

30/11

PLANNING AND ENVIRONMENT COURT  
QUEENSLAND  
23 NOV 2016  
FILED  
BRISBANE

In the Planning and Environment Court  
Held at: Brisbane

**FINAL ORDER**

Appeal No. 1787 of 2016

Between:

**MTAA SUPERANNUATION FUND (FLAGSTONE CREEK AND SPRING  
MOUNTAIN PARK) PROPERTY PTY LIMITED  
ACN 082 445 663**

Appellant

And:

**LOGAN CITY COUNCIL**

Respondent

And:

**HOPE ISLAND CONSORTIUM PTY LTD  
ACN 117 045 735**

Co-Respondent

**JUDGMENT**

Before: His Honour Judge Rackemann  
Date of Hearing: 23 November 2016  
Date of Judgment: 23 November 2016

**THIS MATTER HAVING** on this day come on for hearing by way of appeal against the decision of the Respondent on 1 March 2016 to give a development approval for a Material Change of Use - Shopping Centre (Expansion) in respect of land located at 1-21, 6/1-15, 8/1-15, 23-27, 29-33 & 17-21 Bushman Drive, Jimboomba in the State of Queensland and more particularly described as Lots 0 and 6 on SP146553, Lot 8 on SP198926 and Lots 155, 156 and 157 on RP848032.

**AND UPON HEARING** the solicitor for the Appellant, the solicitor for the Respondent and the solicitor for the Co-Respondent.

**AND UPON READING:**

- 1 the Notice of Appeal filed on 11 May 2016; and
- 2 the Affidavit of Carl Knaggs sworn on 21 November 2016 and the Affidavit of Carl Knaggs sworn on 22 November 2016.

*AND UPON THE COURT BEING SATISFIED THAT THE CHANGES TO THE PROPOSAL ARE MINOR*

**IT IS ORDERED BY CONSENT THAT:**

- 1 The appeal be allowed in part.



**JUDGMENT**

Filed on behalf of the Co-Respondent  
**Form PEC-7**

**Corrs Chambers Westgarth**

Level 43, 111 Eagle Street  
Brisbane Qld 4000  
Tel (07) 3228 9333

Fax (07) 3228 9444

Email: [eva.coggins@corrs.com.au](mailto:eva.coggins@corrs.com.au)

Ref: ML/EC/9120450

- 2 The development application be approved on the basis of the amended package of conditions and documents attached hereto and marked "A".
- 3 The Appellant pay the parties' costs of the Application heard on 13 July 2016, on a standard basis, to be assessed pursuant to the *Uniform Civil Procedure Rules 1999*.

---

Registrar



"A"

## DEVELOPMENT CONDITIONS

**APPLICANT:** COLLIERS INTERNATIONALCONSULTANCY PTY LTD  
**APPLICATION NUMBER:** MCUI/36/2015  
**TYPE & DESCRIPTION:** Material Change of Use - Shopping Centre (Expansion)

### OFFICER DETAILS

The Assessment Manager for this application was:

**Officer Name:** Ben Travers  
**Contact Number:** (07) 3412 5269  
**Please Quote:** MCUI/36/2015  
**Document Number:** 10557081

### LAND

Development Permit to apply to the following land:

**Street Address:** FLAGSTONE VILLAGE, 1-21, 6/1-15, 8/1-15, 23-27, 29-33 & 17-21 Bushman Drive, JIMBOOMBA QLD 4280

**Real Property Description:** Lots 0 & 6 SP146553, Lot 8 SP198926, Lots 155, 156 & 157 RP848032.

### CONDITIONS OF DEVELOPMENT:

#### 1. GENERAL

##### Approved Documents

- 1.1. Undertake development generally in accordance with the following approved plan(s)/document(s) of development; except as altered by other conditions of this development approval including any amendments wherever made in red on the approved plan(s)/document(s):

Title	Plan Number	Rev/Amd't	Date	Prepared by
Site Plan (Overall)	SK01	P	-	Thomson Adsett
Site Plan	SK03	P1	03/12/2015	Thomson Adsett
Staging Plan	WL01	P2	19/10/2015	Thomson Adsett
Demolition Plan	DA03	P2	25/06/2015	Thomson Adsett
Elevations – Sheet 01	DA05	P4	15/10/2015	Thomson Adsett
Sections – Sheet 01	DA06	P4	15/10/2015	Thomson Adsett
Landscape Concept Plan	0715-0053-00 LD-001	A	22.06.2015	Tract
Proposed Flagstone	S-7701-006	H	27/10/2016	Jensen Bowers

Title	Document Number	Rev/Amd't	Date	Prepared by
Flagstone Village Shopping Centre Flood Impact Assessment	0740-04-B	0	25 June 2015	WRM Water & Environment

### **Compliance Timing**

- 1.2. Comply with all conditions of this development approval at no cost to Council and prior to any approval of Building Works or the commencement of the use unless otherwise stated in a specific condition.
- 1.3. Stage 4 of the development, being the future 600m<sup>2</sup> expansion of the Supermarket, cannot commence until such time as Stage 1 of the Major Centre within the Greater Flagstone Priority Development Area commences use.

### **Terms**

- 1.4. Interpret words and terms used in this development approval as having the meaning ascribed to them in the planning scheme under which this development approval has been given unless otherwise stated in a specific condition.

## **2. PROPERTY**

### **Amalgamation of Lots**

- 2.1. Amalgamate Lot 8 on SP 198926, and Lots 155, 156 157 on RP 848032 into one allotment. The Subdivision Plan providing for the amalgamation must be registered prior to any approval of Building Works or the commencement of the use.

### **Parking and Access - Integration between the Land and the Community Titles Scheme**

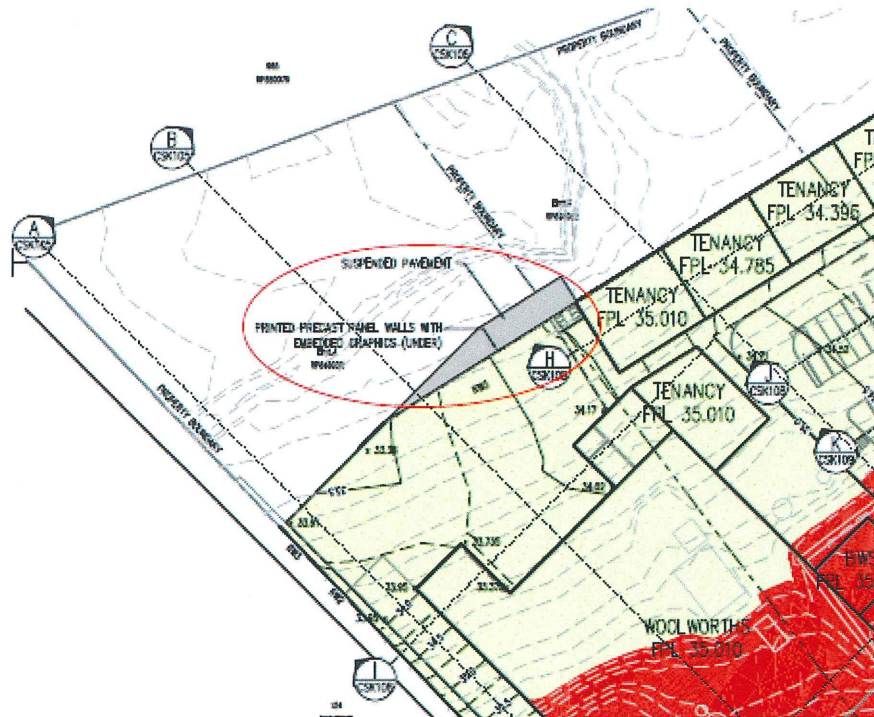
- 2.2. Ensure the car parking area shown on the approved plan Proposed Flagstone S-7701-006, Issue H, dated 27 October 2016, prepared by Jensen Bowers, is available for the parking and pedestrian and vehicular movement of all visitors and patrons of the Community Titles Scheme on which the shopping centre (as expanded) is situated, which includes visitors and patrons of Lots 1, 5, 6 and 7 on SP 146553, and maintained as part of an integrated car park, in accordance with the approved plan.
  - 2.2.1. Ensure the car parking area situated on the Common Property, unless indicated for exclusive use of Lot 6 on SP 146553 on approved plan Proposed Flagstone S-7701-006, Issue H, dated 27 October 2016, prepared by Jensen Bowers, is available for the parking and pedestrian and vehicular movement of all visitors and patrons of the Community Titles Scheme on which the shopping centre (as expanded) is situated and operated and maintained as part of an integrated car park, in accordance with the approved plan.
  - 2.2.2. Ensure no structures, signs or similar impediments are erected or displayed which prevent or restrict the approved car parking area from being available for the parking and pedestrian and vehicular movement of all visitors and patrons of the Community Titles Scheme on which the shopping centre (as expanded) is situated.
  - 2.2.3. Provide internal access for pedestrian and vehicular movement to Lot 7 on SP 146553, generally in accordance with the location shown on approved plan Proposed Flagstone S-7701-006, Issue H, dated 27 October 2016, prepared by Jensen Bowers.

*Note: Council's minimum number of required car parking spaces for the shopping centre (as expanded) is agreed to be reduced as the integrated parking arrangements for the shopping centre allows for the sharing of parking at different hours of operation. The above conditions are required to ensure car parking is provided in an integrated manner.*

## Easement(s)

- 2.3. The development is to be wholly located outside of Easements J and K on RP 848032 with the exception of the suspended slab shown in *Figure 1*.

*Figure 1: Suspended pavement encroaching within Emt J and K on RP 848032*



## Land dedication specifically as road reserve

- 2.4. Dedicate to the state, at no cost to Council, the following land as road reserve:
- 2.4.1. land along the frontage of the site to Bushman Drive which is necessary to facilitate access arrangements to the development, as shown on the approved plan(s) of development, or as approved as part of a subsequent Operational Works application.

### Further Advice:

*Documentation in relation to any land required to be registered to the benefit of Council is required to be prepared and carried out by Council's solicitors at the applicant's expense.*

## Permanent Survey Mark(s)

- 2.5. Where Permanent Survey Marks are required to be shown on new survey plans the Surveyor will provide the Department of Natural Resources and Mines an Australian Height Datum height for all new and unlevelled existing Permanent Survey Marks.
- 2.6. Ensure that at least 50% of any new Permanent Survey Marks placed as a result of the subdivision are to be a standard brass plaque in concrete.
- 2.7. Level all Permanent Survey Marks shown on the Subdivision Plan (ie. the Plan of Survey) submitted to the Council for approval with information about the level to be submitted to both Council and the Department of Natural Resources and Mines, unless Council confirms in writing that this is not required due to the location of the land and its survey constraints.
- 2.8. Submit certification from a cadastral surveyor that the previous conditions with respect to Permanent Survey Marks have been complied with.

## Demolish Building(s) and/or Structure(s) – all on site

- 2.9. Demolish or relocate off site all existing buildings and/or structures on the site, as shown on the approved plan(s) of development, and disconnect and where required cap all associated services in accordance with a Plumbing and Drainage application and the Water Infrastructure Branch guidelines prior to demolition commencing.

### 3. LANDSCAPE AND AMENITY

#### Landscaping Drawings and Works

- 3.1. Submit for Council approval detailed landscape drawings and documentation consistent with the conditions of this approval, the approved plan(s) of development and modified as follow:
  - 3.1.1. Provide a minimum 3.0 metre wide garden bed with planting along the whole of the Bushman Drive and Homestead Drive frontage of the site, to maximise visual appeal, except where varied by other conditions of this development approval.
  - 3.1.2. Provide a minimum 3.0 metre wide visual buffer garden bed being primarily screen planting along the south-western boundary of the site adjacent existing residence, to ensure visual screening, except where varied by other conditions of this development approval.
  - 3.1.3. Provide landscaping including shade tree planting, or the provision of shade structures, to proposed car parking to ensure provision of appropriate garden bed area, planting and shade.
  - 3.1.4. Provide landscaping, including street trees and turf, to existing Bushman Drive road reserve as follows:
    - 3.1.4.1. Street trees to locations with clearances, spacing, and setbacks coordinated with aboveground infrastructure, underground infrastructure;
    - 3.1.4.2. Street trees installed to standard detail;
    - 3.1.4.3. Street tree species selection based on maximised suitability to site soil conditions and as per recommend;
    - 3.1.4.4. Public seating located generally in accordance with the approved plan(s) of development;
    - 3.1.4.5. A minimum 2.0 metre wide visual buffer garden bed being primarily screen planting within the southern verge of Bushman Drive, fronting 4-8 to 34-38 Bushman Drive (more accurately described as Lots 3-7 on RP 848031 and Lot 8 on RP848032), to ensure visual screening.
      - 3.1.4.6.1 Established maintenance for a minimum of 24 months following practical completion.
  - 3.1.5. Provide appropriate width equitable access connections adjacent to all proposed vehicle entrances to the internal pedestrian network to satisfy safe pedestrian entry into and movement within the existing and proposed new shopping centre.
  - 3.1.6. Provide a six (6) metre wide threshold treatment to all vehicle entry and exit road points commencing at the property and verge boundary / interface. Highlight in a different colour / treatment to the surrounding pavement to signify internal (no-public) road, vehicle only access and on verge pedestrian warning of vehicles crossing.
  - 3.1.7. Provide threshold treatments to pedestrian crossings on internal vehicle paths, to be highlighted in a different colour / treatment to the surrounding pavement to signify warning to pedestrian crossing of vehicles and to vehicles of pedestrians on internal road.
  - 3.1.8. Provide a minimum six (6) metre threshold treatment to the entry of services vehicle paths, to be highlighted in a different colour / treatment to the surrounding pavement to signify no public access for vehicles on the internal road.
  - 3.1.9. Provide a minimum 1.8 metre high 50% transparent and non-climbable fence to be located along the common boundary of Homestead Park, to ensure no access in to the shopping centre from Homestead Park.
  - 3.1.10. Provide a minimum 1.8 metre high 50% transparent, non-climbable fence and lockable access gate/s perpendicular to the proposed buildings, structures and/or property boundaries to ensure controlled access and public exclusion to the rear of the loading area and specialty tenancies adjoining the amenities and mini major.

- 3.1.11. Provide other forms of public access deterrents to the rear of the supermarket and drive through take away in the form of CCTV cameras, sensor lighting and signage.
- 3.1.12. Provide security (motion sensor) lighting to the entire controlled access / public exclusion rear area of proposed new buildings.
- 3.1.13. Provide variety of massed planted in like groupings of native grasses species with maximum growth height of 1.0 metre to the proposed garden areas to the rear of proposed new building area/s.
- 3.1.14. Provide to all proposed refuse storage area:
  - 3.1.14.1. impervious, drained and provided with a hose cock;
  - 3.1.14.2. enclosed and lockable to be secured after hours;
  - 3.1.14.3. illuminated for night time use; and
  - 3.1.14.4. screened from view from public land.
- 3.1.15. Provide a location and design for letterboxes for all existing and proposed tenancies to ensure clear access for both occupant collection and postal delivery.
- 3.1.16. Provide to the proposed bio-retention basins planting to be in accordance with the Healthy Waterways 'Water by Design' Technical Guidelines'.
- 3.2. Obtain a Compliance Certificate – Landscape (Documents) from Council, for landscape drawings and documentation in accordance with the Planning Scheme Policy 5 – Infrastructure landscape drawing standards that is a coordinated and responsive landscape design.
- 3.3. Obtain a Compliance Certificate – Landscape (Works) from Council, prior to the commencement of the use, that the required landscape works have been done on site in accordance with Planning Scheme Policy 5 – Infrastructure landscape works standards consistent with the conditions of this approval and Compliance Certificate - Landscape (Documents) or if not done prior to the commencement of the use have been bonded to ensure their compliance.

Further Advice:

- *Select planting species with the criteria of low maintenance, tolerant of site conditions, predominantly native trees, shrubs and groundcovers.*
- *Provide detailed information for construction on the height, material and location of proposed existing to be retained and new fencing internally and on common boundaries.*
- *Provide typical cross-section in strategic location through any areas with a change of level to illustrate landscape treatments, drainage and garden widths / setbacks, etc.*
- *Provide a completed IDAS Form 32, Operational Works / Compliance Certificate Application fees and Landscape Drawing / Documentation to commence assessment of Compliance Certificate (documents).*
- *Provide with IDAS forms a completed Supplementary Information Sheet for Landscape Compliance Certificate application fees (documents and works)*

**Parks**

- 3.4. Proposed retaining walls must be wholly located within the shopping centre subject site, and not within the adjoining parkland (Homestead Park).
- 3.5. Provide external graffiti resistant paint to all proposed retaining walls and fencing adjoining parkland.
- 3.6. Erect protective mental fence of 1800mm in height and in accordance with AS4970-2009 Protection of Trees on Development Sites, along the boundary of the adjoining park (Homestead Park) and the subject site at the location of construction works, to prevent damage to the park.
- 3.7. Provide and maintain temporary erosion and sedimentation control fencing in accordance with the Council's adopted standards to protect the adjoining park (Homestead Park) from any potential impacts of sediment from the development site.
- 3.8. Any proposed damage or removal of existing vegetation within the adjoining parkland must be prior approved by Council in accordance with a Development Permit for Operational Works.

- 3.9. Any disturbance to the adjoining parkland must be restored and/or rehabilitated in accordance with a Development Permit for Operational Works.
- 3.10. Excavation, including trenching, must occur no closer than 3.0 metres from the trunk of any trees sought to be preserved within the adjoining park (Homestead Park).
- 3.11. Any park area caused to become unsightly or contaminated during construction works as a result of placement, deposition or discarding of rubbish, refuse or waste matter or thing onto or into the park must be restored and/or rehabilitated to the state it was in prior to the actions having occurred.
- 3.12. Do not store mechanical plant or materials within the adjoining park (Homestead Park).

#### **4. ENVIRONMENT, HEALTH AND OPERATION**

##### **Hours of Operation and Services- Supermarket**

- 4.1. Ensure the hours of operation of the supermarket are between 7:00am to 10:00pm Monday to Saturday and 8:00am to 6:00pm Sunday.
- 4.2. Ensure waste collection and service activities (i.e. grease trap removal) activities associated with the operation of the use only occur between the hours of 7:00am and 6:00pm Monday to Friday.
- 4.3. Ensure all pick-up/deliveries are limited to between the hours of 7.00am and 6.00pm Monday to Saturday.
- 4.4. Refrigerated vehicle deliveries are to be restricted to 7.00am and 5.00pm Monday to Friday and 8.00am to 5.00pm Sundays and Public Holidays.
- 4.5. Cleaning of all car parks including trolley collection is to be between the hours of 7.00am to 7.00pm Monday to Saturday and 8.00am to 6:00pm Sunday.

##### **Hours of Operation - Specialty Shops and Food Outlet**

- 4.6. Ensure the hours of operation of the specialty shops and food outlets are between 7:00am to 10:00pm Monday to Sunday.
- 4.7. Ensure all pick-up/deliveries are limited to between the hours of 7.00am and 10.00pm Monday to Saturday and 8:00am to 12:00pm (noon) Sunday.
- 4.8. Ensure waste collection and service activities (i.e. grease trap removal) activities associated with the operation of the use only occur between the hours of 7:00am and 6:00pm Monday to Friday.

##### **Lighting Emissions**

- 4.9. Provide certification to Council from a suitably qualified person that all on site lighting (particularly outdoor lighting) complies with AS4282:1997 (Control of Obtrusive Effects of Outdoor Lighting) and any requirements of the applicable planning scheme.

##### **Refuse Storage Area**

- 4.10. Provide a refuse storage area located as shown on the approved plan(s) of development (service yard). This storage area must be:
  - 4.10.1. impervious, drained and provided with a hose cock;
  - 4.10.2. enclosed so the area is able to be secured after hours;
  - 4.10.3. located in accordance with crime prevention through environmental design principles so as not to create a natural ladder;
  - 4.10.4. illuminated for night time use;
  - 4.10.5. screened from view from public land with a maximum transparency of 20%.

##### **Substation**

- 4.11. Relocate the proposed substation away from the childcare centre and the outdoor play area.

##### **Acoustics - General**

- 4.12. Ensure that all deliveries are prearranged and there are no vehicles queuing onsite.

- 4.13. Secure and maintain all stormwater grates to prevent rattling.
- 4.14. Ensure all forklifts and delivery vehicles associated with the use have broadband reverse beepers/alarms installed and operated.
- 4.15. Conduct the activity in a manner that achieves the noise emission standards outlined in Table 3.2.1.2-(Noise emission standards for the protection of general amenity) *Logan Planning Scheme 2015 version 1.1* are met, and the acoustic quality objectives outlined in Schedule 1 of the *Environmental Protection (Noise) Policy 2008*, and does not allow the unreasonable emission of noise to the environment.
- 4.16. Noise emissions from the activity including from any fixed or mobile machinery must not exceed the following levels at the site boundary.

**Table 1 - Residential Amenity Noise Emission Standards**

<b>Noise level at the boundary of premises</b>			
<b>Noise type</b>	<b>Time period</b>	<b>Monday to Saturday</b>	<b>Sunday and public holidays</b>
Non-steady sound*	Day 7:00am – 6:00pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)
	Evening 6:00pm – 10:00pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)
	Night 10:00pm – 7:00am	$L_{Aeq,adj,T} \leq L_{A90}$ plus 0 dB(A) and $L_{Amax} \leq 60$ dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 0 dB(A) and $L_{Amax} \leq 60$ dB(A)
Continuous noise*	Anytime	$L_{A90,T}$ plus 0 dB(A)	$L_{A90,T}$ plus 0 dB(A)

*As defined in AS1055.1-1997 Acoustics – Description and measurement of environmental noise*

- 4.17. In the event of a noise complaint regarding the operation of the activity, conduct an appropriate investigation to determine whether the operation of the activity has exceeded the noise emission standards outlined in the applicable planning scheme and the acoustic quality objectives outlined in Schedule 1 of the *Environmental Protection (Noise) Policy 2008*.
- 4.18. If the noise emission standards outlined in the applicable planning scheme and the acoustic quality objectives outlined in Schedule 1 of the *Environmental Protection (Noise) Policy 2008* have been exceeded, prepare and submit a Transitional Environmental Program (TEP) to Council for approval within one month of the noise complaint being received. The TEP must address all relevant sections of the *Environmental Protection Act 1994*, particularly sections 331, 334 and 335. The TEP must include, but is not restricted to:
  - 4.18.1. objectives of the program;
  - 4.18.2. measures to be implemented to achieve the objectives;
  - 4.18.3. appropriate performance indicators at intervals of less than 6 months; and
  - 4.18.4. provisions for monitoring and compliance recording.
- 4.19. The TEP must demonstrate how compliance with the noise emission criteria outlined above will be achieved, and include a timetabled implementation plan. Once approved, the use must operate in accordance with the approved TEP.

**Acoustics – Trolley Storage**

- 4.20. Relocate the designated trolley storage area to at least 30 metres from the adjoining residential boundary as shown in *Figure 2*.

### Acoustics - Loading Dock

- 4.21. Install and maintain a roof over the loading dock as shown in *Figure 2* with the following minimum basic specifications:
- 4.21.1. A surface mass density of 12.5kg/m<sup>2</sup>;
  - 4.21.2. Use absorbent material on the underside to reduce reverberation; and
  - 4.21.3. Free from holes, gaps and rattle.

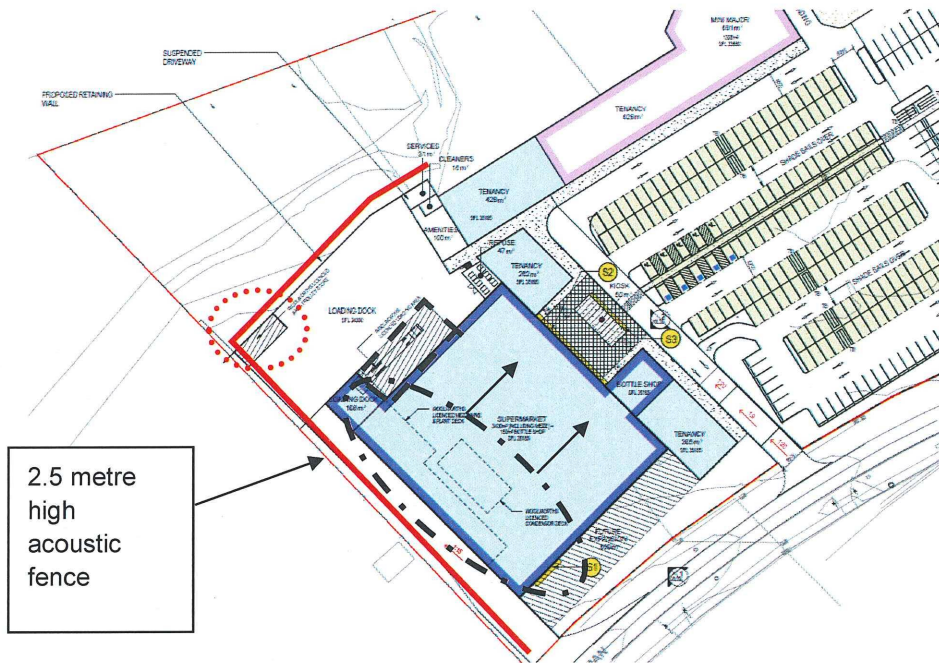
### Acoustics - Roof mounted plant

- 4.22. Relocate all roof mounted equipment to the eastern section of the supermarket roof.

### Acoustics - Fences

- 4.23. Construct an acoustic fence as outlined in *Figure 2*. The fence is to have the following minimum basic specifications:
- 4.23.1. A height of 2.5m above the finished ground level;
  - 4.23.2. A surface mass density of 12.5kg/m<sup>2</sup>; and
  - 4.23.3. Free from holes, gaps and rattle.

*Figure 2: Additional acoustic measures to be carried out*



- 4.24. Construct an acoustic fence around the north, east and west sections of the child care centre boundary that are adjacent to car parking lots. The fence is to have the following minimum basic specifications:
- 4.24.1. A height of 1.8m above the finished ground level;
  - 4.24.2. A surface mass density of 12.5kg/m<sup>2</sup>; and
  - 4.24.3. Free from holes, gaps and rattle.

### Mechanical Plant

- 4.25. All mechanical plant installed must be certified by a suitably qualified acoustic engineer demonstrating that the noise limits outlined in Table 3.2.1.1 of Planning Scheme Policy 3—Environment management 3.2 Emission and immission standards Logan Planning Scheme 2015 version 2.0 are complied with at all times at the site boundary.

## **Vegetation - Replanting & Rehabilitation**

- 4.26. Develop a Site Based Rehabilitation Plan (SRP) that provides a strategy for the rehabilitation and maintenance of the site in accordance with Council planning scheme policy(s). To ensure that there is no net loss in biodiversity values, at least 64 trees are to be replanted in the waterway buffer area. The SRP must comply with all other conditions of this approval and must include, but is not limited to, the following items:
- 4.26.1. site characteristics;
  - 4.26.2. revegetation locations;
  - 4.26.3. species selection;
  - 4.26.4. planting densities;
  - 4.26.5. planting methodology;
  - 4.26.6. maintenance schedules; and
  - 4.26.7. satisfaction of the following objectives;
    - 4.26.7.1. revegetation must occur in strategic locations which will enhance biodiversity outcomes, existing areas of native vegetation or fauna habitat and link or enhance wildlife corridors;
    - 4.26.7.2. provide for the direct restoration of the bed and/or banks of the waterway/wetland, and the associated vegetation;
    - 4.26.7.3. species selection will be based on the regional ecosystems which naturally occur on the subject site (including canopy species);
    - 4.26.7.4. plants used are to be made up of locally derived seed stock;
    - 4.26.7.5. ensure that trees planted as part of the rehabilitation of the site are planted in a manner and in locations, which will ensure their long-term survival. In considering the precise planting locations, consider matters such as the potential height of the trees on maturity, the locations of actual and future structures, works and the usage areas;
    - 4.26.7.6. maintenance of the completed revegetation must be undertaken that will include the removal of weeds, mowing and slashing, replacement of dead or damaged trees which have been planted, as well as ongoing sediment and erosion control methods for a period of at least 12 months after planting.
- 4.27. Ensure the SRP is:
- 4.27.1. prepared and signed by a suitably qualified environmental consultant (or an alternative person determined by Council as being suitably qualified to prepare such a plan) as being in accordance with the planning scheme and this development approval;
  - 4.27.2. submitted to Council for compliance assessment under the Sustainable Planning Act 2009 prior to or concurrently with any application for operational works; and
  - 4.27.3. approved by Council.
- 4.28. Implement any approved Site Based Rehabilitation Plan at all times during construction of the development and for any maintenance period identified in the Site Based Rehabilitation Plan.
- 4.29. Ensure any revegetation required in any approved Site Based Rehabilitation Plan is completed.
- 4.30. Ensure a legible copy of the approved Site Based Rehabilitation Plan and approval conditions are available on site at all times during construction and earthworks.

## Vegetation Clearing

- 4.31. Undertake vegetation clearing only within the development footprint of approved buildings and structures and their associated parking and access areas as identified on the approved plan(s) of development. No additional clearing is permitted within the waterway buffer areas nor beyond the development footprint other than in accordance with Table 8.2.2.1.1 to Table 8.2.2.1.5 of the Biodiversity areas overlay code of the planning scheme.
- 4.32. Ensure all vegetation cleared as a result of this development approval and requiring disposal is disposed of:
  - 4.32.1. on the premises for landscaping and sediment and erosion control purposes (for example as mulch); and/or
  - 4.32.2. at a waste disposal facility operated by Council provided that the waste is delivered to the waste disposal facility in a manner and form which allows it to be mulched at the facility; and/or
  - 4.32.3. in such other environmentally responsible manner as meets with the written approval of the Council; and
  - 4.32.4. ensure any vegetation cleared as a result of this development approval is not burnt or incinerated except for the purpose of domestic heating inside a dwelling on the subject site.
- 4.33. Ensure compliance with AS 4970 - 2009 Protection of trees on development sites, including but not limited to the implementation of a 'Tree Protection Zone' where trees are to be retained onsite and undertake the following:
  - 4.33.1. install protective fencing to prevent any damage to areas not in the approved vegetation clearing area in general accordance with Section 4.3 of AS 4970 - 2009;
  - 4.33.2. provide signs identifying the 'Tree Protection Zone' on exclusion fencing that are clearly visible from all areas within the development site within 20 metres of the exclusion fencing; and
  - 4.33.3. ensure all trees to be retained within allotments are protected from harm during works on site. Ensure activities such as traffic, stockpiling and compaction are excluded from areas of retained vegetation particularly within the tree protection zones of retained trees.
- 4.34. Develop a Vegetation Clearing and Management Plan (VMP) that addresses all activities associated with construction of the development (including Building Works, Operational Works and Plumbing and Drainage Works) as they relate to existing vegetation on site. The VMP must comply with all other conditions of this approval and must include, but is not limited to, the following items:
  - 4.34.1. a clear indication of all trees to be removed and retained;
  - 4.34.2. details of all operational works likely to impact on existing vegetation;
  - 4.34.3. temporary and permanent exclusion and protection fencing;
  - 4.34.4. roles and responsibilities for site contractors, the proponent, and the consultant group;
  - 4.34.5. stockpiling and reuse of cleared vegetation;
  - 4.34.6. a clearing sequencing plan showing the commencement of clearing and the direction of removal (this should be in conjunction with the Fauna Management Plan to allow the appropriate flushing of fauna to surrounding safe haven areas);
  - 4.34.7. ongoing weed management;
  - 4.34.8. a detailed ongoing rehabilitation and maintenance plan including the restoration and enhancement of disturbed areas in the post construction phase and processes to maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas; and
  - 4.34.9. specific details on the removal of potential habitat trees.

- 4.35. The VMP must be:
- 4.35.1. prepared and signed by a suitably qualified environmental consultant (or an alternative person determined by Council as being suitably qualified to prepare such a plan) as being in accordance with the planning scheme and this development approval; and
  - 4.35.2. submitted to Council for compliance assessment under the *Sustainable Planning Act 2009* prior to or concurrently with any application for operational works; and
  - 4.35.3. approved by Council.
- 4.36. Implement any approved Vegetation Clearing and Management Plan at all times during construction of the development.
- 4.37. Ensure a legible copy of the approved Vegetation Clearing and Management Plan and approval conditions are available on site at all times during construction and earthworks.

#### **Fauna Management**

- 4.38. Ensure all potential habitat trees that are to be removed are checked for wildlife prior to removal. Where native vertebrate animals are found, clearing must cease and a Wildlife Spotter (Department of Environment and Heritage Protection approved) contacted. All native vertebrate animals located within, on and amongst plants or areas of plants proposed to be harmed in accordance with this approval are only to be managed under the guidance of a Wildlife Spotter (Department of Environment and Heritage Protection) approved.

### **5. ENGINEERING**

#### **General - Engineering standard - Obtain Permit**

- 5.1. Obtain an operational works permit for Roadworks, stormwater quantity and quality, access, parking, earthworks, erosion and sediment control, electrical reticulation, sewer and water.

#### **General - Engineering standard**

- 5.2. Construct all works generally in accordance with the approved plan(s) of development and in accordance with the Council's adopted standards.
- 5.3. The applicant is responsible for protecting nearby property owners from dust pollution arising from the construction and maintenance of the works required by this approval and must comply with any lawful instruction from the Council if in his opinion a dust nuisance exists.

#### Advice Note:

*This approval does not include the sewer house drain/s for proposed lot/s/development. The applicant is required to obtain a plumbing and drainage permit prior to commencement of any works on internal sewer (house drains) and water reticulation.*

*The movement of commercial soil, extracted or waste soil, mulch, grass clippings, branches, commercial and non-commercial pot plants, baled hay and straw, within a Fire Ant Restricted Area must be undertaken in accordance with movement controls for those materials. Movement controls for high-risk materials are documented on the Department of Agriculture, Fisheries and Forestry web site. For further advice about movement controls, identification and treatment of fire ants, refer to the DAFF web site ([www.daff.qld.gov.au](http://www.daff.qld.gov.au)) or phone the DAFF Call Centre on 13 25 23.*

*When water restrictions are in place within the City of Logan, use of reticulated water for construction purposes is not permitted except for landscaping in accordance with the South East Queensland water restrictions.*

#### **General - RPEQ Certification**

- 5.4. Submit to Council certification from a Registered Professional Engineer of Queensland (RPEQ-Civil) that all engineering works authorised by this development approval and any related approval issued by Council as defined in Section 341(7) of the *Sustainable Planning Act 2009* have been designed and constructed in accordance with the requirements of the development approval(s).

#### **General – Submission of As Constructed drawings**

- 5.5. Submit to Council 'As Constructed' drawings in accordance with Part 5 of Planning Scheme Policy 5 - Infrastructure, including an asset register, checked by a Registered Professional Engineer Queensland (RPEQ-Civil), certifying that the works have been completed in accordance with the Council's adopted standard(s).
- 5.6. Ensure that the asset register is in editable spreadsheet format comprising assets with design life, geographical, geometrical attributes consistent with the as-constructed drawings.

#### **Rectification**

- 5.7. Be responsible for the full cost of any alteration necessary to electricity, telephone, water mains, sewer mains, stormwater drainage systems or easements and/or other public utility installations resulting from the development or from road and drainage works required in connection with the development.

#### **Stormwater Quality**

- 5.8. Submit to Council for approval a final Detailed Stormwater Quality Management Plan (DSQMP) including all stormwater infrastructure, relevant landscaping and engineering designs as a part of any operational works application. The final detailed stormwater management plan and designs are to be in accordance with the Water Sensitive Urban Design Technical Design Guidelines for South East Queensland (WSUD TDG), the Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands (C&E guidelines) and IPWEAQ Standard Drawings numbers WSUD-001 to WSUD-012 and must include:
  - 5.8.1. a copy (on CD and also emailed to EAP@logan.qld.gov.au) of MUSIC modelling, undertaken in accordance with the MUSIC User Manual and MUSIC Modelling Guidelines, that demonstrates that the proposed treatment train achieves Council's load based reduction water quality objectives;
  - 5.8.2. detailed calculations for each treatment measure and completed copies of the applicable Design Calculation Summary checklists from the WSUD TDG;
  - 5.8.3. a completed copy of the relevant design assessment checklist from the WSUD TDG for each treatment measure certified by the stormwater quality system designer;
  - 5.8.4. details of how the bioretention basin will be protected during the construction and building phases of the development based on one of the four methods outlined in the C&E guidelines. Identify which method will be adopted and include a copy of the relevant step-by-step sequence and sign-off forms as an appendix to the report; and
  - 5.8.5. an Operational Management and Maintenance Plan (OMMP) as a separable section of the DSQMP to provide an outline of the proposed long term operational management and maintenance requirements of the proposed stormwater system on the site. The OMMP must include a plan showing the location of the individual components of the system.

#### **Stormwater Quality: Sediment & Erosion Control**

- 5.9. An operational works permit is required to address Erosion and Sediment Control
- 5.10. Provide to Council an Erosion and Sediment Control Plan designed in accordance with the International Erosion Control Association (Australasia) Best Practice Erosion and Sediment Control Guidelines (2008) prior to the commencement of any works on site or prior to the submission to Council of any application for operational works, whichever occurs first. Install, monitor and amend where necessary the erosion and sediment control measures during all phases of the development to ensure all reasonable and practicable measures are taken to prevent environmental harm.

#### **Stormwater Quantity - Connection**

- 5.11. Connect the development to the existing stormwater system at no cost to Council.

#### **Stormwater Quantity - Design**

- 5.12. An operational works permit is required to address Stormwater Quantity design.

- 5.13. Provide stormwater drainage for the development in accordance with the Queensland Urban Drainage Manual (QUDM), Australian Rainfall and Runoff (ARR) and the applicable section of the planning scheme. Where there is any inconsistency, the planning scheme takes precedence.
- 5.14. Provide overland flow paths that do not alter the characteristics of existing overland flows on other properties or that create an increase in flood damage on other properties.
- 5.15. Ensure that all stormwater drainage through parkland is via underground pipes unless it is via a lawful waterway or approved otherwise by Council in writing.
- 5.16. Design and construct stormwater drainage to ensure that the development will achieve 'no worsening' as described in the Queensland Urban Drainage Manual (QUDM) and not:
  - 5.16.1. make material changes to the pre-development overland flows and/or peak flow; or
  - 5.16.2. increase the pre-development, frequency or concentration of overland stormwater flow at the point of discharge to all downstream properties including road reserves and the like. This must be based on design storms of Q2, Q5, Q10, Q20, Q50 and Q100.
- 5.17. Submit to Council a stormwater design, checked and certified by a Registered Professional Engineer of Queensland (RPEQ) for a major storm recurrence interval of 100 years. The design must have a minimum freeboard determined in accordance with the requirements of:
  - 5.17.1. Table 9.03.1 of the Queensland Urban Drainage Manual (QUDM) for overland flow paths; and
  - 5.17.2. Table 5.06.1 of the Queensland Urban Drainage Manual (QUDM) for detention basins and an underground drainage network designed to cater for the minor storm recurrence interval of 10 years.

#### **Stormwater Quantity - Lawful Point of Discharge**

- 5.18. Lawful point of discharge for the development is Sandy Gully.
- 5.19. Discharge all minor storm flows that fall or pass onto the site to the lawful point of discharge in accordance with the Queensland Urban Drainage Manual (QUDM).

#### **Stormwater Quantity – Stormwater Management On site (Operational Works approval required)**

- 5.20. An operational works permit is required for Stormwater Quantity Management.
- 5.21. Submit to Council for approval, as a part of an application for operational works, a final detailed stormwater management plan, designed in accordance with QUDM and Council's planning scheme and policies.

#### **Flooding - Local**

- 5.22. Works are to be carried out generally in accordance with approved Flood Impact Assessment and plan(s) of development.

#### **Roadworks – Frontage works**

- 5.23. An operational works permit is required for the following roadworks/frontage works.
- 5.24. Design and construct the road along the Bushman Drive frontage of the site as an urban collector single carriageway road and more specifically include:
  - 5.24.1. concrete barrier kerb and channel on a 4.0 metre alignment, subsequent to any road reserve widening required by this approval, from the road reserve boundary and associated stormwater;
  - 5.24.2. maintain a minimum width of 3.2 metres for the full length of all traffic lanes, including turning lanes, unless otherwise approved as part of an Operational Works application;
  - 5.24.3. a compacted gravel pavement and an Asphaltic Concrete (AC) wearing course up to a minimum of 1.0 metre beyond the road centreline unless:
    - 5.24.3.1. an alternative alignment or construction material has been approved by Council in writing; or

5.24.3.2. it has been demonstrated to Council that an existing road pavement is satisfactory to cater for the ultimate traffic conditions for the nominated hierarchy of the road and that the existing pavement complies with Planning Scheme Policy 5 – Infrastructure. In this instance and where road widening is a minimum of 1.2 metres wide along the frontage; it is instead only required 300mm beyond the edge of the existing pavement. Demonstration is to occur by way of submitting and having approved by Council, a pavement investigation report prepared by a suitably qualified Registered Professional Engineer of Queensland (RPEQ) that includes appropriate geotechnical test results;

- 5.24.4. tapers to existing road pavement;
- 5.24.5. line marking and signage should be in accordance with Manual of Uniform Traffic Control Devices (MUTCD);
- 5.24.6. street lighting to Council standards; and
- 5.24.7. the installation of disabled compliant kerb ramps at the road corners in accordance with Council's Standard Drawings 8-00314, 8-00315 or 8-00316.

#### **Roadworks – T-intersections and turning lanes**

- 5.25. An operational works permit is required for the following T-intersections and turning lanes.
- 5.26. Design and construct the Site Access on Homestead Drive with an Urban Channelised Right Turn (CHR) and an Urban Auxiliary Short Left Turn (AUL(S)) treatment on Homestead Drive, as defined in the Austroads Guide to Road Design, Part 4A - Unsignalised and Signalised Intersections.
- 5.27. Design and construct the Eastern Site Access on Bushman Drive with an Urban Channelised Right Turn (CHR or CHR(S)) and an Urban Auxiliary Left Turn (AUL or AUL(S)) treatment on Bushman Drive, as defined in the Austroads Guide to Road Design, Part 4A - Unsignalised and Signalised Intersections.
- 5.28. Design and construct the Western Site Access on Bushman Drive with an Urban Channelised Right Turn (CHR or CHR(S)) and an Urban Auxiliary Left Turn (AUL or AUL(S)) treatment on Bushman Drive, as defined in the Austroads Guide to Road Design, Part 4A - Unsignalised and Signalised Intersections.
- 5.29. Design and construct the Service Vehicle Access on Bushman Drive with an Urban Short Channelised Right Turn (CHR(S)) and an Urban Basic Left Turn (BAL) treatment on Bushman Drive, as defined in the Austroads Guide to Road Design, Part 4A - Unsignalised and Signalised Intersections.
- 5.30. Provide line marking & signing in accordance with the Manual of Uniform Traffic Control Devices. This should include signs to indicate the location of the Service Vehicle Access.
- 5.31. Provide street lighting in accordance with Council standards.
- 5.32. Provide kerb and channel and stormwater drainage in accordance with Council standards and the requirements of the Queensland Urban Drainage Manual.
- 5.33. All costs associated with the service relocations required are to be borne by the developer.

#### **Road – Sight distance**

- 5.34. Ensure sight distances at the proposed driveways (entrance/exit) to the site, as shown on the approved plan(s) of development, comply with AUSTRROADS Guide to Road Design, Part 4 - Intersections and Crossings General and Part 4A – Unsignalised and Signalised Intersections.

#### **Vehicle Access – New Crossovers (Commercial and Industrial)**

- 5.35. An operational works permit is required for the new crossovers.
- 5.36. The reinforced concrete driveway crossover/s between the kerb and channel and the property boundary must be inspected by Council's Technical Officers prior to concrete pour.

Advice Note:

*An inspection compliance fee is applicable and must be paid prior to the inspection by Council's Technical Officers, as per Council's Register of Cost-Recovery Fees current at the time of payment (Refer to council's website: <http://www.logan.qld.gov.au>)*

- 5.37. Construct a reinforced concrete industrial crossovers between the property boundary and the edge of the road pavement, having a minimum width of 7.0 metres, in accordance with IPWEAQ Drawing No. INPUT R-051.
- 5.38. Construct any new crossover in the location(s) shown on the approved plan(s) and in accordance with the following:
  - 5.38.1. the edge of the crossover must be no closer than 0.5 metres to any built infrastructure including any stormwater gully pit, manhole, service infrastructure (eg. power pole, telecommunications pit), road infrastructure (eg. street sign, bus stop, street tree, etc); and
  - 5.38.2. the edge of the crossover is not to be within 12 metres (measured from the cadastral boundary) of an intersection of roads.

**Vehicle Access – Redundant Crossovers**

- 5.39. Remove all redundant crossovers and reinstate the kerb and channel, road pavement, services, verge and any footpath to the same standard as existing (or proposed) immediately adjacent along the frontage.

**Pedestrian Access – general**

- 5.40. Construct a reinforced concrete pathway having a minimum width of 2.0 metres along the full frontage of the development along Bushman Drive, including the Child Care Centre site, extending to Shearer Court.

**Parking – directional signage**

- 5.41. An operational works permit is not required for line marking and signage.
- 5.42. Line mark the car park aisles and driveways within the development with directional arrows on the pavement consistent with the directions shown on the approved plan Proposed Flagstone S-7701-006, Issue H, dated 27 October 2016, prepared by Jensen Bowers, of development a minimum distance of every 20 metres and in accordance with AS 1742.11 Manual of Uniform Traffic Control Devices - Parking Controls.
- 5.43. Prior to commencement of use, submit to Council certification from a suitably qualified Registered Professional Engineer Queensland (RPEQ), confirming that the linemarking and signage for the development have been provided in accordance with the requirements of the Conditions of the development permit.

**Parking and Access - General**

- 5.44. An operational works permit is required for parking and access.
- 5.45. Provide car parking spaces, including disabled car parking spaces, parking for parents with prams and motorcycle parking on the site in accordance with approved plan Proposed Flagstone S-7701-006, Issue H, dated 27 October 2016, prepared by Jensen Bowers.
- 5.46. Design all access driveways, circulation driveways, parking aisles and car parking spaces in accordance with Australian Standard 2890.1 - *Parking Facilities - Off Street Car Parking* except where stated otherwise in the planning scheme.
- 5.47. All car parking spaces must be laid out, paved, line marked, signposted, drained and maintained in accordance with the planning scheme and Australian Standard 2890.1 and Australian Standard 2890.2
- 5.48. Design all disabled car parking spaces in accordance with Australian Standard AS 2890.6.
- 5.49. Ensure access to car parking spaces, bicycle spaces, vehicle loading and manoeuvring areas and driveways remain unobstructed and available for their intended purpose during the hours of operation.

- 5.50. Tandem car parking spaces are to be restricted and sign posted for staff vehicles only.

#### **Parking and Access - Servicing**

- 5.51. An operational works permit is required for parking and access.
- 5.52. Provide loading bay facilities for a Medium Rigid Vehicle, a Heavy Rigid Vehicle and an Articulated Vehicle in the locations generally shown on the approved plan(s) of development that are designed in accordance with Australian Standard 2890.2 – Off-street commercial vehicle facilities except where stated otherwise in the planning scheme.
- 5.53. Design along the route to and from all loading bay facilities and the external road network, all access driveways, circulation driveways, parking aisles and the like with a layout that accommodates the turning movements of for a Medium Rigid Vehicle, a Heavy Rigid Vehicle and an Articulated Vehicle to ensure that these vehicles are able to enter and exit the site in a forward direction.
- 5.54. Demonstrate turning movements for a Medium Rigid Vehicle, a Heavy Rigid Vehicle and an Articulated Vehicle on any drawing(s) or plan(s) submitted to the Council as a part of an application for operational works.
- 5.55. Ensure loading and unloading operations are conducted wholly within the site and vehicles enter and exit the site in a forward direction.
- 5.56. Design along the route to and from the main entrance into the building and the external road network, all access driveways, circulation driveways, parking aisles and the like with a layout that accommodates the turning movements of a passenger bus and ensure that these vehicles are able to enter and exit the site in a forward direction.

#### **Electricity and Telecommunications - General**

- 5.57. An operational works permit is required for Electricity and Telecommunications.
- 5.58. Design and provide underground electricity supply and telecommunications to the development in accordance with the Planning Scheme Policy 5 - Infrastructure and the Energex - Underground Distribution Construction Manual.
- 5.59. Remove all redundant electrical and telecommunications connections and reinstate the land.
- 5.60. Pay the cost of any alterations to electricity supply and telecommunications mains, services or installations required as a result of the development.
- 5.61. Prior to commencement of use, submit to Council an Energex certificate of supply and written confirmation from an electricity provider that an agreement has been made for the supply of electricity to the development and where staged, written confirmation is required for each stage of the development.
- 5.62. Prior to commencement of use, Submit to Council written confirmation from a telecommunications carrier that an agreement has been made for the supply of telecommunications to the development and where staged, written confirmation is required for each stage of the development.
- 5.63. Do not install any electrical transformers or telephone control pillars within existing or proposed park unless otherwise approved by Council in writing.
- 5.64. Do not install property poles or flying fox overhead connections.

#### **Electricity and Telecommunications – Street Lighting**

- 5.65. If street lighting is required, an operational works permit must be obtained.
- 5.66. Design and install any required street, path or public lighting in accordance with AS/NZ 1158.
- 5.67. Install a street and path light system on all roads within and bounding the site and on all footpaths/bikeways constructed as part of the development at no cost to Council. The street and path light system must be designed in accordance with the 'Crime Prevention through Environmental Design: Guidelines for Queensland' produced by the Queensland Government and unless otherwise approved by Council in writing, be powered using underground power.
- 5.68. Install street lighting in all road reserves on the same side of the road that accommodates any footpath or bikeway.

### **Electricity and Telecommunications – Road Crossing**

- 5.69. Construct electrical and telecommunications conduits where required under any existing road to service the development by thrust boring.

### **Earthworks – Carrying out Earthworks**

- 5.70. An operational works permit is required for earthworks.
- 5.71. Provide details of all batter treatments proposed.
- 5.72. Carry out earthworks in accordance with AS3798-2007 – Guidelines on earthworks for commercial and residential developments.
- 5.73. Supervise bulk earthworks to Level 1 and have a frequency of field density testing done in accordance with Table 8.1 of AS 3798-2007.
- 5.74. Do not place earth fill adjacent or in proximity to any site boundary unless:
- 5.74.1. the fill is retained on the boundary with approval from Council in accordance with the Planning Scheme; and
  - 5.74.2. adjoining properties are not adversely affected with respect to a loss of privacy and safety (caused by the ability for example to look over boundary fences) and changes in the natural drainage pattern as a result of the works.
- 5.75. Do not place earth fill on any existing adjoining parkland or land required by Council as parkland unless otherwise approved by Council in writing.

### **Earthworks – Retaining structures**

- 5.76. An operational works permit is required for retaining structures.
- 5.77. Submit detailed drawings of all proposed retaining walls. Details to be provided must including and not be limited to the following information:
- 5.77.1. Identify all retaining wall locations and types on a layout plan (including any retaining walls that may be associated with buildings);
  - 5.77.2. Show details of any treatments proposed to the creek/park area along the bottom of the proposed retaining walls;
  - 5.77.3. Show distances/clearance of the retaining walls to any property boundaries and/or existing infrastructure;
  - 5.77.4. Levels at the top and toe of the retaining walls;
  - 5.77.5. Existing and proposed ground levels;
  - 5.77.6. Footing and backfill designs and details;
  - 5.77.7. Details of the proposed drainage (how the drainage/ag pipe behind the proposed wall will function and connect to a suitable outlet or drainage system);
  - 5.77.8. Design details and calculations of the retaining walls (depth of footings, slope stability, undermining, safety, depth of flooding/effects of any submersion in water etc); and
  - 5.77.9. Certification that the wall is designed in accordance the conditions of this approval and Planning scheme policy 5 – Infrastructure.

#### Advice Note:

*As a part of the design of the retaining wall, please consider the type of fencing and/or buildings proposed for the top of the wall and how the associated footings/post brackets can be incorporated.*

- 5.78. Design and construct all retaining walls and associated footings:
- 5.78.1. in accordance with Australian Standard 4678 - 2002 Earth Retaining Structures;
  - 5.78.2. without encroachment onto adjoining properties or public land;
  - 5.78.3. with the retaining wall wholly located within a single allotment;

- 5.78.4. to not cause any adverse effect on the stability and integrity of the neighbouring buildings, properties, utility services and infrastructures;
  - 5.78.5. to achieve a long term factor of safety greater than 1.5;
  - 5.78.6. confirming that the retaining structure has a design life of not less than 60 years; and
  - 5.78.7. in accordance with Planning Scheme Policy 5 - Infrastructure.
- 5.79. Ensure the inspection of the retaining structure(s) by a Registered Professional Engineer Queensland (RPEQ) at the following stages:
- 5.79.1. Footing stage (including excavation and reinforcement); and
  - 5.79.2. At the time of installing drainage behind the wall (including geo-fabric, backfill, perforated pipe and connection of the perforated pipe to the stormwater system).
- 5.80. Do not construct retaining walls between any:
- 5.80.1. existing or proposed parkland; and
  - 5.80.2. existing or proposed road reserve;
- unless otherwise approved by Council in writing.

## FURTHER ADVICE TO APPLICANT

### Infrastructure Charges

Infrastructure charges for the Transport, Parks, Stormwater, Water and Wastewater networks are no longer levied as a condition of development within the development approval. Infrastructure charges for these networks are now levied under the *Sustainable Planning Act 2009* by way of an **Infrastructure Charges Notice (ICN)**, which accompanies this development approval (unless incorporated into an agreed Infrastructure Agreement).

In relation to the application, the applicant is further advised:

1. The relevant period for this approval is in accordance with Section 341 of the *Sustainable Planning Act 2009*.
2. Authorised persons of the Council may enter the premises the subject of this approval at any reasonable time to ascertain whether the above conditions have been complied with (and/or whether the above requirements have been carried out).
3. All site works and earthworks must be carried out in accordance with the Standard Drawings and policies in the assessable Planning Scheme.
4. Commencement of works which will ultimately revert to Council or on adjacent roads or drainage schemes until Council has been advised in writing, of the name of the responsible contractor and that the contractor has received from Council a notice of appointment of principal contractor under the provisions of the *Workplace Health and Safety Act 2011*.

### The applicant and owner be further advised:-

It is the owner's and occupants responsibility under the *Environmental Protection Act 1994* to advise the Chief Executive of the Environmental Protection Agency, of any Notifiable Activity conducted on the site or contamination or suspected contamination which may cause a hazard to human health or the environment within 30 days of becoming aware of the operation of a Notifiable Activity on the site or of any contamination or suspected contamination. The Chief Executive, pursuant to the Act, is empowered to require that the development complies with the provisions of the Act, including the preparation of site investigation reports and if necessary the remediation of the site at the owners expense.

Under the *Plumbing and Drainage Act 2002*, regulated work requires a complete 'Compliance assessment application for plumbing, drainage and on-site sewerage work' Form 1, to be lodged and a compliance permit issued by Council's Plumbing Services section prior to commencement of any plumbing and drainage work.

Regulated work can be defined as plumbing and drainage work that will not become a service provider's asset. Examples are where:

- House drainage and/or water service is to be installed along an access driveway/easement to rear lots
- Existing dwellings require house drains and/or water services to be connected to new wastewater (sewer) and/or new water meters

In the case of a **Dual Occupancy**, a separate wastewater (sewer) connection, roof water and water meter connection must be provided for each unit within their own designated area.

You are also advised that it is the developer's responsibility to ensure that all development should proceed in accordance with the Duty of Care Guidelines under the *Aboriginal Cultural Heritage Act 2003*, Penalties apply where the duty of care is breached.

For further information in regards to the provisions of the *Aboriginal Cultural Heritage Act 2003*, please contact the Cultural Heritage Coordination Unit, Department of Natural Resources and Water on (07)3238 3838.

**LEGEND - TENANCIES**

- SUPERMARKET
- LIQUOR
- SPECIALTY SHOPS
- COMMERCIAL
- FAST FOOD
- AMENITIES

**LEGEND**

- EXISTING CONTOUR
- SLAB FLOOR LEVEL

**NOTE**

- CONTOURS SHOWN ARE EXISTING SITE CONTOURS
- PROPOSED LEVELS SHOWN ARE INDICATIVE
- ONLY VALID ARE SUBJECT TO VARIANCE AFTER FURTHER DESIGN DEVELOPMENT & CIVIL ENGINEERS ADVICE

**REAL PROPERTY DESCRIPTION:**  
 Lot 1, 2 & 3 of SP14603,  
 Lot 4 of SP18925,  
 Lot 105, 116, 127 of RP44832

DEVELOPMENT SCHEDULE - TOTAL GLA	
TYPE	AREA Sq.M
SUPERMARKET EXPANSION	600 m <sup>2</sup>
SUPERMARKET	3400 m <sup>2</sup>
SPECIALTY SHOPS	2222 m <sup>2</sup>
LIQUOR	150 m <sup>2</sup>
FAST FOOD	400 m <sup>2</sup>
COMMERCIAL	400 m <sup>2</sup>
TOTAL GLA	7172 m <sup>2</sup>

PARKING SCHEDULE		
TYPE	SIZE	BAY COUNT
PARENTS WITH FRAMS	2400 x 5400 mm	5
DISABLED PARKING	2400 x 5400mm	9
STAFF PARKING	2500 x 5400mm	16
CUSTOMER PARKING	2700 x 5400mm	5
CUSTOMER PARKING	2700 x 5400mm	326
TOTAL		403
CARPARK RATIO		5.62/100m <sup>2</sup>

DEVELOPMENT SCHEDULE - TOTAL GFA	
TYPE	Area (m <sup>2</sup> )
AMENITIES	126
FAST FOOD TENANCIES	419
GYM	418
LIQUOR	154
MINI MAJOR	1694
SPECIALTY SHOPS	1075
SPECIALTY SHOPS	271
SPECIALTY SHOPS	314
SUPERMARKET	3307
SUPERMARKET EXPANSION	611
SUPERMARKET MEZZANINE	210
TOTAL GFA	7660

OVERALL SITE AREA SCHEDULE	
SITE AREA	34603 m <sup>2</sup>



**DECISION NOTICE**  
 The Approved Plan of Development for Development Approval  
**MCUI/36/2015**  
 subject to changes in the conditions of approval and these not being a  
 Negotiated Decision Notice, other Notice or Court consent order that  
 changes the development approval

020

NO.	DATE	REVISION

**ThomsonAdsett**  
 architecture | urban design | interiors  
 128 Robertson Street  
 Fortitude Valley  
 PO Box 2195  
 Fortitude Valley QLD 4006  
 www.thomsonadsett.com

**DEVELOPMENT APPLICATION**  
 WOOLWORTHS FLAGSTONE  
 BUSHMAN DRIVE, FLAGSTONE

**PRELIMINARY**  
 SITE PLAN CARPARK ONLY  
**(Overall)**

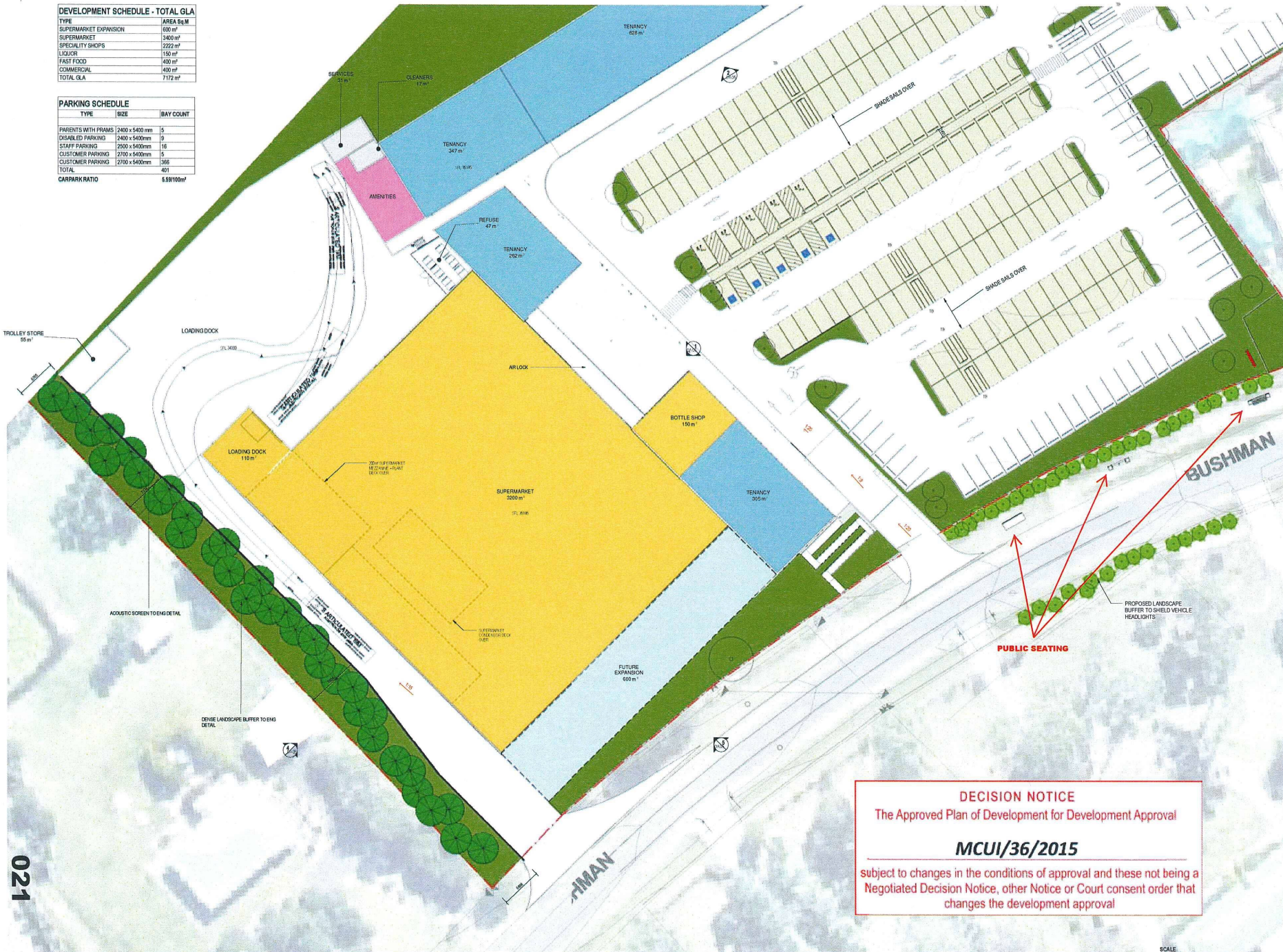
NO.	DATE	REVISION

10351  
 SK01  
 P

SCALE

DEVELOPMENT SCHEDULE - TOTAL GLA	
TYPE	AREA Sq.M
SUPERMARKET EXPANSION	600 m <sup>2</sup>
SUPERMARKET	3400 m <sup>2</sup>
SPECIALITY SHOPS	2222 m <sup>2</sup>
LICENSURE	150 m <sup>2</sup>
FAST FOOD	400 m <sup>2</sup>
COMMERCIAL	400 m <sup>2</sup>
TOTAL GLA	7172 m <sup>2</sup>

PARKING SCHEDULE		
TYPE	SIZE	BAY COUNT
PARENTS WITH PRAMS	2400 x 5400mm	5
DISABLED PARKING	2400 x 5400mm	9
STAFF PARKING	2500 x 5400mm	16
CUSTOMER PARKING	2700 x 5400mm	5
CUSTOMER PARKING	2700 x 5400mm	356
TOTAL		401
CARPARK RATIO		5.58/100m <sup>2</sup>



**DECISION NOTICE**  
 The Approved Plan of Development for Development Approval  
**MCUI/36/2015**  
 subject to changes in the conditions of approval and these not being a  
 Negotiated Decision Notice, other Notice or Court consent order that  
 changes the development approval

NO.	REV.	DATE	BY	DESCRIPTION

This document is used in accordance with the copyright and other intellectual property rights of ThomsonAdsett Pty Ltd and is not to be used or reproduced in any form without the prior written consent of ThomsonAdsett Pty Ltd. All rights reserved.

**© Copyright**  
 ThomsonAdsett Pty Ltd

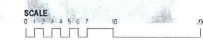
**ThomsonAdsett**  
 architecture | urban design | interiors  
 123 Robinson Street  
 Fortitude Valley  
 PO Box 2195  
 Fortitude Valley QLD 4006  
 www.thomsonadsett.com

**DEVELOPMENT APPLICATION**  
 WOOLWORTHS FLAGSTONE  
 BUSHMAN DRIVE, FLAGSTONE

DATE	DESCRIPTION

**10351**      **SK03**      **P 1**

021



**PRELIMINARY**

**DEVELOPMENT SCHEDULE STAGE 1-TOTAL GLA...**

Name	Area (m <sup>2</sup> )
BOTTLE SHOP	150 m <sup>2</sup>
GYM	400 m <sup>2</sup>
CASUAL MALL LEASING	50 m <sup>2</sup>
SUPERMARKET	3400 m <sup>2</sup>
WOOLWORTHS SUPPORT SHOPS	966 m <sup>2</sup>
TOTAL STAGE 1 GLA	4956 m <sup>2</sup>

**DEVELOPMENT SCHEDULE STAGE 2-TOTAL GLA**

Name	Area (m <sup>2</sup> )
MINI MAJOR	681 m <sup>2</sup>
TENANCY	628 m <sup>2</sup>

**DEVELOPMENT SCHEDULE STAGE 3-TOTAL GLA**

Name	Area (m <sup>2</sup> )
DRIVE THRU FAST FOOD	250 m <sup>2</sup>
TENANCY	150 m <sup>2</sup>

**DEVELOPMENT SCHEDULE FUTURE EXPANSION -TOTAL GLA**

Name	Area (m <sup>2</sup> )
FUTURE EXPANSION	600 m <sup>2</sup>

**TOTAL DEVELOPMENT GLA**

TOTAL GLA (m <sup>2</sup> )
7303 m <sup>2</sup>

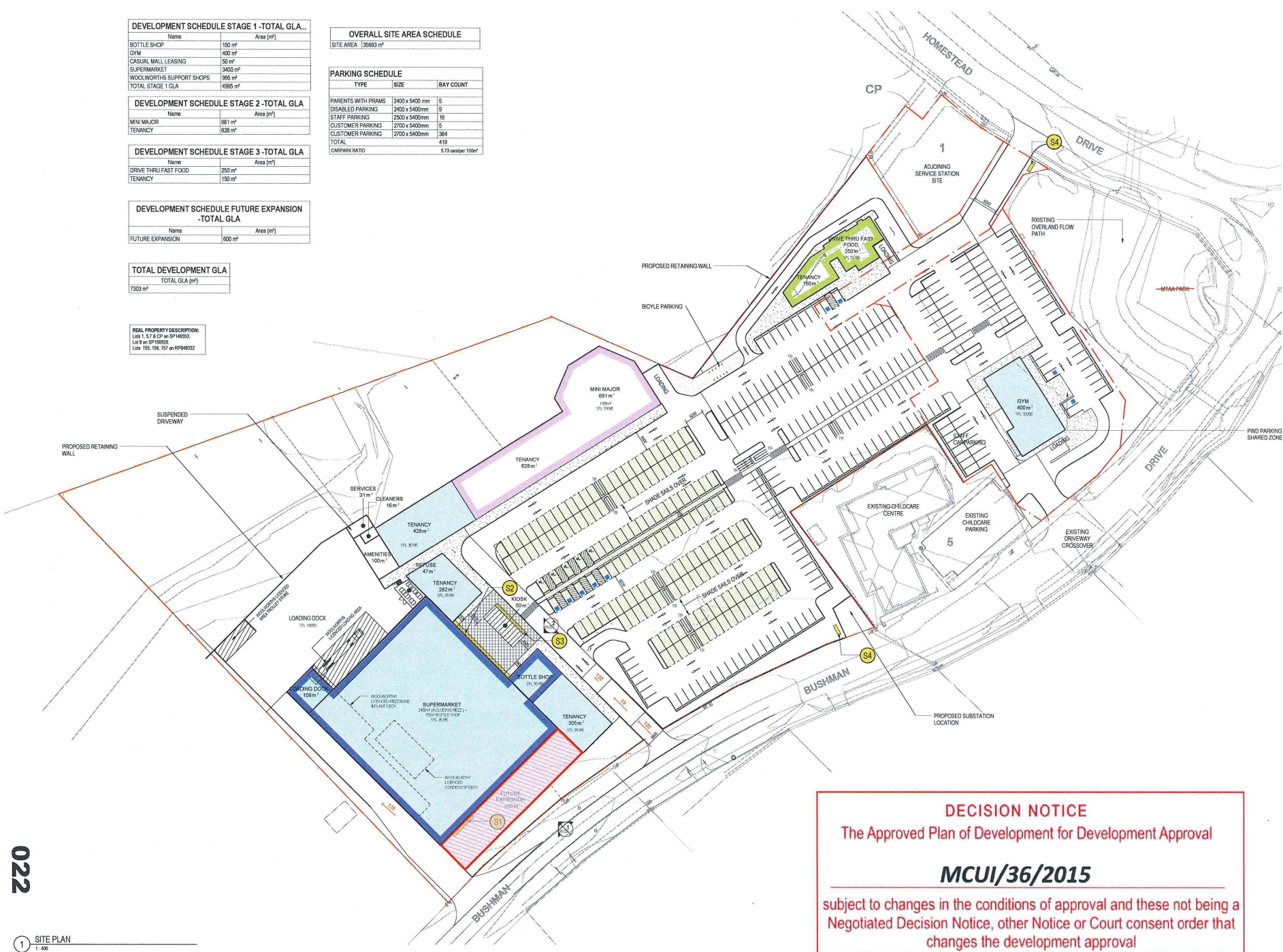
**OVERALL SITE AREA SCHEDULE**

SITE AREA	136993 m <sup>2</sup>
-----------	-----------------------

**PARKING SCHEDULE**

TYPE	SIZE	BAY COUNT
PARENTS WITH PRAMS	2400 x 5400 mm	5
DISABLED PARKING	2400 x 5400mm	9
STAFF PARKING	2500 x 5400mm	16
CUSTOMER PARKING	2700 x 5400mm	5
CUSTOMER PARKING	2700 x 5400mm	384
TOTAL		419
CARPARK RATIO	9.9 cars/ha/100m <sup>2</sup>	

**REAL PROPERTY DESCRIPTION:**  
Lots 1, 5, 7 & CP on SP148033  
Lot 8 on SP148026  
Lots 155, 156, 157 on RP948032



Symbol	Description
[Red Line]	Stage 4 Development
[Blue Line]	WW PREMISE
[Light Blue Line]	STAGE 1 DEVELOPMENT
[Light Green Line]	STAGE 2 DEVELOPMENT
[Light Purple Line]	STAGE 3 DEVELOPMENT
[Cross-hatch]	KIOSK FREE CASUAL LEASE EXCLUSION ZONE
[Diagonal Lines]	WOOLWORTHS LICENCED AREA
[Dotted]	SIDEWALK SALES ZONE
[Blue Box]	TROLLEY BAYS
[Yellow Circle S1]	1500mm ICON EXTERNAL FASCIA WOOLWORTHS SIGN 8775 X 1875mm
[Yellow Circle S2]	1250mm ICON HORIZONTAL INTERIOR MALL WOOLWORTHS SIGN
[Yellow Circle S3]	1500mm ICON EXTERNAL FASCIA WOOLWORTHS SIGN 8775 X 1875mm
[Yellow Circle S4]	VERTICAL Pylon SIGN

**Stage 4 Development**

**LEGEND**

WW PREMISE

STAGE 1 DEVELOPMENT

STAGE 2 DEVELOPMENT

STAGE 3 DEVELOPMENT

KIOSK FREE CASUAL LEASE EXCLUSION ZONE

WOOLWORTHS LICENCED AREA

SIDEWALK SALES ZONE

TROLLEY BAYS

S1 1500mm ICON EXTERNAL FASCIA WOOLWORTHS SIGN 8775 X 1875mm

S2 1250mm ICON HORIZONTAL INTERIOR MALL WOOLWORTHS SIGN

S3 1500mm ICON EXTERNAL FASCIA WOOLWORTHS SIGN 8775 X 1875mm

S4 VERTICAL Pylon SIGN

**Notes**

This plan is not to be used for any other purpose without the written consent of Thomson Adsett Pty Ltd. All dimensions are to be verified on site.

© Copyright Thomson Adsett

**Thomson Adsett**

architecture | urban design | interior

128 Robertson Street  
Fortitude Valley  
Phone: (07) 3440 9999  
Fax: (07) 3322 1001  
PO Box 2165  
Fortitude Valley QC 4006  
Email: info@thomsonadsett.com  
www.thomsonadsett.com

**DEVELOPMENT APPLICATION**

FLAGSTONE VILLAGE CENTRE NEIGHBOURHOOD CENTRE

BUSHMAN DRIVE, FLAGSTONE

**PRELIMINARY**

**WOOLWORTH'S LEASING PLAN Staging Plan**

Scale: 1:10000

Drawn: As indicated

Checked: LM

Verified: [Signature]

10351

W01

P 2

**DECISION NOTICE**



The Approved Plan of Development for Development Approval

**MCUI/36/2015**

subject to changes in the conditions of approval and these not being a Negotiated Decision Notice, other Notice or Court consent order that changes the development approval

022

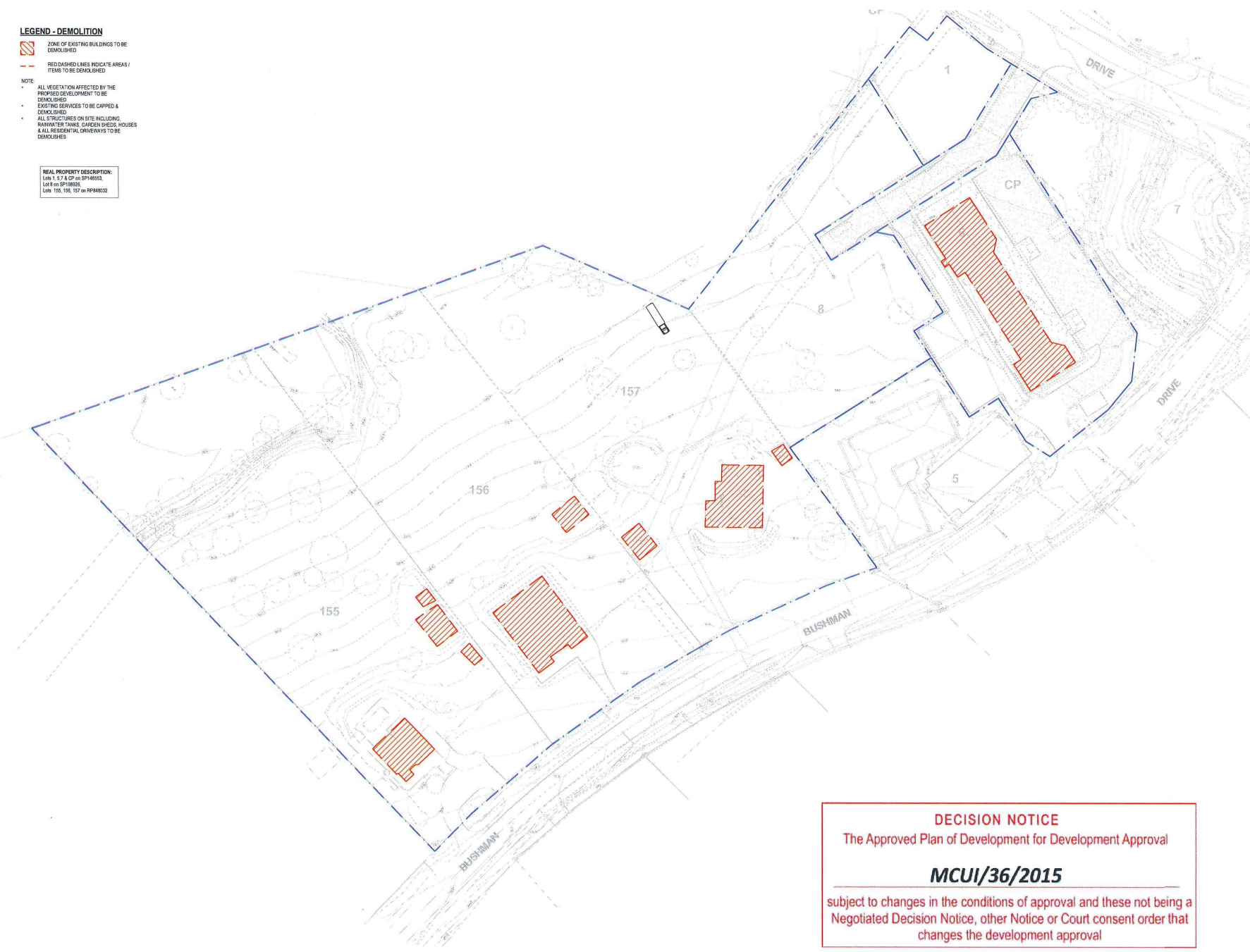
**LEGEND - DEMOLITION**

-  ZONE OF EXISTING BUILDINGS TO BE DEMOLISHED
-  RED DASHED LINES INDICATE AREAS / ITEMS TO BE DEMOLISHED

NOTE

- ALL VEGETATION AFFECTED BY THE PROPOSED DEVELOPMENT TO BE DEMOLISHED
- EXISTING SERVICES TO BE CAPPED & DEMOLISHED
- ALL STRUCTURES ON SITE INCLUDING RAINWATER TANKS, GARDEN BEDS, HOUSES & ALL RESIDENTIAL DRIVEWAYS TO BE DEMOLISHED

REAL PROPERTY DESCRIPTION:  
 Lot 1, 2 & 3 CP on SP14655  
 Lot 8 on SP18926  
 Lots 155, 156, 157 on RP48832



**DECISION NOTICE**  
 The Approved Plan of Development for Development Approval  
**MCUI/36/2015**  
 subject to changes in the conditions of approval and these not being a  
 Negotiated Decision Notice, other Notice or Court consent order that  
 changes the development approval

023



DATE	ISSUE	BY
20/05/2015	1A/02	JL
PRELIMINARY FOR GOVERNMENT		

ThomsonAdsett would not be responsible for the validity, completeness or accuracy of data provided electronically. Requests for hard copies necessary to aid in any further enquiry for verification. Use figures and dimensions in preference to notes. All dimensions are to be finished in situ.

© Copyright  
 These drawings and designs are the copyright of ThomsonAdsett Pty Ltd and are not to be used or copied without the written permission of ThomsonAdsett Pty Ltd. A.B.N. 18 176324 866.  
 Trading as ThomsonAdsett

**ThomsonAdsett**  
 architecture | urban design | interiors  
 128 Robertson Street  
 Forthside Valley Phone: (07) 3840 9999  
 Forthside Valley Fax: (07) 3822 1001  
 Forthside Valley EC Q 4005 Email: info@thomsonadsett.com  
 www.thomsonadsett.com

**DEVELOPMENT APPLICATION**  
 FLAGSTONE VILLAGE  
 NEIGHBOURHOOD CENTRE

BUSHMAN DRIVE, FLAGSTONE

PROJECT  
 DEMOLITION PLAN

DATE	20/05/2015
SCALE	As indicated
DRAWN	JL
CHECKED	
VERIFIED	
10351	DA.03
PROJECT NO.	SHEET NO.

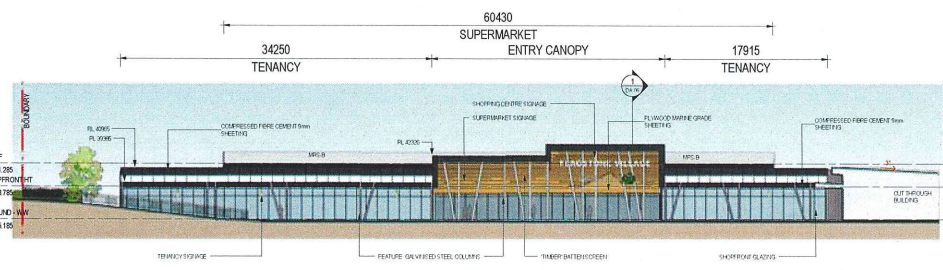
**PRELIMINARY**

C:\2015\10351\10351\_Plan\10351\_03.dwg

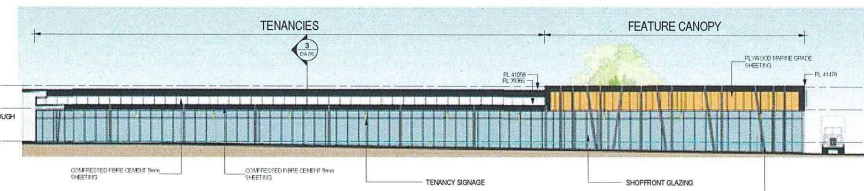
**LEGEND**

EG	EASEL OUTLET
MPS-B	PLANT ROOM SHEET PILING
MPS-B	METAL ROOF SHEETING
FP	FLY ASH CONCRETE
	PRECAST PANEL JOINT

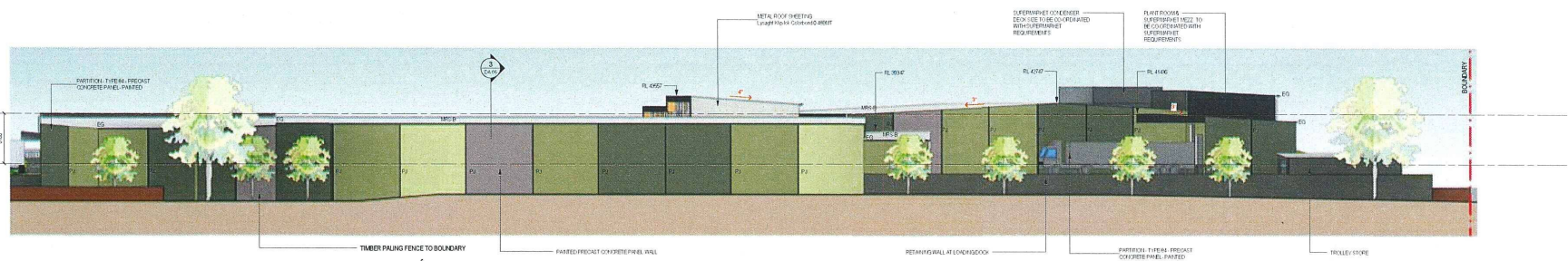
NO.	DATE	BY
1	15/10/15	JP
2	15/10/15	JP
3	15/10/15	JP
4	15/10/15	JP
5	15/10/15	JP
6	15/10/15	JP



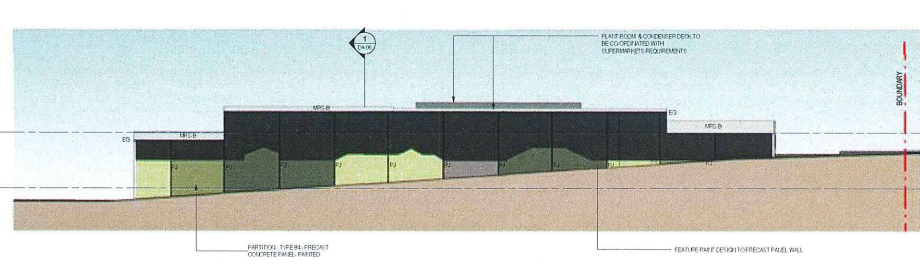
**ELEVATION 01**  
DA/02 1:200



**ELEVATION 02**  
DA/02 1:200



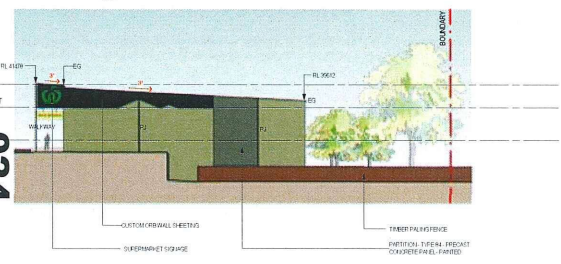
**ELEVATION 03**  
DA/02 1:200



**ELEVATION 04**  
DA/02 1:200



**ELEVATION 05**  
DA/02 1:200



**ELEVATION 06**  
DA/02 1:200

**DECISION NOTICE**  
The Approved Plan of Development for Development Approval  
**MCUI/36/2015**  
subject to changes in the conditions of approval and these not being a  
Negotiated Decision Notice, other Notice or Court consent order that  
changes the development approval

**Thomson Adsett**  
architecture | urban design | interiors  
128 Robertson Street  
Fortitude Valley Phone: (07) 3840 9999  
PO Box 2155 Fax: (07) 3332 1991  
Fortitude Valley, QC 4005 Email: info@thomsonadsett.com.au  
www.thomsonadsett.com

**DEVELOPMENT APPLICATION**  
FLAGSTONE VILLAGE  
NEIGHBOURHOOD CENTRE  
BUSHMAN DRIVE, FLAGSTONE

**ELEVATIONS - SHEET 01**

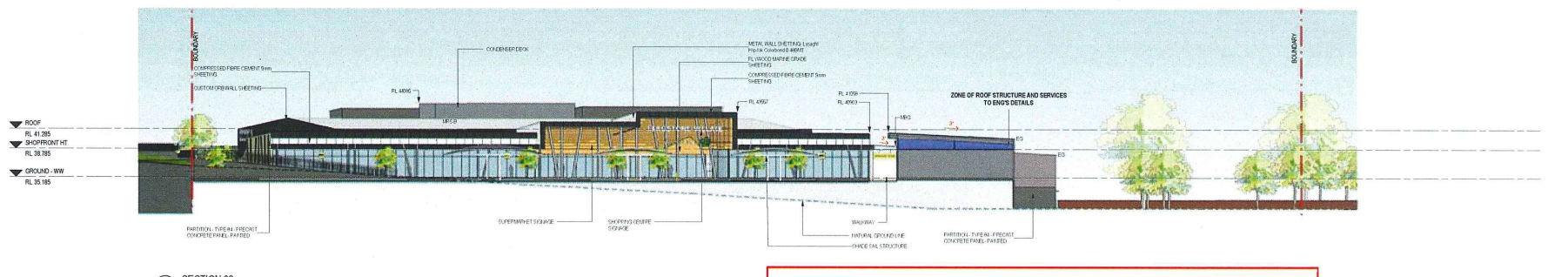
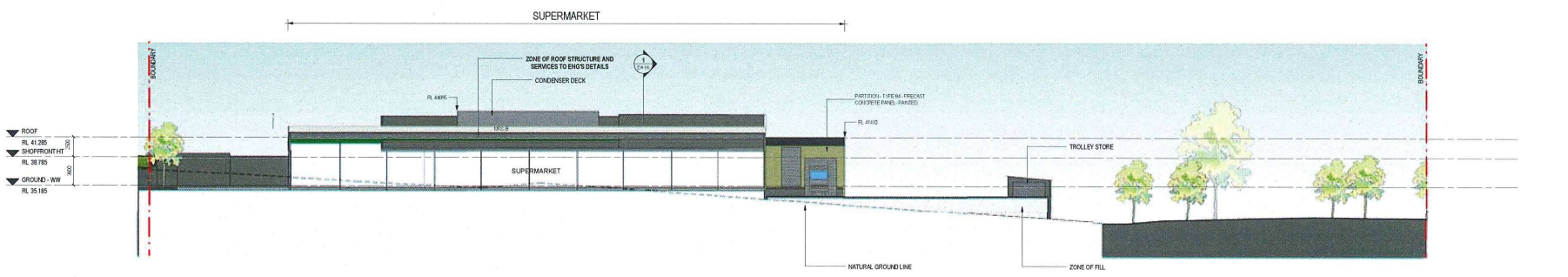
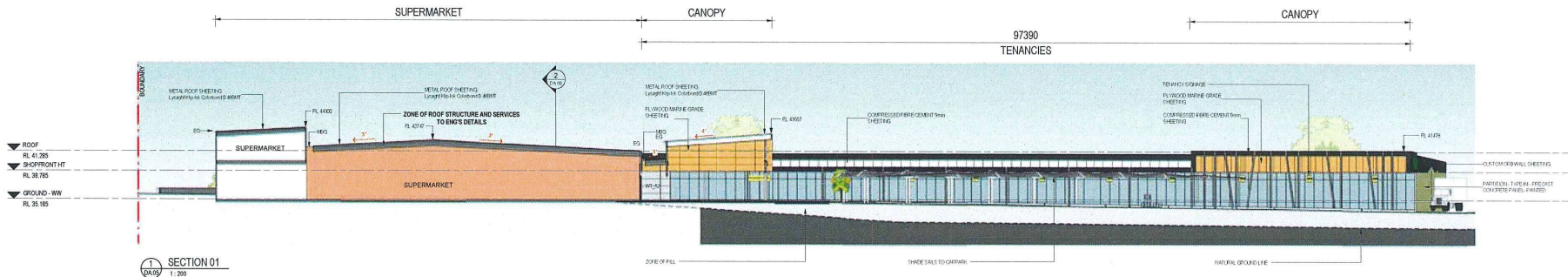
DATE	15/10/15
SCALE	1:200
DRAWN	JP
CHECKED	
VERIFIED	
PROJECT NO.	10351
SHEET NO.	DA.05
PAGES	P.4



**PRELIMINARY**

**024**

C:\PROJECTS\10351\10351\_05.dwg 15/10/15 10:35:15 AM



**DECISION NOTICE**  
The Approved Plan of Development for Development Approval  
**MCUI/36/2015**  
subject to changes in the conditions of approval and these not being a  
Negotiated Decision Notice, other Notice or Court consent order that  
changes the development approval



**PRELIMINARY**

DATE	BY	CHKD	APPD

**LEGEND**

- MS (S) METAL ROOF SHEETING
- MS (C) METAL ROOF CLADDING
- MS (D) METAL ROOF CLADDING
- MS (E) METAL ROOF CLADDING

**Thomson Adsett**  
architecture | urban design | interiors  
128 Robertson Street  
Fortitude Valley Phone: (07) 3440 9999  
PO Box 2165 Fax: (07) 3322 1001  
Fortitude Valley, QC 4006 Email: info@thomsonadsett.com  
www.thomsonadsett.com

**DEVELOPMENT APPLICATION**  
FLAGSTONE VILLAGE NEIGHBOURHOOD CENTRE  
BUSHMAN DRIVE, FLAGSTONE

SECTIONS - SHEET 01

DATE	10/10/15
SCALE	1:200
DRAWN	JL
CHECKED	
VERIFIED	

10351 10351 DA.06 P.4

**DECISION NOTICE**

The Approved Plan of Development for Development Approval

**MCUI/36/2015**

subject to changes in the conditions of approval and these not being a Negotiated Decision Notice, other Notice or Court consent order that changes the development approval

**LEGEND**

- GENERAL**
  - PROPERTY BOUNDARY
  - EXISTING CONTOURS
  - OVERLAND FLOW PATH
  - EXISTING SWALE
  - EXISTING CREEK
- HARDSCAPE**
  - PROPOSED AWNING
  - PROPOSED SHADE SAILS
  - PROPOSED RETAINING WALLS REFER ENGINEER
  - EXISTING HARDSCAPE TO BE RETAINED
  - PROPOSED ROAD PAVEMENT
  - PROPOSED PAVING TYPE 1
  - PROPOSED PAVING TYPE 2
  - SEATING WITH PLANTING
  - STONE LINED STORMWATER OUTFLOW CHANNEL
- SOFTSCAPE**
  - EXISTING TREES TO BE RETAINED AND PROTECTED
  - NEW FEATURE TREES
  - NEW SHADE TREES
  - NEW STREET TREES TO ENHANCE FRONTAGE
  - EXISTING GARDEN BED TO BE RETAINED AND PROTECTED
  - NEW FEATURE GARDEN BED
  - NEW GENERAL GARDEN BED
  - NEW SHRUB PLANTING AND GROUND COVERS
  - NEW SCREENING LANDSCAPE
  - EXISTING BUSH / NATURAL HABITAT TO BE PROTECTED AND RETAINED
  - PROPOSED BUSH / NATURAL HABITAT RESTORATION USING LOCAL BUSHLAND VEGETATION COMMUNITIES

**KEY ELEMENTS**

- BUSHMAN AVENUE STREET FRONTAGE ENHANCED WITH STREET TREE PLANTING
- ENTRANCES HIGHLIGHTED WITH FEATURE TREES AND GARDEN BEDS
- CAR PARK PLANTED WITH EVERGREEN SHADE TREES, GROUNDCOVERS AND GRASSES
- SCREENING CREATED WITH EVERGREEN SPREADING CANOPY TREES, SHRUBS AND GROUNDCOVERS
- EXISTING BUSHLAND HABITAT WHERE POSSIBLE RETAINED AND PROTECTED
- IMPACTED BUSHLAND RESTORED USING LOCAL NATIVE BUSHLAND VEGETATION SPECIES



**PLANTING PALETTE**

BOTANIC NAME	COMMON NAME	BOTANIC NAME	COMMON NAME
<b>Feature Trees</b>		<b>Shrubs / Screen Planting</b>	
<i>Brachychiton acerifolius</i>	Sawara Flame Tree	<i>Melaleuca lincolniensis</i>	Melaleuca Claret Flag
<i>Banksia integrifolia</i>	Lemon Myrtle	<i>Mitrasacme flammula</i>	New Zealand Christmas Bush
<i>Grevillea robusta</i>	White Oak	<i>Syzygium australe 'Aussie Southern'</i>	Lilly Pilli
<b>Street Trees</b>		<b>Groundcovers &amp; Grasses</b>	
<i>Hamamelis virginica</i>	Tulipwood	<i>Agrostis sp.</i>	Agrostis Flax Bush Endiview
<i>Casuarina cunninghamiana</i>	Tuckeroo	<i>Dianella caerulea</i>	Little Iris
<i>Shade Trees</i>		<i>Dieris indivisa</i>	Wood Iris
<i>Waterhousea floribunda</i>	Weeping Lilly Pilli	<i>Dieris discolor</i>	African Iris
<b>Shrubs / Screen Planting</b>		<i>Linum catharticum</i>	Lithospermum Giant
<i>Alphitonia cuneata</i>	Native Ginger	<i>Leucanthea sp.</i>	Springhead Mat rush
<i>Acrostichum diffusum</i>	Madigan Berry	<i>Shorea robusta</i>	Bird of Paradise
<i>Callistemon litoralis</i>	Little John	<i>Wrightia speciosa</i>	Coastal Rosemary
<i>Floribunda verticillata</i>	Blueberry Ash		



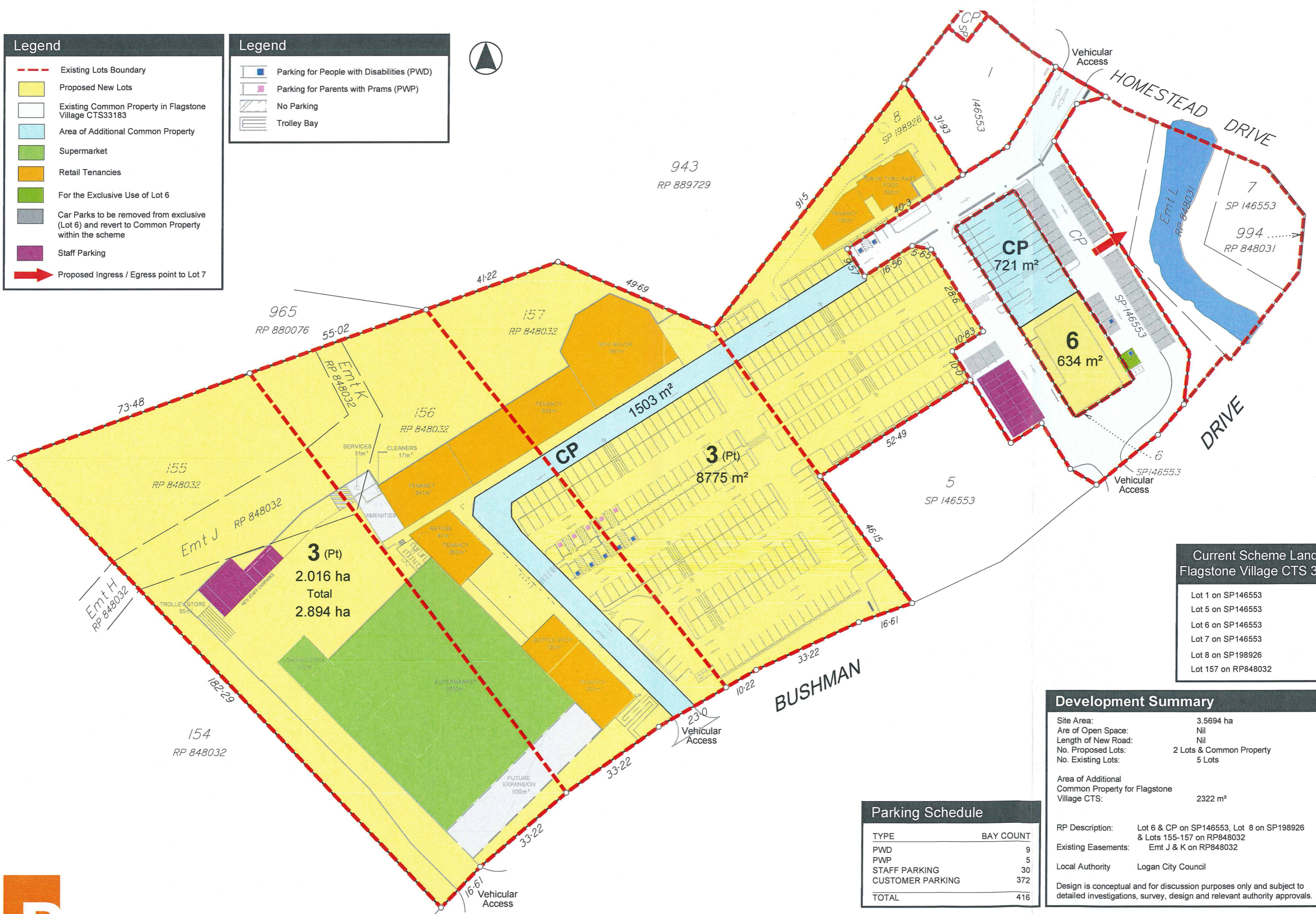
Landscape Concept Plan

**Legend**

- Existing Lots Boundary
- Proposed New Lots
- Existing Common Property in Flagstone Village CTS33183
- Area of Additional Common Property
- Supermarket
- Retail Tenancies
- For the Exclusive Use of Lot 6
- Car Parks to be removed from exclusive (Lot 6) and revert to Common Property within the scheme
- Staff Parking
- Proposed Ingress / Egress point to Lot 7

**Legend**

- Parking for People with Disabilities (PWD)
- Parking for Parents with Prams (PWP)
- No Parking
- Trolley Bay



**Current Scheme Land of Flagstone Village CTS 33183**

- Lot 1 on SP146553
- Lot 5 on SP146553
- Lot 6 on SP146553
- Lot 7 on SP146553
- Lot 8 on SP198926
- Lot 157 on RP848032

**Development Summary**

Site Area:	3.5694 ha
Area of Open Space:	Nil
Length of New Road:	Nil
No. Proposed Lots:	2 Lots & Common Property
No. Existing Lots:	5 Lots
Area of Additional Common Property for Flagstone Village CTS:	2322 m <sup>2</sup>
RP Description:	Lot 6 & CP on SP146553, Lot 8 on SP198926 & Lots 155-157 on RP848032
Existing Easements:	Emt J & K on RP848032
Local Authority	Logan City Council

Design is conceptual and for discussion purposes only and subject to detailed investigations, survey, design and relevant authority approvals.

**Parking Schedule**

TYPE	BAY COUNT
PWD	9
PWP	5
STAFF PARKING	30
CUSTOMER PARKING	372
<b>TOTAL</b>	<b>416</b>



**SURVEYORS | PLANNERS | DEVELOPMENT ADVISORS**  
 jensenbowers.com.au  
 72 Costin Street, Fortitude Valley, Qld. 4006 | PO Box 799, Spring Hill, Qld. 4004 T (07) 3852 1771  
 © Jensen Bowers Group Consultants Pty Ltd ABN 52 010 872 607

Drawing Ref: S-7701-006-Issue H  
 Date: 27th October 2016  
 Scale: 1:1000 @ A3

**Proposed Flagstone**  
**FLAGSTONE VILLAGE NEIGHBOURHOOD CENTRE, Bushman Drive, Flagstone**  
 for TL Property Ltd



# Flagstone Village Shopping Centre Flood Impact Assessment

---

Hope Island Consortium Pty Ltd c/o TLPC Pty Ltd  
0740-04-B, 25 June 2015

<b>Report Title</b>	Flagstone Village Shopping Centre Flood Impact Assessment
<b>Client</b>	Hope Island Consortium Pty Ltd c/o TLPC Pty Ltd L20/307 Queen Street, Brisbane Qld 4000
<b>Report Number</b>	0740-04-B

Revision Number	Report Date	Report Author	Reviewer
0	25 June 2015	DS	GR

For and on behalf of WRM Water & Environment Pty Ltd  
 Level 9, 135 Wickham Tce, Spring Hill  
 PO Box 10703 Brisbane Adelaide St Qld 4000  
 Tel 07 3225 0200



Greg Roads  
 Director / Principal Engineer

NOTE: This report has been prepared on the assumption that all information, data and reports provided to us by our client, on behalf of our client, or by third parties (e.g. government agencies) is complete and accurate and on the basis that such other assumptions we have identified (whether or not those assumptions have been identified in this advice) are correct. You must inform us if any of the assumptions are not complete or accurate. We retain ownership of all copyright in this report. Except where you obtain our prior written consent, this report may only be used by our client for the purpose for which it has been provided by us.

# Contents

---

<b>1</b>	<b>Introduction</b>	<b>5</b>
1.1	Overview	5
<b>2</b>	<b>Drainage characteristics</b>	<b>7</b>
2.1	Overview	7
2.2	Existing hydraulic infrastructure	7
<b>3</b>	<b>Hydrologic model development</b>	<b>8</b>
3.1	General	8
3.2	XP-RAFTS model configuration	8
3.2.1	Model setup	8
3.2.2	Model parameters	8
3.3	XP-RAFTS validation against the Rational Method	11
3.3.1	General	11
3.3.2	Design rainfalls	11
3.3.3	Rational Method estimates	11
3.3.4	Comparison of Rational Method and XP-RAFTS estimates	12
<b>4</b>	<b>Design discharge estimation</b>	<b>14</b>
<b>5</b>	<b>Hydraulic model development</b>	<b>15</b>
5.1	General	15
5.2	TUFLOW model configuration	15
5.2.1	Model configuration	15
5.2.2	Topography	15
5.2.3	Modifications to the Sandy Creek channel and flood plain	17
5.2.4	Manning's 'n'	17
5.2.5	Inflow and outflow boundaries	17
5.2.6	Culvert structures	17
<b>6</b>	<b>Flood impact assessment</b>	<b>19</b>
6.1	Overview	19
6.2	Approved conditions flooding	19
6.3	Proposed development	19
6.4	Developed conditions flood impacts	19
<b>7</b>	<b>Summary and discussion</b>	<b>25</b>
<b>8</b>	<b>References</b>	<b>26</b>

## List of Figures

---

Figure 1.1 - Development site locality map	6
Figure 3.1 - XP-RAFTS model configuration	9
Figure 5.1 - TUFLOW model configuration	16
Figure 5.2 - TUFLOW model ground cover distribution	18
Figure 6.1 - Sandy Creek 10% AEP flood levels and extent - approved development conditions	20
Figure 6.2 - Sandy Creek 1% AEP flood levels and extent - approved development conditions	21
Figure 6.3 - Sandy Creek 10% AEP flood level impacts, developed - approved conditions	22
Figure 6.4 - Sandy Creek 1% AEP flood level impacts, developed - approved conditions	23

## List of Tables

---

Table 2.1 - Existing culvert details	7
Table 3.1 - Adopted land use parameters - Sandy Creek XP-RAFTS model	10
Table 3.2 - Initial and continuing losses - Sandy Creek XP-RAFTS model	10
Table 3.3 - Adopted Sandy Creek XP-RAFTS model parameters	10
Table 3.4 - Intensity-frequency-duration data (mm/hour)	11
Table 3.5 - Rational Method design discharges	12
Table 3.6 - Comparison of Rational Method and XP-RAFTS model peak discharges	13
Table 4.1 - XP-RAFTS model design discharges	14
Table 5.1 - Adopted Manning's 'n' values	17
Table 6.1 - Sandy Creek 10% and 1% AEP flood levels and relative differences - approved and proposed development conditions	24



# 1 Introduction

---

## 1.1 OVERVIEW

Hope Island Consortium Pty Ltd (the Developer) has previously obtained approval to develop 1-17 Bushman Drive, Flagstone in Logan City Council for commercial purposes. The approved development is located on Lot 157 on RP848032 (17-21 Bushman Drive), the undeveloped portion of Lot 922 on RP912582 (1-15 Bushman Drive) and will be amalgamated with the existing shopping centre on Lot 922 on RP912582. The developer proposes to expand the development to include the neighbouring lots 156 and 155 on RP848032 (23-27 and 29-33 Bushman Drive). The proposed development will include shops, a supermarket, roads and car parks. Figure 1.1 shows the location of the proposed development site. The proposed development site drains in a northerly direction to Sandy Gully, a tributary of the Logan River.

WRM Water & Environment Pty Ltd was requested by Hope Island Consortium Pty Ltd to undertake a flood impact assessment for the proposed development in accordance with the Logan Planning Scheme 2015 Version 1.1 (LCC 2015) as part of the operational works approval. This report presents the methodology and results of the hydrologic and hydraulic modelling to estimate design discharges the design flood levels and assess the potential flood level impacts on surrounding properties and infrastructure due to the proposed development up to the defined flood event (in this case a 1% annual exceedance probability (AEP)).

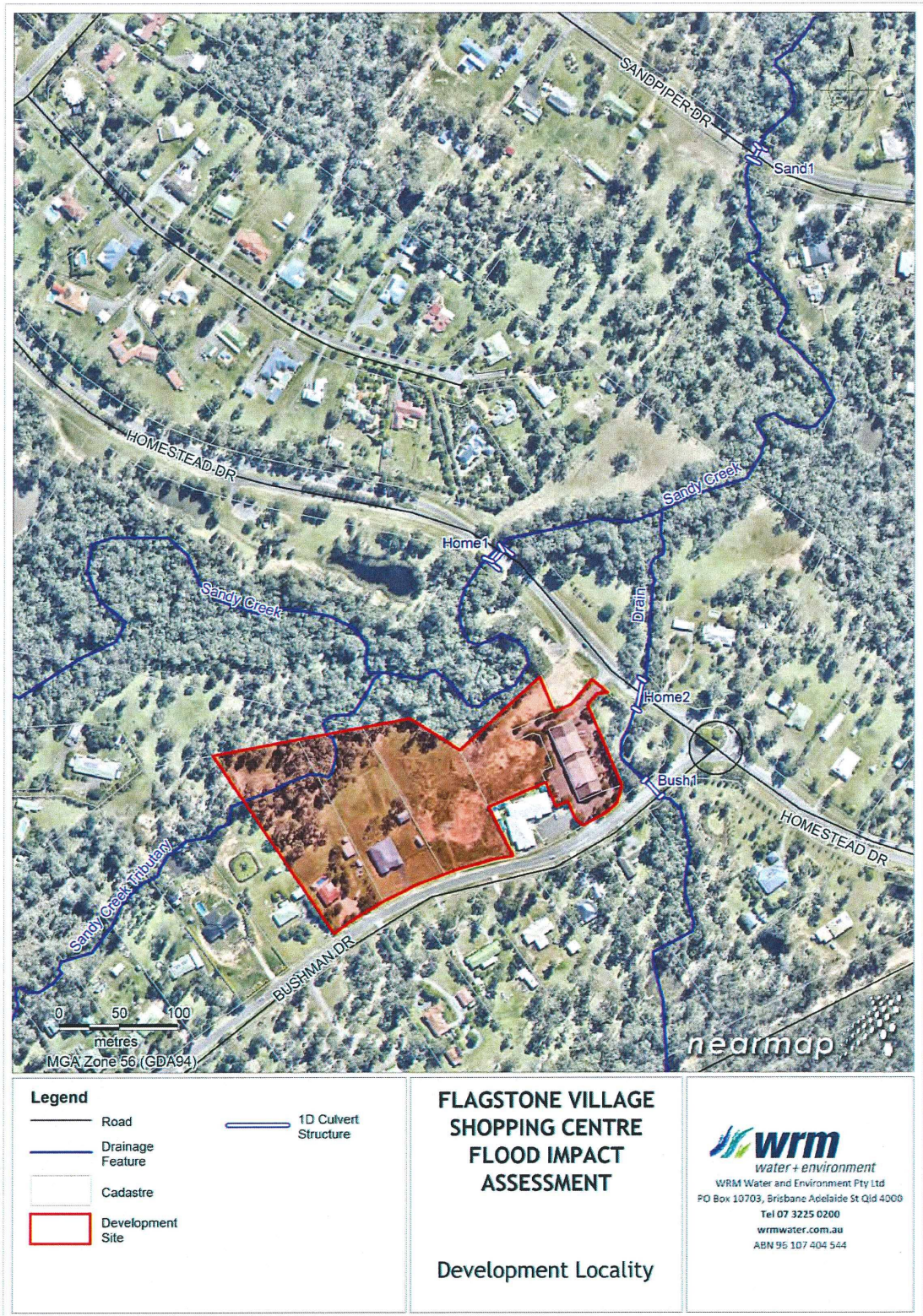


Figure 1.1 - Development site locality map

## 2 Drainage characteristics

### 2.1 OVERVIEW

Figure 1.1 shows the drainage characteristics in the vicinity of the development site. A tributary of Sandy Creek drains past the western side of the development site and discharges into Sandy Creek immediately upstream of the development site. The tributary has a catchment area of about 84 ha.

A constructed drain flows in a north-easterly direction to the east of the development site and may have been constructed as part of the existing commercial development next to the development. The constructed drain crosses both Bushman Drive and Homestead Drive before discharging into Sandy Creek about 150 m downstream. The constructed drain has a catchment area of about 57 ha to Homestead Drive.

### 2.2 EXISTING HYDRAULIC INFRASTRUCTURE

A number of key culverts in the vicinity of the development site are shown in Figure 1.1 and summarised in Table 2.1.

Please note that the road deck levels reported are the lowest point on the road deck in the vicinity of the culverts, and may not be representative of the road deck level immediately above the culverts. It is also of note that there is a solid block wall barrier along Homestead Drive at the Sandy Creek crossing, the crest of which is about 1.2 m higher than the deck of the road.

**Table 2.1 - Existing culvert details**

ID	Dimensions	No. Barrels	Upstream Invert (mAHD)	Downstream Invert (mAHD)	Road / deck level (mAHD)	Culvert length (m)
Home1	3.55Wx2.7H RCBC	4	27.43	27.32	30.62	12.7
Home2	1.5 RCP	3	28.8	28.48	32.26	15
Bush1	1.75 RCP	2	29.36	29.04	30.6	17
Sand1	3.55Wx3.3H RCBC	3	25.49	25.37	29.77	9.65

## 3 Hydrologic model development

### 3.1 GENERAL

The XP-RAFTS rainfall runoff-routing model (XP Software, 2013) was used to estimate the existing conditions design discharges along Sandy Creek, and its tributaries for a range of design events from the 63% AEP to 1% AEP. The XP-RAFTS model discharges were verified against Rational Method discharge estimates for a number of model subcatchments.

The XP-RAFTS model included the external catchment areas draining past the development site, extending downstream to Sandpiper Drive (location 'N1' in Figure 3.1). The XP-RAFTS model was configured to be consistent with the land use conditions shown in council's planning scheme zoning and precincts map for the Sandy Creek catchment.

As part of the stormwater management plan for the development (being developed by Farr Engineers Pty Ltd), detention basins were proposed to mitigate developed conditions peak discharges back to existing conditions. Therefore developed conditions discharges for the development site were assumed to be equal to existing conditions discharges for the purposes of this assessment.

The following section presents the methodology and results of the hydrological modelling of the Sandy Creek catchment.

### 3.2 XP-RAFTS MODEL CONFIGURATION

#### 3.2.1 Model setup

Figure 3.1 shows the configuration of the XP-RAFTS model. Sandy Creek sub-catchments were delineated based on DNRM LiDAR survey data. The sub-catchments were generally broken down in an attempt to create a homogenous land use for each sub area and boundaries were located to provide inflow hydrographs to the TUFLOW hydraulic model (described in Section 5). The Sandy Creek catchment areas to Homestead Drive (node 'N4' in Figure 3.1) and Sandpiper Drive (node 'N1' in Figure 3.1) are 931 ha and 1,073 ha respectively.

#### 3.2.2 Model parameters

XP-RAFTS model parameters for each subcatchment were determined based on the mix of land uses occurring within each subcatchment (and resulting overall fraction impervious). Topographic maps, aerial photography and council's planning scheme maps were used to identify existing conditions land uses in each subcatchment.

Table 3.1 and Table 3.2 show the adopted XP-RAFTS parameters for each land use in the Sandy Creek XP-RAFTS model. Table 3.1 also shows the adopted fraction impervious for each land use based on the Queensland Urban Drainage Manual (QUDM) (DEWS, 2013) recommendations. The XP-RAFTS model percentage impervious values and catchment PERN 'n' values, which represent the average sub-catchment roughness, were used as a calibration parameter.

Table 3.3 shows the adopted sub-catchment parameters for the Sandy Creek XP-RAFTS model. Where there was more than one land use in each sub-catchment, the percentage impervious and PERN 'n' was factored in proportion to catchment area.

A global 'Bx' factor of 1.0 was adopted. The adopted channel routing parameters were assigned based on the physical channel characteristics including channel length and slope. A flow velocity of 0.9 m/s and channel storage factor (X) of 0.2 was adopted for determining all XP-RAFTS routing links.

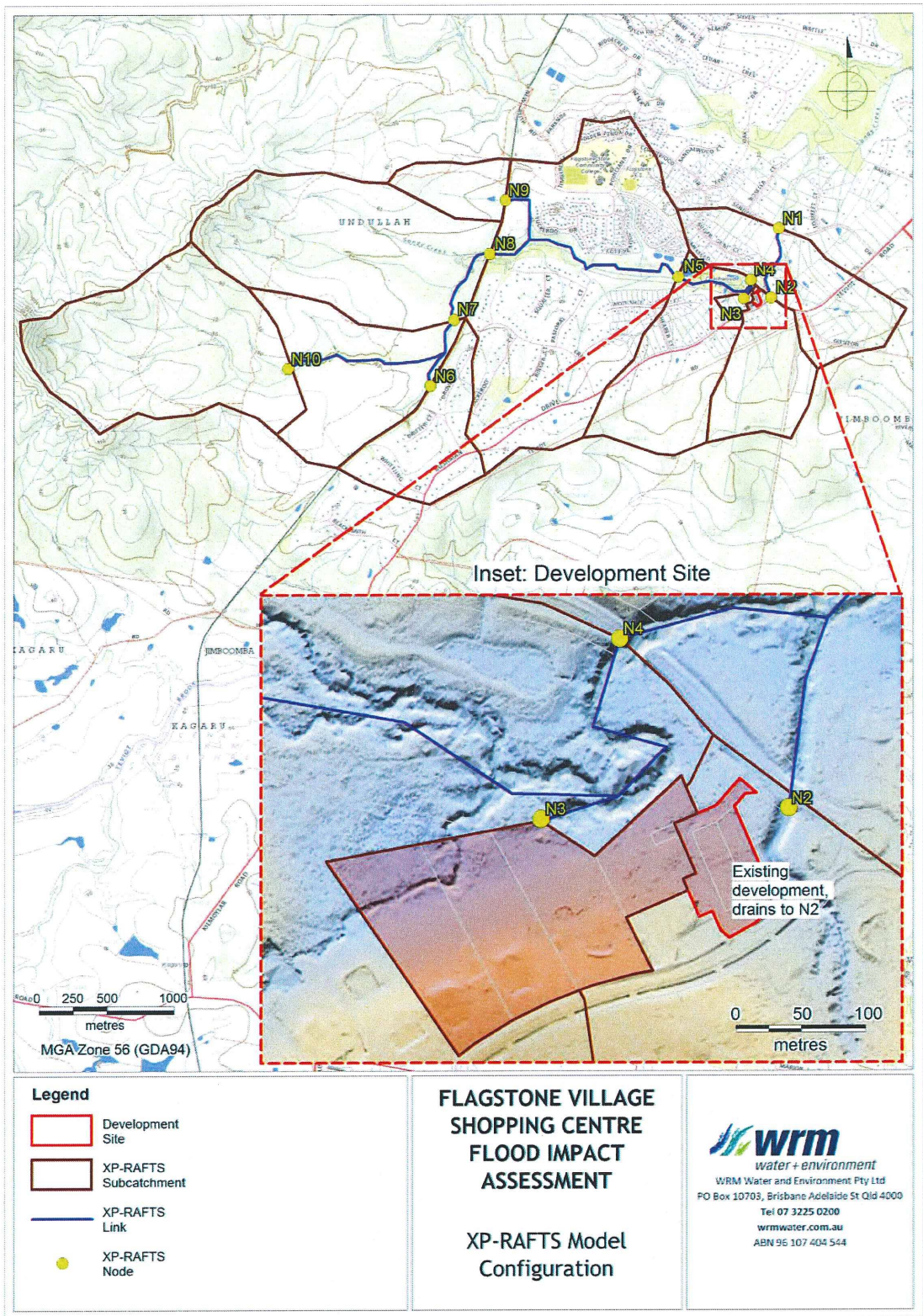


Figure 3.1 - XP-RAFTS model configuration

**Table 3.1 - Adopted land use parameters - Sandy Creek XP-RAFTS model**

Land Usage	Typical Lot Size (ha)	Fraction Impervious (fi)	Adopted Parameters	
			Percent Impervious (%)	Catchment PERN 'n'
Commercial/Industrial	Varies	0.90	70	0.020
Special Purpose	Varies	0.75	55	0.030
Urban Res (Med Density)	0.04 to 0.1	0.70	50	0.035
Urban Res (Low Density)	0.1 to 0.2	0.50	40	0.040
Rural Res (High Density)	0.2 to 1.0	0.40	30	0.045
Rural Res (Low Density)	1.0 to 10	0.20	20	0.050
Rural	>10	0.10	10	0.060
Open Space	Varies	0.00	0	0.065

**Table 3.2 - Initial and continuing losses - Sandy Creek XP-RAFTS model**

Percent Impervious (%)	Initial loss (mm)	Continuing loss (mm/hr)
<20	15	2.5
20 to 30	15	1.5
>30	5	1.0

**Table 3.3 - Adopted Sandy Creek XP-RAFTS model parameters**

Sub-catchment	Catchment Area (ha)	Percent Imp. (%)	'PERN' 'n'	Catchment Slope (%)
N1	85.58	16.5	0.053	1.18
N2	56.68	13.9	0.057	2.33
N3	3.07	30.0	0.045	4.50
N4	94.02	13.2	0.056	1.20
N5	271.45	26.4	0.048	1.05
N6	61.49	26.6	0.047	2.23
N7	105.04	0.0	0.065	0.94
N8	183.00	0.0	0.065	1.02
N9	29.17	0.0	0.065	1.90
N10	182.85	0.0	0.065	1.41

## 3.3 XP-RAFTS VALIDATION AGAINST THE RATIONAL METHOD

### 3.3.1 General

The Sandy Creek XP-RAFTS model discharge estimates from the open space and rural residential land uses were validated against the Rational Method estimates at 3 locations using the methodology recommended in QUDM assuming the same homogenous land use. The XP-RAFTS model was validated to the following locations (see Figure 3.1):

- Node N4: Sandy Creek to Homestead Drive assuming fully open space land use, that is, it was assumed that the land use in subcatchments N4, N5 and N6 is open space;
- Node N2: Open drain to Homestead Drive assuming existing rural and rural residential land use; and
- Node N1: Sandy Creek to Sandpiper Drive assuming the entire catchment land use is open space.

The catchment parameters were then adjusted to reflect the actual land use given in Table 3.3 to determine the design discharges for the study (see Section 4).

### 3.3.2 Design rainfalls

Design rainfall intensity-frequency-duration (IFD) data for Sandy Creek was obtained from the Bureau of Meteorology website. The IFD data is derived in accordance with the methodology described in Australian Rainfall & Runoff - A Guide to Flood Estimation (IEAust, 1987). Table 3.4 shows the adopted rainfall IFD data for the study.

**Table 3.4 - Intensity-frequency-duration data (mm/hour)**

Duration (hours)	Annual Exceedance Probability (AEP) (mm/hr)						
	63%	39%	18%	10%	5%	2%	1%
0.08	110	141	177	198	227	266	296
0.1	103	132	165	185	212	248	276
0.17	84	108	135	152	174	204	227
0.33	62.1	79.6	100	113	130	152	169
0.5	50.6	64.9	82.1	92.3	106	125	139
1	33.6	43.2	54.8	61.7	71.2	83.8	93.5
2	20.9	26.8	34.1	38.5	44.4	52.3	58.4
3	15.5	19.9	25.3	28.5	32.9	38.7	43.3
6	9.17	11.8	15	16.9	19.5	23	25.7
12	5.52	7.11	9.09	10.3	11.9	14	15.7

### 3.3.3 Rational Method estimates

Table 3.5 shows the Rational Method estimates of 63% to 1% AEP events at the above 3 locations. The Rational Method discharges were calculated assuming the following:

- A catchment-weighted fraction impervious and equal area slope based on undeveloped / open space conditions for nodes N4 and N3 and existing conditions for node N02;
- A catchment-weighted  $C_{10}$  value was assigned to each catchment based on the values recommended in QUDM (2013). The 10% AEP 1-hour duration rainfall intensity for Sandy Creek is 61.7mm/hr;
- A  $C_{10}$  value of 0.59 was assigned to all catchments (except for N2) assuming they are all open space (with a catchment weighted fraction impervious of 20% or less). A  $C_{10}$

value of 0.63 was assigned to the N2 catchment as it is a mixture of rural and rural residential land use; and

- The time of concentration for open space catchments (N1 and N4) was calculated using the Bransby-Williams equation for rural catchments. The time of concentration for rural residential catchments (N2) was calculated using the modified Friend's equation and Manning's 'n' Equation.

**Table 3.5 - Rational Method design discharges**

	N04	N02	N01
Catchment Area (ha)	931	56.7	1073
<b>Travel Time</b>			
<i>Bransby-Williams / Manning's 'n' equation</i>			
Stream Length (km)	7.9	1.1	8.5
Stream Equal Area Slope (m/m)	0.0049	0.0209	0.0046
Manning's 'n'	n/a	0.06	n/a
<i>Friend's equation</i>			
Length (m)	n/a	180	n/a
Overland slope (m/m)	n/a	0.02	n/a
Horton's 'n'	n/a	0.06	n/a
Overland travel time (mins)	n/a	31.5	n/a
<b>Time of Concentration (mins)</b>	<b>266.8</b>	<b>43.0 (1%AEP) - 50.1 (63%AEP)</b>	<b>286.6</b>
<b>Coefficient of Discharge</b>			
Fraction Impervious (%)	0	11	0
C <sub>10</sub> (no units)	0.59	0.63	0.59
<b>63% AEP Discharge (m<sup>3</sup>/s)</b>	<b>15.2</b>	<b>3.1</b>	<b>16.5</b>
<b>39% AEP Discharge (m<sup>3</sup>/s)</b>	<b>20.7</b>	<b>4.4</b>	<b>22.6</b>
<b>18% AEP Discharge (m<sup>3</sup>/s)</b>	<b>29.5</b>	<b>6.3</b>	<b>32.1</b>
<b>10% AEP Discharge (m<sup>3</sup>/s)</b>	<b>34.9</b>	<b>7.6</b>	<b>38.0</b>
<b>5% AEP Discharge (m<sup>3</sup>/s)</b>	<b>42.4</b>	<b>9.3</b>	<b>46.1</b>
<b>2% AEP Discharge (m<sup>3</sup>/s)</b>	<b>54.6</b>	<b>12.1</b>	<b>59.5</b>
<b>1% AEP Discharge (m<sup>3</sup>/s)</b>	<b>63.7</b>	<b>14.2</b>	<b>69.4</b>

### 3.3.4 Comparison of Rational Method and XP-RAFTS estimates

Table 3.6 compares the 63% AEP to 1% AEP peak discharges estimated using the Rational Method with XP-RAFTS model predicted peak discharges for the two open space

catchments to N4 and N1 and the rural/rural residential land use catchment (N2). The comparison shows that the XP-RAFTS peak discharges for the open space and rural residential land use sub-catchments to N1 (Outlet), N2 and N4 match reasonably well with the Rational Method discharges and that the differences are generally less than 10% for all design events up to and including the 1% AEP event.

Note that the open space XP-RAFTS model parameters given in Table 3.1 and Table 3.2 were adopted for Nodes N3, N4, N5 and N6 and not those given in Table 3.3. For N2, the XP-RAFTS parameters given in Table 3.3 were adopted.

**Table 3.6 - Comparison of Rational Method and XP-RAFTS model peak discharges**

AEP (%)	N4		N2		N1	
	XP-RAFTS	RM	XP-RAFTS	RM	XP-RAFTS	RM
63	13.6	15.2	2.4	3.1	15.5	16.5
39	20.8	20.7	3.8	4.4	23.7	22.6
18	29.6	29.5	6.0	6.3	33.6	32.1
10	35.7	34.9	7.4	7.6	40.5	38.0
5	44.3	42.4	9.4	9.3	50.1	46.1
2	54.6	54.6	11.9	12.1	61.8	59.5
1	64.6	63.7	14.1	14.2	72.4	69.4

## 4 Design discharge estimation

The XP-RAFTS model updated using the actual catchment land use was used to determine the peak design discharges and critical durations in the vicinity of the development site. The XP-RAFTS parameters given in Table 3.3 were adopted for determining design discharges. Table 4.1 summarises existing conditions peak design discharges at a range of locations. Please note:

- The critical duration along Sandy Creek to Homestead Drive and Sandpiper Drive (nodes N4 & N1) is
  - 180 minutes for the 63% AEP design event, and
  - 120 minutes for the 39% to 1% AEP events;
- The critical duration along the drain crossing Homestead Drive (node N2) is
  - 120 minutes for the 63% and 39% AEP design events, and
  - 60 minutes for the 18% to 1% AEP events;
- The Sandy Creek 1% AEP design discharge of 72.2 m<sup>3</sup>/s adjacent to the development site (N4) is approximately 12% greater than for the validation event assuming the entire catchment is open space.

**Table 4.1 - XP-RAFTS model design discharges**

AEP (%)	N4		N2		N1	
	Peak discharge (m <sup>3</sup> /s)	Critical duration (hours)	Peak discharge (m <sup>3</sup> /s)	Critical duration (hours)	Peak discharge (m <sup>3</sup> /s)	Critical duration (hours)
63	15.6	3.0	2.4	2.0	18.9	3.0
39	23.8	2.0	3.8	1.0	29.2	2.0
18	34.6	2.0	6.0	1.0	43.0	2.0
10	41.3	2.0	7.4	1.0	51.4	2.0
5	50.6	2.0	9.4	1.0	63.5	2.0
2	62.1	2.0	11.9	1.0	78.3	2.0
1	72.2	2.0	14.1	1.0	90.8	2.0

# 5 Hydraulic model development

---

## 5.1 GENERAL

The TUFLOW two-dimensional hydraulic model (WBM, 2010) was used to assess the impact of the development on peak flood levels and extents along Sandy Creek and its tributary for developed conditions for the 10% AEP and 1% AEP design flood events.

The TUFLOW model was configured to represent two scenarios:

- Approved conditions; and
- Developed conditions

In the absence of validation data, design flood levels along Sandy Creek were estimated using published Manning's 'n' values. Design inflows to the TUFLOW model for each AEP were obtained from the XP-RAFTS model as described in Section 4.

## 5.2 TUFLOW MODEL CONFIGURATION

### 5.2.1 Model configuration

The TUFLOW model extends about 200 m upstream of the development site to the west, Sandpiper Drive to the north, and Bushman Drive to the south, as shown in Figure 5.1. The hydraulic model area covers approximately 37 ha and includes Sandy Creek, its tributary and the drain through the existing commercial development.

A 2 m grid cell size and 0.5 second timestep were adopted for the model.

### 5.2.2 Topography

The existing conditions topographic data for the study area was provided from a number of sources including:

- ground survey by Jensen Bowers shown in drawing no. S-7011-001 Issue C dated 7 July 2013 of the development site and Bushman Drive and Homestead Drive including part of Sandy Creek, roads, drains, and culverts within the study area;
- additional survey by Jensen Bowers in 2014 which consists of surveyed cross sections of the Sandy Creek channel provided in 12da format (7701 BUSHMAN DRIVE MGA DTM[140822].12da) as well as surveyed levels at the Homestead Drive and Sandpiper Drive culvert crossings of Sandy Creek provided in Drawing S-7701-004; and
- LiDAR aerial survey by the Queensland Government Department of Natural Resources and Mines (DNRM) captured in 2010 Sandy Creek and its catchment.

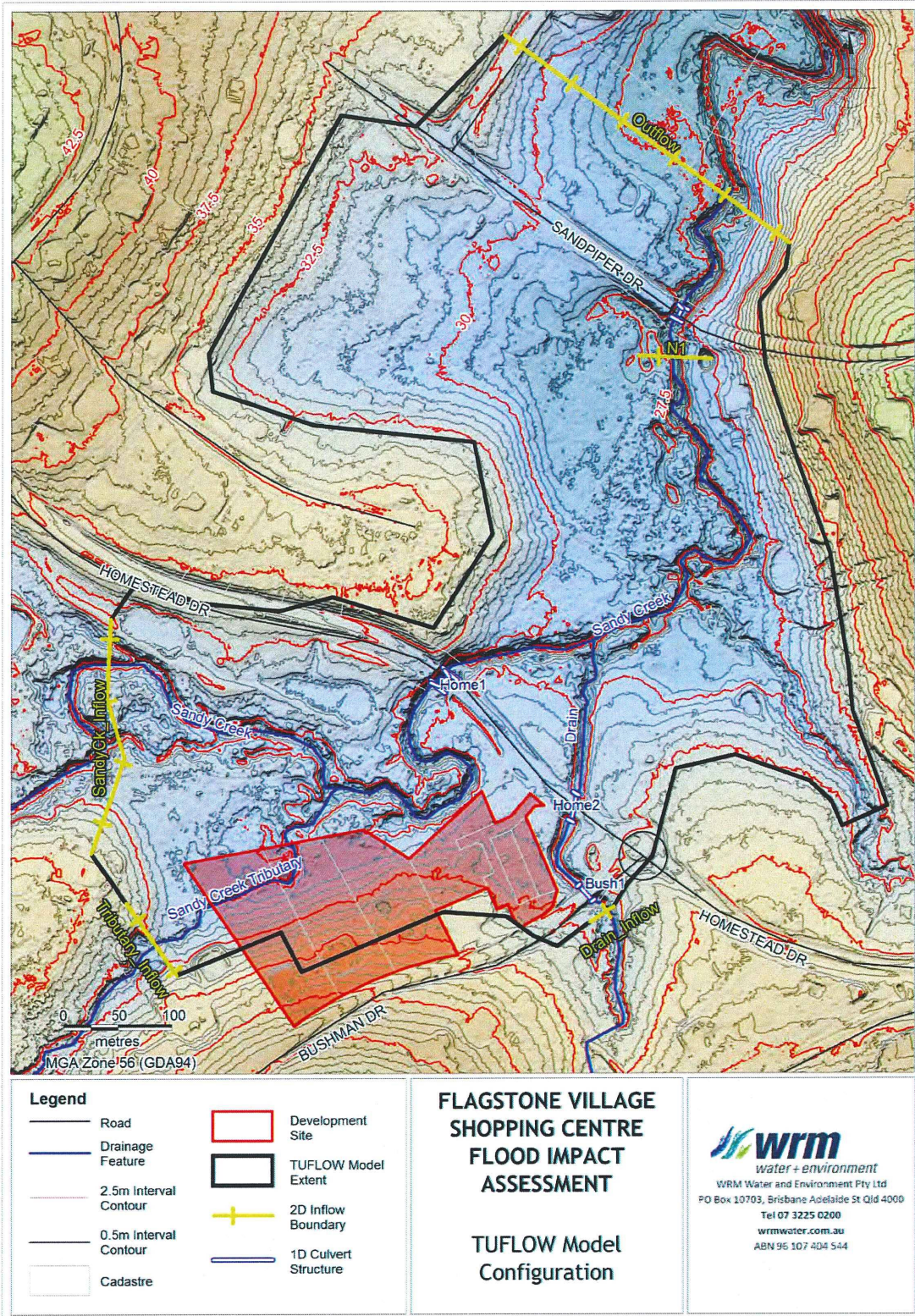


Figure 5.1 - TUFLOW model configuration

### 5.2.3 Modifications to the Sandy Creek channel and flood plain

The Sandy Creek channel adjacent to the development site was modified based on the surveyed cross sections provided by Jensen Bowers using TUFLOW Z-shape files. The surveyed cross sections along Sandy Creek indicate that the flood plain levels are also lower than the DNRM's LiDAR survey information. However, the ground levels on the overbank areas were not modified because the available survey information of the overbank was limited to cross sections. The use of the higher LiDAR data is likely to produce conservatively high design flood levels at the development site.

### 5.2.4 Manning's 'n'

The TUFLOW model uses Manning's 'n' values to represent hydraulic resistance across the study area. An orthophotograph of the area captured in April 2015 (obtained from Nearmap) was used to determine the spatial location of each ground cover and vegetation characteristics within the study area. A site visit undertaken in July 2014 was used to assess the characteristics of the open drainage network, road culverts and overbank areas. The Manning's 'n' values for each ground cover were estimated according to guidelines given in Chow (1973).

Table 5.1 shows the adopted Manning's 'n' values for different ground covers. Figure 5.2 shows the spatial extent of each ground cover adopted in the model.

**Table 5.1 - Adopted Manning's 'n' values**

Ground cover type	Adopted Manning's 'n'
Concrete / Pavement / Culvert approach	0.02
Mown Grass	0.03
Waterbodies	0.04
Sparsely vegetated/Long grass	0.05
Creek channel	0.07
Moderate vegetation	0.08
Dense vegetation	0.10

### 5.2.5 Inflow and outflow boundaries

Figure 5.1 shows the locations of the inflow boundaries used in the TUFLOW model. Local and total inflow boundaries were added to the TUFLOW model as 2D QT (discharge vs time).

One outflow boundary called "Outflow" (see Figure 5.1) was added to the TUFLOW model. A normal depth tailwater boundary condition with a slope of 0.5% was adopted. This is consistent with the flood slope in the area of interest. The downstream boundary is far enough downstream to not impact on design flood levels at the site. The hydraulic model was run for the critical storm durations for all design events ranging from 38% to 1% AEP. Based on available mapping, the model extent is not tailwater affected from the Logan River for any of the AEP events investigated in this study.

### 5.2.6 Culvert structures

Road stormwater culverts were embedded within the 2D domain of the TUFLOW model as 1D structures. Details of existing culvert structures were obtained from detailed survey provided by Jensen Bowers. Table 2.1 shows the hydraulic characteristics for each existing culvert in the model. Figure 5.1 shows the locations of the existing 1D culverts in the TUFLOW model. The ESTRY 1D hydraulic model, a built-in feature of TUFLOW, was used to undertake the hydraulic calculations of structures within the 1D domain.

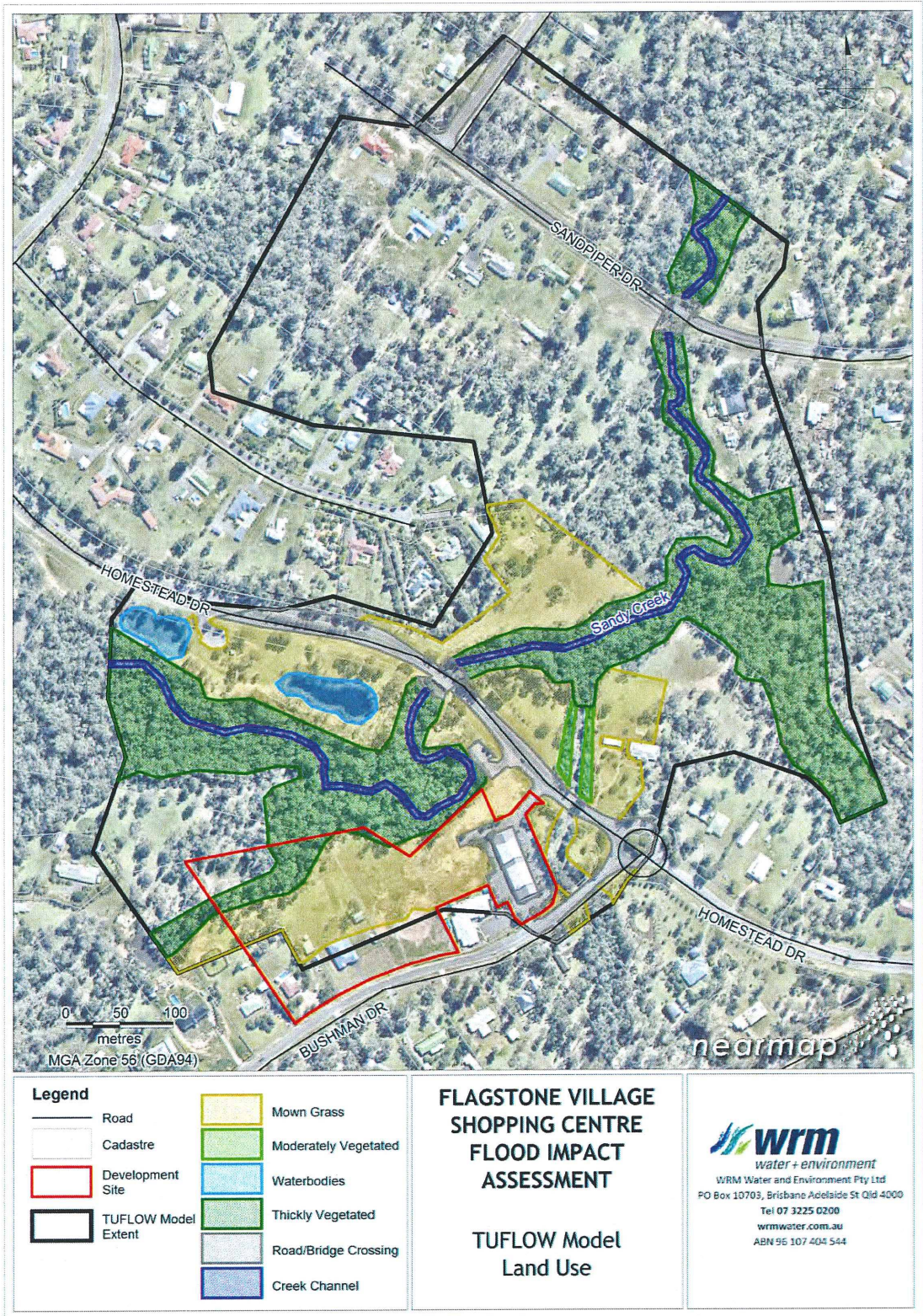


Figure 5.2 - TUFLOW model ground cover distribution

## 6 Flood impact assessment

---

### 6.1 OVERVIEW

The TUFLOW model was used to assess the impact of the development on peak flood levels and extents along Sandy Creek and its tributary for post development conditions, and for design events up to 1% AEP.

### 6.2 APPROVED CONDITIONS FLOODING

Figure 6.1 and Figure 6.2 show the results for the approved conditions peak water surface contours and extents for the 10% and 1% AEP design flood events. The approved conditions scenario is based on the site configuration given in the previous development approval (COM/7/2011). The model results show the northwestern portion of the development site is inundated for the 10% AEP and 1% AEP events.

### 6.3 PROPOSED DEVELOPMENT

The proposed development was included in the 'developed' conditions model by placing a 'z-shape' (a TUFLOW element used to modify model topography) along the perimeter of the proposed retaining wall to the north of the development. The retaining wall was positioned along the edge of the 10% AEP approved conditions flood extent on the new development areas (23-33 Bushman Drive) and on the approved development area further to the south (1-21 Bushman Drive). The retaining wall has a minimum crest level of 33.36 mAHD based on the revised site plan (Earthworks Key Plan - drawing number CKS-100 2) prepared by Farr Engineers Pty Ltd on 23 June 2015.

### 6.4 DEVELOPED CONDITIONS FLOOD IMPACTS

Figure 6.3 and Figure 6.4 show flood level impact results for the 10% and 1% AEP design flood events respectively. Table 6.1 shows the modelled existing and developed 10% and 1% AEP flood levels and the relative difference between the two cases. Under post-development conditions, minor flood level decreases of up to 0.01 m for the 10% AEP and up to 0.06 m for the 1% AEP design flood events were predicted on the lot immediately upstream of the development site because the proposed development does not extend as far into the floodplain as the approved development. No flood levels impacts were predicted downstream of the development site.

Specific outcome O1 of Table 8.2.5.3.1 of the Logan Planning Scheme (LCC 2015) requires that "A building has a finished habitable floor level a minimum of 500 mm above the defined flood event". The defined flood event for this development is the 1% AEP flood. The original flood level for the site as advised by Logan City Council was 32.0 mAHD. It should be noted that this level is about 0.5 m higher than the modelled 1% AEP flood level at the upstream end of the development site at reporting 'Loc3' (see Table 6.1).

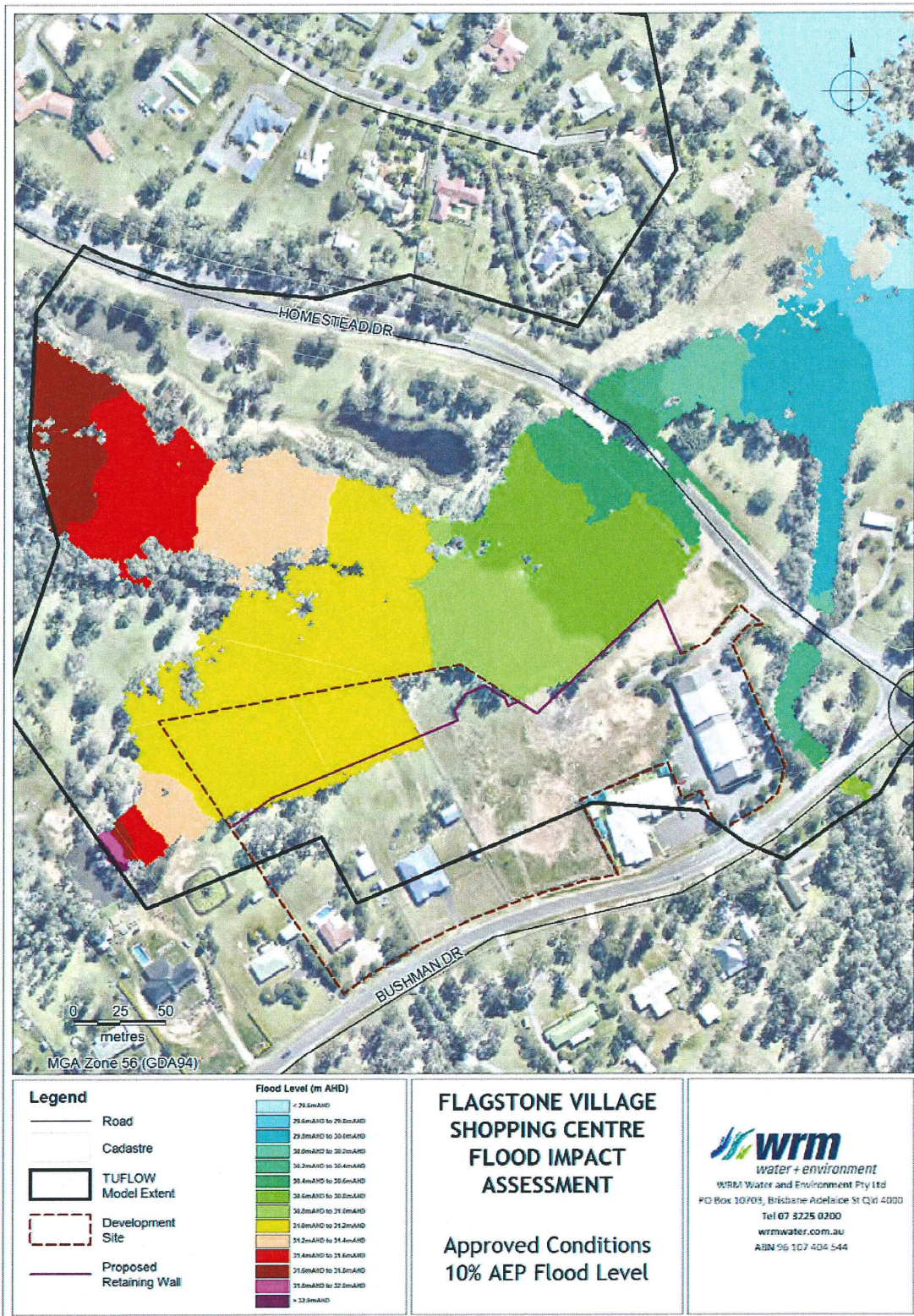


Figure 6.1 - Sandy Creek 10% AEP flood levels and extent - approved development conditions

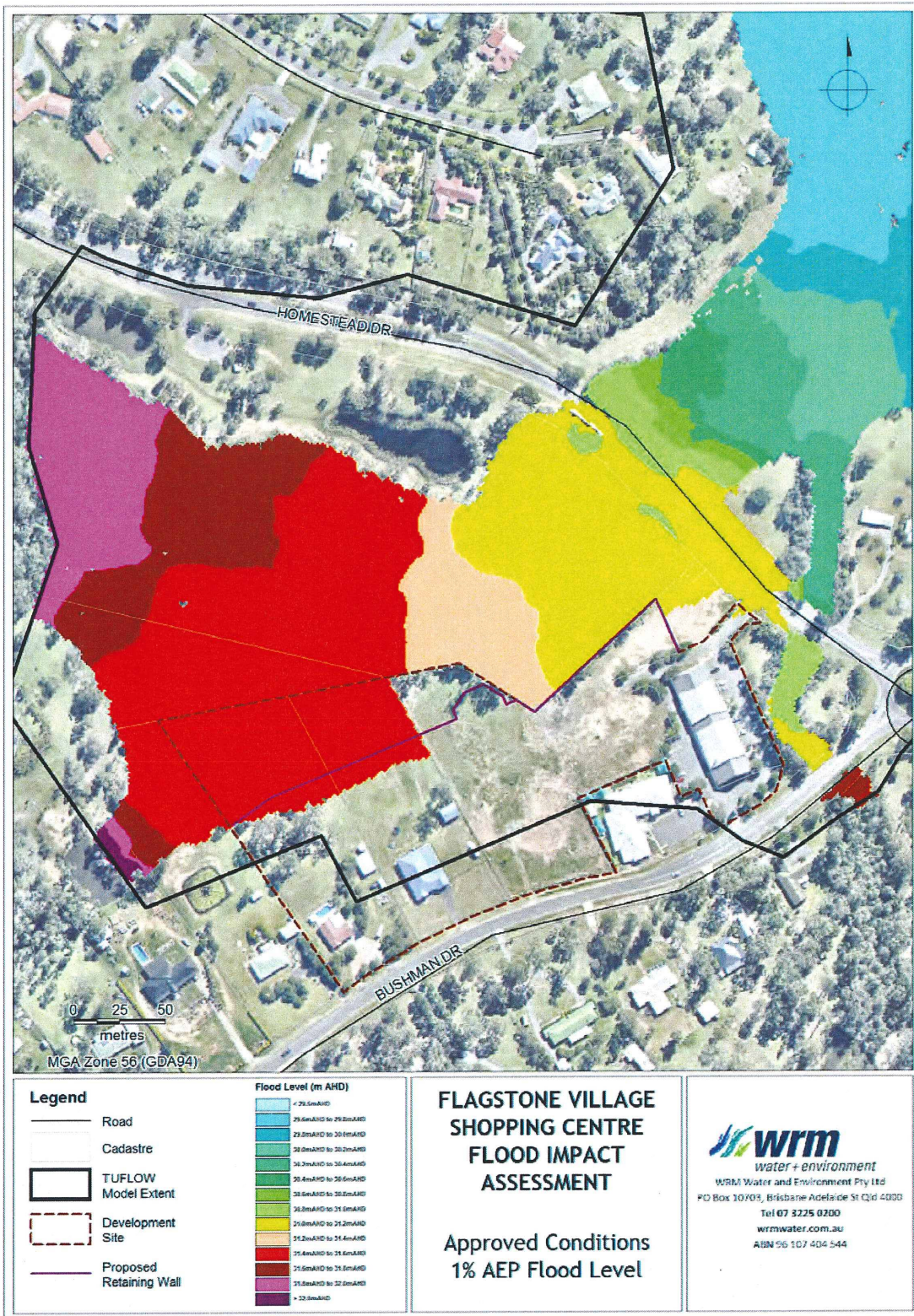


Figure 6.2 - Sandy Creek 1% AEP flood levels and extent - approved development conditions

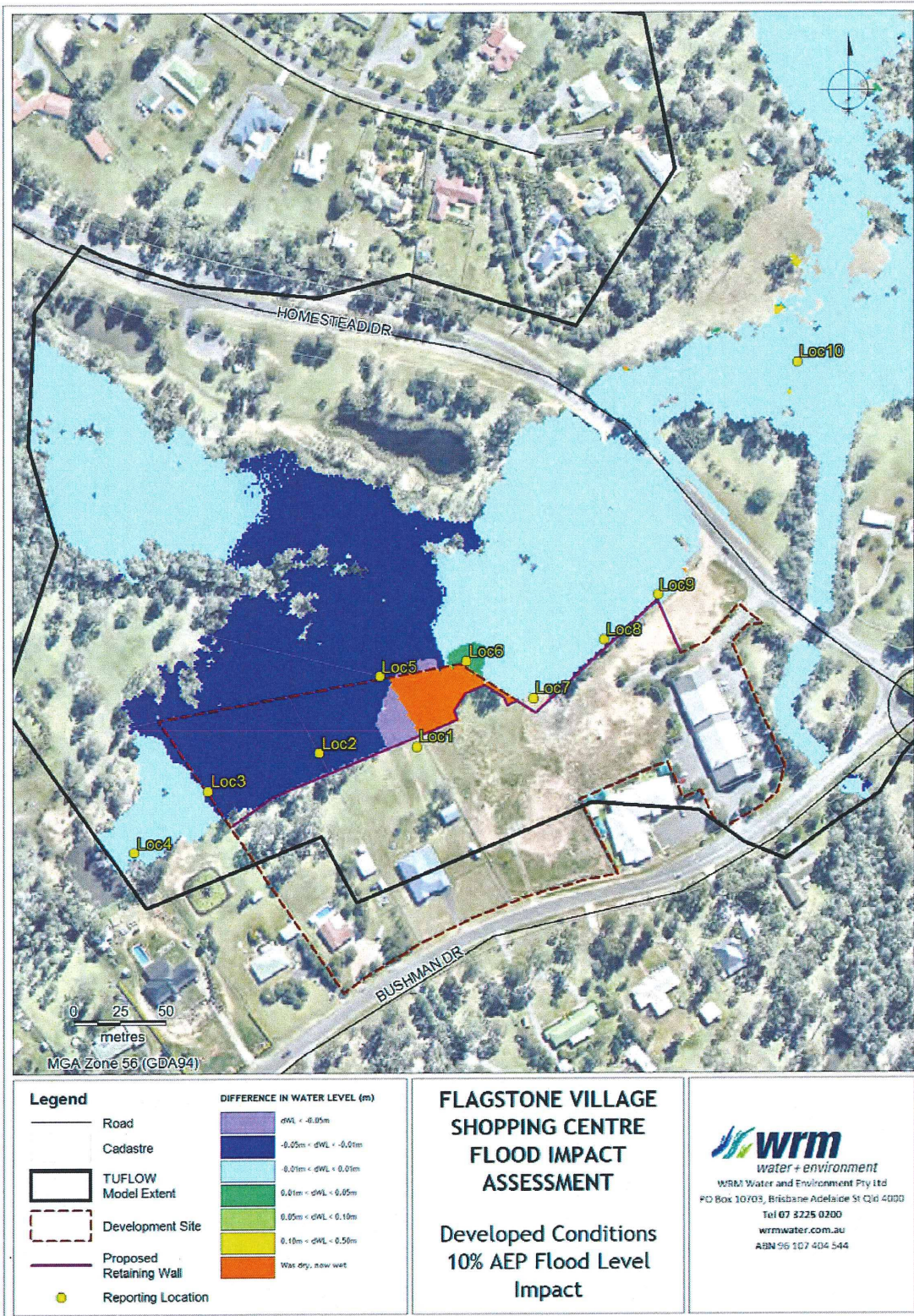


Figure 6.3 - Sandy Creek 10% AEP flood level impacts, developed - approved conditions

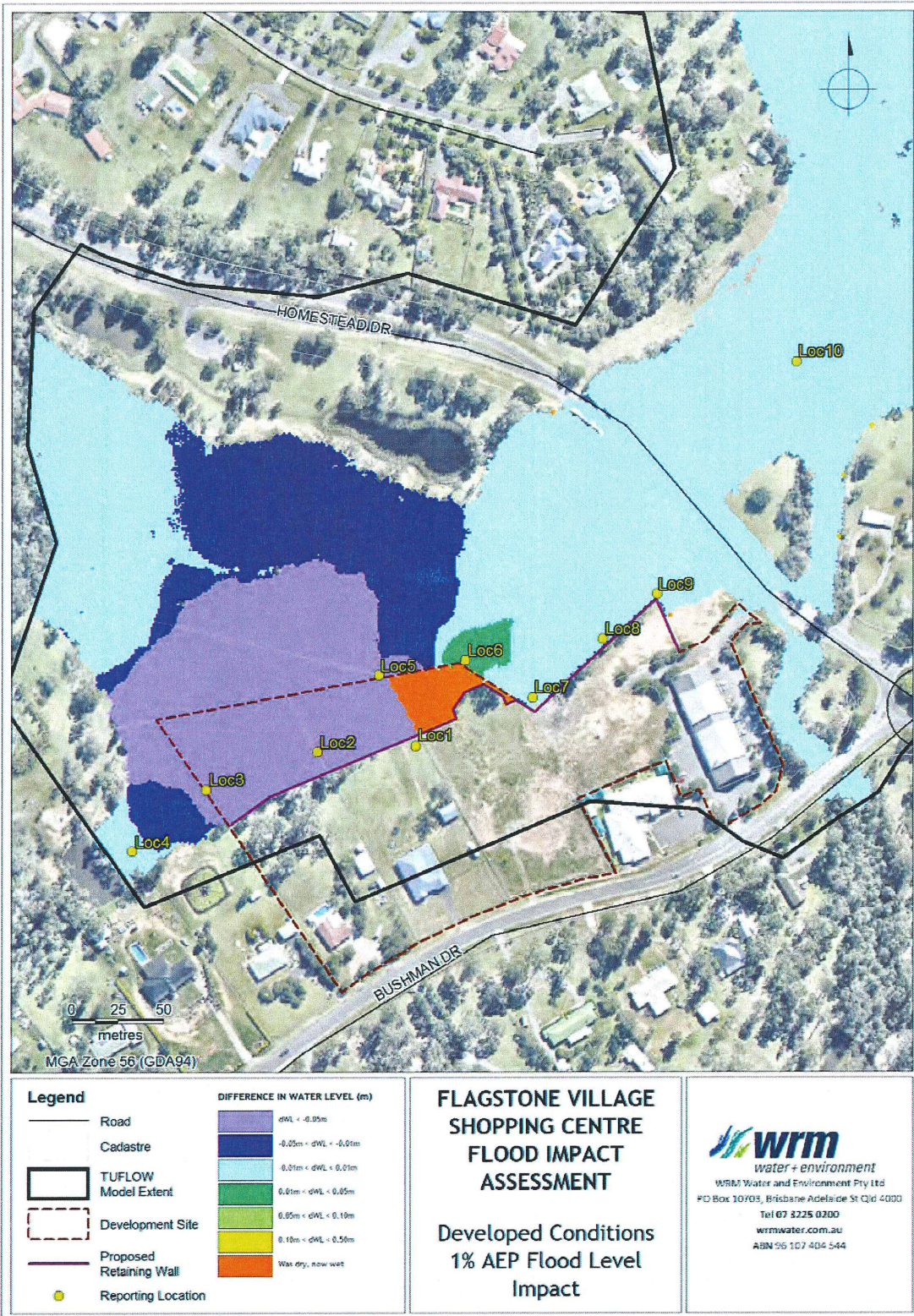


Figure 6.4 - Sandy Creek 1% AEP flood level impacts, developed - approved conditions

**Table 6.1 - Sandy Creek 10% and 1% AEP flood levels and relative differences - approved and proposed development conditions**

Reporting Location	Ground Level (mAHD)	10% AEP flood level (mAHD)			1% AEP flood level (mAHD)		
		Approv	Dev	Diff.	Approv	Dev	Diff.
Loc1	31.01	31.07	- <sup>a</sup>	-0.06 <sup>a</sup>	31.47	- <sup>a</sup>	-0.46 <sup>a</sup>
Loc2	29.66	31.07	31.04	-0.03	31.47	31.40	-0.07
Loc3	30.26	31.15	31.14	-0.01	31.49	31.43	-0.06
Loc4	30.68	31.59	31.59	0.00	31.78	31.77	-0.01
Loc5	30.39	31.06	31.03	-0.03	31.44	31.37	-0.06
Loc6	30.23	30.87	30.89	0.02	31.21	31.25	0.04
Loc7	31.06	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	31.21	31.22	0.01
Loc8	29.87	30.80	30.80	0.00	31.14	31.15	0.00
Loc9	30.32	30.77	30.78	0.00	31.11	31.11	0.00
Loc10	27.72	29.91	29.91	0.00	30.22	30.22	0.00

a. No longer inundated post-development. Difference equals depth of inundation under approved conditions

b. Not inundated during 10% AEP event

## 7 Summary and discussion

---

A flood impact assessment was undertaken for the proposed commercial development at 1-33 Bushman Drive, Flagstone in accordance with the Logan City Council's Logan Planning Scheme 2015 Version 1.1.

The TUFLOW two-dimensional hydraulic model (WBM, 2010) was used to assess the impact of the development on peak flood levels and extents along Sandy Creek and its tributary for post development conditions, up to the 1% AEP design flood event.

The model results show that under approved conditions, the northwestern portion of the development site is inundated for the 10% AEP and 1% AEP events. The proposed development has been located along the 10% AEP flood extent in the new areas (23-33 Bushman Drive) and reduced in the approved areas (1-21 Bushman Drive). Under post-development conditions, minor flood level decreases of up to 0.01 m for the 10% AEP and up to 0.06 m for the 1% AEP design flood events were predicted on the lot immediately upstream of the development site. No flood levels impacts were predicted downstream of the development site.

## 8 References

---

- Chow 1973            Chow, VT 1973, *Open-Channel Hydraulics*, McGraw-Hill Book Company, Singapore
- LCC 2015            Logan City Council 2015, Logan Planning Scheme 2015 Version 1.1, viewed June 2015, <<http://www.logan.qld.gov.au/planning-and-building/planning-and-development/logan-planning-scheme/logan-planning-scheme-2015-version-1.1>>
- WBM 2010            BMT-WBM 2010, *TUFLOW User Manual, GIS Based 2D/1D Hydrodynamic Modelling, Build 2010-10-AB*, Brisbane
- WRM 2014            WRM Water & Environment 2014, *Flagstone Shopping Centre Flood Impact Assessment*, Brisbane