



TO: Health Officer

PROPERTY DETAILS 28 Lonergan Drive GREENLEIGH NSW 2620
Lot 5 DP 1199045

FILE NO'S: 109-2019

SUBJECT: Referral to Town Planner for Comments

DESCRIPTION: Subdivision for 219 residential lots, 1 residue lot for open space and associated infrastructure and open space

REFERRAL FOR:

- ☐ Development Application Comment
- ☐ Bushfire Assessment
- ☐ Local Government Approval
- ☐ Construction Certificate

RESPONSIBLE OFFICER Jacinta Tonner

DATE: 18 June 2019

Health and environment matters assessed:

- | | |
|---|---|
| ☐ Food | ☐ Air pollution and odour |
| ☐ Skin penetration & beauty | ☐ Water pollution |
| ☐ Other public health | ☐ Hazardous industry (SEPP 33) |
| ☐ Noise | ☒ Contaminated land (SEPP 55) |
| ☐ Sediment and erosion control | ☐ Other |

Recommended Environmental Health Conditions

Environmental Health supports the development application, subject the following conditions:

Standard conditions:	
Standard conditions (edited):	<u>PRIOR TO CC</u> Submit a Construction Environmental Management Plan Prior to release of any Construction Certificate, a Construction Environmental Management Plan for the management of soil, water, vegetation, waste, noise, vibration, dust, hazards and risk for the construction works must be submitted to, and endorsed by, Council. The plan must: a) describe the proposed construction works and construction program and,

- b) set standards and performance criteria to be met by the construction works and,
- c) describe the procedures to be implemented to ensure that the works comply with the standards and performance criteria and,
- d) identify procedures to receive, register, report and respond to complaints and,
- e) nominate and provide contact details for the persons responsible for implementing and monitoring compliance with the plans
- f) includes an unexpected find protocol that addresses recommendations made in *Report on Updated Contamination Assessment, Douglas Partners, September 2020* (doc ref 88224.06.R.001.Rev1)

Reason: To ensure that satisfactory measures are in place to provide for environmental management of the construction works, and to ensure waste and contamination at the site are appropriately managed.

Updated Remedial Action Plans

Prior to issue of a Construction Certificate (Building or Subdivision) the Remediation Action Plans (Coffey 2009 and 2010) must be updated and submitted to, and endorsed Council. Updates to these Remediation Action Plans must include all recommendations included in *Report on Updated Contamination Assessment, Douglas Partners, September 2020* (doc ref 88224.06.R.001.Rev1)

Reason: To ensure that remediation of the site will make it suitable for the proposed land use.

PRIOR TO OC

Validation Report

Prior to the issue of an Occupation Certificate (including interim) a Validation Report must be prepared in accordance with the NSW EPA's *Guidelines for Consultants Reporting on Contaminated Sites* by a certified contaminated land consultant and must be submitted to Council and must include a statement that the site has been remediated to the extent that it is suitable for the intended land use.

Any recommendations or conditions contained within the Validation Report must be implemented and evidence of their implementation must be submitted to Council prior to the issue of an Occupation Certificate (including interim). Any ongoing management conditions will become enforceable under this consent.

Reason: To ensure that the site is remediated prior to any work commencing and to ensure that no issues arise during the remediation work that would subsequently impact on the issue of an Occupation Certificate.

Site Audit Statement

Prior to issue of an Occupation Certificate (including interim) a Site Audit Statement (SAS) and Site Audit Report (SAR) must be prepared by an accredited site auditor and be submitted to Council. The SAS must state that the site has been

	remediated and validated to allow it to be used for the intended land use. Any recommendations or conditions contained within the SAS must be implemented and evidence of their implementation must be submitted to Council prior to the issue of a Occupation Certificate (including interim). Any ongoing management conditions will become enforceable under this consent. <i>Reason: To ensure construction works only proceed after a Site Audit Statement has been received confirming that the site is capable of being remediated for a future residential and recreational use.</i>
Other recommendations:	

Comments

Contaminated Land

Previous contamination reports, remedial actions plans and site audit statements provided with the application indicate that there is significant land contamination at the site from past mining and agricultural activities. Several data gaps were noted in these reports, and Environmental Health requested additional information from the applicant on 11 May 2020.

Environmental Health has reviewed the following document that was submitted in response to this request for information.

Report on Updated Contamination Assessment, Douglas Partners, September 2020 (doc ref 88224.06.R.001.Rev1

This document was read alongside other contaminated land documents provided with the application.

Douglas Partners (DP) conducted an additional review of previous studies and reports for the site. DP notes the findings and recommendations made in previous reports, including remedial actions plans (RAP) are against the NEMP 1999, and did not reflect the changes made in 2013. DP supports the recommendations made in previous RAPs (which were found suitable by a site auditor), but notes that they need to be updated to reflect regulatory changes.

DP also conducted additional site visits and sampling in July 2020. These site assessments uncovered an additional mine and limekiln, which are located in the proposed residential areas. Samples collected exceeded residential health investigation levels (HIL) and environmental investigation levels for heavy metals including zinc, cadmium and lead. As part of the assessment of HILs, DP assess results from past sampling against the newer 2013 NEPM HILs. Exceedances of contaminants is consistent with previous reports, but adjustments have been made to account for revised plans that include more public open space (opposed to residential).

Sites assessments by DP also found fragments of cement sheeting that contain bonded asbestos. DP considers the human health risk from the bonded asbestos sheeting to be minimal and that their removal can be managed through a construction environmental management plan (CEMP).

DP's recommendations following the July 2020 site assessment, report review and comparison of pervious results/recommendations against NEPM 2013 can be summarised as:

- The RAP prepared by Coffey (June 2010) should be updated to reflect regulatory changes and include remediation and management details for the additional mine site (AEC4), limekiln (AEC 5) and areas surround sample RE34 (located in proposed residential area).
- The RAP prepared by Coffey (December 2009) should be updated to reflect changes in regulatory framework and legislation

- Remediation, validation and management detailed in the updated RAPs should be implemented. Where necessary site environmental management plans should also be implemented.
- A CEMP with unexpected find protocol should be prepared and implemented to manage waste across the site and potential areas of contamination outside the areas identified in the submitted reports.
- All waste soil and rock that is transported off site should be assessed in accordance with relevant waste classification legislation.

DP stands by previous recommendations that areas of mine site 3 and 4 are not suitable for residential development, and that access to these areas is unsafe and should be restricted until remediation.

Environmental Health considers that an extensive review of previous reports has been carried out by DP, and additional considerations for the age of these reports has been addressed. In response to the request for additional information DP has uncovered two additional areas of environmental concern that need to be amended into the existing RAPs for the site.

The site audit statement (Environmental Strategies 2010) concluded that following remediation outlined in Coffey 2009 and 2010 RAPs the site could be made suitable for the following uses:

- Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry;
- Day care centre, preschool, primary school;
- Secondary school; and
- Park, recreational open space, playing field.

Remediation, validation and management of the site could be controlled through the following conditions:

- Prior to CC – submit revised RAPs that address recommendations made by DP
- Prior to OC – submit validation reports for remediation that state that site is suitable for the proposed use

Because of the extensive nature of contamination at the site, it is also recommended that a Site Audit Statement for all remediation and validation reports be submitted prior to OC. Remediation involves the excavation of contaminated soil so will likely be carried out with construction and bulk earthworks.

Jessica Perkins
Program Coordinator – Environmental Health



TO: Development Engineer Dirk Jol (Primary), Tim Reich (Secondary)

PROPERTY DETAILS: 28 Lonergan Drive GREENLEIGH NSW 2620
No related Land

FILE NO'S: 109-2019

SUBJECT: Referral to Development Engineer for Comments

DESCRIPTION: Subdivision for 218 residential lots, 1 residue lot for open space and associated infrastructure and open space

REFERRAL FOR:

- ☒ Development Application Comment
- ☐ Bushfire Assessment
- ☐ Local Government Approval
- ☐ Construction Certificate

RESPONSIBLE OFFICER: Luke Perkins

DATE: 9 July 2021

Additional Info Required:

1. THE CIVIL REPORT PROVIDED TO COUNCIL BY THE APPLICANT IS STILL WATERMARKED AS "DRAFT" DESPITE BEING APPROVED FOR ISSUE BY A DELEGATE OF THE CONSULTANCY. THE BELOW REFERRAL HAS ASSESSED THE DEVELOPMENT BASED ON THE CONTENT OF THAT REPORT BUT SHOULD NOT BE RELIED UPON UNTIL THE APPLICANT'S CONSULTANT HAS VERIFIED THAT THE CIVIL REPORT IS NOT A DRAFT, HAS REMOVED THE WATERMARK AND STATED THAT THE INFORMATION CONTAINED WITHIN THE REPORT CAN BE RELIED UPON.
2. It needs to be ascertained whether other rainfall events between 20% and 1% will exceed predevelopment flow rates from the development site. It is known that 5% AEP events cause riverine flooding and an increase in predevelopment discharge rates from the site for the 5% event seems likely given the detention of 20% events is ineffective. This needs to be investigated further.
3. Odour modelling for proposed sewer vent stack at the edge of Greenleigh to be provided to Council.
4. Provide a response to Council addressing the requirements of Design Specification D5 clauses D5.14.4 and D5.14.5 as these do not appear to be addressed in the Civil report.
5. Civil report should be revised to specify the Water Quality Objectives identified in accordance with Design Specification D7 Clause D7.21.

Sewer Available:	Grav network + SPS required	Driveways: To be provided with house DAs
Water Available:	Retic to be prov. from Greenleigh res. supply	Kerb and Gutter: QPRC to require MLBK
Flood Category:	All dev. above Q100. No isolation in PMF.	Footway Width: Varies – typically 5m verge
Natural Water Course:	Jumping & Valley Creeks	Footway Grade: Crossfall typically 2 - 4%
Drainage Easements:	☐ existing easement over adjoining land ☒ easements will be required over some of the resultants lots or adjoining land	
Hydraulics:	☐ attached ☐ unavailable at time of assessment ☒ irrelevant	
Is Construction Certificate – Subdivision required:	☒ Yes ☐ No	

Water:

The development is proposed to be serviced by constructing a new 200mm PVC-M PN16 water main from the Greenleigh reservoir supply. The connection location is on the western side of EDE, adjacent the Greenleigh reservoir access track. The new main will be regulated to 63m head via a pressure reducing valve near the estate entrance and will then be fed under EDE into the estate at both proposed vehicle access points (150mm connection at Road 002 and 200mm connection at Road 001) in accordance with the bored/sleeved installation methodology in WSA Standard Drawing WAT1214. QPRC Utilities Branch has confirmed that this reservoir has the capacity to service the Jumping Creek Development. In general, this arrangement is seen to be satisfactory.

Within the estate, the main that continues along Road 001 until the second access to Road 009 is 200mm whilst the remainder of lines are a combination of 100 or 150mm depending on the servicing requirements of the loop in question. Please see below dot point comparison against QPRC Design Specification D11 requirements. N.B. Overly specific requirements best left to detail design at Subdivision Works Certificate (SWC) stage have been omitted from this assessment.

Spec. Clause	Requirement	Achieved How
D11.05.1	Reticulation systems shall be designed to supply peak instantaneous demand by gravity while maintaining a minimum static heads stipulated in Table 2.3 of WSA 03 Part 1, section 2.5.	Minimum static head for residential reticulation is 350kPa. Provided that the Pressure Reducing Valve (PRV) is located higher than the remainder of the estate, the limited pressure of 63m head will ensure min. static head is achieved for the whole development.
D11.05.2	Peak Instantaneous Demand of 0.15L/s.	PID of 0.15 L/s adopted as design parameter.
D11.05.4	Maximum of 800 kPa in the reticulation system.	The lowest point in the retic (the corner of Roads 013 and 015) labelled as node 2 in the civil plans has a pressure corresponding to the average daily demand of 80.5m head (or 790kPa).
D11.05.5	Water mains required for fire-fighting purposes in the development shall be designed in accordance with AS 2419.1-2005.	Firefighting pressure and flow requirements adopted by the design originate from AS2419.1.
D11.05.6	The Designer shall provide a network analysis of the reticulation system detailing the pressure and velocity	No software modelling provided, however a water report has been provided with information regarding

	distribution after consultation with the Water Authority. The data and model shall be supplied in an electronic format compatible with Council's water network analysis model. If compatible data is not available then the network analysis provided will include computer software sufficient for Council to investigate the proposed reticulation system. Detailed surge and fatigue analyses of the pipe network(s) and detailed water age analyses shall be included in the design submission.	the network. QPRC provided a simplified network model (built in InfoWorks WS) to assist with the design. The model was not comprehensive and so various assumptions have been made by the designer. It is NBC Subdivision's understanding that Utilities are satisfied with the Developer's proposal in regards to water servicing. The report clearly acknowledges the design parameters adopted for the estate as in concurrence with QPRC D11 requirements.
D11.05.8	Flow velocities shall be as specified in WSA 03, Part 1, Section 3.1.6.48 "To avoid uneconomical head losses, flow velocities in the reticulation network shall not exceed 2.0 m/s for an hour period in any day or as specified by the Water Agency. In special circumstances, such as with flows required for fire fighting, velocities up to 4.0 m/s may be acceptable."	Flows limited to less than 2m/s under general operational conditions. Flows limited to less than 4m/s under fire flow conditions.
D11.05.9	Pressure and supply zones shall be designed in consultation and agreement of the Water Authority.	Not certain this has been resolved. Suspect that loop formed by Roads 013 and 015 should be a separate reduced pressure zone to avoid individual PRVs at property services as pressure exceeds recommended max of 600kPa for direct supply to residence. This could be resolved at SWC stage.
D11.05.10	The selection of pressure reducing and pressure sustaining valves shall be done in consultation and agreement of the Water Authority.	Expect this to be resolved at SWC stage.
D11.05.11	Electromagnetic flow meters shall be installed and connected to the Water Authority's management system at each pressure and supply zone	Expect this to be resolved at SWC stage.
D11.06.1	Trunk mains directly supplying reticulation systems shall be designed as part of the reticulation system to carry peak instantaneous demands. (WSA 03 Part 1, sections 3 and 5)	Acknowledged in Civil Engineering report accompanying design plans.
D11.06.3	Reticulation mains shall be looped to eliminate dead ends	All mains in proposed development are looped.

D11.06.6	Each lot shall have an individual service tapped from each main	Reticulation layout will permit ties to all proposed lots in accordance with Council requirements.
D11.07.1(b)	Stop valves shall be located to limit the number of dwellings isolated during a shutdown. Stop valves shall be provided at maximum of 200m spacing on mains or at road intersections (whichever is the lesser). Each local street shall have a valve configuration to allow it to be isolated from surrounding streets. Mains in cul-de-sacs and dead end mains shall be provided with a Stop valve adjacent the tee with the through main.	Does not comply. Though this can be resolved at SWC stage.
D11.07.1(c)	Hydrants shall be located on all reticulation mains as follows 1. The interval between hydrants shall not exceed 60 metres except at locations where firefighting coverage is not required, where the spacing may be increased to 90 metres. 2. Hydrants shall also be installed at all high and low points of the main, and at dead ends. 3. Permanent dead ends of mains shall be provided with a hydrant bend, hydrant riser and spring hydrant.	Does not strictly comply in regards to point 1. There are no areas of this development where it could be considered that fire fighting coverage is not required. Therefore the maximum hydrant spacing is required to be 60m. Whilst the Civil Engineering Report concludes that a 60m hydrant spacing dimension was adopted, scaling off Civil Plans indicate this is in fact quite variable with multiple instances in excess of 60m. This can be addressed at SWC stage
D11.07.1(d)	Water mains laid around the curves at the end of cul-de-sacs shall be minimum DN 100 and be located within the verge in accordance WSA Drawing WAT-1101.	Looped main on Road 003 is 100mm and is located within the verge.
D11.09.1	The working pressure of pipes, fittings, valves and hydrants shall be fit for the purpose in accordance with the relevant Australian Standard for the material and shall be at least 1600 kPa (160m).	This is more of a construction matter, though Series 2 PVC-M PN16 pipe is proposed by Developer. Noted that Council may require bored and sleeved crossings of EDE to be completed using DICL for maintenance and asset longevity reasons.

Sewer:

The development is proposed to be serviced by a combination of 150mm diameter PVC-U local gravity sewer network, approximately 1km of 150mm DICL Sewer Rising Main (SRM), an upgrade to approximately 400m of existing 150mm gravity sewer and a Sewer Pump Station (SPS) currently proposed to be located east of Jumping Creek just south of the intersection of Roads 001 and 009. It is noted that the proposed SPS location may be changed during detailed design.

The residential gravity network is split into almost equally comparable parts (JC East and JC West). Each portions catchment is approximately 100 ETs and can roughly be taken as the catchments located on the east or the west of Jumping Creek respectively. Of particular note is the fact that the network contains many lines proposed by the developer to be curved using pipe deflection (up to the manufacturer's limit of recommendation – min. radius of 300 x pipe dia.). This is not favourable but is claimed to be a result of the required road network layout (i.e. lack of straight stretche, i.e. something unavoidable).

The proposed SRM is 150mm DICL PN35 pipe. This is the typical requirement of Council's Utilities branch for such infrastructure. Whilst the PN35 pressure rating is not needed, the additional wall thickness of the pipe increases expected asset service life. The proposed SRM runs along Road 001 from the proposed SPS back to EDE (with one diagonal road crossing of Road 001 and a transverse crossing of EDE which will need to be sleeved as per WSA SEW1403). The SRM then continues along EDE to Lonergan Drive down which a new receiving manhole will need to be constructed to permit the outlet of the SRM to transition to gravity. This transition will need to include the upgrade of approximately the last 400m of existing 150mm gravity main (from MH 3/18 to the connection to 600mm trunk sewer) to 225mm gravity main before it can eventually be discharged into the 600mm trunk main servicing Barracks Flat near the end of Beston Place. The receiving manhole will need to include construction of an educt to WSA/QPRC requirements (this can be handled at SWC stage). The proposed SRM includes provision for a scour outlet and an air valve at respective sag and crest locations. It is Development Engineering's understanding that the above transition from SRM to gravity sewerage between Lonergan Drive and Beston Place is generally to the satisfaction of Council's Utilities Branch though it is understood that Utilities had requested odour modelling that has yet to be conducted or reviewed by Council (presumably to ensure there are no adverse results from installing a new educt on the edge of Greenleigh).

The Developer has been liaising with QMax to produce a concept design for the SPS for the sake of this development application. However, it is expected that the Developer will likely contract QMax to complete a detailed design should the DA be approved by Council. For the sake of this DA, the proposed SPS specifications as included in the submitted Civil Engineering Report appear to meet Council's requirements.

Please see below dot point comparison against QPRC Design Specification D12 requirements. N.B. Overly specific requirements best left to detail design at SWC stage have been omitted from this assessment.

Spec. Clause	Requirement	Achieved How
D12.04.3	The Designer shall confirm the design criteria with the Sewer Authority and shall design a gravity pipeline distribution system with pump stations and rising mains, where necessary to comply with the requirements of this Specification, to transport fresh sewage, or common effluent, for treatment.	Design criteria has been adopted as per WSA02 2014-3.1 and following consultation with QPRC.
D12.05.2	The depth of sewer shall be sufficient to allow a minimum of 90 per cent of each lot to be serviced.	Design contours in civil plans indicate this is likely but it not detailed enough to be conclusive. Most service ties are also not shown. However, the plan provide a reasonable level of assurance that this requirement will be met. One identified area of concern is the most elevated parts of Road 009.

		This is on the eastern part of the loop. This is not a serious concern because it is apparent from the plans that alternate satisfactory arrangements could be made to ensure appropriate servicing. This needs to be scrutinised at SWC stage.
D12.06.1	Design requirements listed in Annexure D12-B (Gravity)	QPRC were consulted on design criteria and design in accordance with WSA02 2014-3.1 Appendix C adopted.
D12.07.2	Where sewers are proposed to be located within existing road reserves, the Designer shall check that the sewers do not conflict with other utility services and locate the sewers in accordance with established protocols (WSA 02 Part 1, section 5.3).	Proposed alignment from JCE through Ellerton Drive Road Reserve and then through Greenleigh is agreed in principle but subject to detail design at SWC stage.
D12.07.5	Sewers shall be laid in a straight horizontal and straight vertical alignment. Curved sewers shall not be provided in the design without the prior written consent of the Sewer Authority (WSA 02, Part 1, sections 5.3.8 & 5.6.7). The gaining of approval for curved sewers constitutes a HOLD POINT.	Curved sewers have been proposed in multiple areas (though primarily as a result of the road design (road design to suit existing topography as best as possible without increasing extent of bulk earthworks). Not considered to be best practice. Whilst there has been no written agreement from Council's Utilities branch to the use of curved sewers, it is noted that the curvature of the sewers will not exceed the pipe manufacturer's recommended deflection. As such, whilst not ideal, Council will not object.
D12.08.1	Spacing and location of maintenance holes.	The location and spacing of maintenance holes in the proposed development appears to generally comply with the requirements of D12.08.
D12.08.4	The Designer shall provide for the venting of the sewerage system (WSA 02, Part1, section 7.5). Maintenance holes which accept pumped discharges shall be vented.	The transition from the proposed SRM to existing gravity sewer in Greenleigh has been designed with required venting. Odour modelling yet to be provided.
D12.08.5	Connections to existing maintenance holes or sewers of the existing sewerage system are to be based on a sewerage master plan. A master plan is to be developed for each subdivision stage and be approved by the Sewer Authority.	Connection location of the proposed subdivision into existing infrastructure in Greenleigh has been agreed to by Council's Utilities branch and capacity of receiving system has been confirmed.
D12.10.4	Pipelines shall be buried. Above ground sewers may be designed in a	All proposed pipelines are below ground.

	gravity system only where other options are less practical (WSA 02, Part 1, section 9.8). The Designer shall obtain the concurrence of the Sewer Authority to any proposed above ground sewer. The action to provide for above ground sewers constitutes a HOLD POINT	
D12.10.8	The pipeline alignment shall be such that no property connection sewer is to be more than 25 m in length.	Complies.
D12.20	Pump stations	The design of the sewerage pump station can be discussed with the applicant and assessed in detail during the SWC stage. For now, it suffices that Council are aware that a pump station and SRM will be required.

Storm Water:

The development is proposed to be serviced by a combination of a pit and pipe drainage network following the proposed road layout alongside inter-allotment drainage (where the primary network is unable to adequately service any lot due to topography) and overland flow through proposed road reserves. Stormwater modelling appears to have been completed in accordance with procedures set out in AR&R2016.

The pit and pipe network is designed to cope with a 20% annual exceedance probability storm event whilst the road reserve network should be generally capable of conveying larger flows up to the 1% AEP event. It is noted that the plans submitted for the development application do not suggest pit locations. The drainage master plan has only assessed the topography and catchment areas in order to size the pipes for the drainage network. It is anticipated that the pit locations and sizes will form part of the detail design at the time of SWC along with revision to various pipe sizes and potentially locations too. Bearing this in mind, the drainage network as presented appears that it will be capable of general compliance with Council's design specification D5. Please note that structures to cross the existing creek lines will be covered under comments made against flooding and road network.

In addition to the pit and pipe requirements for the stormwater drainage network, Council's design specifications D5 and D7 impose restrictions on the discharge quantity and quality of water from the development. To address these requirements, the development ultimately provides for outlets from the pipe and road drainage networks into the existing Jumping and Valley Creeks via way of a gross pollutant trap for the small catchment denoted "C" on the plans and two sediment ponds (each 600m²) and two bioretention basins (470m² and 520m² respectively) for the remainder of the catchments. The inclusion of these three types of devices addresses both the detention requirement of the development (to meet the permissible site discharge rate of no more than predevelopment rates for the 1% and 20% AEP storm events whilst also addressing the pollution retention targets. It is noted however, that the pollution retention targets for nitrogen and phosphorus set by D7 are not met. This is due to the assertion the consultant makes in regards to the need for bioretention basins to increase in size by a factor of 3 or 4 to achieve the targets set by D7. The consultant argues that these basins will no longer achieve satisfactory flow rates for healthy plant life and will thus fail. The consultant argues instead for the adoption of the "Best Practice" rates as laid out in Australian Runoff Quality (ARQ) 2016. This is a reduction in the targeted TN and TP removal rate from 65% to 45% of total expected annual load which is not insignificant. Aside from this matter, the development appears to be generally compliant with Council's design specifications D5 and D7.

Please see below dot point comparison against QPRC Design Specifications D5 & D7 requirements. N.B. Overly specific requirements best left to detail design at SWC stage have been omitted from this assessment.

D5.02.2(a)	New Developments are to provide a stormwater drainage system in accordance with the "major/minor" system concept set out in Book 9 of Australian Rainfall & Runoff, 2016 (AR&R); that is, the "major" system shall provide safe, well-defined overland flow paths for rare and extreme storm runoff events while the "minor" system shall be capable of carrying and controlling flows from frequent runoff events.	Complies. 5 year ARI adopted as minor event for piped infrastructure. 100 year ARI adopted as major event for overland flow through road reserves and drainage reserves. Velocity x Depth products minimised through road design to ensure hazard is minimised as much as possible for overland flow (max depth of 0.2m and max VxD of 0.4). Note that the design was completed with the assistance of TUFLOW and RORB modelling in conjunction with flooding considerations. See civil report for further information.
D5.02.2(c)	Water Sensitive Urban Design (WSUD) methods shall be incorporated in all developments in accordance with the Australian Runoff Quality manual (ARQ) and Design Specification D7 EROSION CONTROL AND STORMWATER MANAGEMENT.	ARQ has been adopted by the designer in preference to D7 for pollution retention targets. It is acknowledged that the targets set by ARQ are considered to be the standard industry practice within the region.
D5.06.1	Calculations to determine peak flows for non-urban catchment shall be carried out in accordance with Chapter 3 Regional Flood Methods of Book 3 Peak Flow Estimation of Australian Rainfall and Runoff: A Guide to Flood Estimation, © Commonwealth of Australia (Geoscience Australia), 2016 (AR&R) and the requirements of this Specification. The Regional Flood Frequency Estimation Model referred to in this chapter of the AR&R is available at the following link: http://rffe.arr-software.org/	This applies to determination of the predevelopment condition only from a detention point of view. The provided stormwater section of the civil report specified that the RFFE was used in accordance with ARR2016 to determine the peak flow targets for the predevelopment condition
D5.07.1	Urban Catchments are to be modelled in accordance with of Book 9 Runoff in Urban Areas of AR&R. The appropriate model to be used for urban catchments is up to the discretion of the designer, as long as the requirements of AR&R are met.	The method for assessing the predevelopment condition to determine peak flow rates was to produce a RORB routing model after breaking the watershed done into many smaller catchments and comparing the results with those produced by the RFFE tool.

		For the determination of pipe sizing for the drainage network within the proposed estate (and this includes the capacity of road reserves to carry overland flow) the rational method was used. It is Development Engineering's opinion that the rational method is not suited to a site of this size. Nevertheless, Council believes that the details of the urban catchment (pipe sizing etc) will be able to be appropriately refined to a satisfactory design at SWC stage.
D5.08.1	Hydraulic calculations shall generally be carried out in accordance with AR&R and shall be undertaken by a qualified person experienced in hydrologic and hydraulic design. The calculations shall substantiate the hydraulic grade line adopted for design of the system and shown on the drawings. Summaries of calculations are added to the plan and details of all calculations are given including listings of all programme input and output.	Development Engineering are satisfied that the consultant is appropriately qualified. Hydraulic grade line and calculation summaries are not provided. Though a basic process explanation is given in the civil engineering report. RORB, TUFLOW flood models were created for the analysis of this development. Development Engineering do not have the means to interrogate such models. Initial pipe sizing has been based off the rational method with contributing flows from catchments west of the site provided by Council for inclusion in the consultant's calculations. Preliminary pipe grades have been based off road design grades. It is expected that the above is satisfactory for this stage of assessment (DA) but that detail design will include a more rigorous assessment.
D5.08.2	The "major" system shall provide safe, well-defined overland flow paths for rare and extreme storm runoff events while the "minor" system shall be capable of carrying and controlling flows from frequent runoff events.	Generally compliant.
D5.09.1	The acceptable gutter flow widths for the minor system design AEP event, as set out in D5.04.5, is 2.5 metres maximum.	This is not specifically addressed in the civil report.

D5.09.2	Minimum conduit sizes shall be as follows: Pipes: 375mm diameter. Box culverts: 600mm W x 300mm H. Individual Lot Connections: 100 mm (minimum).	Submitted plans appear to comply noting that 375mm minimum pipes have only been adopted for locations within road reserves.
D5.09.3	Minimum and maximum velocity of flow in stormwater pipelines shall be 0.6m/sec and 6m/sec respectively.	Information not located in submitted documentation. This will be further scrutinised at SWC stage once a detail design for the piped network is available.
D5.11.1(a)	Surcharging of drainage system for storm frequencies greater than 5% AEP may be permitted across the road centreline where the road pavement is below the natural surface of the adjoining private property.	Road reserves are capable of carrying 1% events.
D5.11.1(b)	Flow across footpaths will only be permitted in situations specifically approved by Council, where this will not cause flooding of private property.	It appears that flows up to 1% events may inundate footpaths within road reserves whilst still maintaining flow within the road reserve.
D5.11.2	The velocity x depth product of flow across the footpath and within the road reserve shall be such that safety of children and vehicles is considered. The maximum allowable depth of water is 0.2 metres and the maximum velocity x depth product of 0.4m ² /s is permitted. Where the safety of only vehicles can be affected, a maximum velocity x depth product of 0.6m ² /s is permitted. In open channels the above velocity x depth product criteria will be followed where possible or the design shall address the requirements for safety in relation to children by providing safe egress points from the channel or other appropriate methods.	As stated by the submitted civil report, the maximum flow depth within the road reserve is 0.2m and the maximum VxD product is 0.4m ² /s.
D5.11.4	Flow capacities of roads shall be calculated in accordance with Book 9 Runoff In Urban Areas, Chapter 5 Stormwater Conveyance of AR&R.	Flow capacity of roads was determined using PC Convey. It is not clear from the civil report whether this modelling used the procedures of Book 9 Ch5 of AR&R.
D5.12.1	Generally, open channels will only be permitted where they form part of the trunk drainage system and shall be designed to have smooth transitions with adequate access provisions for maintenance and cleaning. Where Council permits the use of an open channel to convey flows from a development site to the receiving water body, such a channel shall	Open channels used for permanent diversion drains only. Detailed design of open channels has not been completed at this stage of documentation.

	comply with the requirements of this Specification.	
D5.13.1	All major structures in urban areas, including bridges and culverts, shall be designed for the 1% AEP storm event without afflux. Some afflux and upstream inundation may be permitted in certain rural and urban areas provided the increased upstream flooding is minimal and does not inundate private property.	All culverts and bridges in the development have been sized to accommodate the 1% AEP flood event. Freeboards to bridge or culverts have been checked as suitable by employing a 20% blockage factor to the culverts in question. Results were satisfactory. It is noted that part of the riparian corridor requires realignment and restoration. It is expected that there is going to be a localised increase to 1% flood levels to land located within the development only. It is noted that this does not affect and proposed parcels of residential land.
D5.13.2	A minimum clearance of 0.3m between the 1% AEP flood level and the underside of any major structure superstructure is required to allow for passage of debris without blockage.	See above comment.
D5.13.4	Culvert crossings in urban areas shall be designed for a 1% AEP flow with an upstream freeboard of at least 0.6m.	See above comment.
D5.14.1	Detention storages are to be designed to meet the Permissible Site Discharge equal to predevelopment peak discharge rates for 20% and 1% AEPs not to be exceeded.	Complies for the 1% AEP event. Site discharge for the 20% event is increased by 3.5%. It could be argued that because discharge is effectively direct to the Queanbeyan River and that 20% events do not cause riverine flooding of the river, that this effect is negligible in nature and will not affect downstream properties. However, it needs to be ascertained whether other rainfall events between 20% and 1% will exceed predevelopment rates. It is known that 5% AEP events cause riverine flooding and an increase in predevelopment discharge rates from the site for the 5% event seems likely given the detention of 20% events is ineffective. This needs to be investigated further.
D5.14.3	Stormwater detention facilities shall be combined with Retention structures to maintain the water cycle regimes within each catchment area. Refer to Specification D7 EROSION	Proposed system combines both sedimentation ponds and bioretention basins.

	CONTROL AND STORMWATER MANAGEMENT for details of infiltration and bioretention systems.	
D5.14.4	For each AEP a range of storm events shall be run to determine the peak flood level and discharge from the retarding basin. Design temporal patterns shall be derived from methods set out in AR&R. Sensitivity to storm pattern should be checked by reversing these storm patterns.	Provided civil report does not provide clarity on how/if this was done.
D5.14.5	The critical storm duration with the retarding basin is likely to be longer than without the basin. A graph showing the range of peak flood levels in the basin and peak discharges from the basin shall be provided for the storms examined.	Provided civil report does not provide clarity on whether this was done.
D5.16.1	Interallotment Drainage shall be provided for every allotment which does not drain directly to its frontage street or a natural watercourse.	Complies, subject to detailed design.
D5.16.2	Pipe Capacity - The interallotment drain shall be designed to accept concentrated drainage from buildings and paved areas on each allotment for flow rates having a design AEP the same as the "minor" street drainage system.	Complies, subject to detailed design.
D7	General application up to (but not including) D7.20	Pertains to detailed design and construction phase temporary measures to address sedimentation. As such, this section has not been scrutinised here for the sake of assessing a concept plan.
D7.20.1	Most developments mean a change in land use and are usually accompanied by a decline in stormwater quality. This applies to the long term as well as during the short term construction phase. The main components required to enhance stormwater quality are as follows:- a. Vegetated Buffer Zones (VBZ) and filter strips, porous pavements, grass swales in landscaped areas or similarly treated areas to facilitate the natural assimilation of water pollutants and reduce run-off. Swales are not preferred as a substitute for kerb and gutter where on street parking is required.	Proposed design incorporates VBZs, GPTs, retention ponds (sed ponds) and wetland nutrient filters (bioretention). It is noted that retention ponds and bioretention basins are located downstream of residential development. Permanent diversion drains are also proposed to direct clean watershed from the catchment areas higher than the development around the development and directly into Jumping and Valley Creeks. This will reduce the quantity of water requiring treatment to meet quality targets.

	b. Where required, gross pollutant/sediment traps shall be designed to intercept litter, oil and debris to maintain visual quality in downstream waterways, and to reduce the coarse sediment load on downstream water management structures. c. Wet retention ponds/permanent sediment ponds shall be designed to allow particulate matter to settle out operating under both sedimentation and macrophyte regimes. d. Wetland (Nutrient) Filters shall be designed to enhance the removal of fine sediment and nutrients from stormwater run-off, (which are largely dependent on biochemical removal mechanisms). e. Infiltration systems shall be designed to focus on the control of pollutants and the retention of stormwater. f. Selection of stormwater quality enhancement devices and practises shall be based on current environmental guidelines and best practise management procedures.	
D7.21	An assessment of water quality impacts and control measures to mitigate or improve the water quality shall be a carried out by the following process. a. Identify the Water Quality Objectives (WQO). b. Determine the Risk Category of the proposal. c. Determine the type and condition of the receiving water ecosystem. d. Determine the pollutant loads generated by the proposed works. e. Determine the types of treatment measures to be used to mitigate or improve the water quality from the proposed works.	The provided civil report has stated that the Developer has identified the WQO, though those objectives have not been specified. As provided in D7, Council considers the development to be high risk (large subdivision development located in a waterway corridor). The Jumping and Valley Creek network was assessed by the Developer as highly disturbed due to previous land uses. Whilst Development Engineering generally concur with this determination, though refrain from extending this determination to apply to the Queanbeyan river, it is not our place to make such a determination. This responsibility rests with Council's Environmental Health (EH) Team. In consultation with the NRAR, the Developer is proposing riparian

		corridor realignment and rehabilitation to improve the existing ecosystem within the development. Whilst Development Engineering do not object to a process agreed to by the NRAR, and are generally supportive of measures to improve water quality and health of an existing ecosystem, the details should be reviewed and commented on by Council's EH Team. The Developer has considered that the downstream receiving system is a modified ecosystem though they do not specify the level of modification assumed. D7 provides that Council will make the final determination in regard to the classification of protection levels of aquatic ecosystems which again will fall to Council's EH team. Whilst the WQO have not been specified in the civil report, the report outlines the treatment measures and devices required to meet these objectives. Without knowing the objectives, Development Engineering are unable to comment on whether the proposed treatment is appropriate. Whilst the proposed treatment is typical of what Development Engineering have come to expect from such a development, we are unable to assess the premise on which these controls have been selected/sized. Finally, as mentioned previously, the civil report discusses the determination of average annual loads of pollutants produced by the development catchment and has adopted retention targets in line with ARQ rather than with D7. The modelling for this assessment was conducted using MUSIC.
D7.22	Selection of Stormwater Quality Improvement Devices.	It is noted that whilst GPTs, sediment basins and bioretention basins are appropriate SQUIDs for this type of development, Council will wish to see further detailed analysis for SWC including clarifying the adopted

		WQOs and provided maintenance regimes and plans.
D7.23	A wet retention basin can be located either on-line or off-line. Its capacity however needs to be considerably greater if it is located on-line. The wet retention basin usually has some form of energy dissipation at the inlet or a sufficient length to-width ratio (greater than 2:1) to prevent short circuiting of flow across the pond, although its shape may vary considerably. It should be located such that the basin does not locally raise the subsurface water table under circumstances that might lead to a salinity problem. . Refer to Chapter 11 of ARQ for details of appropriate design procedures to be adopted. Basins may be installed as smaller multiple units (in series) or as large single units.	The proposed basins are located in the riparian area of the Jumping and Valley creek confluence with ability to discharge to the creeklines. This effectively precludes the basins from being in a location where they may contributed to raising the subsurface water table. Basins have aspect ratio of about 2:1 when considering length to be the distance from inlet to spillway (not necessarily straight).
D7.23	Other design guides for basin efficiency.	Whilst it is acknowledged that the basin depth is compliant with D7, the rest of the detailed design parameters will not be assessed here at DA stage. The Developer will need to include an all-weather access track for basin maintenance in the SWC submission. The basin spillways are located downstream of all proposed residential development within the site. Inlets to each basin will accommodate GPTs or trash racks (to be designed or specified with SWC application in accordance with D7.24 and D7.25). Required buffer zones will surround each basin (greater than 20m to nearest development).

Roads, Access and Parking:

The components of this aspect of the development can be put into one of three categories.

1. Access intersections into/out of the estate (i.e. intersections with Ellerton Drive Extension).
2. Internal road network (including commentary on bus routes).
3. Parking functionality & lot access.

Access Intersections:

The development is proposed to be serviced by two intersections joining the proposed estate with the EDE. It is noted that these intersections are designed for one as primary and the other as

secondary access points. It has been Council's stance since the two intersections were first proposed, that there should only be one intersection onto EDE (to minimise the number of potential points of conflict on an arterial road). Should two intersections be unavoidable due to the requirements of other agencies (such as RFS), then Council would require that the secondary access employ a ranger gate and be classified as an emergency only access. This will be conditioned.

The primary access intersection between EDE and Road 1 has been a small point of contention between the Developer and Council since prior to the commencement of the EDE project. At this time, Council entered into discussions with the Developer to attempt to resolve access requirements with the Developer so that those arrangements could be constructed as part of the EDE project (though funded by the Jumping Creek Developer). Council arranged for a design of the primary intersection to be completed and priced for construction to advise the Developer. The offer to construct the intersection early was refused by the Developer on the grounds that they did not wish to fund a project that did not yet have approval for the proposed minor planning proposal (zoning) let alone an approved Development Consent. It may also have been rejected on the cost to construct put forth by Council. Nevertheless, the intersection will need to be constructed by the Developer with the subdivision works and will require work under live traffic for which a Section 138 approval will be required. It is noted that as Council has already completed a design for this intersection with our requirements in mind, we are satisfied that this design can be utilised and it is Development Engineering's intention to condition the construction of the intersection to the same standard as that designed by Council's consultants. This intersection will take the form of a Seagull style intersection with concrete island protection for the right-hand deceleration/turning lane. It appears that the consultant's approach to designing the southern (primary) intersection is generally in line with Council's requirements.

Aecom Pty Ltd were engaged to complete a traffic assessment report for the Jumping Creek development. The report include an analysis of the estimated traffic generated by the development along with estimated through traffic on EDE to assess the functionality of both intersection from a safety and Level Of Service (LOS) perspective. A brief summary of the variables used for assessment follows:

1. Total estimated average daily traffic generated by the development is 2330 VPD. This was based of the accepted rate of 10 movements per residential lot per day as specified in D1.07.4. It is noted that the development has been revised to 218 residential lots now, though the traffic analysis remains unchanged making it a little more conservative.
2. The AM/PM peak vehicle movements have been modelled at 1 per residential lot per peak hour. This is the requirement from D1.07.4 but is a little conservative by the RTA's Guide to Traffic Generating Developments which suggests a rate of 0.85 movements per residential lot per peak hour.
3. Estimated through traffic on EDE during the AM and PM peaks was derived from *Part 3 - Queanbeyan Network Improvement Assessment Report – Appendix A* prepared by TDG, dated December 2014.
4. Trip distribution was assigned based on the 2016 Australian Bureau of Statistics journey to work data utilising Karabar as a close suburb. This is used to determine the estimated split in left and right peak hour turns out of the development.
5. Safe Intersection Sight Distance (SISD) has been determined in accordance with Austroads Guide to Road Design Part 4A (Signalised and unsignalised intersections) and AS2890. Corrections have been made for the grade of EDE. It is noted that for left turns into the development, a design speed of 80km/h has been adopted for EDE whilst left turns out of the development have adopted a design speed of 90km/h which increases the SISD required for the assessment of the intersection.
6. Aecom have determined that the likely split of intersection use would be 80% using the southern intersection and 20% using the northern intersection. It is asserted that the twin intersections are not needed from a traffic generation point of view. This is good as it will permit Council to condition the emergency only use of the northern intersection.

7. Design vehicle for both intersections was the Austroads Single Unit (SU) Truck/bus. This is an acceptable design vehicle for the intersection as it will permit the accommodation of both garbage trucks and buses. It is noted that for the SWC, there should be a check vehicle introduced into the assessment. The check vehicle should be an Articulated Vehicle (AV) in recognition of the fact that the site will have many AVs delivering building material to site during home construction post subdivision land release. If need be, the intersection should be adjusted to permit the use by AVs.

Adoption of the above variables appears to be appropriate for the circumstances of the development. Using these variables, Aecom have completed intersection modelling for the peak hours using Sidra 7.0 and have determined that all movements from both intersections operate at LOS A. This analysis has resulted in the determination of storage lengths for turning lanes (maximum of 15m according to Aecom's modelling) which is used to determine overall lane length. Whilst it is noted that it appears that the intersections have generally been designed in accordance with Austroads Guide to Road Design Part 4a, the total deceleration length of turning lanes has not adopted the comfortable deceleration rate of 2.5m/s^2 as per Austroad Guide to Road Design Part 4a Table 5.2. For example, using a design speed of 80km/h, the deceleration length for right turn lanes would ideally be 100m whereas the design only allows for 90m. Whilst this is technically still compliant with Austroads, as it does not exceed the maximum deceleration limit of 3.5m/s^2 , it is not seen as acceptable because there are no limiting factors preventing the desirable deceleration length from being achieved.

Additionally, whilst LOS A is the only satisfactory result for a brand new intersection on a new arterial road, and also noting that the sensitivity of the intersection to changing traffic volumes has been tested out to 2031 (using forecast data from *Part 3 - Queanbeyan Network Improvement Assessment Report – Appendix A* prepared by TDG, dated December 2014), Development Engineering wish to investigate total length of turning lanes in greater detail at the time of SWC. As such, any approval provided at DA stage will be an in-principle approval for the types of intersection only, rather than the final dimensions. This will allow Council to verify satisfactory storage requirements can be met, knowing that all traffic must be routed through the southern intersection (due to the conditioned emergency only use of the northern intersection) before locking in final dimensions.

In general, Council are satisfied with the application of a seagull intersection (utilise concrete island for protection of turning and merge lanes) for the southern intersection and left-in left-out arrangement for the northern intersection subject to the caveats noted above regarding turning lane lengths requiring additional scrutiny at SWC stage.

Internal Road Network:

The internal road network consists of only two road types according to Council's QPRC Design Specification D1 – Local Streets and Collector Streets. Because Local and Access streets have the same physical carriageway dimensions, the only difference is in the design speed (i.e. changes in curve geometry). The Developer has asserted that all streets that would normally be classified as Access Streets have been designed to comply with the design speed of Local Streets and therefore, be classified as such. Road 001 is intended to be the only collector street (and bus route) and all remaining streets will therefore fall into the category of Local Streets. All roads within the subdivision have a 1.5m wide footpath located in one of the verges as per requirement from D1. It is generally thought that this arrangement is satisfactory in principle, including the use of Road 001 as a Collector road for bus routes up to the roundabout at intersection with Roads 12 & 13 (noting that proposed bus stops are within a 400m radius of all but four lots which is acceptable). However, there have been some proposed deviations from QPRC's D1 Specification which are summarised below:

1. Road 001 does not meet the width requirements for a Collector Street as specified in D1. Collector Streets should have a pavement width of 11.2m. This is the minimum standard for bus routes under D1. Road 001 is proposed to be 9m in width and utilise indented bays for bus stops. From the provided turning paths in the civil plans, it would appear that if Council accept Road 001 as proposed, then we will need to impose no on-street parking as the street becomes too narrow for two way traffic (with buses) whilst cars are parked on both sides of the road. In its current form, this is unacceptable. **Council should not need to accept brand new development that does not provide adequate on-street amenity for parking. If this is intended to be permitted, then Council should condition the preparation and submission of Traffic Control Devices (TCD) plans showing the no parking provision along Road 001. These plans should be submitted to Council prior to application for a SWC to allow time to have the plans discussed at Local Traffic Committee.**
2. D1 stipulates minimum verge widths of 5m. The Developer Proposes to utilise 4m verges in a few locations where there is no private property frontage (parts of Roads 003, 009, 011 & 012). It is Development Engineering's understanding that this deviation to specification is likely to be approved subject to the verge areas in question being able to satisfactorily contain any required services.
3. The submitted civil engineering report states that despite D1 requiring cul-de-sac turning heads of minimum 15m diameter, they believed this to be excessive. The report proposes to adopt 12.5m turning heads stating that service vehicles could perform three-point turns and that this was a satisfactory arrangement. **This is not a satisfactory arrangement and compliance with D1 is required. It is noted that the civil plans appear to show cul-de-sac turning heads compliant with D1. The anomaly cannot be ignored and it is proposed to condition the correct diameter of turning heads to ensure there is no room for ambiguity.**
4. Road 001 does not comply with the minimum Vertical Curve (VC) radius requirement at intersections as stipulated by D1 for Collector Streets. The fact that Road 001 is the main road through the new development and is also the proposed bus route, it needs to be classified as a Collector Street (road width arguments as per point 1 above aside) and should therefore comply with the minimum VC of 12m at intersections. The current proposal has a VC of 10m at the intersection with EDE. This needs to be amended for the SWC application. As such, it will be conditioned as part of any DA consent to ensure there is no ambiguity.
5. Following on from Point 4 above, as a Collector Street, Road 001 should also have adopted a design speed of 50km/h rather than the stated 40km/h in the civil plans. **As this may have implications for geometry of the road, this should be amended ASAP.**

In addition to the specification non-compliance issues, there are a few issues with the design that, whilst aren't non-compliant, are not designed well and could be improved.

- A. The proposed bridge across Jumping Creek (Part of Road 013 downstream of the creeks confluence) has been designed with as short a span as can be achieved. A flow on effect of this design is that the minimum permissible VC radius is used on Road 013, the abutments reach about 5m above existing ground height with exceptionally steep surrounding terrain requiring retention and forming a flow constriction just downstream of the creeks confluence. An increased span would open up the channel for the passage of waters during flooding events and permit the reduction of batter grades from the creekline to the bridge abutments making maintenance of the area easier/safer for Council staff.
- B. There are numerous bends in the local roads (not intersections) that have tight horizontal curvature which makes two way traffic manoeuvring quite close when considering the case of one vehicle being equivalent to an Austroads Service Vehicle (Medium Rigid Truck). Whilst turning paths have been provided showing that both vehicles can pass each other at 20km/h, these turning paths fail to realise that drivers are not always capable of taking the perfect path through a corner that maintains no intersection of the clearance envelopes around each vehicle as shown in the turning paths. Whilst technically compliant, the road

network is seen to perform at a low standard of operation for this scenario. It is acknowledged that this scenario is unlikely to be frequent.

Parking and lot access:

The local street network has adopted a carriageway width of 8m. This is satisfactory for the inclusion of on-street parking in residential areas. However, one issue that has arisen is that the Developer is reticent to constructed Modified Layback Kerbing (MLBK) within the subdivision, as requested by Council, opting instead to propose barrier kerb and gutter (K&G). Council has requested MLBK because it creates capacity for the development to have optimally designed and constructed houses with appropriate driveway locations. This should be conditioned to ensure that there is no ambiguity regarding Council's insistence on the use of MLBK.

As mentioned previously, the proposed width of Road 001 does not permit two-way traffic if parking is permitted on both sides of the road. Ideally, as a Collector Road, Road 001 should have adopted a width of 11.2m. If Council will accept a 9m width pavement with indented bays for bus stops, then a no parking zone will be required for the length of Road 001 on one side. This can be conditioned appropriately once direction is received from management regarding acceptance of a 9m with Collector Road.

Summary (Roads, Access & Parking)

Summarising the road and access assessment, it is concluded that a significant portion of the proposed works will comply with Council's Design Specification D1, with the exception of the 5 non-compliances noted above. To address the non-compliances the following recommendations are made point by point respectively:

1. Classify Road 001 as a Collector Road. Submit TCD plans to Council showing appropriate arrangements have been made to accommodate on-street parking.
2. Recommend Council agree to reduced verge widths (to 4m min.) where verges abut open space.
3. Include a condition of consent requiring cul-de-sac minimum turning head diameter of 15m.
4. Classify Road 001 as a Collector Road and increase VC radii to 12m minimum at intersections.
5. Classify Road 001 as a Collector Road, increase design speed to 50km/h and make any necessary geometric changes to account for increase in design speed.

Additional recommendations as per points A & B above for items that are seen to be capable of improvement are blow:

- A. Increase the length of bridge span on Road 013 to improve vertical road geometry (increase of VC radii), reduce batter grades between abutments and the creek, and derestrict the creek flow path for flood events.
- B. Increase the minimum horizontal curve radii for the local streets in the subdivision to allow more clearance between passing vehicles on tight corners.

Transport for NSW have stated that they do not believe the development will have a significant impact on the state road networks and as such do not object to the development.

A tabulated comparison of the requirements of QPRC's D1 Design Specification and the proposed development will not be included for brevity as it is expected such a review would be overly extensive and better suited to application at SWC stage.

Section 64:

Section 64 contributions have been calculated based of the Water Directorates Section 64 Determination of Equivalent Tenements Guidelines. Appropriately, 1 ET is required for each new residential lot. As the site has not existing water of sewerage infrastructure, there is no credit

applicable to the site. However, the Jumping Creek Voluntary Planning Agreement (VPA) may provide for alternative arrangement to the typical S64 contribution scheme that Council may have agreed to by entering into the VPA with the Developer. If not, there may be potential for the applicant to negotiate the contributions with Council to some extent based on their provision of new trunk infrastructure (a new sewer pump station, sewer rising main, trunk water main). This decision will be the responsibility of Council's Utilities Branch.

<u>Item</u>	<u>No of Units</u>	<u>ETs per Unit</u>	<u>ETs</u>
<u>Water</u>			
Number of proposed lots	218	1	218
Allow for existing lot/dwelling	0	0	0
<u>TOTAL</u>			218

<u>Item</u>	<u>No of Units</u>	<u>ETs per Unit</u>	<u>ETs</u>
<u>Sewer</u>			
Number of proposed lots	218	1	218
Allow for existing lot/dwelling	0	0	0
<u>TOTAL</u>			218

Flooding:

It is noted that a significant portion of comments addressing flooding control from Council's Design Specification D5 have been covered under stormwater comments previously in this report.

The NSW Floodplain Development Manual states:

- a. "...flood prone land is a valuable resource that should not be sterilised by unnecessarily precluding its development..."
- b. "The policy provides for...a merit based approach to selection of appropriate flood planning levels (FPLs). This recognises the need to consider the full range of flood sizes, up to and including the probable maximum flood (PMF) and the corresponding risks associated with each flood, whilst noting that with few exceptions, it is neither feasible, nor socially or economically justifiable to adopt the PMF as the basis for FPLs. FPLs for typical residential development would generally be based around the 1% AEP flood event plus an appropriate freeboard (typically 0.5m); councils to be responsible for the determination of appropriate planning and development controls, including FPLs..."

The most recent Queanbeyan flood study, had not been adopted by Council at the time the subject DA was lodged. As such, any information relating to flooding that may have been provided by Council would have been in accordance with Council's DCP and also in accordance with the previous flood study. As such, to avoid moving the goal post, it would seem reasonable and appropriate to continue to assess the application based on advice already provided.

For typical residential development, Council has adopted an FPL based on the 1%AEP event plus 0.5m freeboard. This is stated in the DCP and is also in accordance with what the Floodplain Development Manual indicates is normal.

It is noted that the development is typical residential development and does not contain any at-risk developments such as aged care. Each resultant lot will be able to permit the construction of a dwelling at or above the FPL as determined by Council based on the previous Queanbeyan Flood

Study. The Developer has asserted that the PMF level for the site is approximately 585m. Development Engineering have checked this based off the previous Queanbeyan Flood Study using river station 6660 and found the PMF level likely to be 585.2m AHD. Therefore, no regions of the development would likely be isolated due to flooding of the Queanbeyan River. This can be confirmed by reviewing the grading plans and the road long-sections as submitted for review by Spiire.

A TUFLOW hydraulic model was created by the Developer to determine the existing flooding conditions of the site with existing terrain. The model was compared with a RORB catchment analysis with good correlation of results (within 6% of catchment flows). The TUFLOW model was revised to incorporate post development terrain to determine proposed flooding conditions. The analysis showed that there would be some increase to 1% flood levels upstream of the bridge at the confluence of the creeks but that this was limited to within the footprint of the development. The localised Q100 flooding due to the creeks has been detailed on Drawing 305492 CA655 Rev A by Spiire. This shows that no lots or roads within the development are isolated by this flood. As such, it is considered that the localised increase in 1% flood level within the development site may be acceptable as it does not impact upon properties upstream or downstream.

In summary, Council is responsible for determining the FPL and planning controls. The 1% AEP + 0.5m has been deemed appropriate for this use and can be considered to be reasonable based on the guidance of the NSW Floodplain Development Manual. The PMF has not historically been used to control development, though, if considered at a level of 585.2m AHD, then access and egress to all lots and roads within the subdivision appears to be maintained.

ENGINEERING CONDITIONS

The following conditions may apply to the development:

		✓ Which is applicable
<u>Residential</u> <u>Subdivision -</u> <u>Torrens</u>	DA.06.03 (Water & Sewer Comp. Cert – Design) DA.06.12 (Subdivision Works Certificate) DA.08.03 (Site Identification) DA.08.04 (Section 138 Consent) DA.08.12 (Notice to Commence) DA.09.33 (Protection of works on public roads) DA.10.85 (Water & Sewer Comp. Cert – Construction) DA.11.01 (Application and final survey) DA.11.02 (Statement from surveyor) DA.11.03 (Water & Sewer Comp. Cert - Service) DA.11.05 (Subdivision works DLP - Bond) DA.11.06 (Separate Connections & Services) DA.11.08 (Inspections – Water & Sewer Authority) DA.11.12 (Submission from service authority) DA.11.20 (Covenant on Land) DA.11.21 (Creation of Easements – External land) DA.11.22 (Dedication to Council) DA.11.54 (Work in accordance with Eng. Specs) DA.11.56 (Submission of TCD Plans)	
	SPECIAL CONDITIONS DA.04.01 (Developer to engage Council's Utilities Branch for off-site works to existing water and sewerage infrastructure) DA.04.01 (Design of intersections with EDE. Use of comfortable deceleration rate of 2.5m/s² as per Austroads Guide to Road Design Part 4a for turning	

	lane length determination plus review on storage length for right hand turn off EDE.) DA.04.01 (Footpath to be provided on the open space side of Road 001 between bus stops.) DA.04.01 (Local Streets to implement MLBK only) DA.04.01 (Road 001 to be reclassified as a Collector Road and redesigned for 50km/h design speed and minimum vertical curve radius at intersections of 12m) DA.04.01 (Secondary site access from EDE to be gated emergency services access only). DA.04.01 (Cul-de-sac turning heads to be minimum radius of 15m) DA.04.01 (Provision of odour modelling for proposed sewer educt adjacent Greenleigh)	
--	--	--

Further information required:

See Page 1.

Engineer: D. Jol / T. Reich

Date: 30/9/21

SPECIAL CONDITIONS

Proposed wording for special conditions follows in order, as they appear above.

Works to Existing Water and Sewerage Infrastructure

The applicant is to engage Council's Utilities Branch to complete any required works to existing water or sewerage infrastructure or to make connections of new works to existing infrastructure.

Reason: To ensure that responsibility for live in service infrastructure remains with Council at all times.

Intersections with Ellerton Drive

Prior to the issuing of a Subdivision Works Certificate, the Applicant is to amend the design of intersections with Ellerton Drive to utilise a comfortable deceleration rate of 2.5m/s² or slower in accordance with Austroads Guide to Road Design Part 4A. Additionally, modelling of the storage length for the right turn lane off Ellerton Drive is to be provided to Council for concurrence.

Reason: To ensure that intersection designs comply with the relevant standards and industry best practice.

Additional Footpath on Road 001

An additional footpath must be included on the open space side of Road 001 between proposed bus stops.

Reason: To ensure safe and adequate pedestrian connectivity between public transport infrastructure.

Use of Modified Layback Kerbing on Local Roads

All local roads are to implement Modified Layback Kerbing (MLBK). Other forms of kerbing will not be accepted.

Reason: To achieve Council's desired streetscape and provide adequate flexibility for driveway location during individual dwelling design.

Redesign of Road 001 as a Collector Road

Road 001, between Ellerton Drive and the intersection with Roads 012 and 013, is to be redesigned as an 11.2m wide Collector Road in accordance with the requirements QPRC's Design Specification D1.

Reason: To improve passing clearances between cars, buses and other large vehicles such as garbage trucks as well as providing the required space for on-street parking on both sides of Road 001. Noting no parking has been provided for the park and open space area located in the central basin.

Secondary Access to Ellerton Drive

The secondary access to/from Ellerton Drive must be a gated access for use by emergency services staff only.

Reason: To minimise the number of direct access links to Ellerton Drive.

Cul-de-sac Turning Heads

Cul-de-sac turning heads must implement a minimum kerb line radius of 15m in accordance with QPRC's Design Specification D1.

Reason: To achieve satisfactory vehicle manoeuvring capacity for garbage collection services and other large vehicles.

Provision of Odour Modelling for Proposed Sewer Educt Adjacent Greenleigh

Prior to the issue of a Subdivision Works Certificate, odour modelling results for the proposed sewer educt adjacent Greenleigh are to be provided to Council's Utilities Branch for concurrence. Council's assessment of the modelling may require that the entity who holds the benefit of this consent carry out additional actions to amend any observed/foreseen odour issues. This may include, but not be limited to, actions such as dosing of the Sewer Pump Station until the development supports enough Equivalent Persons that this is no longer required.

Reason: To mitigate the risk of nuisance odour to the resident's of Greenleigh.

Queanbeyan-Palerang Regional Council - Heritage Advisory Service

Place	Jumping Creek
Issue	DA Potential impact to historic site
Contact	Jacinta Tonner

A number of sites had been identified by Navin Officer however only Machiori's Lime Kiln and Quarry have been assessed by Council and listed on the LEP heritage schedule as Item A2. Navin Officer identified the items as JCH3 and JCH4.

The site was inspected some time ago in the company of council officers and the developers, and various conservation options for the quarry and kiln were discussed at the time. The developers advised that Machiori's lime kiln and quarry were outside the area to be developed. This appears to be reflected in the plans.

As there is potential for inadvertent damage to the kiln and quarry during nearby earth works, it is recommended that a protective fence around the kiln, quarry and pathway be erected until the historic site is stabilised and made safe for public access.

Pip Giovanelli
Heritage Adviser, Queanbeyan-Palerang Regional Council
22 Sept 2021