODUCTION

This report contains the results of the geotechnical investigation and provides advice and recommendations relating to the following:

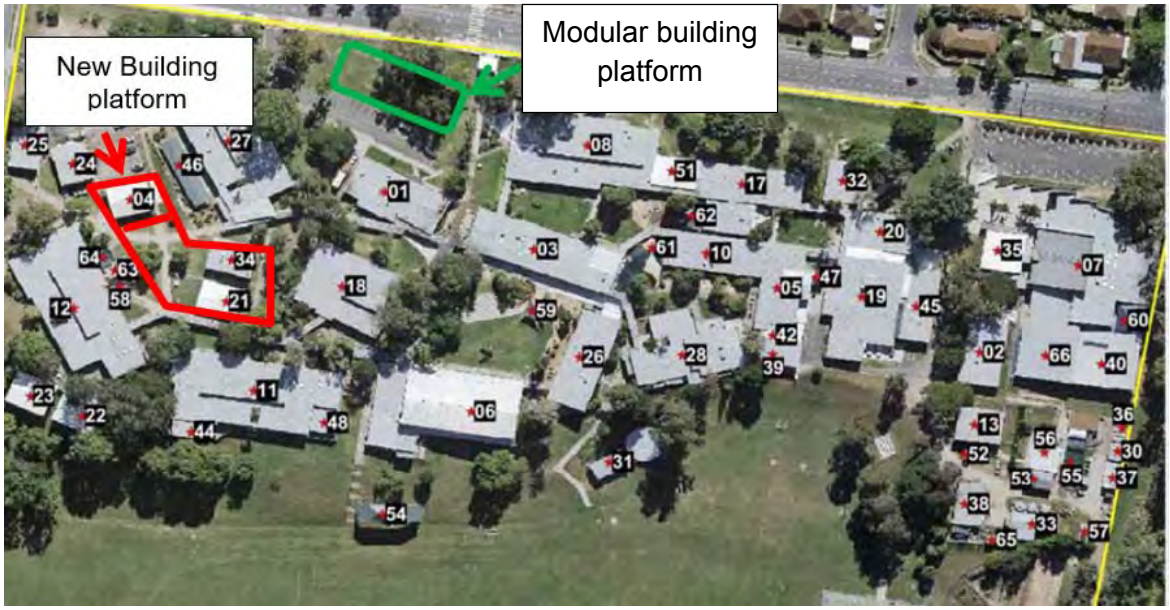
- Subsurface conditions in accordance with AS 1726
- Foundation Recommendations
- Characteristic ground surface movements
- Earthworks considerations
- Batter slope recommendations
- Construction Considerations

Proposed Development

It is understood that the proposed development is to comprise of the construction of a new two storey building at the above site, plus the relocation of the existing modular building to the front of the campus.

Earthworks are envisaged to consists of a cut and fill operation to create level building platforms.

The proposed development is indicated below.



PROPOSED DEVELOPMENT

2.0 METHODOLOGY

The geotechnical investigation comprised the drilling and sampling 6 boreholes, to depths of between 1.8m (drilling rig refusal) to 4.0m, using an EVH 1750P drilling rig and 100mm solid flight augers. Dynamic Cone Penetrometer (DCP) testing was conducted adjacent to the boreholes.

The soil classification descriptions and field tests were carried out in general accordance with Australian Standards.

AS 1726	Geotechnical Site Investigations
AS 1289	Methods of Testing Soils for Engineering Purposes

Borehole records, Dynamic Cone Penetrometer test results and a site plan showing the test locations are appended to the report.

3.0 SITE DESCRIPTION

The site of the proposed development is located in Ferny Grove State High School at McGinn Road, Ferny Grove.

At the time of the investigation, overall the site contained numerous existing school facilities. The proposed new building location is occupied by three existing buildings with footpaths in between the buildings. The new modular building location was clear of existing buildings and is abutting a carpark.

Vegetation comprised of good grass cover across the whole site. Established trees were located within the proposed building locations.

The site sloped gently and drainage was considered fair.

Refer following site photographs for typical site conditions.

SITE PHOTOGRAPHS

4.0 GEOTECHNICAL MODEL

Modular Building Platform

The subsurface profile within vicinity of the modular building platform location encountered in the boreholes (BH 01, BH 02) consisted of a topsoil silty sand layer overlying natural very stiff to hard silty clay which is underlined by highly weathered phyllite to termination depths.

New Building Platform

The subsurface profile within the vicinity of the new building platform location encountered in the boreholes (BH 03, BH 04, BH05, BH06) consisted of a fill material to depths of up to 1.1m overlying a weathered phyllite.

The natural profile consisted generally of a layer very stiff to hard silty clay overlying medium dense to dense clayey gravel / gravelly sand underlined by highly weathered phyllite to termination depths. The rock strength typically increased with depth and decreased in weathering.

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 / Topsoil	Natural			BH TD
		Clayey Gravel / Gravelly Sand	Silty Clay	Phyllite	
		M. Dense / Dense	V. Stiff – Hard	HW	
BH 01	0-0.1	NE	0.1-3.6	3.6-TD	4.0
BH 02	0-0.1	NE	0.1-2.8	2.8-TD	3.5
BH 03	0-0.5	NE	NE	0.5-TD	2.2(3)
BH 04	0-0.4	NE	NE	0.4-TD	1.8(3)
BH 05	0-1.1	1.7-2.1	1.1-1.7	2.1-TD	2.6(3)
BH 06	0-0.2	0.2-0.7	NE	0.7-TD	2.2(3)

Notes:
1. All depths in metres below ground level at time of investigation.
2. NE - Not Encountered; TD - Termination Depth.
3. Maximum TC bit; drill rig refusal.

Groundwater or subsurface seepage was not encountered in the boreholes at the time of drilling. Seepage could be expected through the surficial fill and soils and along the soil/rock interface following periods of rainfall.

Whilst the fill appered to be generally well compacted and no deleterious material was encountered within the fill, given the lack of filling history or certification the fill must be defined as uncontrolled fill.

5.0 LABORATORY TESTING

Laboratory testing was carried out on samples retrieved from the site investigation program and was directed towards assessing the reactivity and subgrade characteristics of the subsurface material.

Laboratory testing included: -

- Aggressivity – to assess required exposure class for concrete members in contact with the ground
- Unconfined Compressive Strength – to assess the bearing capacity of the founding soils.
- Shrink/Swell Index - to assess the reactivity of the subsurface material.

The results of the laboratory testing are contained in Appendix C.

6.0 EARTHWORKS AND SITE PREPARATION CONSIDERATIONS

Earthworks are expected to comprise of a cut and fill operation of up to 1m to create the level building platforms. Insitu treatment of the existing fill material may be required to allow support of the ground floor slab (if adopted).

It is recommended that the following site preparation and earthworks procedures be carried out as part of the earthworks procedures during development.

- All earthworks operations should be carried out in general accordance with AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments".
- Trafficability across the site at the time of the investigation was assessed to be fair to good with no difficulties encountered.
- If significant rainfall events occur during the earthworks operation, some difficulties could be experienced in trafficing the exposed surface, particularly where the silty clays are exposed.
- All topsoil (i.e. soil containing organic matter) and soils containing deleterious matter should be stripped from the construction area at the commencement of the earthworks operation.
- Assessment of the existing fill should be undertaken at the commencement of the bulk earthworks operation to determine the extent of removal and replacement or insitu treatment required.
- The stripped surface should be proof rolled under Pacific Geotech's supervision using a large vibrating roller to identify areas of weak surficial soils and to compact the upper level material.
- The majority of the soils on site will be suitable for re-use as structural fill, provided material is free of organic matter and deleterious material. It is likely that the soils require conditioning to bring the soils to optimum if the soils were

overly moist, difficulty in achieving compaction of the materials will be encountered and moisture conditioning will be required.

- Imported fill should be of fair to good quality with a minimum Soaked CBR value of 10%, a maximum lss=1.0% and a maximum particle size of 75mm.
- All filling should be undertaken in layer thicknesses of approximately 250mm (or as appropriate for the compaction equipment being used). Fill should be compacted to a minimum dry density ratio of 98% Standard in accordance with AS1289 5.1.1.
- Excavation of the subsurface soils (to borehole termination depths) is expected to be achieved using conventional earthworking equipment. Excavators of say 20 tonne are not expected to encounter difficulties in achieving penetration of the soils.
- 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.
- All earthworks operations should be performed under appropriate supervision, in general accordance with the requirements of AS3798 and should be certified as controlled fill by the testing authority.

7.0 BATTERS

Only minor batters are expected across the site (i.e. less than 1m in height) for the development.

Considering the proposed maximum height of cut, a maximum long term batter slope of 25 degrees (1V:2H) and 45 degrees (1V:1H) for the temporary batter slopes (subject to inspection at the time of excavation) could be adopted. Steeper batters are possible by use of retaining structures. These batter slopes are applicable to fill batters where they are suitably compacted.

In case of weathered rock, steeper angles may be possible but would require assessment during excavation.

For excavations of a very short term nature, and subject to assessment of factors such as the conditions at the time of excavation, length of time excavations are to remain open, working conditions/requirements and soil structure and consistency in the cut face, etc., steeper excavations could be possible. Pacific Geotech should be contacted to determine an appropriate profile when construction details have been finalised.

It is essential that batters be suitably protected from erosion and scour. Runoff should not be allowed to discharge directly across the batters.

8.0 POTENTIAL GROUND SURFACE MOVEMENTS

Site investigation and laboratory test results indicate the development site would be classified Class P, in accordance with AS 2870-2011 'Residential Slabs and Footings', due to the depth of fill encountered on site.

From a reactivity perspective the proposed demountable building site would be considered equivalent to Class S, with a maximum y_s of 20mm calculated for the encountered subsurface profile.

The proposed new building rea would be considered equivalent to Class M, with a potential ground surface movement of up to 40mm calculated.

It is recommended that the readers satisfy themselves that the use of AS 2870-2011 is applicable for the proposed design and the above site classification re-confirmed following the completion of the bulk earthworks operation.

9.0 BUILDING FOUNDATIONS

9.1 High Level Foundations

It is recommended that a high level footing system, founding through the existing fill and into the natural clay or weathered rock, be adopted for the support of the proposed buildings.

An allowable bearing capacity of 250kPa in the very stiff to hard silty clay and 600kPa in the highly weathered phyllite would be available, subject to inspection at the time of excavation.

Where uncontrolled fill is encountered, footings should be deepened to penetrate the uncontrolled fill material. This may involve the use of short bored piers or mass concrete pedestals where the depth of filling is excessive for high level footings.

It is recommended that footing inspections be undertaken by Pacific Geotech, following excavation, to confirm the specified founding strata has been reached.

It is recommended that walls supported on high level footings founding in the fill or natural clay be suitably articulated.

Where footings are located adjacent to excavations such as underground service trenches, excavations, or retaining wall etc., it is recommended that the footings be deepened to found at least 200mm below a line drawn up at 45 degrees from the base of the trench / excavation.

9.2 Deep Foundations

If the bearing capacities of the upper level soils is inadequate or where footings are located adjacent to service trenches etc, consideration could be given to adopting a deep foundation system for the support of the proposed structures.

Bored piers or possbily timber push or screw piles could be considered for the support of the proposed structure if reqiured.

The deep foundation system should be designed in accordance with the recommendations of AS 2159-2009 'Piling - Design and Installation'.

The ultimate geotechnical strength ($R_{d,ug}$) of piles can be calculated using the unfactored, ultimate shaft adhesion and end bearing values given in Table 2. The $R_{d,ug}$ values given in Table 2 will need to be multiplied by a suitable geotechnical strength reduction factor ($ø_g$) to obtain the design geotechnical strength ($R_{d,g}$) of piles. In accordance with AS2159-2009, the $ø_g$ value must be determined by the designer, but based on the anticipated site, design and installation risk factors, a $ø_g$ value of 0.48 is recommended. Higher values may be applicable with suitable supervision.

If working stress methods are used in the pile design, the $R_{d,ug}$ values given in Table 2 will need to be divided by a factor of safety of 2.5 to caluculate the maximum single pile working load.

TABLE 2 ULTIMATE (UNFACTORED) PILE DESIGN PARAMETERS

Material	Ultimate Unfactored End Bearing* (kPa)		Ultimate Unfactored Shaft Adhesion* (kPa)
	<4D	>4D	
Existing Fill	NR	NR	NR
Very stiff to hard clays	1200	1800	40
Phyllite - HW	1800	2700	100

Notes:
*Geotechnical strength reduction factor needs to be applied to these parameters.
1. NR – Not Recommended.

Construction Considerations

The bases of bored pile holes must be thoroughly cleaned of all loose soil and rock debris using a proper cleaning tool. The practice of adding water and spinning the auger is generally not acceptable.

Drilling piles is not only dependent on the subsurface profile characteristics, but also the type (power and size) of the bored pile drilling rig, drilling teeth, size of pile, etc. It is recommended that a specialist drilling contractor be consulted to be able to manage the above conditions and materials encountered.

During construction, all bored piles must be inspected by a geotechnical engineer to confirm the geotechnical strength parameters presented in Table 2 and to check the capacity of the piles.

Slab on Ground Floor

Given the good results of the testing undertaken to date, and subject to assessment at the time of the bulk earthworks, consideration could be given to adopting a slab on ground floor for the proposed structures. If this option is adopted, some minor degree of risk of settlement of the fill would still exist and this would have to be accepted by the client.

10.0 RETAINING WALLS

Some minor retaining walls (less than 1.5m in height) may be required as part of the development.

Retaining walls should be specifically engineer designed in accordance with AS 4678-2002 (Ref 9).

The design of flexible and rigid retaining walls could be undertaken using a triangular pressure distribution and the earth pressure parameters given in Table 3. Flexible walls are those which are free to rotate or tilt (such as cantilevered walls) and should be designed using active (Ka) earth pressure coefficient. Rigid walls should be designed using the at-rest earth pressure (Ko).

Passive resistance (Kp) at the toe of the wall should be ignored in the zone where future disturbance (e.g. services trenches) could occur.

The effects of surcharge in the retained zone should be included by multiplying the vertical pressure developed by the surcharge by the appropriate lateral earth pressure coefficient. Allowance should also be made for the surcharge due to sloping crests if applicable.

TABLE 3 EARTH PRESSURE COEFFICIENTS (NON-SLOPING CREST BACKFILL)

Material	Unit Weight (kN/m^3)	Friction Angle (degrees)	Active Ka	At Rest Ko	Passive Kp
Fill	19	24	0.45	0.60	2.40
Clays – Hard	19	28	0.35	0.50	2.75
Phyllite – HW (if encountered)	20	35	0.27	0.43	4.50

Notes: * Depends on fill material type and level of compaction.

Preference should be given to adopting thin soil layers and using small hand-controlled compaction equipment during backfilling against retaining walls. This is in order to limit the stress applied to the walls during construction. Should heavy compaction be required, then wall stresses will be well in excess of Ko and temporary propping should be used.

Clay backfill if adopted should not be placed dry of optimum moisture content, as this can lead to increased future swelling with changes to moisture content or inundation from water creating additional load on the back of the wall.

It is recommended that all retaining walls be drained for full height in order to minimise hydrostatic pressure build-up behind the wall. Additional guidelines on wall drainage are provided in Appendix G of AS 4689-2002.

11.0 SOIL AGGRESSIVITY

Site investigation and laboratory test results indicate the development site concrete exposure classification with surface of members in contact with the ground be classified as 'A2' in accordance with AS3600-2009 'Concrete Structures'.

12.0 EARTHQUAKE SITE CLASSIFICATION

Reference to Section 4.2 in AS1170.4-2007, it is recommended that a site classification of "Class Ce – shallow soil site" be adopted, in accordance with the definitions presented in "Section 4.2 – Class Definitions".

13.0 SITE MANAGEMENT

To maintain the long term performance of the structure, good management of the soil conditions and the development is vital throughout the life of the development.

The following are some specific comments with respect to site management.

- The ground surface around the perimeter of the buildings should slope away from the structure and fall to the stormwater system. Water should not be allowed to pond adjacent to the buildings.
- Founding soils should not be allowed to become saturated.
- Service trenches under the buildings should be kept to a minimum. Saturation of the on-site material will result in an increase in potential ground surface movements.
- Footings should be poured immediately after excavation. If footings cannot be poured on the same day as excavation, a blinding layer of 50mm thickness is recommended.
- Trees, garden beds and other vegetation should be planted at a distance at least equivalent to three quarters of their mature height away from the structures. This will assist in minimising shrinkage movements in the expansive on-soils.
- Existing trees within three quarters of their mature height away of the proposed structures should be removed along with their root structure. This will assist in minimising shrinkage movements in the expansive on-soils.

14.0 LIMITATIONS

We have prepared this report for the Proposed Building at McGinn Road, Ferny Grove. The report is provided for the exclusive use of Honeywill Consulting Pty Ltd, for this project only and for the purposes outlined in the report. It should not be used by, or relied upon, for other projects on the same or different sites or by a third party. In preparing this report, we have relied upon information provided by the client or their agents.

The results are indicative of the subsurface conditions on site only at the specific testing locations. Subsurface conditions can change between test locations and the design and construction should take the spacing of the testing and testing methods adopted and the potential for variation between the test locations.

It is recommended that Pacific Geotech be engaged to provide advice and ensure the development is undertaken in accordance with the assumptions made in writing this report.

This is not to reduce the level of responsibility accepted by Pacific Geotech, but rather to ensure that the parties who may rely on the information contained in this report are aware of the responsibilities they assume in doing so.

P. ELKINGTON (RPEQ 7226)

For and on behalf of
PACIFIC GEOTECH PTY LTD

APPENDICES

APPENDIX A

NOTES RELATING TO THIS REPORT

Notes Relating to this Report

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis.

Every care has been taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical conditions and contains recommendations or suggestions for design and construction. However, unexpected variations in ground conditions will occur. The potential for this will depend partly on testing, spacing and sampling frequency.

If variations are identified, Pacific Geotech would be pleased to assist with additional investigations or advice to resolve the matter.

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Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Description and Classification Methods

The description and classification of soils and rocks used in this report are based on AS 1726.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the percent of other particles present (e.g. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silty	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density which can be correlated from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very Loose	less than 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) and can be quantified by the Pocket Penetrometer test, Vane Shear test, laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 - 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 - 400
Hard	greater than 400
Friable	strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc.

Sampling

Sampling is undertaken during the fieldwork to allow examination of the soil or rock and to allow laboratory testing to be undertaken.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content and minor constituents. Bulk samples are similar but of greater volume

required for some test procedures such as CBR testing.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and collecting 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 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.

Investigation Methods

Test Pits: These are typically undertaken with a backhoe or a tracked excavator, allowing examination of the insitu soils. Limitations of test pits are the problems associated with collapse of the pits, 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 typical diameter of between 50mm to 75mm advance manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as fill, gravel, hard clays and collapse of the borehole (typically in non-cohesive soil).

Continuous Spiral flight Augers: The borehole is advanced using 65mm to 100mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. Augers of up to 300mm in diameter are used to recover larger volumes of sample. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights. Samples can be disturbed and layers may become mixed. Augering below the groundwater table can be less reliable than augering above the water table.

A Tungsten Carbide (TC) bit for auger drilling into rock can be used to indicate rock strength and continuity by variation in drilling resistance and from examination of recovered rock fragments but provides only an indication of the likely rock strength. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is advanced by a bit attached to the end of a hollow rod string, with water being pumped down the drill rods and returned up the annulus of the borehole, carrying the drill cuttings. Changes in stratification can be determined from the return, together with information from "feel" and rate of penetration.

The borehole can be stabilised through the use of drilling mud as a circulating fluid. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. This technique provides a reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel is used, which gives a core of about 50mm diameter. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS.

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 and also of obtaining a disturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposed", 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 63kg hammer, with a free fall of 760mm. The sample is driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense soils, hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of , say, 4, 6 and 7 blows, as
  N = 13
  4, 6, 7
- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as
  N > 30
  15, 30/40mm

Cone Penetrometer Testing (CPT): Cone Penetrometer Testing with or without pore pressure measurement (CPTu) is carried out using a Cone Penetrometer in general accordance with AS 1289 6.5.1, 1999.

In the tests, a 36mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the fractional resistance on a separate 135mm long sleeve, immediately behind the cone. Pore Pressure is recovered through a pore ring located either within, or more usually immediately behind the cone/tip.

As penetration occurs (at a rate of approximately 20mm per second) and data is recorded every 20mm of penetration, the results are presented graphically.

The information provided on the plot comprises:

- Cone resistance – expressed in mPa
- Sleeve friction – expressed in kPa
- Friction ratio – the ratio of sleeve friction to cone resistance expressed as a percentage.
- Pore pressure in kPa
- Tilt of probe (in degrees).

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and rising to 2% to as high as 8%, and higher in organic soils. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes, etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive.

Dynamic Cone Penetrometers:

Dynamic Cone Penetrometer (DCP) tests are carried out by driving a 16mm diameter rod into the ground with a 9kg sliding hammer dropping 510mm and counting the blows for successive 100mm increments of penetration.

Logs

The borehole or test pit logs are an 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.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of the 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:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water 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.

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be flushed from the hole and drilling mud must be washed out of the hole or 'reverted' chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes from which ongoing monitoring can be undertaken.

Fill

The present of fill materials can often be determined only by the inclusion of foreign objects (e.g. 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 to reliably determine the extent of the fill.

Laboratory Testing

Laboratory testing is carried out in general accordance with Australian Standard 1289 'Methods of Testing Soil for Engineering Purposes'.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage.

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 design review.

Site Inspection

Pacific Geotech would be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related:

Requirements could range from:

i. a site visit to confirm that conditions exposed are no worse than those interpreted, to
ii. a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
iii. full time engineering present on site.

APPENDIX B

BOREHOLE RECORD SHEETS

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
BH 01
Page 1 of 1

Project No.: PG-1173

Client:	Honeywill Consulting	Commenced:	11/01/2018
Project Name:	Proposed Classroom Building	Logged By:	TTE
Hole Location:	McGinn Road, Ferny Grove	Checked By:	
Hole Position:			
Drill Model and Mounting:	EVH1750P	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: TTE

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			U50 0.80-0.96 m PP=>600kPa			0.10		SM	NATURAL Silty SAND (SM) Very loose, fine to medium grained, dark grey, organics throughout, moist. (top soil)	0 5 10 15 20 25
								CH	Silty CLAY (CH) Very stiff, high plasticity, red brown, trace of fine to medium grained sand, moist.	
						1				
						2				
						2.40		CH	Silty CLAY (CH) Very stiff to hard, high plasticity, red brown, trace of fine grained gravel, moist.	
						3				
						3.60			PHYLLITE (HW) Highly weathered, low strength, light grey and light brown, moist.	
						4.00			Hole Terminated at 4.00 m	

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal met at 3.36m.
3. Maximum 'TC' bit refusal met at 4.0m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
BH 02
Page 1 of 1

Project No.: PG-1173

Client:	Honeywill Consulting	Commenced:	11/01/2018
Project Name:	Proposed Classroom Building	Logged By:	TTE
Hole Location:	McGinn Road, Ferny Grove	Checked By:	
Hole Position:			
Drill Model and Mounting:	EVH1750P	RL Surface:	No survey
Hole Diameter:		Datum:	AHD
		Operator:	TTE

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			U50 2.00-2.15 m PP=>600kPa			0.10		SM	NATURAL Silty SAND (SM) Very loose, fine to medium grained, dark grey, organics throughout, moist. (top soil)	0 5 10 15 20 25
								CH	Silty CLAY (CH) Very stiff, high plasticity, red brown, trace of fine to medium grained sand, moist.	
						1.70		CH	Silty CLAY (CH) Very stiff to hard, high plasticity, red brown, trace of fine grained gravel, moist.	
						2.80			PHYLLITE (HW) Highly weathered, low strength, light grey and light brown, moist.	
						3.50			Hole Terminated at 3.50 m	

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal met at 2.56m.
3. Maximum 'TC' bit refusal at 3.5m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
BH 03
Page 1 of 1

Project No.: PG-1173

Client:	Honeywill Consulting	Commenced:	11/01/2018
Project Name:	Proposed Classroom Building	Logged By:	TTE
Hole Location:	McGinn Road, Ferny Grove	Checked By:	
Hole Position:			
Drill Model and Mounting:	EVH1750P	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: TTE

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			D 0.60-1.20 m			0.08		SP	FILL Gravelly SAND (SP) Very loose, fine to medium grained, grey, fine to medium grained gravel, organics throughout, moist.	0 5 10 15 20 25
						0.50		GC	FILL Clayey GRAVEL (GC) Dense, fine grained, red brown, low to medium plasticity fines, trace of fine to medium grained sand, moist.	
						1			NATURAL PHYLLITE (HW) Highly weathered, low strength, light grey and light brown, moist.	
						2				
						2.10				
						2.20			PHYLLITE (HW) Highly weathered, medium strength, light grey and light brown, moist.	
						3			Hole Terminated at 2.20 m	
						4				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal met at 0.25m.
3. Maximum 'TC' bit refusal met at 2.2m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
BH 04
Page 1 of 1

Project No.: PG-1173

Client:	Honeywill Consulting	Commenced:	11/01/2018
Project Name:	Proposed Classroom Building	Logged By:	TTE
Hole Location:	McGinn Road, Ferny Grove	Checked By:	
Hole Position:			
Drill Model and Mounting:	EVH1750P	RL Surface:	No survey
Hole Diameter:		Datum:	AHD
		Operator:	TTE

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			D 0.40-1.00 m			0.06		SM	FILL Silty SAND (SM) Very loose, fine to medium grained, dark grey, organics throughout, moist. (top soil)	
								SP	FILL Gravelly SAND (SP) Loose, fine to medium grained, red brown and grey, fine to medium grained gravel, moist.	
						0.40			NATURAL PHYLLITE (HW) Highly weathered, very low strength, light grey and light brown, moist.	
						1.70				
						1.80			PHYLLITE (HW) Highly weathered, medium strength, light grey and light brown, moist.	
									Hole Terminated at 1.80 m	

0 5 10 15 20 25

1 2 3 4

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal met at 0.34m.
3. Maximum 'TC' bit refusal met at 1.8m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
BH 05
Page 1 of 1

Project No.: PG-1173

Client:	Honeywill Consulting	Commenced:	11/01/2018
Project Name:	Proposed Classroom Building	Logged By:	TTE
Hole Location:	McGinn Road, Ferny Grove	Checked By:	
Hole Position:			
Drill Model and Mounting:	EVH1750P	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: TTE

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			D 0.50-0.80 m			0.05		SM	FILL Silty SAND (SM) Very loose, fine to medium grained, dark grey, organics throughout, moist. (top soil)	0 5 10 15 20 25
						0.20		SP		
								SP	FILL Gravelly SAND (SP) Medium dense, fine to medium grained, dark grey and brown, fine to medium grained gravel, moist.	
						1			FILL Gravelly SAND (SP) Dense, fine to medium grained, dark grey and brown, fine to medium grained gravel, moist.	
			U50 1.40-1.40 m PP=?			1.10		CH	NATURAL Silty CLAY (CH) Hard, high plasticity, grey, trace of fine grained gravel, moist. (tending to rock)	
						1.70		GC	Clayey GRAVEL (GC) Medium dense to dense, fine to medium grained, red brown and grey, low plasticity fines, moist.	
						2				
						2.10			PHYLLITE (HW) Highly weathered, very low strength, light grey and brown, moist.	
						2.55				
						2.60			PHYLLITE (HW) Highly weathered, medium strength, light grey and brown, moist.	
									Hole Terminated at 2.60 m	
						3				
						4				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal met at 0.22m and 2.05m .
3. Maximum 'TC' bit refusal met at 2.6m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
BH 06
Page 1 of 1

Project No.: PG-1173

Client:	Honeywill Consulting	Commenced:	11/01/2018
Project Name:	Proposed Classroom Building	Logged By:	TTE
Hole Location:	McGinn Road, Ferny Grove	Checked By:	
Hole Position:			
Drill Model and Mounting:	EVH1750P	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: TTE

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			D 1.00-1.50 m			0.05		SM	FILL MULCH	0 5 10 15 20 25
						0.20			FILL Silty SAND (SM) Loose, fine to medium grained, dark grey, moist.	
						0.30		GC	NATURAL Clayey GRAVEL (GC) Medium dense, fine grained, red brown and grey, low to medium plasticity fines, trace of fine to medium grained sand, moist.	
								GC	Clayey GRAVEL (GC) Dense, fine grained, red brown and grey, low to medium plasticity fines, trace of fine to medium grained sand, moist.	
						0.70			PHYLLITE (HW) Highly weathered, very low strength, light grey and brown, moist.	
						1				
						1.90			PHYLLITE (HW) Highly weathered, medium strength, light grey and brown, moist.	
						2				
						2.20			Hole Terminated at 2.20 m	
						3				
						4				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal met at 0.31m.
3. Maximum 'TC' bit refusal met at 2.2m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

APPENDIX C

LABORATORY TEST CERTIFICATES

Pacific Geotech
Consulting Geotechnical Engineers

SHRINK SWELL INDEX REPORT

CLIENT:	Honeywill Consulting	PROJECT NUMBER:	PG-1173
ADDRESS:	McGinn Road, Ferny Grove	REPORT NUMBER:	PG-1173-SS-01
PROJECT NAME:	Proposed New Building	REPORT DATE:	30-01-18
		TEST METHOD:	AS 1289.7.1.1

SAMPLE LOCATION:	**BH 1 @ 0.8m**
SAMPLING METHOD:	U50
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	11-01-18
DATE TESTED:	25-01-18
MATERIAL TYPE:	Silty Clay

SHRINKAGE MOISTURE CONTENT (%):	16.2
SHRINKAGE (%):	1.5
SWELL MOISTURE CONTENT INITIAL (%):	17.8
SWELL MOISTURE CONTENT FINAL (%):	18.4
SWELL (%):	0.0
UNIT WEIGHT (t/m³):	1.95
SHRINK SWELL INDEX Iss (%):	**0.8**
CRACKING:	moderate
CRUMBLING:	yes

REMARKS:

P: (07) 5636 4680 F: (07) 5636 0286 E: info@pacgeo.com.au
47 Brisbane Road, Labrador, Qld, 4216 | PO Box 499, Paradise Point, Qld, 4216
www.pacgeo.com.au
ABN: 62 615 248 952

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47 Brisbane Road
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NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Peter Elkington**

Report **580510-S**
Project name FERNY GROVE STATE HIGH SCHOOL
Project ID PG-1173
Received Date Jan 16, 2018

Client Sample ID			**BH03@0.6-1.2M**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**B18-Ja09153**
Date Sampled			**Jan 11, 2018**
Test/Reference	LOR	Unit	
Chloride	5	mg/kg	52
Conductivity (1:5 aqueous extract at 25°C)	10	uS/cm	49
pH (1:5 Aqueous extract)	0.1	pH Units	8.6
Resistivity*	0.5	ohm.m	210
Sulphate (as SO4)	30	mg/kg	68
% Moisture	1	%	13

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ABN 51 009 878 899
www.morrisongeo.com.au

Unconfined Compressive Strength Report of Soil Specimens

Client :	PRECISE GEOTECHNICAL PTY LTD	Report Number:	GL17/246Q.23
Client Address :	PO BOX 499, PARADISE POINT QLD, 4216		
Job Number :	GL17/246Q	Report Date:	18.01.2018
Project :	PROPOSED NEW BUILDING - PG-1173	Order Number:	
Location :	McGINN ROAD, FERNY GROVE	Test Method:	AS1289.6.4.1

Lab No :	240325			
ID No :	-			
Lot No :	-			
Item No :	-			
Date Sampled :	11.01.2018			
Date Tested :	12.01.2018			
Material Source :	As Supplied			
For Use As :				
Sample Location :	BH 2 2m U50			
Date of Compression:	12.01.2018			
Diameter / Length:	46.3 / 96.2			
Wet Density kg / m3:	1933			
Moisture Content:	17.1			
Max Load (N):	790			
Unconfined Compressive Strength (Kpa):	469			
Remarks :				

	Ian Masman (Gold Coast)	FORM NUMBER ER0032

APPENDIX D

SITE PLAN

Pacific Geotech
Consulting Geotechnical Engineers

Drawn SD	Project:	PG-1173	Drawing No. PG-1173-01	A4
Date Feb. 2018	Location:	McGinn Road, Ferny Grove		
Checked	Client:	Honeywill Consulting		