NORTHERN CONSULTING engineers

CIVIL & STRUCTURAL ENGINEERS

ENGINEERING REPORT

ANNANDALE RETIREMENT VILLAGE AND
RESIDENTIAL AGED CARE FACILITY

FOR
PARKSIDE DEVELOPMENT PTY LTD

JOB No: **PARK0014**

Doc Ref: **PARK0014-ENG**

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B	Andrew Wallace / Brendan Blair	Andrew Wallace	Andrew Wallace (RPEQ 6743)		13/12/2024	Cottee Parker	Support for development applications

EXECUTIVE SUMMARY

Parkside Development Pty Ltd is proposing an independent living and residential aged care facility located at 33 University Road, at the corner of Stuart Dr and University Drive in Annandale. The site is proposed to be developed as depicted on the Cottee Parker layout plans and involves material change of use and a reconfiguration of a lot applications.

This engineering report is prepared in support of the development and outlines the proposal including the infrastructure and engineering requirements demonstrating the site is suitable for the proposed uses.

The findings of this assessment are summarised below:

- An extensive flood impact assessment (FIA) has been carried out using a fine scale mini TUFLOW model based on inputs and boundary conditions derived from Townsville City Council's new Ross River Flood Study. The FIA had been carried out based on the former TCC flood model boundary conditions which was later updated based on the new TCC Ross River flood model inputs. The outcome of the assessment involved significant overbank widening / detention storage in the south-east, overbank widening upstream of the culvert crossing and use of the culverts to restrict and moderate the flows downstream. The outcome of the FIA included reducing the development extent (in conjunction with the above mitigation measures). The FIA which included consideration of the climate change scenario, has demonstrated that the proposed development complies with the flood hazard overlay code. In accordance with the Flood hazard overlay code, the retirement village has been assessed and will be located above the 0.5% AEP flood event. Refer to the attached NCE FIA report, document reference PARK0014-FIA.

  The master plan development site includes a future residential development on the north / north-west side of the drainage feature. This has been included as part of the FIA to ensure the future residential development does not result in afflux off site once that development proceeds. It is noted that the masterplan site inclusive of the future development does not result in afflux off site for the events considered.

- Stormwater is to be conveyed through the site through 2 primary culverts at the crossing of the drainage. Local run-off within the site will be conveyed to legal points of discharge via an underground pit and pipe network, with surcharge flows conveyed overland in the roadways and open corridors. Stormwater quantity and mitigation of post-development flows is addressed utilising the overbank widening and detention storage as well as using the major culverts.

- Stormwater quality is demonstrated to be mitigate through a treatment train and utilising best practice stormwater quality improvement devices. The primary stormwater quality measures utilised is a bioretention device and associated devices depending on the extent of development proceeded with. The treatment devices are proposed to be designed in accordance with the Stormwater quality section of the development manual planning scheme policy. The pollutant reduction targets adopted are listed below:

  - 80% Total Suspended Solids Reduction
  - 65% Total Phosphorous Reduction
  - 40% Total Nitrogen Reduction
  - 90% Gross Pollutants Reduction

- The Water Supply and Sewerage Planning Report prepared by DPM details the water supply assessment. This report demonstrates that the existing water infrastructure surrounding the site has capacity to service the development for peak demands and fire flows. In order to supply the site, the following extension to the water infrastructure is required:
    - A connection to the end of the existing DN150 PVC water main at the northern end of Patterson St. This main will be extended to the east into the development site to the proposed internal development road.
    - A connection to the existing DN100 PVC water main on Shanahan Drv at the intersection with Downey Cres. An initial DN100 water main will be extended along this development road to service the independent living and aged care sites. This DN100 main will connect to the above DN150 water main extension off Patterson St
    - A DN150 main will then continue to the east and south along the new internal development road to service the independent living and aged care sites.
- The DPM Water sewerage planning assessment has demonstrated that the existing system and existing pump station PS SC7 can cater for the proposed development. To service the site and future development, the following infrastructure is proposed:
    - DN225 gravity sewer connected to existing manhole 1/SC7A at the south-west of the site.
    - From the DN225 main, DN150 gravity sewers that will service the site.
- The site is proposed to be accessed via a new road extension from the existing roundabout at the intersection of Shannahan Dr and Downey Cr. This road which will also service the future residential development will be a minor collector road in accordance with TCC standard drawings. The roadway required from the culvert crossing of the drainage feature is an Access Street. A roundabout is proposed on the eastern side of the drainage crossing to access the 2 allotments.
- A traffic impact assessment has been carried out by NCE with the following outcome. A SIDRA analysis found the existing intersection of Gartrell Drive and Shanahan Drive is expected to operate at acceptable levels of service inclusive of the proposed development generated traffic through to the design year 2036, based upon the TAIM background traffic volume predictions.
- The electrical supply is being assessed under separate cover.

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1.0 INTRODUCTION

1.1 Background

Northern Consulting Engineers (NCE) has been commissioned by Parkside Development Pty Ltd to undertake an engineering assessment for a proposed independent living and residential aged care facility located at 33 University Road, at the corner of Stuart Dr and University Drive in Annandale, formally described as Lot 1 on SP343205. The site is proposed to be developed as depicted on the Cottee Parker layout plans and involves material change of use and a reconfiguration of a lot applications. The existing site is currently vacant.

This engineering report demonstrates how the proposed development can be achieved by addressing:

- Flooding
- Stormwater management
- Water and sewer infrastructure
- Traffic and roadways

The information provided in this report is based on the following layout plans as modified which are provided in Appendix ii of this report:

- Cottee Parker Architects – SDA-1003

Also included for reference are the supporting concept engineering plans in Appendix i.

- Northern Consulting Engineers - Conceptual Overall Layout Plan PARK0014/A01 – A07.

NCE is an established consulting firm providing services in the land development and infrastructure sector and has been involved in the engineering design, traffic engineering and flood modelling of various developments within the Townsville region including in the Annandale and Stuart areas.

1.2 Supplementary Reports

The information in this report is supplemented by a number of supporting engineering investigations. Summaries of these reports are provided under the appropriate sections as noted below:

- **Section 2.0** Flooding – *Flood Impact Assessment, Doc Ref: PARK0014-FIA Revision A dated 29/11/2024, prepared by NCE.*
- **Section 0** Water Network – *Water Supply and Sewerage Planning Report, Revision A dated 30/10/2024, prepared by DPM Water.*
- **Section 5.0** Sewerage Network – *Water Supply and Sewerage Planning Report, Revision A dated 30/10/2024, prepared by DPM Water.*
- **Section 6.0** Traffic - *Traffic Impact Assessment Report, Doc Ref: PARK0014-TIA Revision A prepared by NCE.*

1.3 Proposed Development

The site is proposed to be developed into a retirement village and whilst not part of the immediate application, this engineering report also includes the future residential aged care facility as depicted in **Figure 1-1**. The proposal has been presented as concept layouts as shown in this figure. The layout has undergone a number of minor internal updates as part of the concept design development but the outcomes of this assessment remain consistent with the final architectural layout attached herein. Additionally, the final layout will be subject to refinement, however the assessments carried out are considered to address the engineering matters pertinent to the site and proposal. The current development application is based on the retirement village in the south-east of the site.

However, for the purposes of this engineering report as well as the associated FIA, TIA and water and sewerage assessments, the residential aged care facility (RACF) which was identified in the earlier iterations of the architectural layout is also assumed to be included in the development. This engineering report caters for the option for the RACF to be developed to the extent and intensity assumed herein.

Also, by the nature of the works required to be carried out for the retirement village, the channel from the existing roundabout at the entrance has been assume to be filled. Apart from the actual channel, the area of land south-east of the existing roundabout is generally high. It was found that filling this area had insignificant influence on the flooding outcomes and is assumed to be filled in the initial development.

The existing site is subjected to inundation during flood events. In reference to Townsville Maps Flooding Townsville City Plan flood overlay map, the site is within the medium and high hazard areas. As a result of the filling, some areas currently subject to inundation and due to the change in impervious area, increase in run-off is experienced which required mitigation as addressed as part of flood impacts assessment. Overbank widening and detention storage in combination with other mitigation measures, has resulted in no actionable impacts off-site. Further discussion on this is provided in Section 2.0.

Stormwater quality runoff will also be impacted by the development. Best practice solutions to run-off treatment is proposed. Further discussions on these elements are provided in Section 3.0.

The development is to be connected to Townsville City Council's (TCC) water and sewerage network. Connection to the water network will be carried out to the existing trunk network at the site frontage. Connection to the sewer network will be via the existing system in the vicinity of the site as discussed in the Water Supply and Sewerage Planning Report. Further details are discussed in Sections 0 and 5.0.

Assessment of the post development traffic is discussed Section 6.0.

Figure 1-1 Cottee Parker Architects Site Plan – Site Reconfiguration – SDA-1003 - 03

2.0 FLOODING

In reference to the Flood Hazard Overlay OM-6.1 of the Townsville City Council (TCC) Planning Scheme shown and TownsvilleMAPS mapping services in **Figure 2-1**, it has been identified that the proposed development site is located within the medium and high hazard areas. In addition, the hydrological processes and stormwater drainage components of the Healthy Water Code 9.3.2 requires demonstration of compliance, in particular with the Performance Outcomes.

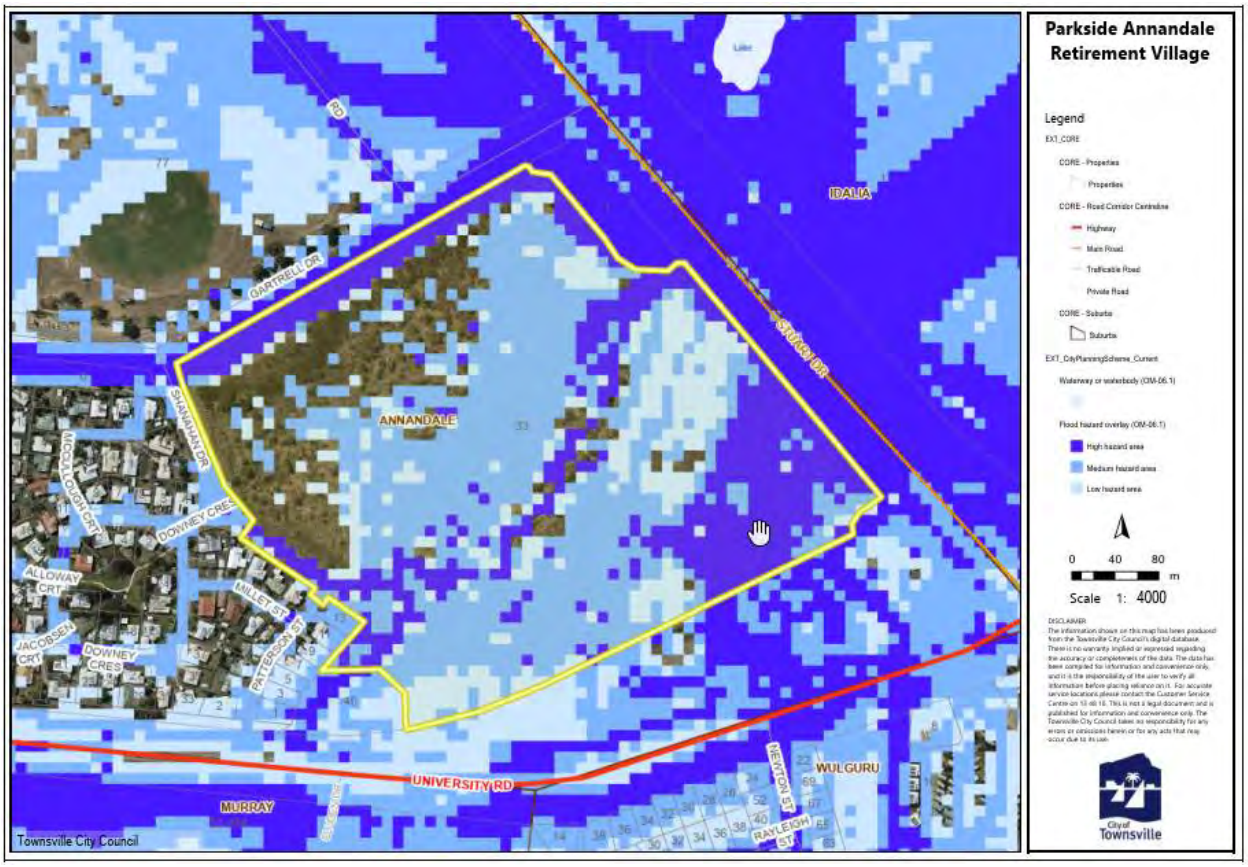

Figure 2-1 TownsvilleMaps Flooding Web Map Service extract and flood levels

To undertake this study, a new fine scale 2D TUFLOW model has been developed to assess the potential impact associated with the proposed development. As this site is located within a broader catchment, external flows and downstream tailwater levels were adopted from the TCC flood models. This model had been developed based on inputs from the former TCC flood model. However, as the updated 2021 TCC Ross River Flood Study model became available, the model was updated with flows extracted and incorporated into the fine scale model. It was observed that the new critical duration resulted in flood levels that were higher than the former modelling and TCC mapping.

NCE have also carried out an assessment of the master planned development to ensure that the future residential subdivision was not compromised. This additional assessment demonstrated that the future subdivision can also be carried out without causing actionable nuisance off site. The flood levels shown on Drawing PARK0014/A02 in Appendix i are based on the ultimate master planned site development flood levels which are the highest levels that apply to the site. There are some areas where the interim flood levels following the development of the retirement village and RACF only are lower than these listed levels. However, the master planned flood levels are provided to ensure that the interim development is located at the appropriate ultimate finished levels.

Any future flood studies relating to the residential subdivision should be considered with respect to the holistic development and the attached flood impact assessment, document reference PARK0014-FIA.

The events assessed as part of the development include a combination of major and minor events as well as relevant critical durations that have been identified and are dominant across the site as follows:

- 0.5% AEP (2hr)
- Defined flood event (DFE), 1% AEP short duration (2hr) – Typically dominant on the majority of the site.
- Defined flood event (DFE), 1% AEP long duration (9hr) – Typically dominant in the downstream portion of the site and downstream from the site.
- Minor event 50% AEP short duration (3hr) – Typically dominant on the majority of the site.
- Minor event 50% AEP long duration (6hr) – Typically dominant in the downstream portion of the site and downstream from the site.
- Results are based on the maximum of the highest flood levels for each of the above events.

Further detailed information on the flood modelling, including discussion of non-worsening and mapping of all these events is provided in the flood impact assessment (FIA) report.

The development will generally be carried out based on the following.

- All finished floor levels (FFL) of habitable areas associated with the retirement village and RACF are to be at or above the 0.5% AEP flood level, as defined by the flood hazard overlay code at the time that the report was drafted.
- All finished pad levels in the vicinity of the building areas are to be at or above the 1% AEP DFE as defined by the flood hazard planning scheme policy at the time that the report was drafted.
- Minor stormwater system designed to the 50% AEP as per TCC planning scheme requirements for residential areas.
- Council proposed roads are designed in accordance with current design standards including 50% AEP storm event for the underground stormwater system with balance flows conveyed overland within the roadway. Additionally, new road extensions are to be designed to remain trafficable during the DFE.
- Hazards in areas of inundation to be maintained within acceptable limits. Hazards are assessed against the flood hazard classification from the Australian Disaster Resilience Handbook (and ARR Book 6 Figure 6.7.9), which shows that classifications H1 and H2 are safe for the elderly.
- The detailed design of the final uses is anticipated to include a combination of underground and overland stormwater network.
- Whilst the bulk of the proposed development is above the 0.5% AEP / 1% AEP events as described above, shallow flooding may be experienced across the development site such as in roads, carparks and pedestrian access areas and account for suitable safe hazard limits in accordance with the ARR / TCC guidelines.
- Any critical infrastructure and hazardous storages areas can be located at suitable freeboard above a nominated rare event in accordance with SC6.7 flood hazard planning scheme policy. Details of this will be confirmed at the detailed design stage.

Refer to **Figure 2-2** for the depth and flood extent during a 1% AEP event for the current proposal (retirement village and RACF).

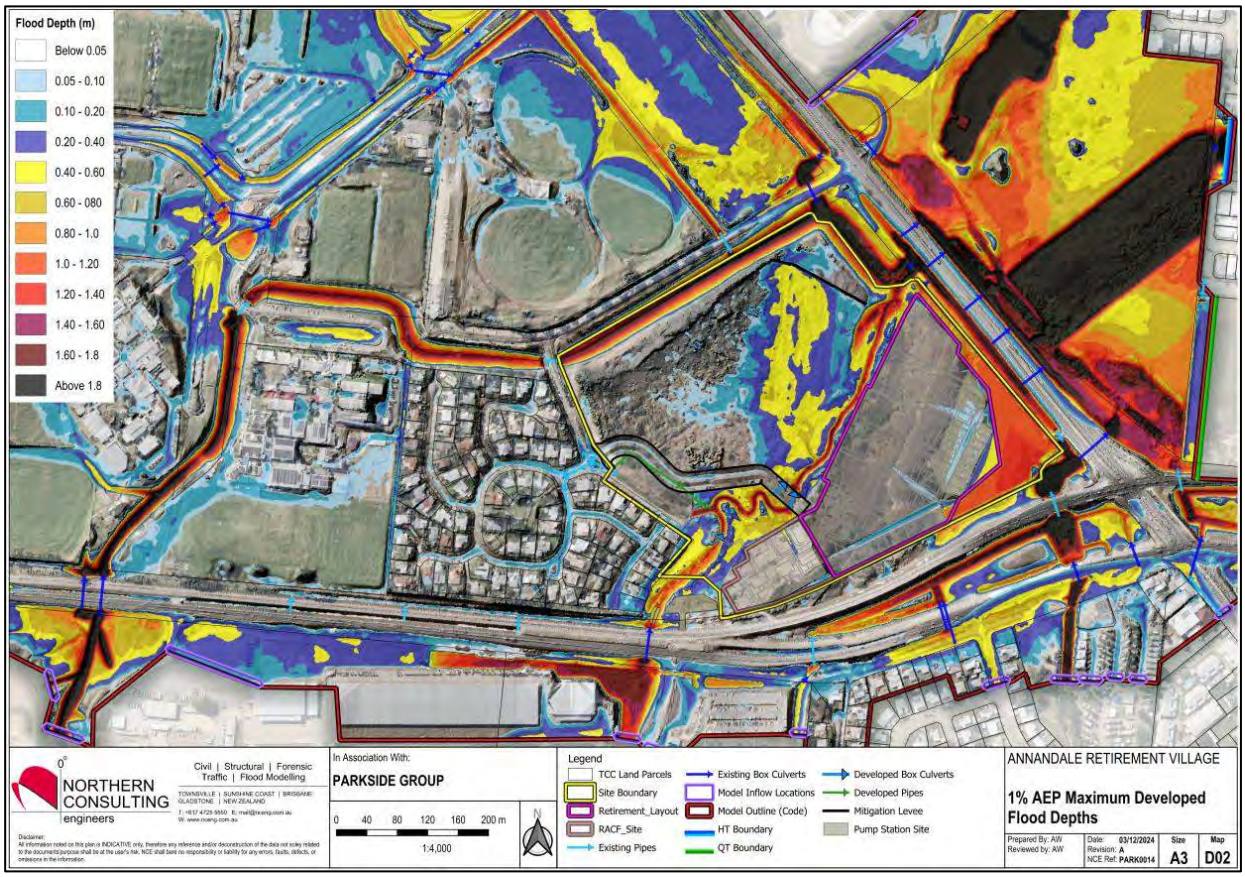

Figure 2-2 1% AEP Maximum Flood Depths

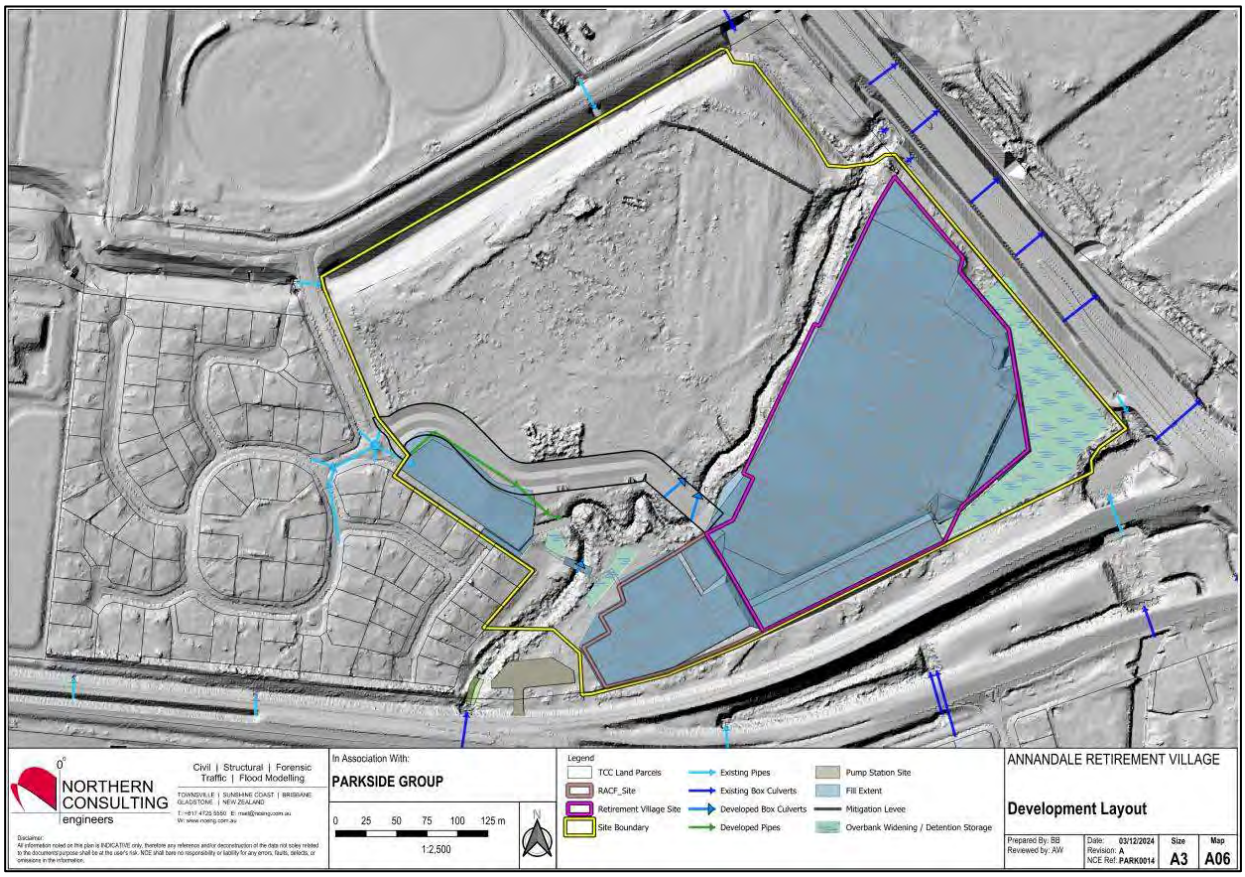

Figure 2-3 Proposed development configuration

The map A06 depicted in **Figure 2-3** should be read in conjunction with the rest of **Appendix iii** contained in the FIA for descriptions and naming conventions of the mitigation measures. Based on Concept 1 and as shown in **Figure 2-3**, a summary of the final outcome to demonstrate non-worsening for all the events and durations analysed included the following:

#	Location	Details	Purpose / Background
1	Existing floodplain region at the East / South-east corner of site	Overbank widening / Detention storage in the South-east corner. Involves varied cut levels that ensure positive drainage to all areas (except where nominated for stormwater quality devices).	Offsets floodplain encroachment and flow restriction by improving mid to high level overbank flow conveyance from the south-east towards the north-east. Reinstitutes the pre-developed flood regime and floodplain storage.
2	Upstream of the culvert crossing either side of the drainage feature	Shallow overbank widening either side of the drainage feature upstream of the culvert crossing.	Provides improved major flow conveyance and offset floodplain encroachment and flow constriction.
3	Road crossing of drainage feature	2 banks of culverts 4 x 1.5 x 1.5m RCBC withing creek invert & 6 x 1.2 x 0.9m RCBC elevated 750mm above on high bank	Sized to moderate and optimize flows as well as control upstream afflux in various events
4	Northern section of the site balance area	Levee with narrow free flowing outlet. Levee top level 4.8m AHD. Channel opening in levee located in natural low point with 2m wide base and 1:5 batters.	Detains the overbank flood plain flows which are conveyed northwards across the balance area to provide a non-actionable outcome off site.

Hazards in areas of inundation to be maintained within acceptable limits. Hazards are assessed against the flood hazard classification from the Australian Disaster Resilience Handbook (and ARR Book 6 Figure 6.7.9), which shows that classifications H1 and H2 are safe for the elderly.

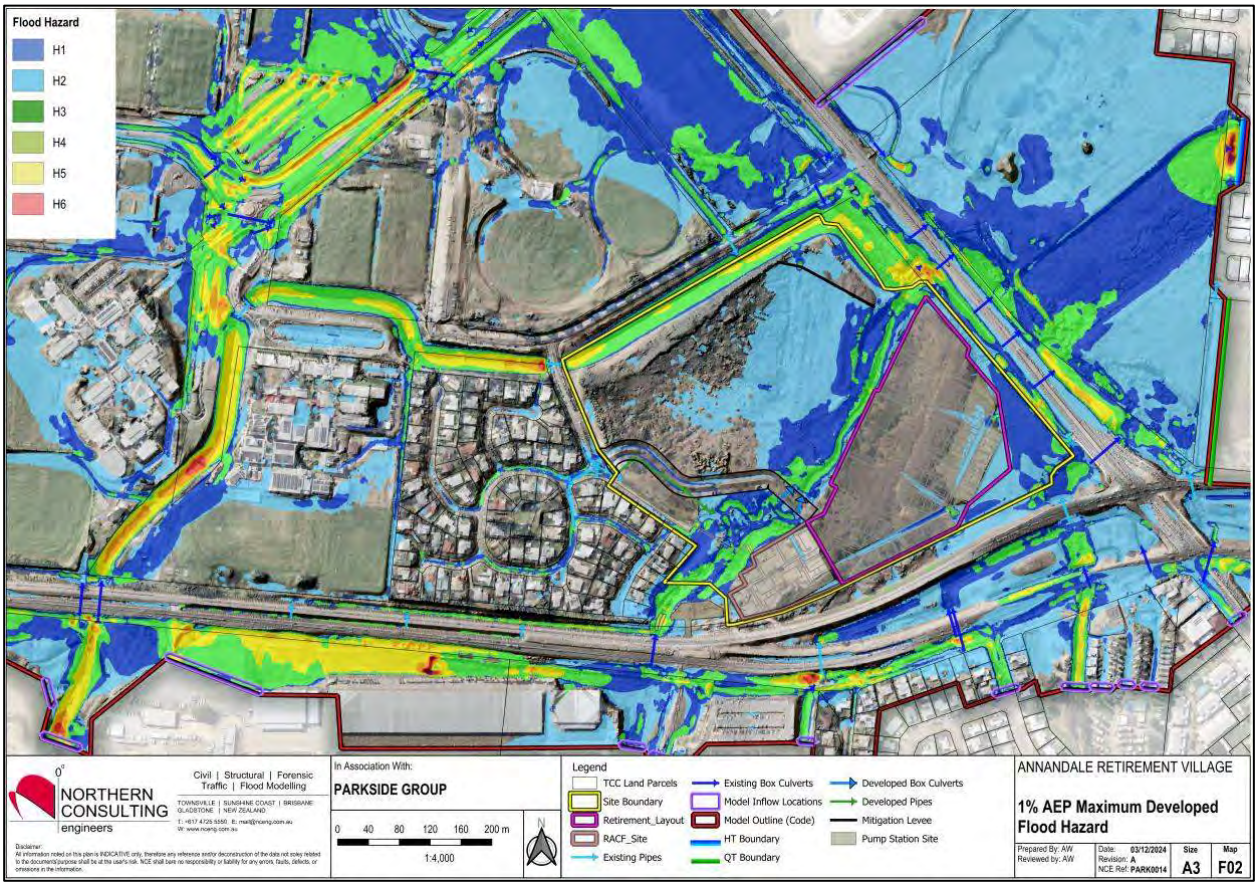

Figure 2-4 Hazard Assessment – 1% AEP Maximum flood hazard

The attached flood impact assessment report demonstrates that the proposed development can comply with the Townsville City Council's flood hazard overlay and flood hazard planning scheme policy. The development is not expected to increase the risk to life, property, community, economic activity or increase the potential for flood damage on-site or to adjacent and downstream properties.

3.0 STORMWATER DRAINAGE

The existing site is bounded by Stuart Drive to the north-east, Racecourse Road (Bruce Highway) to the south, Shannahan Drive to the west and Gartrell Drive to the north. The drainage across and with the vicinity of the site is dominated by the following features:

- A natural drainage corridor that traverses the site from the south to the north-east.
- A constructed drainage channel north-west of the site adjacent to Gartrell Dr and at the north at Stuart Drive.
- A major flow corridor from the south-east that conveys flood water to the north.
- All the above features convey stormwater to the table drain on Stuart Drive or directly to the Stuart Drive culverts.

At the time this report was being prepared, the Stuart Drive upgrade project was under construction with some of the new upgraded culverts having been constructed.

The retirement village site is proposed to grade from the west / north west towards the south-east into the drainage corridor at the east.

The RACF site is designed to grade from the southern boundary towards the north into the internal drainage corridor.

This opposing grades above generally replicates the existing flow regime across the site and with the development filled in a manner that reduces the volume of fill and aligns with the design layout. The concept fill arrangement is depicted in the NCE drawings in **Appendix i**.

3.1 Quantity

The FIA as discussed above in **Section 2.0** was carried out utilising the proposed land use, roughness and increased imperviousness. Therefore, the storage and mitigation measures identified in the FIA have incorporated the increased runoff from the site. The pre-developed and development scenario impervious percentages are as defined within the FIA. The existing development area is completely pervious. The existing site as per the aerial imagery is shown in **Figure 3-1** below.

Figure 3-1 Existing development aerial imagery

The post-developed case has been modelled in accordance with the stormwater quantity planning scheme policy, with 70% lumped fraction impervious for medium density residential development. Refer to **Figure 1-1** for the proposed development layout.

3.2 Stormwater Modelling

As indicated above, the increase in stormwater runoff has been assessed by utilising the developed flood model. The model utilises rain-on-grid (ROG) hydrology and 2016 LiDAR to ensure the increase in run-off due to increased impervious area is accurately modelled, inclusive of any upstream contributing catchments. NCE have conducted an assessment of the 1% Annual Exceedance Probability (AEP) and 50% AEP events. Also considered are the water surface level afflux as outlined in the FIA.

Mitigation of stormwater flows has been achieved by utilising the flood mitigation measures as outlined in **Section 2.0** and in detail within the FIA. The combination of overbank widening, detention, culverts and levees, all attribute to the reduction in peak flows generated downstream of the development. The above results in conjunction with the FIA afflux maps show that the peak post-development flood levels can be mitigated to peak pre-development levels, therefore having a non-worsening outcome and demonstrating compliance with the TCC planning scheme. A comparison of the outflow hydrographs for the 1% AEP event at various locations are shown in **Figure 3-4** to **Figure 3-6**.

The afflux maps in the FIA show non-actionable results but the 1% AEP Maximum WSL Afflux map B01 is provided in **Figure 3-2** below.

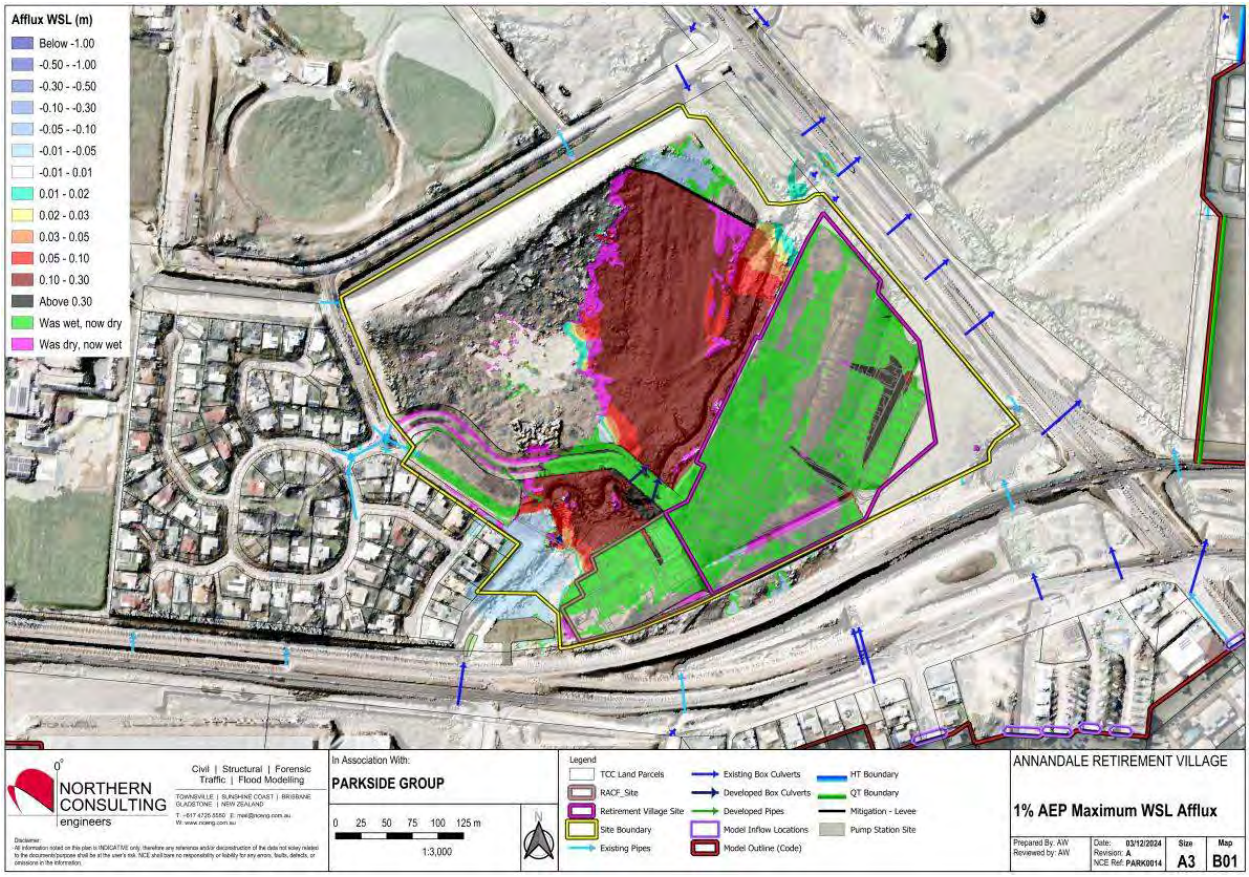

Figure 3-2 FIA 1% AEP Maximum WSL Afflux Map B01

The runoff over time has been captured by the TUFLOW modelling in the Stuart Drive table drain downstream of the development as well as downstream of Stuart Dr for a comparison of pre- vs post-development scenarios.

The recording locations for the results in the 1% AEP is shown in **Figure 3-3** below.

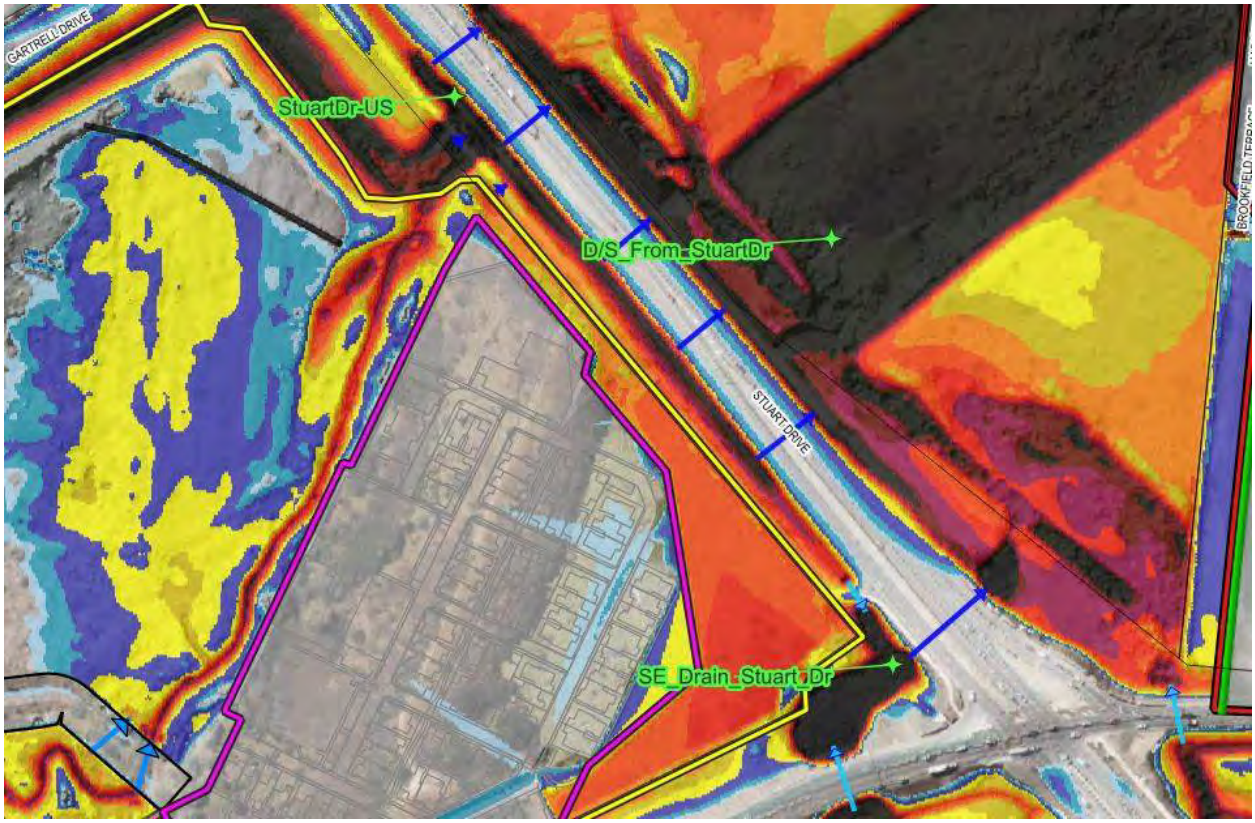

Figure 3-3 TUFLOW time-series reporting location

These recording locations have been used to consider the time of submergence at Stuart Drive. These hydrographs demonstrate that there is no distinguishable difference between the pre- and post-development scenarios and the carriageways are not impacted during the major event.

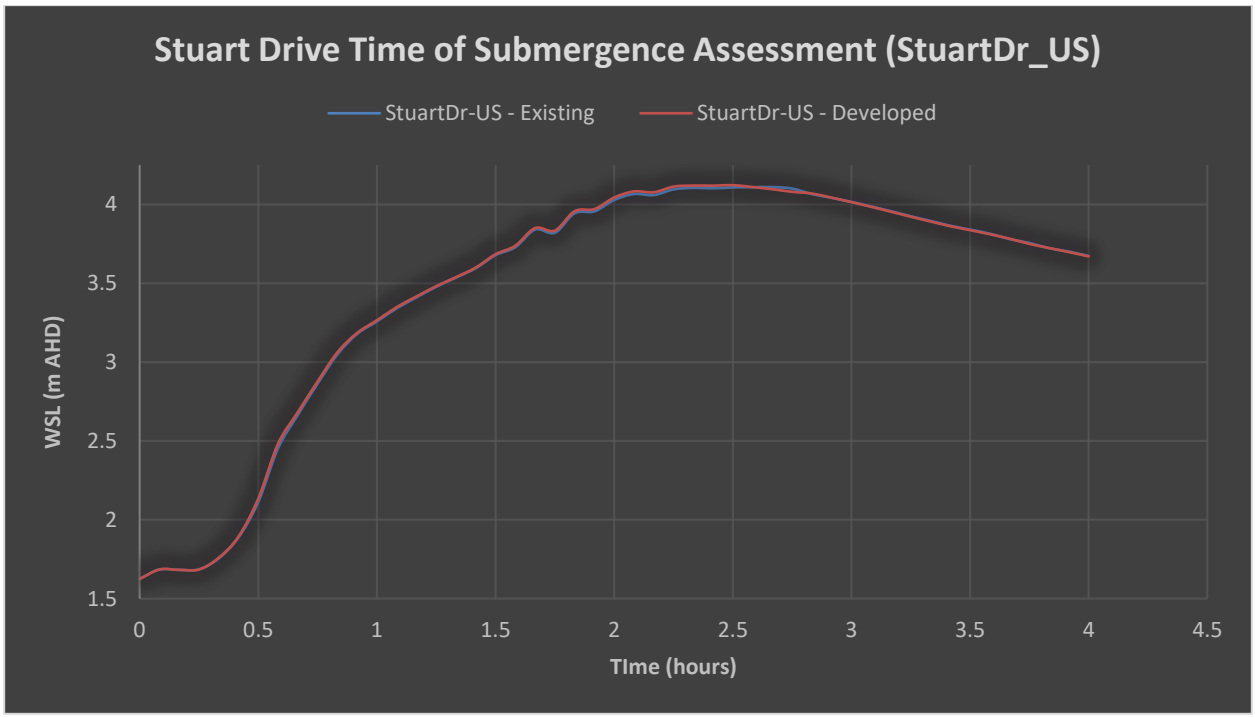

Figure 3-4 1% AEP WSL Hydrograph – Stuart Dr North-East

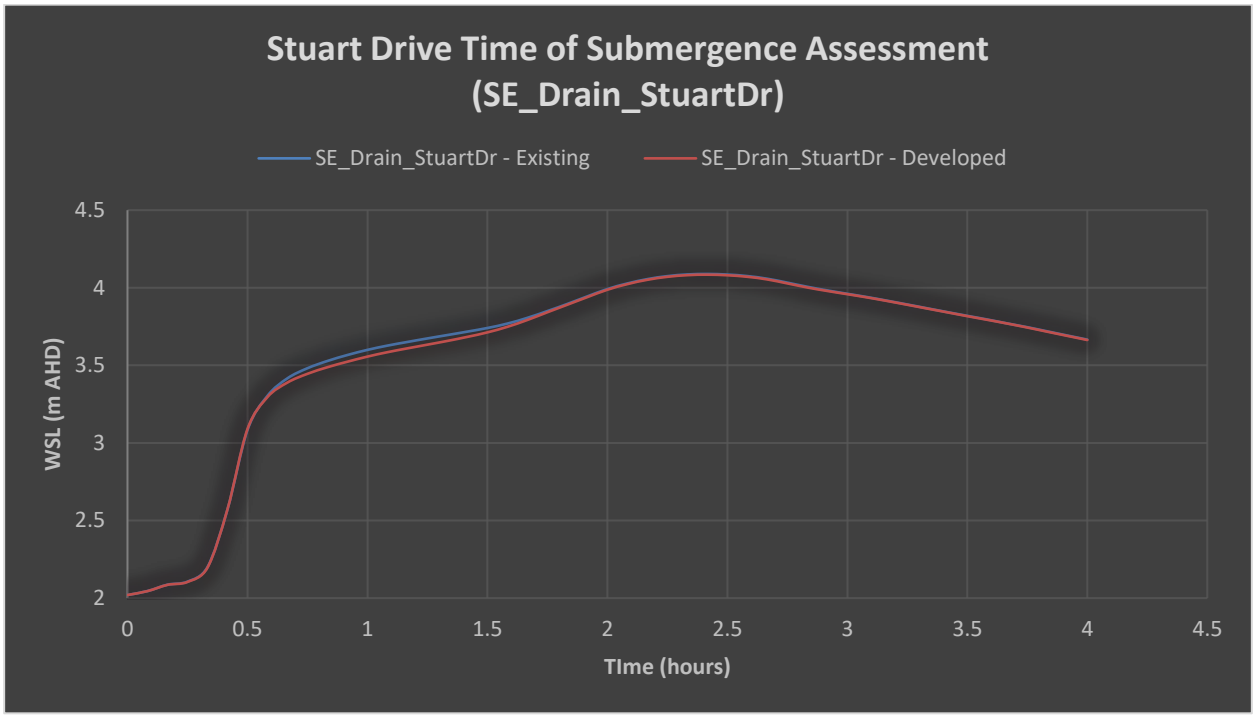

Figure 3-5 1% AEP WSL Hydrograph – Stuart Dr South-East

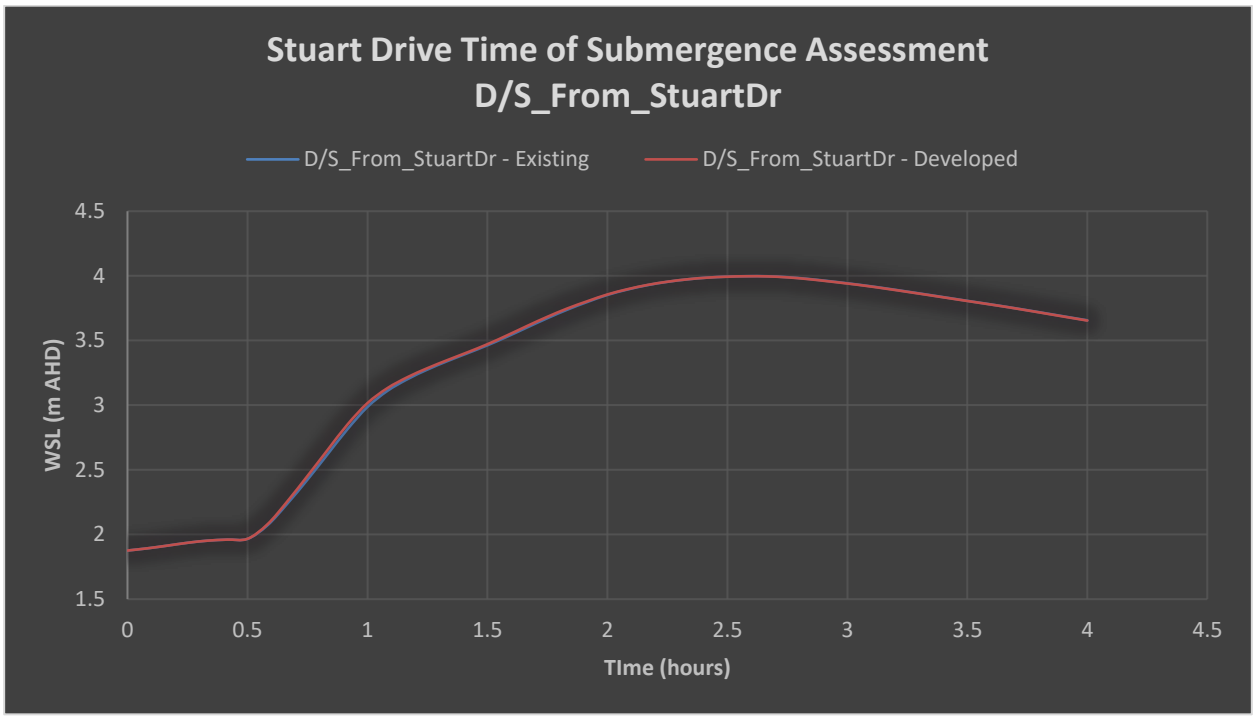

Figure 3-6 1% AEP WSL Hydrograph – D/S From Stuart Dr

3.3 Quality

The quality assessment incorporating a stormwater treatment train has been modelled with the aid of MUSIC version 6.3.0 and utilises buffers, swales, detention basins and Stormwater Quality Improvement Devices (SQIDs) to treat runoff. The catchments have been modelled in accordance with the following:

- "MUSIC Modelling Guidelines November 2018 – Consultation Draft", Water by Design (2018);
- Townsville Aero, 6-minute time step from 3/03/1953 to 31/03/2010;

- Water by Design MUSIC Modelling Guidelines Source Nodes (Lumped) utilising modified percent impervious area & pollutant concentration;
- No drainage routing between nodes;
- Water by Design MUSIC Modelling Guidelines recommended MUSIC rainfall-run-off parameters SEQ for commercial land uses.

3.3.1 Stormwater Quality Objectives

The design intent for the system is to meet the current TCC Planning Scheme water quality targets, namely:

- 80% Total Suspended Solids Reduction
- 65% Total Phosphorous Reduction
- 40% Total Nitrogen Reduction
- 90% Gross Pollutants Reduction

In the event that the above targets are not achievable, the design intent is to ensure that the post development water quality discharging the site is equal to or better than the pre-development quality. Treatment targets shall be reached before water discharges from the lot.

3.3.2 MUSIC Modelling

Pollutant loads for the development have been modelled primarily using “lumped” land use and references the MUSIC Modelling Guidelines November 2018 for the pollutant parameters for commercial catchments. Future development areas along with vegetated drains and basins have been excluded from the catchments in MUSIC.

It is expected the runoff from the site will generally runoff into a pit and pipe network before being discharged into adjacent overland into the treatment areas as shown on the below plans. Runoff for broad regions of the catchment will undergo pre-treatment via landscaping and grassed areas acting as buffers. All development runoff into pits will undergo pre-treatment via pit insert gross pollutant traps (GPTs). Runoff will then be piped to the primary treatment areas. The primary treatment areas include a bioretention basin and two wetlands. NCE note that alternative treatment options including proprietary products that comply with the reduction targets may be utilised.

The inclusion of the RACF results in the system requiring more substantial treatment which includes the addition of wetlands to provide the treatment area. In the event that the RACF is omitted from the layout (as noted in the most recent architectural plans), the wetlands can be omitted. In the absence of the RACF, the majority of the catchments within the retirement village are required to discharge to the bioretention basin which then discharges through a wide open swale.

If required, the wetlands are proposed to be designed as relatively shallow ephemeral wetlands with appropriate species targeted.

It is noted that the detention areas have not been considered a they are typically effective at higher flood levels rather than for the low flows and first flushes.

Table 3-1 below outlines the source node parameters input into MUSIC with the buffer parameters. **Table 3-2** details the SQIDs utilised for the assessed treatment train. The MUSIC model is shown in **Figure 3-8**.

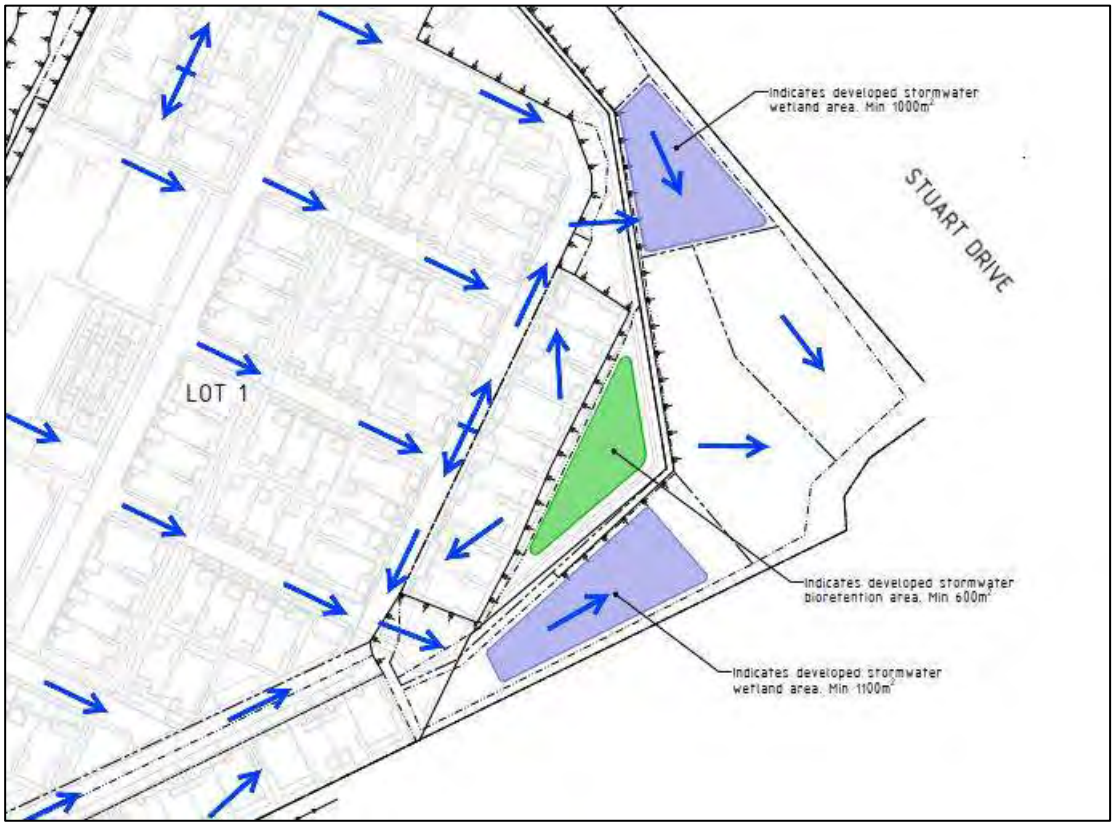

Figure 3-7 Stormwater runoff and treatment areas

Table 3-1 MUSIC source nodes

Node Name	Zoning / Surface Type	Surface Area (ha)	Impervious (%)	Percentage of Upstream Area Treated	Buffer Area (%)
Pre-development					
Pre Dev Catch	Revegetated Land	4.48	0	-	-
Post-development					
Northern Apartments - 0.14ha	Medium Density	0.14	90	100	50
North Units - 0.85ha	Medium Density	0.85	70	40	5
Independent Living - 1.68ha	Medium Density	1.68	70	25	5
Community Fac & Independent Living - 2.15ha	Medium Density	2.15	70	25	5
RACF - 1ha	Medium Density	1	70	40	5
Entrance Road	Road	0.61	50	-	-
Entrance Road Flush Kerb	Road	0.14	50	20	5

Table 3-2 Stormwater quality improvement devices

Stormwater Treatment Devices			
Bioretention Node Name	**Extended Detention Depth**	**Surface Area (m^2)**	**Filter Depth (m)**
Bioretention B1	0.2	680	0.4

Wetland Node Name	**Extended Detention Depth**	**Permanent Pool Volume (m³)**	**-**
Wetland WL1	0.3	1,100	-
Wetland WL2	0.3	1,000	-

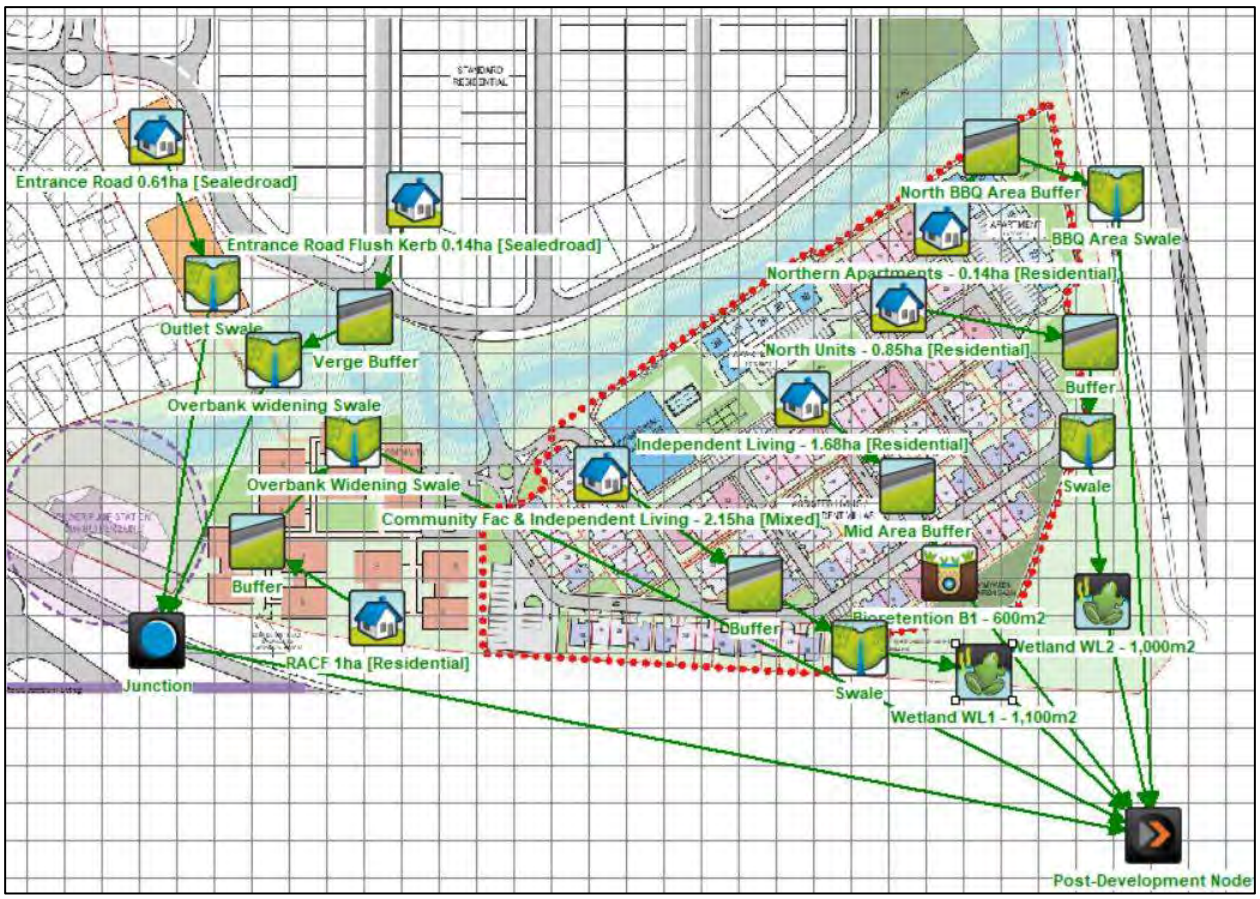

Figure 3-8 MUSIC model set-up

Table 3-3 summarises the results of the assessment. It is evident that the water quality leaving the site post development meets the quality objectives set by TCC.

Table 3-3 MUSIC treatment train effectiveness

Description	Sources	Residual Load	% Reduction	Targets
Flow (ML/yr)	51.1	42.8	16.2	
Total Suspended Solids (kg/yr)	1.01E+04	1.46E+03	85.6	80
Total Phosphorus (kg/yr)	18.2	6.34	65.1	65
Total Nitrogen (kg/yr)	123	69.1	43.7	40
Gross Pollutants (kg/yr)	1.02E+03	0	100	90

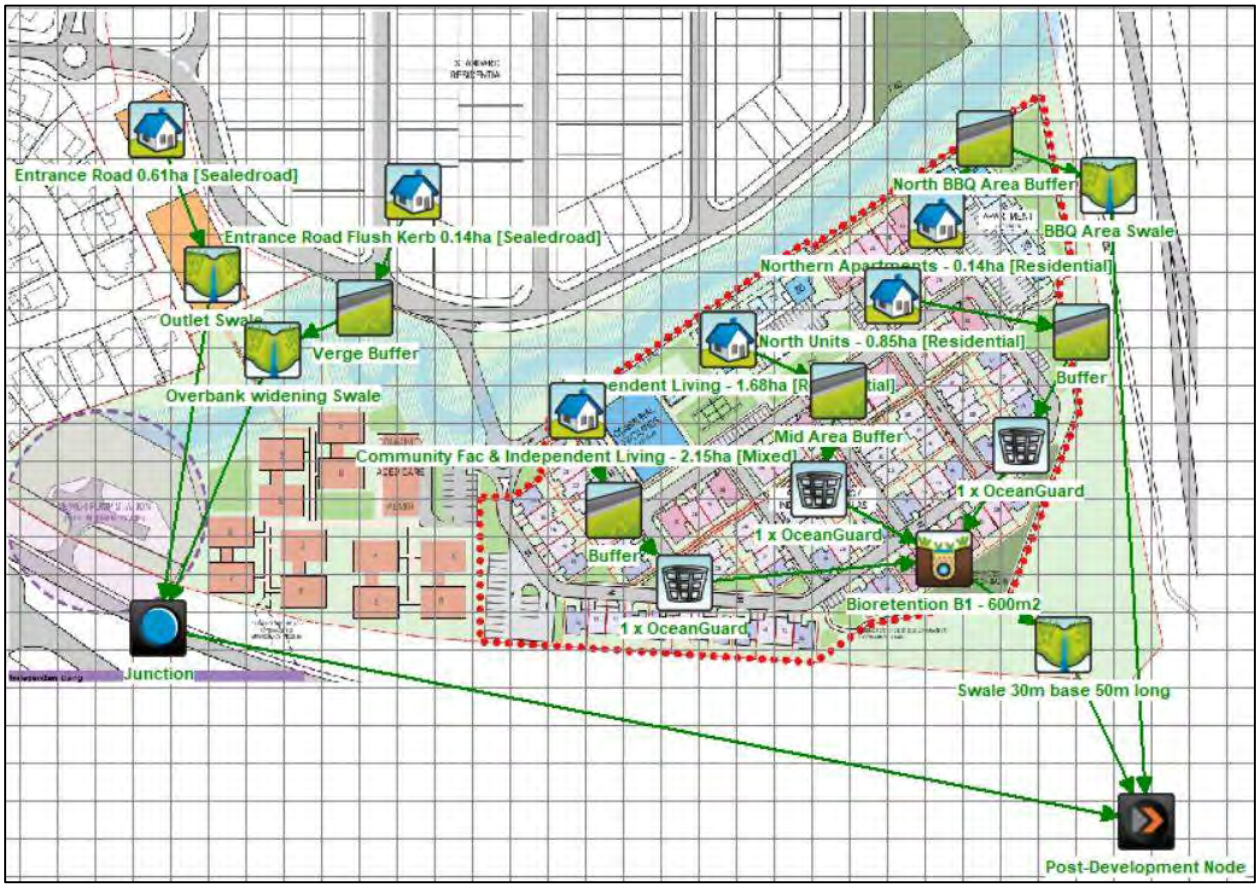

Figure 3-9 MUSIC model set-up excluding RACF

Table 3-4 MUSIC treatment train effectiveness excluding RACF

Description	Sources	Residual Load	% Reduction	Targets
Flow (ML/yr)	43.4	36.7	15.5	
Total Suspended Solids (kg/yr)	8.82E+03	1.17E+03	86.7	80
Total Phosphorus (kg/yr)	15.9	5.81	63.4	65
Total Nitrogen (kg/yr)	106	60	43.4	40
Gross Pollutants (kg/yr)	8.63E+02	0	100	90

The majority of nutrient targets are exceeded except of TP but is still considered to be a suitable outcome. Alternative treatment options that achieve the nominated targets may be adopted at the detailed design stage.

4.0 WATER NETWORK

NCE engaged a specialist water engineer (DPM Water), who is familiar with the water supply in the area to provide advice in relation to potable water supply and fire flow for the proposed development. Refer to the Water Supply and Sewerage Planning Report for details of the assessment in **APPENDIX v**.

The summary outcomes of this report is provided below.

The above theoretical water network modelling shows that the proposed initial and full development of the Parkside Annandale development is able to be serviced with a potable water supply that meets Council's standards.

In order to service the proposed development with reticulated water supply, the following water infrastructure will be required:

- *A connection to the end of the existing DN150 PVC water main at the northern end of Patterson St. This main will be extended to the east into the development site to the proposed internal development road.*

- *A connection to the existing DN100 PVC water main on Shannahan Drv at the intersection with Downey Cres. This is where the proposed new development road to the independent living and residential aged care sites will run from. An initial DN100 water main will be extended along this development road to service the independent living and aged care sites. This DN100 main will connect to the above DN150 water main extension off Patterson St.*

- *A DN150 main will then continue to the east and south along the new internal development road to service the independent living and aged care sites.*

- *There will be internal development water mains within the independent living development area. These mains have been sized to ensure sufficient water flows and pressures are provided to the residential lots and community centre.*

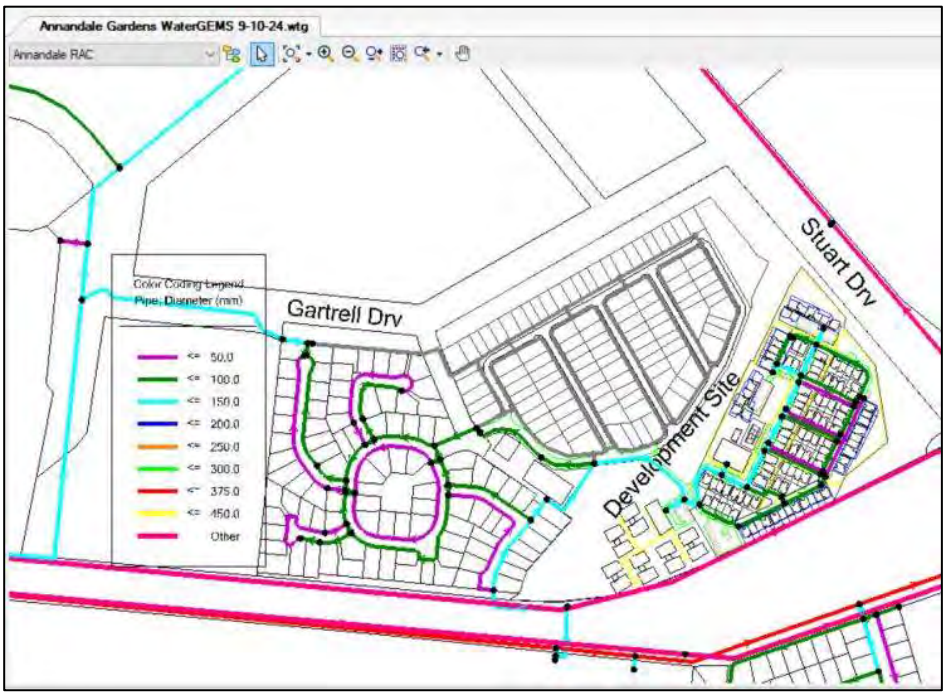

Figure 4-1 (DPM Water) Water Modelling Figure

5.0 SEWERAGE PLANNING

NCE engaged a specialist sewerage engineer (DPM Water) to provide advice in relation to the sewer infrastructure for the proposed development. Refer to the Water Supply and Sewerage Planning Report for details of the assessment.

The summary outcomes of this report is provided below.

The above assessment illustrates the existing gravity sewer system and PS SC7 has sufficient capacity to cater for the 5xADWF flows from the proposed full development of the Parkside Annandale development area and its existing catchment.

In order to service the proposed development with reticulated water supply, the following water infrastructure will be required:

- A DN225 gravity sewer is proposed/required to extend from existing MH 1/SC7A to the north east to service most of the proposed development area. The DN225 sewer will service the residential aged care site, the independent living sites along with the majority of the future proposed residential development area.

- The proposed DN225 sewer will then split into a couple of DN150 gravity sewers to service the various portions of the development area.

Refer to the Water Supply and Sewerage Planning Report in **APPENDIX v** for details of the assessment including the various ultimate development options.

6.0 TRAFFIC ASSESSMENT

NCE carried out a separate traffic impact assessment to provide advice in relation to the traffic engineering in order to address the potential impacts due to the development. Refer to the attached Traffic Assessment in **APPENDIX iv**.

The outcome of the traffic assessment is summarised as follows:

- Intersection impact assessment and mitigation
    - SIDRA analysis found the existing intersection of Gartrell Drive and Shanahan Drive is expected to operate at acceptable levels of service inclusive of the proposed development generated traffic through to the design year 2036, based upon the TAIM background traffic volume predictions.
    - Whilst the TMR intersection warrant assessment indicated the inclusion of an AUL(s) may be required, further assessment through the analysis of the intersection with SIDRA modelling has indicated the intersection will perform adequately as it currently stands.
    - NCE confirm that the upgrades to the Gartrell Drive / Stuart Drive intersection currently being performed by TMR will be suitable for proposed development of the overall site at 33 University Road, Annandale, on a land parcel described as Lot 1 on SP327484. NCE concur with TCC and TMR that the traffic predictions within TAIM are suitable for the upgrade purposes and represent projected development traffic over the next 10 years adequately.

The site is proposed to be accessed via a new internal road extension of Lakeside Drive through to Stuart Drive at Edison St. The road category proposed for this new section of road is a TCC major collector (Townsville City Council Drawing SD-002).

6.1 Site Access and Road Profiles

The site is proposed to be accessed via a new road extension from the existing roundabout at the intersection of Shannahan Dr and Downey Cr. This road extension from the existing roundabout up to the crossing of the drainage feature which will also service the future residential development will be a minor collector road in accordance with TCC standard drawings.

The roadway required from the culvert crossing of the drainage feature is an Access Street. A roundabout is proposed on the eastern side of the drainage crossing to access the 2 allotments proposed for the retirement village and the separate RACF.

Refer to Drawing PARK0014/A05 in Appendix i which shows the typical cross sections proposed to service the site.

7.0 ELECTRICAL AND COMMUNICATIONS

The client engaged a specialist electrical consultant to carry out a separate electrical assessment.

8.0 CONCLUSION

NCE have undertaken an engineering investigation associated with the development of the Annandale Retirement Village. The findings of this assessment are summarised below:

- An extensive flood impact assessment (FIA) has been carried out using a fine scale mini TUFLOW model based on inputs and boundary conditions derived from Townsville City Council's new Ross River Flood Study. The FIA had been carried out based on the former TCC flood model boundary conditions which was later updated based on the new TCC Ross River flood model inputs. The outcome of the assessment involved significant overbank widening / detention storage in the south-east, overbank widening upstream of the culvert crossing and use of the culverts to restrict and moderate the flows downstream. The outcome of the FIA included reducing the development extent (in conjunction with the above mitigation measures). The FIA which included consideration of the climate change scenario, has demonstrated that the proposed development proposal complies with the flood hazard overlay code. In accordance with the Flood hazard overlay code, the retirement village has been assessed and will be located above the 0.5% AEP flood event. Refer to the attached NCE FIA report, document reference PARK0014-FIA.

  The master plan development site includes a future residential development on the north / north-west side of the drainage feature. This has been included as part of the FIA to ensure the future residential development does not result in afflux off site once that development proceeds. It is noted that the masterplan site inclusive of the future development does not result in afflux off site for the events considered.

- Stormwater is to be conveyed through the site through 2 primary culverts at the crossing of the drainage. Local run-off within the site will be conveyed to legal points of discharge via an underground pit and pipe network, with surcharge flows conveyed overland in the roadways and open corridors. Stormwater quantity and mitigation of post-development flows is addressed utilising the overbank widening and detention storage as well as using the major culverts.

- Stormwater quality is demonstrated to be mitigate through a treatment train and utilising best practice stormwater quality improvement devices. The primary stormwater quality measures utilised is a bioretention device and associated devices depending on the extent of development proceeded with. The treatment devices are proposed to be designed in accordance with the Stormwater quality

section of the development manual planning scheme policy. The pollutant reduction targets adopted are listed below:

- 80% Total Suspended Solids Reduction
- 65% Total Phosphorous Reduction
- 40% Total Nitrogen Reduction
- 90% Gross Pollutants Reduction

- The Water Supply and Sewerage Planning Report prepared by DPM details the water supply assessment. This report demonstrates that the existing water infrastructure surrounding the site has capacity to service the development for peak demands and fire flows. In order to supply the site, the following extension to the water infrastructure is required:

  - A connection to the end of the existing DN150 PVC water main at the northern end of Patterson St. This main will be extended to the east into the development site to the proposed internal development road.

  - A connection to the existing DN100 PVC water main on Shanahan Drv at the intersection with Downey Cres. An initial DN100 water main will be extended along this development road to service the independent living and aged care sites. This DN100 main will connect to the above DN150 water main extension off Patterson St

  - A DN150 main will then continue to the east and south along the new internal development road to service the independent living and aged care sites.

- The DPM Water sewerage planning assessment has demonstrated that the existing system and existing pump station PS SC7 can cater for the proposed development. To service the site and future development, the following infrastructure is proposed:

  - DN225 gravity sewer connected to existing manhole 1/SC7A at the south-west of the site.

  - From the DN225 main, DN150 gravity sewers that will service the site.

- The site is proposed to be accessed via a new road extension from the existing roundabout at the intersection of Shannahan Dr and Downey Cr. This road which will also service the future residential development will be a minor collector road in accordance with TCC standard drawings. The roadway required from the culvert crossing of the drainage feature is an Access Street. A roundabout is proposed on the eastern side of the drainage crossing to access the 2 allotments.

- A traffic impact assessment has been carried out by NCE with the following outcome. A SIDRA analysis found the existing intersection of Gartrell Drive and Shanahan Drive is expected to operate at acceptable levels of service inclusive of the proposed development generated traffic through to the design year 2036, based upon the TAIM background traffic volume predictions.

- The electrical supply is being assessed under separate cover.

APPENDIX i

Northern Consulting Engineers Concept Drawings

LEGEND

- Existing RP boundary.
- Existing sewer main.
- Existing sewer manhole.
- Existing sewer pressure main.
- Obsolete existing sewer main.
- Existing stormwater drain line.
- Existing water main.
- Obsolete existing water main.
- Proposed property boundary.
- Proposed property boundary.
- Proposed stormwater drain line.
- Proposed gravity sewer system.
- Proposed water supply system.
- Top of batter.
- Toe of batter.
- Change of grade.

LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

N

Scale 1:1500 @ A1
0 15 30 45 60m

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ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

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W: www.nceng.com.au

Drawn DC
Date 20/11/2024
Checked
Approved

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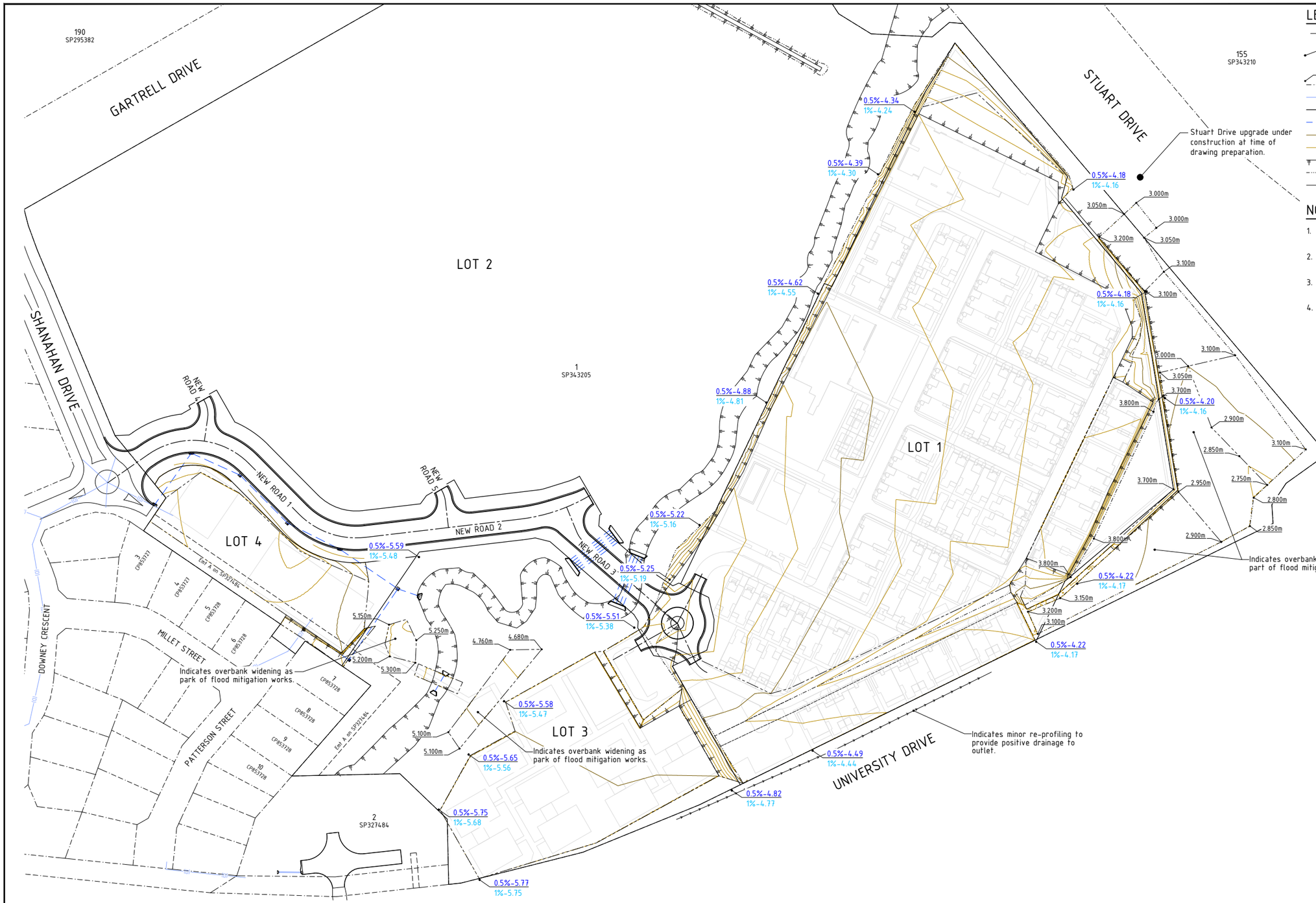
PARKSIDE GROUP

AGED CARE FACILITY
33 UNIVERSITY ROAD
ANNANDALE
(Lot 1 on SP343205)

CONCEPT LAYOUT PLAN
OVERALL

Drawing Number PARK0014/A01
Issue P2



LEGEND

- Flow arrow.
- 0.5%-5.00 / 1%-5.00 – Stormwater flood levels.
- 4.640m – Stormwater mitigation finished level.
- Existing RP boundary.
- Existing stormwater drain line.
- Proposed property boundary.
- Proposed stormwater drain line.
- Indicative bulk earthworks major contour.
- Indicative bulk earthworks minor contour.
- Top of batter.
- Toe of batter.
- Change of grade.

NOTES:

1. 0.5%-5.00 – Indicates 0.5% AEP flood levels (Based on master planned fully developed layout).
2. 1%-5.00 – Indicates 1.0% AEP flood levels (Based on master planned fully developed layout).
3. Earthworks pad levels to be designed to the 1% AEP flood level.
4. FFL of any buildings associated with retirement village or RACF to be designed to the 0.5% AEP flood level.

LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

N

Scale 1:1000 @ A1
0 10 20 30 40m

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P3	PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR CLIENT REVIEW AND APPROVAL.	05/11/2024
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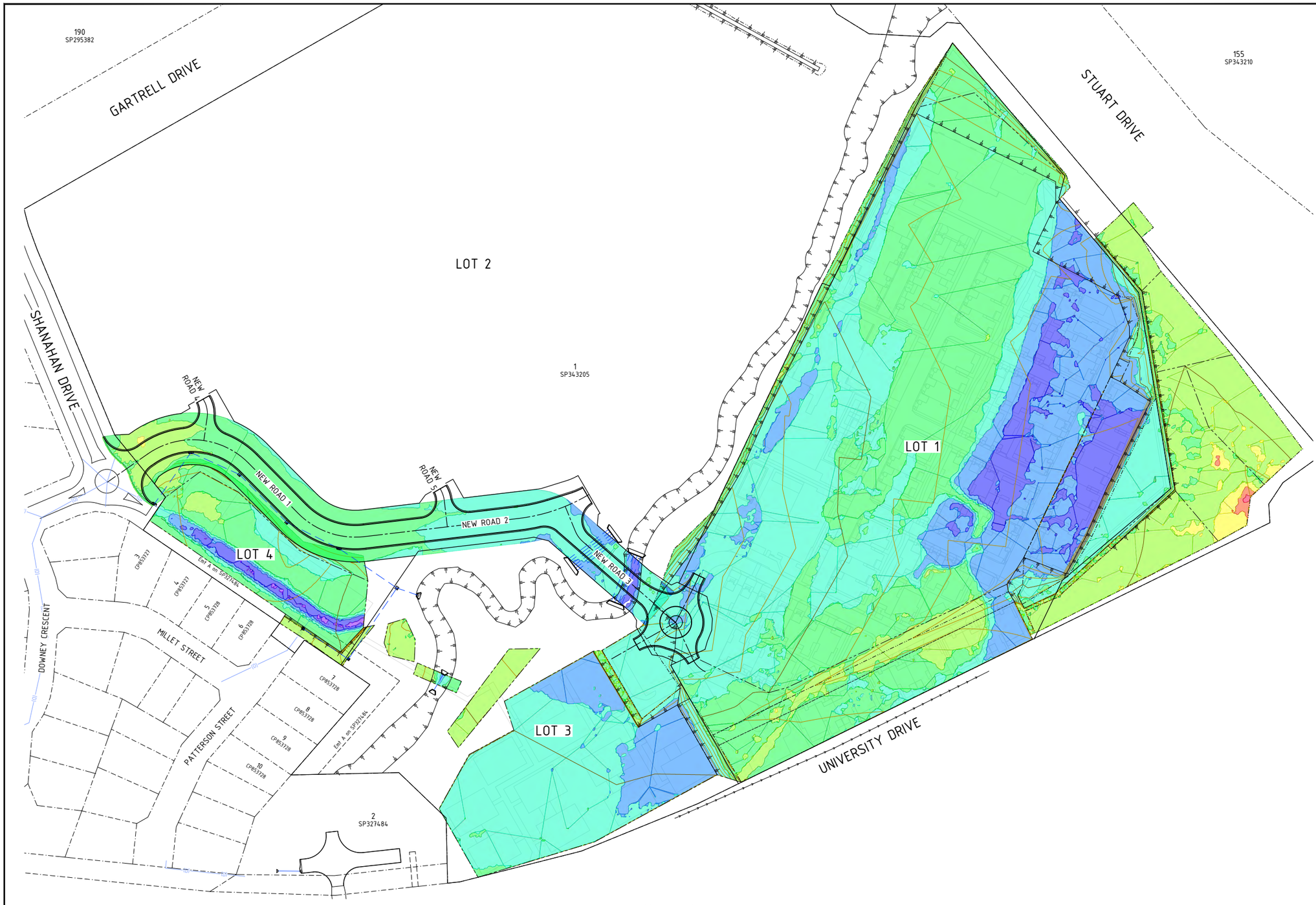
CONCEPT LAYOUT PLAN
EARTHWORKS PLATFORMS

Drawing Number: PARK0014/A02
Issue: P3



LEGEND

- Flow arrow.
- 4.640 – Finished surface levels.
- IL 4.640 – Stormwater drain invert level.
- Existing RP boundary.
- Existing stormwater drain line.
- Proposed property boundary.
- Proposed stormwater drain line.
- 4.0 – Bulk earthworks major contour.
- 4.5 – Bulk earthworks minor contour.
- Top of batter.
- Toe of batter.
- Change of grade.

CUT/FILL DEPTHS
-2.0 to -1.5 m
-1.5 to -1.0 m
-1.0 to -0.5 m
-0.5 to 0.0 m
0.0 to 0.5 m
0.5 to 1.0 m
1.0 to 1.5 m
1.5 to 2.0 m
2.0 to 2.5 m

LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

N

Scale 1:1000 @ A1
0 10 20 30 40m

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CONCEPT LAYOUT PLAN
CUT-FILL

Drawing Number: PARK0014/A03
Issue: P2

LEGEND

- Existing RP boundary.
- Existing stormwater drain line.
- Proposed property boundary.
- Proposed stormwater drain line.
- Top of batter.
- Toe of batter.
- Change of grade.

LAYOUT PLAN

ROAD CLASSIFICATION LEGEND

	- Access Street	- 22.0m road reserve	- 8.8m Asphalt Surfacing
	- Minor Collector Street Modified	- 24.0m road reserve	- 11.8m Asphalt Surfacing
	- Minor Collector Street	- 26.0m road reserve	- 11.8m Asphalt Surfacing

N

Scale 1:1000 @ A1
0 10 20 30 40m

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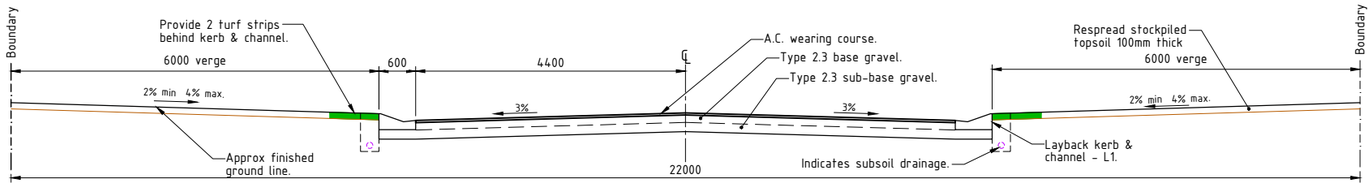
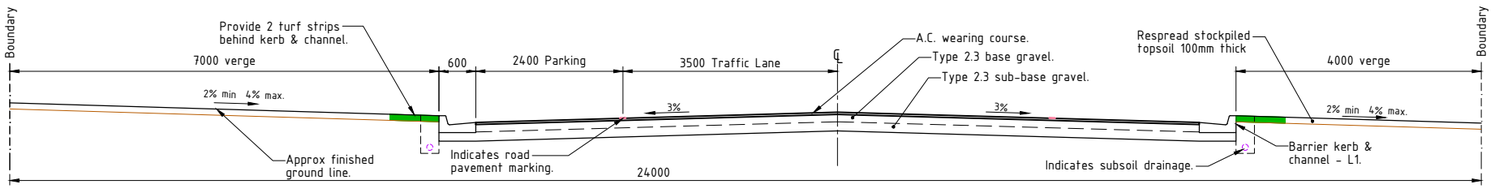
CONCEPT LAYOUT PLAN
ROAD CLASSIFICATION

Drawing Number: PARK0014/A04
Issue: P2



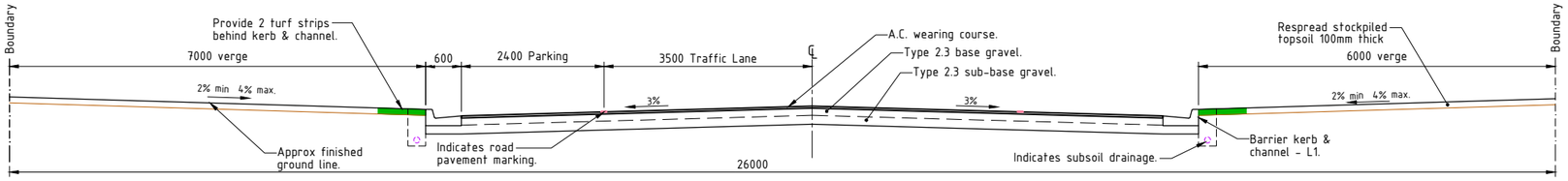
ACCESS STREET - 22.0m ROAD RESERVE

- ROAD 3, 4 & 5
- TO TOWNSVILLE CITY COUNCIL STANDARD
- DESIRED SPEED ZONE 40km/h



MINOR COLLECTOR STREET MODIFIED - 24.0m ROAD RESERVE

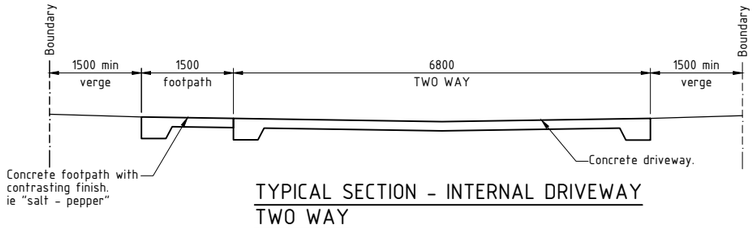
- ROAD 2
- MODIFIED TOWNSVILLE CITY COUNCIL STANDARD
- DESIRED SPEED ZONE 50km/h



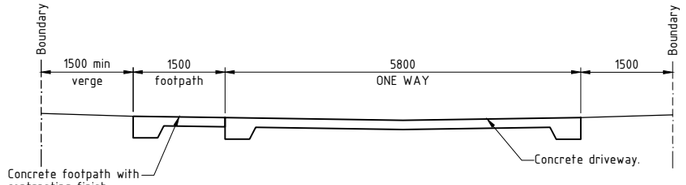
MINOR COLLECTOR STREET - 26.0m ROAD RESERVE

- ROAD 1
- TO TOWNSVILLE CITY COUNCIL STANDARD
- DESIRED SPEED ZONE 50km/h

TYPICAL ROAD CROSS SECTIONS



TYPICAL SECTION - INTERNAL DRIVEWAY TWO WAY



TYPICAL SECTION - INTERNAL DRIVEWAY ONE WAY

PRELIMINARY
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Scale 1:50 @ A1
0 0.5 1 1.5 2m

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CONCEPT TYPICAL SECTIONS
ROAD CLASSIFICATION

Drawing Number: PARK0014/A05
Issue: P2

LEGEND

- Existing RP boundary.
- Existing stormwater drain line.
- Proposed property boundary.
- New stormwater drain line.
- Stormwater flow path.
- Top of batter.
- Toe of batter.
- Change of grade.

NOTES:

1. All RCBC stormwater culverts are to be installed and constructed in accordance with D.T.M.R. standard drawings.
2. All RCP stormwater drain lines are pipes to be flush jointed with external rubber band and installed in accordance with D.T.M.R. standard drawings.
3. Pipe Class (2) – RCP class 2
   (3) – RCP class 3

LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

N

Scale 1:1000 @ A1
0 10 20 30 40m

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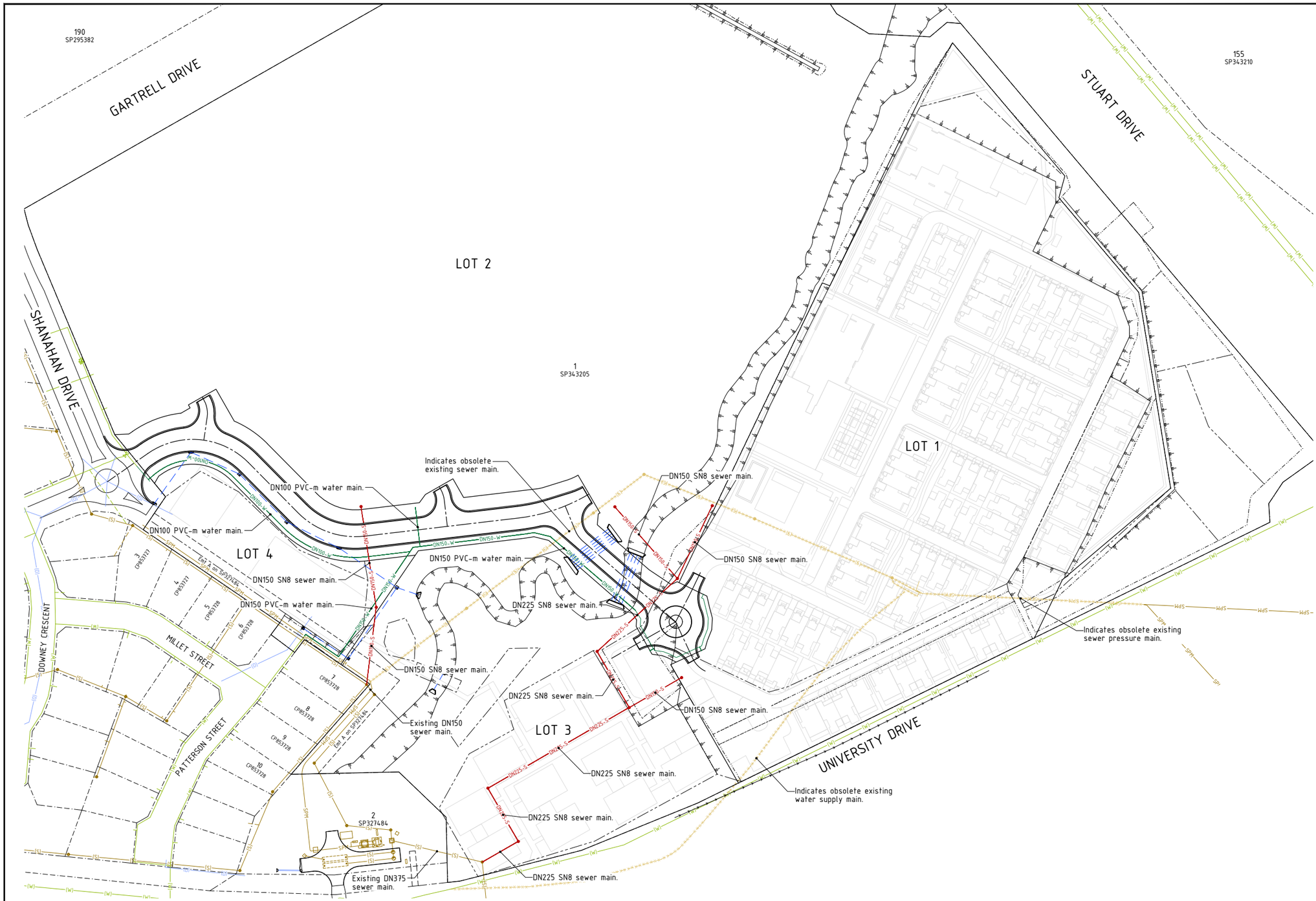
ANNANDALE
(Lot 1 on SP343205)

CONCEPT LAYOUT PLAN
STORMWATER CULVERTS AND FLOW PATHS

Drawing Number: PARK0014/A06
Issue: P3



LEGEND

- Existing RP boundary.
- Existing sewer main.
- Existing sewer manhole.
- Existing sewer pressure main.
- Obsolete existing sewer main.
- Existing stormwater drain line.
- Existing water main.
- Obsolete existing water main.
- Proposed property boundary.
- Proposed stormwater drain line.
- Proposed DN150 SN8 sewer main (exact alignment to be confirmed).
- Proposed DN225 SN8 sewer main (exact alignment to be confirmed).
- Proposed sewer manhole.
- Proposed DN100 PVC-m water main.
- Proposed DN150 PVC-m water main.
- Top of batter.
- Toe of batter.
- Change of grade.

LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

N

Scale 1:1000 @ A1
0 10 20 30 40m

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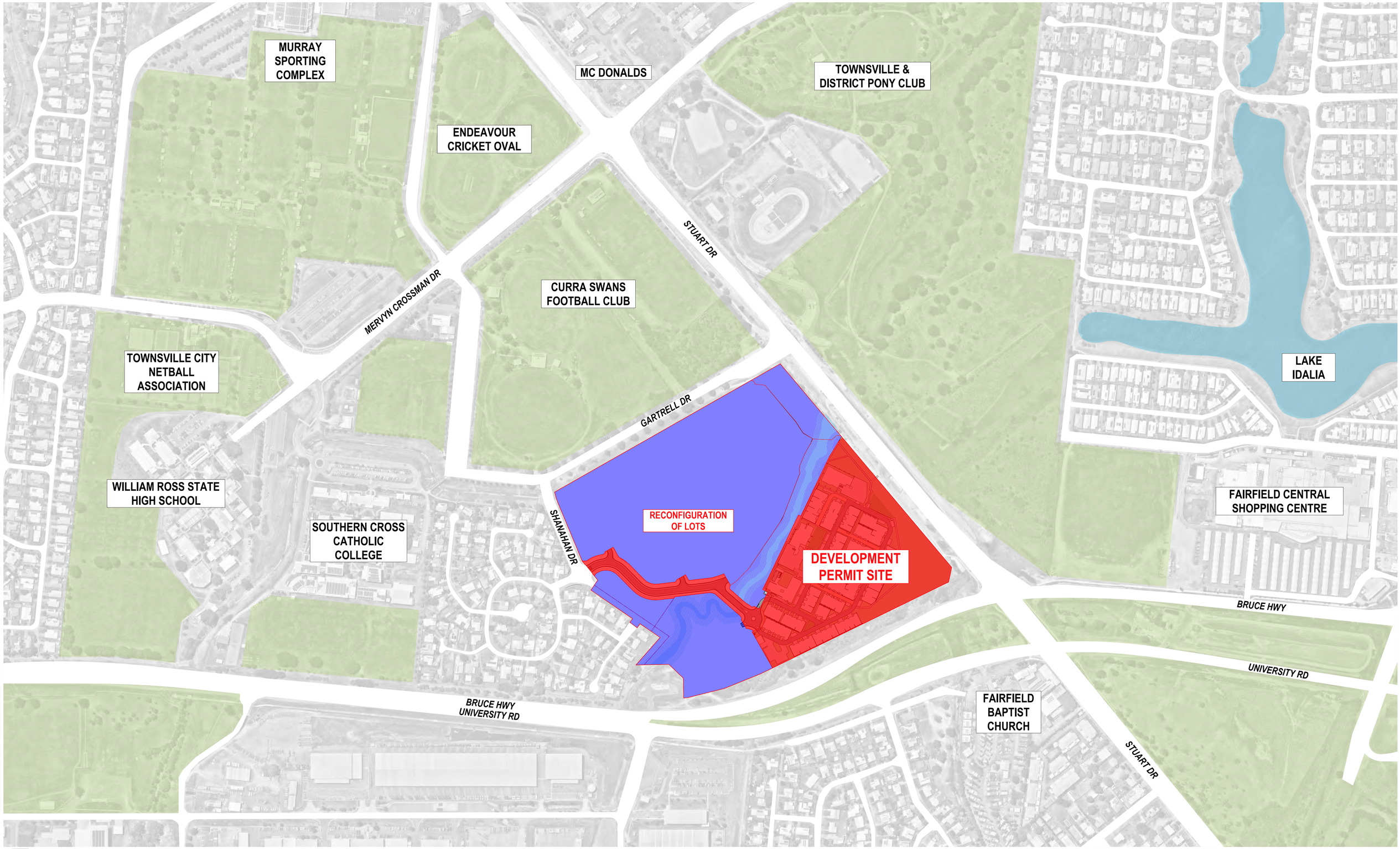
ANNANDALE
(Lot 1 on SP343205)

CONCEPT LAYOUT PLAN
WATER & SEWER RETICULATION

Drawing Number: PARK0014/A07
Issue: P2

APPENDIX ii

Cottee Parker Architects Concept Drawings



1 - LOCATION PLAN

COTTEEPARKER

BRISBANE
T 61 7 3846 7422

COTTEE PARKER ARCHITECTS PTY LTD
ABN 77 010 924 106

COTTEEPARKER.COM.AU

PARKSIDE GROUP

0 56 112 168 224 280

SCALE 1: 2800 @ A1
SCALE 1: 5600 @ A3

N

BIMcloud: CPACLDBIMM01 - BIMcloud/2300/7309 Parkside Annandale Masterplan Master: 29/11/2024: 12:01 PM

Parkside Annandale Masterplan

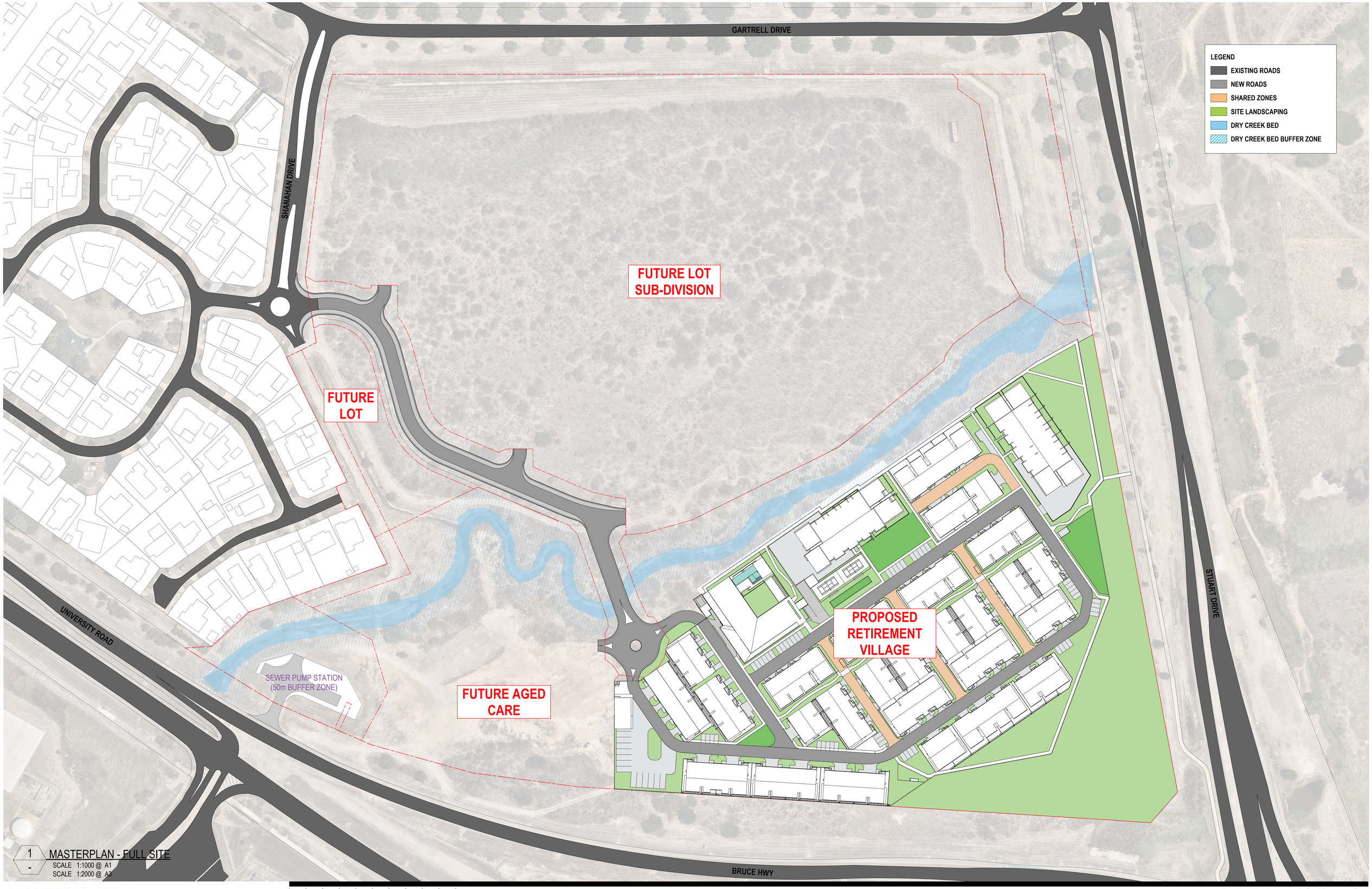
33 UNIVERSITY ROAD, ANNANDALE
CLIENT - PARKSIDE DEVELOPMENTS PTY LTD

DRAWING TITLE
LOCATION PLAN

ISSUE	PURPOSE	DATE	VT/D	GP	BD
01	Draft DA Set	29/11/2024	D	C	A

SCHEMATIC DESIGN

JOB No	DRAWING No	ISSUE
7309	SDA-1002	01



1 MASTERPLAN - FULL SITE
- SCALE 1:1000 @ A1
SCALE 1:2000 @ A3

0 10 20 30 40 50 60 70 80 90 100

SCALE 1: 1000 @ A1
SCALE 1: 2000 @ A3

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COTTEEPARKER

BRISBANE
T 61 7 3846 7422

COTTEE PARKER ARCHITECTS PTY LTD
ABN 77 010 924 106

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PARKSIDE GROUP

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ISSUE	PURPOSE	DATE	D	C	A
03	Draft DA Set	29/11/2024	VT/D L	GP	BD
02	For Coordination	22/11/2024	VT/D L	GP	BD
01	For Information	04/11/2024	VT	GP	BD

SCHEMATIC DESIGN

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33 UNIVERSITY ROAD, ANNANDALE

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DRAWING TITLE
SITE PLAN - SITE RECONFIGURATION

JOB No	DRAWING No	ISSUE
7309	SDA-1003	03